URANIUM GIS OPERATION PROJECT OF THE *"ADRAR EMOLES 3"* RESEARCH PERMIT (AGADEZ REGION, NIGER)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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Executive Summary

Note: This Executive Summary includes the latest figures on Mineral Resources and Reserves as quoted in the 9 Jan 2023 Feasibility Study, for regulatory alignment. Other project, environmental and social information which has become available since the ESIA was developed is addressed in the ESIA Addendum (10 February 2023).

Introduction

The Canadian TSX listed company, Global Atomic Corporation (GAC), through its subsidiary Global Atomic Fuels Corporation (GAFC), owns an 80% interest in Société Miniere de DASA S.A. (SOMIDA), the remaining 20% of which is owned by the Government of Niger. GAC is proposing the development of the "Adrar Emoles 3" research permit uranium mining project.

In accordance with Nigerien legislation, in particular law n° 98-56 of 29 December 1998 on the framework law relating to environmental management, law n° 2018-28 of 14 May 2018 determining the fundamental principles of environmental assessment in Niger, and its implementing decree n° 2019- 027/PRN/MESU/DD of 11 January 2019, the project was the subject of an environmental and social impact study dated November 2020 prepared by Niger based environmental consulting firm Art & Genie, which was approved by the Ministry in charge of the Environment.

As part of an initiative to move towards compliance with the Equator Principles and the International Finance Corporation (IFC) Performance Standards, GAC retained Niger based environmental consulting firm FEED Consult to update the Art & Genie ESIA report.

Niger has significant mining potential which is largely under-exploited. Resources include uranium, oil, gold, mineral coal, cassiterite, etc. Uranium has been exploited since the 1970s and remains an important industry for the country, despite recent reductions in its contribution to GDP (down from 10.8 % in 2013 to 6 % today). To enhance the impact of mining on poverty reduction, the state introduced a provision in the mining law in 2006 that devotes 15% of all mining revenue to the communes of the regions concerned.

GAC holds six mining exploration permits for uranium and related substances. It has been present in Niger since 2007 and has an office in Niamey, a regional office in Agadez and an exploration camp at the site of the proposed mine.

The company's staff is made up of Nigerien technical staff and numbers around 50 permanent employees and several dozen temporary employees. Support services such as drilling, geophysics, analysis, consulting, transport, security etc. are procured locally.

Since arriving in the Agadez region, GAC has made a significant contribution to local development by financing actions to benefit the populations living near its exploration sites. This amounts to around 291 million CFA which has funded water supply infrastructure, food donations, an ambulance and medical equipment. In addition, SOMIDA has prioritized two key CSR programmes: training and apprenticeships for the local population; and support of local market gardening initiatives to provide agricultural training, infrastructure and irrigation.

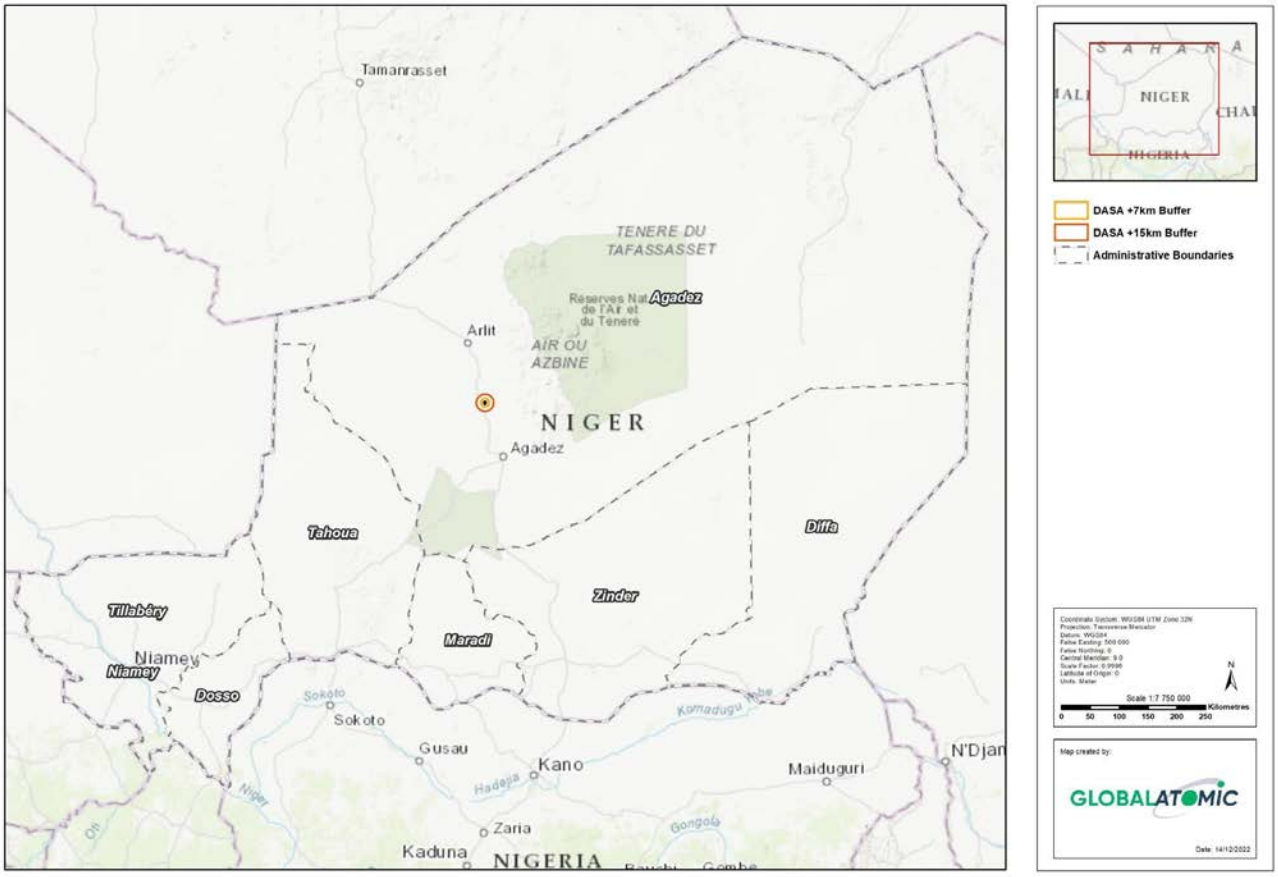
The proposed mine

The area of the exploitation permit, which is the subject of this project, covers an area of 25.01 km² located in the rural commune of Tchirozérine (Department of Tchirozérine, Agadez Region). The Project is known as the Dasa Mine. Phase I operations anticipate the underground mining of approximately 45 million pounds of uranium oxide (U_3O_8 or "Yellowcake") over a 12-year mine life. The Dasa Mine will be managed by an experienced uranium mining team previously responsible for running the nearby Cominak Uranium Mine.

The Niger Government deems yellowcake a "strategic product". Therefore, it will be transported from the mine site to the Port of Cotonou, Benin, by the Niger Government's transportation company, the National Company for the Transport of Strategic Products ("CNTPS") in their trucks and accompanied by armed security. From the point of collection at the mine, the transport of yellow cake is the responsibility of the CNTPS.

All known uranium deposits in Niger are located in sandstones and conglomerates of the Tim Mersoi basin. They are all classified as belonging to the tabular sedimentary type. The best grade and tonnage of uranium in the Adrar Emoles 3 deposit is found in the sandstone of the Tchirozérine 2 formation, the same formation that also contains the large ORANO Imouraren deposit, located about 40 km to the northwest.

The uranium in the Tchirozérine 2 formation occurs mainly as hexavalent uranium minerals in an oxidised environment. Uranophane is the most abundant mineral and is commonly associated with chrysocolla and boltwoodite. Metatyuyamunite, coffinite, chalcocite, native copper and pitchblende are also found in small amounts. The ore occurs as massive sulphide mineralisation in microcracks with galena and spalerite, and as interstitial deposits in the sandstones.



Location Map

Mineral resource and reserve estimates

The project will process 4.066 Mt of uranium-bearing ore grading 5,267 ppm U_3O_8 over a 12-year mine plan to produce 44.1 Mlb of recovered Yellowcake, with an average steady state metallurgical recovery of 94.15% (overall average 93.4%).

The Mineral Resource Estimate (MRE) (2019) is summarized below. The MRE includes Inferred Mineral Resources that are normally considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as Mineral Reserves. It is reasonably expected that most of the Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued infill drilling.

Category	Million tonnes	eU_3O_8 (ppm)	Contained eU_3O_8 (Mlb)
Indicated (Open pit)	25.59	1,711	96.5
Indicated (Underground)	0.71	3,250	5.1
Total Indicated	26.30	1,752	101.6
Inferred (Open pit)	18.93	1,357	56.6

Category	Million tonnes	eU_3O_8 (ppm)	Contained eU_3O_8 (Mlb)
Inferred	3.38	4,151	31.0
(Underground)	22.31	1,781	87.6
Total Inferred			

Source: Dasa Uranium project Phase 1 Feasibility Study, NI43-101 Technical report 9 Jan 2023

Mineral Reserves are reported in the Probable category as shown below, effective 15th Nov 2021.

Mineral Reserve Category	Run of Mine (Mt)	U_3O_8 (ppm)	U_30_8 (kt)	U_3O_8 (Mlb)
Proven Mineral Reserve	-	-	-	-
Probable Mineral Reserve	4.1	5,267	21.5	47.2
Total Mineral Reserve	4.1	5,267	21.5	47.2

Source: Dasa Uranium project Phase 1 Feasibility Study, NI43-101 Technical report 9 Jan 2023

The mine will be an underground operation with an initial life of 12 years, producing ore at a rate of 4.13 million tonnes per annum. Water consumption is calculated to be approximately 100 m^3/hr, fuel usage 2000 l/d, and processing reagents use 93 t/d. A total of 450 direct and indirect jobs will be created during construction, and 450 direct and an estimated 500 indirect jobs during operations.

Financial and economic impact of the project

The implementation of the project will generate financial and economic impacts in terms of improved revenues from the payment of taxes and royalties. This is in addition to the creation of direct and indirect employment opportunities. Ultimately, it's estimated the project will generate the following revenues expressed in millions of US dollars:

- Tax revenue: 92
- Mining royalties: 141
- Nigerien labour costs: 64
- Expenditure on corporate social responsibility (CSR): 1.2

Project activities

The main project activities are set out below.

Project phase	Activities
Development (Preparation and construction)	• Development of access roads/tracks and fencing of surface infrastructure. • Site preparation (stripping or removal of overburden) for the construction of temporary facilities. • Installation of temporary infrastructure (living quarters for the construction personnel, laydown areas etc.). • Borrow pits and quarries (operated by third party). • Construction of surface structures and equipment (employee living quarters, administrative and technical blocks, processing plant and support services including maintenance workshops/garages, warehouses, sulphuric acid plant, ponds, dams, boreholes, tailings facility, power generation system, etc.). • Development of the underground mine (ramps, galleries, ventilation holes) and support services (garage, workshops, crushing plant etc).
Operation	• Extraction of ore from underground (drilling, blasting, transport of ore to the primary crusher, conveying to surface). • Storage of inputs (chemicals including sulphur, hydrocarbon products). • Operation of workshops. • Ore storage, crushing and conveying to the plant. • Processing plant (grinding and classification, leaching, liquid/solid separation, clarification, precipitation, purification, uranate drying/calcination and smelting). • Waste rock and paste tailings backfill to underground workings. • Dewatering and storage of excess tailings from ore processing. • Loading and shipping of uranate. • Periodic maintenance of the plant.
Closure	• Dismantling of facilities. • Site clean-up. • Site redevelopment/restoration.

Water supply and efficiencies

Water for the mine and support services will be supplied from groundwater. The aquifers in the Téloua formation and Tchirozérine 2 will be the main sources. Dewatering water from the mine will also be used in processing to reduce overall abstraction. Hydrogeological surveys have also highlighted the possibility of exploiting other aquifers such as the Gezouman and Tarat.

Pump tests carried out on boreholes in the Teloua aquifer have given flow rates varying between 15 and 25 m^3/h. According to the Feasibility Study, the process plant will require 64.1 m^3/hour, the underground mine will require 30.4 m^3/h for dust suppression, drilling, cleaning, etc. and the camp 3.3 m^3/h, totaling approximately 100 m^3/hr.

Electricity supply and efficiency

Electricity supply during construction will be provided by diesel generators, including for the water supply systems. Diesel for the generators will be stored in a protected area equipped with spill kits and associated oil/water separators.

In the operational phase, power will be provided by the national power company, SONICHAR, with back-up diesel generators, battery storage and a 13.5 MW solar power plant. A 5 km connection will be built from the existing line which runs along the main road between Agadez and Arlit, to a substation within the operational area. The power line and substation are the only Associated Facilities identified for the project.

Base-case operations-phase greenhouse gas (GHG) emissions are estimated at 65,395 tonnes per annum (tpa) including 12,477 tpa scope 1 emissions and 52,919 scope 2 emissions. This assumes that most of the Project's electricity requirements will be provided by a state-owned coal-fired power station via the Nigerien national grid with a solar photovoltaic (PV) panels component and diesel back-up, and that vehicles will be fueled by diesel. There is an optimized plan to install solar photovoltaic (PV) panels linked to battery storage and back-up diesel, with the intent of providing approximately 20% of the Project's total requirement as renewable energy. This would reduce the total estimated GHG emissions to 52,871 tpa to include 21,275 tpa scope 1 emissions and 31,596 tpa scope 2 emissions. Furthermore, there is a conceptual plan to reduce the mine site power demand from 12 megawatts (MW) to 9 MW which, coupled with solar PV and battery storage, and back-up diesel, would target a reduction in GHG emissions to 43,000 tpa; a 34% reduction from the base case scenario to include 18,691 tpa scope 1 emissions and 24,422 tpa scope 2 emissions.

GHG emissions will exceed 25,000 tpa and will therefore need to be measured and reported on an annual basis in order to comply with IFC PS3. Power for the construction phase is expected to be provided via diesel fuel (vehicles and generators).

In line with IFC PS3, SOMIDA has an obligation to continuously seek and implement cost effective measures for improving efficiency in its consumption of energy, as well as water and other natural resources and material inputs. SOMIDA plans to introduce battery electric vehicles (BEV) to the underground and surface fleets over time to the extent practical.

UN Sustainable Development Goal #7 is to ensure access to affordable, reliable, sustainable and modern energy for all. According to the European Nuclear Society, 1 kg of natural uranium is equivalent to 14,000 kg of coal and enables the generation of 45,000 kWh of electricity, so the production of approximately 45 million pounds of U_3O_8 in yellowcake, after enrichment, will be transformed into 17,580,000 kg of natural uranium which replaces 246 mt of coal and generate 791,100 million kWh of electricity.

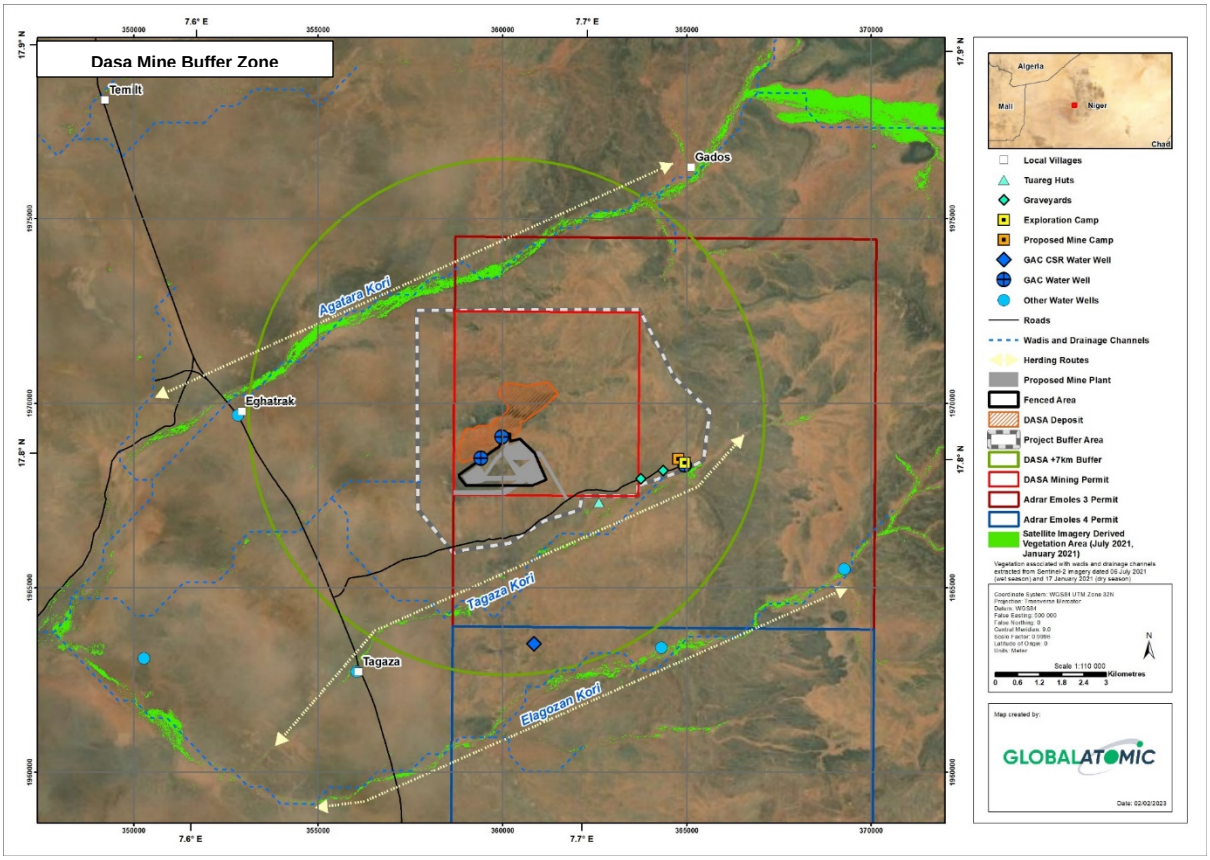
Geographical boundaries and types of impacts

Taking into account the environmental and social issues related to this type of project, three main impact zones were defined. These include the direct impact zone, the intermediate impact zone and the diffuse impact zone:

- Zone of direct impact: This corresponds to the deposit area, the exploitation permit area (a regulatory limit defined by the corners of the exploitation permit) and a radius of 15 km. This includes a 40 km^2 operational area within which areas close to surface infrastructure measuring roughly 2 km^2 will be fenced, and from which domestic animals and community members will be excluded. Within this area, disturbance will be caused to elements of the biophysical and human environment and direct and indirect impacts are assessed. This area includes the villages of Gados, Issakanane, Tagaza, Egatrak, Timelt-Abouss and Ouford.
- Intermediate impact zone: This corresponds to the zone beyond the 15 km radius. Within this zone, some positive (in terms of job creation, economic development, health, education, water supply, etc.) and negative (emissions) impacts of the project will be felt or perceived.
- Diffuse impact zones: this is a large zone in which the project's impacts will be perceived on a regional or even national scale, particularly in relation to the improvement of tax revenues. This includes consideration of any potential transboundary effects associated with the mine, for example airshed and catchment considerations. Other than the overall contribution of the project to greenhouse gas levels in the atmosphere, no potential transboundary effects have been identified.

Stockbreeding is the primary economic activity of the inhabitants of the region. It is carried out by all sectors of the population, irrespective of ethnic group, gender or social category. Except for some large-scale stock farmers, the herds are family capital managed on behalf of the family members by the head of household. Family stock farming involves several species of animals including goats, sheep, donkeys, and camels. In the Project area, it is understood that the east-northeast to west-southwest trending koris are used as transit or nomadic herding corridors on a limited basis, in connection with the “Cure Salee”, a meeting of Kel Tamashek (Tuareg) from around the region which celebrates the end of the rainy season and is held at the Town of In-gal, located approximately 150 km south-west of Dasa.

Crop farming is an important activity that is carried out by a small number of men and women in the Project area. This activity is carried out in the main valleys, is irrigation-based and takes place practically all year round. The market gardens are laid out on both sides of the koris. The main crops are lettuce, bell peppers, cabbage, carrots, squashes, onions, potatoes and alfalfa. In the Project area, FEED Consult (2022) found approximately 7.3 ha under cultivation within an approximate 15 km radius around the Project site, the closest being the market gardens of Elagozan, approximately 5 km to the south.



In the Project vicinity, the vast majority of the population lives in villages, of which Eghatrak and Tagaza are nearest to the Project site, more than 5 km to the west. The area surrounding the mine site is sparsely populated, with small clusters of huts occupying land along the koris. Settlement within the koris is limited to families with small groups of animals on an approximate 200-300 m spacing. The inhabitants typical live within the kori during April to June and September to December. During the wet season from July to September and winter season from December to March, the inhabitants move to the edges of the koris where it is dryer and warmer respectively. The nearest settlement to the Project site is a collection of three huts approximately 1.5 km to the east-southeast. There are not believed to be any permanent residents within the 40 km^2 buffer area around the site.

Cumulative impacts have been considered, which includes other industries or development projects which might be taking place in the area and which may add to pollution loads or stresses on the environment and communities or enhance positive effects such as economic development.

Initial state of the environment

Relief

The relief of the study area is heterogeneous. The setting is characterised by the presence of the Aïr massif to the east, from which koris (ephemeral channels) flow to the extensive rocky plateaus and sandy plains to the west.

Climate

The climate of the Agadez region is tropical and sub-desert, characterised by a very high level of aridity. There are two main seasons, a long dry season from November to May and a very short rainy season from June to September. These are further subdivided into a dry and cold period (November to March), a hot season (April to June), a rainy season from June to September, and an intermediate transition period (September to November).

According to the 10-year record from the nearby Tchirozérine station, seven years out of 10 have recorded rainfall greater than 100 mm and three years out of 10 have rainfall less than 100 mm. The maximum recorded during the period is 271.6 mm and the minimum 48.8 mm. Maximum temperatures range from 26 to 42 °C and minimum temperatures from 12 – 26 °C.

Soils

Soils are relatively poor, saturated and sometimes overexploited and their agricultural development requires significant amendments (mineral fertilisers and organic matter).

The project area is located in an area of Quaternary deposits composed of sands, gravels and clays.

Geology

The geology of the project area is marked by two major groups: the basement (Air crystalline massif) which occupies the eastern part of the Agadez region and the sedimentary basin (Tim Mersoi basin) which occupies the western part of the region.

The basement is formed of crystalline rocks of Precambrian age and granite intrusions. Volcanic events and tectonic movements have shaped the region. The Tim Mersoi Basin is essentially made up of clay, clay-sandstone and sandstone sequences of Carboniferous and Lower Cretaceous ages. This basin forms the eastern part of the larger Iullemmeden basin located south of the Hoggar mountains.

Within the perimeter of the permit, sedimentary formations outcrop, mainly Carboniferous and Permo-Triassic. These contain the uranium mineralisation of the Akouta and Arlit deposits.

Water resources

The surface waters are made up of temporary streams known as koris and semi-permanent streams. The koris are seasonally flowing valleys that drain the western slopes of the Air massif and provide limited recharge to groundwater.

The hydrogeology of the region consists of a multi-layered aquifer system comprising the Guezouman, the Tarat and the Izégouandane aquifers in the eastern part of the In-Azaoua-Arlit fault. In the western part, these are overlain by a permeable horizon which hosts the Tchirozérine and Téloua aquifers.

Abstraction in the area is insignificant overall, despite abstractions by companies to the southwest of the site. Monitoring in 2013, 2018, and 2022 showed no change in the aquifer levels in the area. Rainfall recharge is thought to be low, based on aquifer levels over time, and there is thought to be limited connectivity between the aquifers based on the same data. Major faults may provide increased transmissivity.

Hydrochemistry

Both physico-chemical and bacteriological analyses were carried out on the water samples from three boreholes and compared to WHO standards. All results were below limit values apart from one exceedance at one borehole for fluoride.

Air quality

Baseline monitoring of air quality covered fine and coarse particulate matter (PM), heavy metals in aerosols and black carbon. PM_{10} and $PM_{2.5}$ were monitored in four locations and the results compared to WHO standards. $PM_{2.5}$ levels were exceeded at two sites and PM_{10} at four sites. PM_{10} concentrations vary with windspeed while $PM_{2.5}$ concentrations are more consistent.

Metals levels in the $PM_{2.5}$ fraction are within WHO/EU limits with the exception of chromium. Metal levels in the PM_{10} fraction show no exceedances. Exceedances are thought to be due to the desert environment, harmattan winds and the factories in Agadez, including the Sonichar power station at Tchirozérine.

The area is subject to sandstorms that often originate in the Sahara, exacerbated by sparse vegetation cover. Approximately 70% of the total area of the region has a *"very high"* level of vulnerability. Sandstorms affect the movement of people with disruption to visibility.

Dust deposition monitoring was not carried out, as due to the above, any baseline readings would exceed any recognised standards for dust deposition. Sensitive receptors are generally located several kilometers from the mine site. For this reason, air quality modelling has not been carried out, but mitigation measures are built into project procedures.

Noise environment

Ambient measurements were carried out at five sites based on the direction of the prevailing winds. The values obtained vary from 29.1 to 57.9 dB. WHO Environmental Noise Guidelines (WHO, 1999) are 55 dB during the day and 45 dB at night. Average values do not exceed WHO standards; there are no current noise generating activities within the permit area.

Background radiation

The Project area is located in a region of elevated background radiation due to the natural presence of high concentrations of uranium in the rocks and soils. Key exposure (dose) routes for workers and local residents are based on external atmospheric radiation, external radiation received from the ground, inhaled dust and gases, and ingestion of radionuclides on foodstuffs and contained in drinking water.

The radiological baseline was measured as follows:

- Measurements of external exposure dose rates at several points in and around the uranium deposit area and along two axes through the site;
- Measurements on soil samples; and,
- Measurements on water samples from all the supply points (wells and boreholes) of the villages and camps within a radius of 20 km of the deposit. External exposure dose rate measurements were also carried out where water samples were taken.

Based on the results of recorded external exposure dose rate measurements, the annual natural external exposure dose that would be received by a member of the public living in the area varies between 2.20 mSv (with a continuous dose rate of 250 nSv/h) and 0.53 mSv (with a continuous dose rate of 60 nSv/h).

The mass concentrations of uranium was measured in the soil samples; results vary from 0.99 mg/Kg to 4.28 mg/Kg.

In the water samples, the overall alpha activity concentrations are high in three wells (Gani, Tilkin, Adelay) and two boreholes (Base camp, Taden Sikiret), being greater than the WHO recommendation of 0.50 Bq/l/. The same is true for the overall beta activity concentration in the Taden Sikiret borehole, compared to the 1 Bq/l recommended by WHO. Apart from Adelay, the water points with high radiological levels are on the same Base camp-Taden Sikiret alignment.

The results of the ambient dose rate measurements are highly variable and reflect the heterogeneous nature of the terrain. They provide a good baseline, but in order to complement them and also to comply with the requirements for radiological environmental monitoring, GAC established four dosimeter stations to monitor alpha, beta, gamma and radon on a quarterly basis for a period of 12 months. An additional assessment of potential exposure will be calculated and compared with exposure rates elsewhere to Naturally Occurring Radioactive Materials (NORM) and health-based dose rates.

Biodiversity

A desktop-based biodiversity GIS review and Critical Habitat (CH) Screening Assessment were undertaken in 2021, with the aim of further aligning the Project with the requirements of IFC PS6, building on information and fieldwork provided by the 2020 ESIA.

The CH screening included identification and initial assessment of biodiversity features present within, or potentially impacted by the development of the project and was conducted in accordance with the requirements of the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC PS6) and the accompanying Guidance Note 6 (GN6).

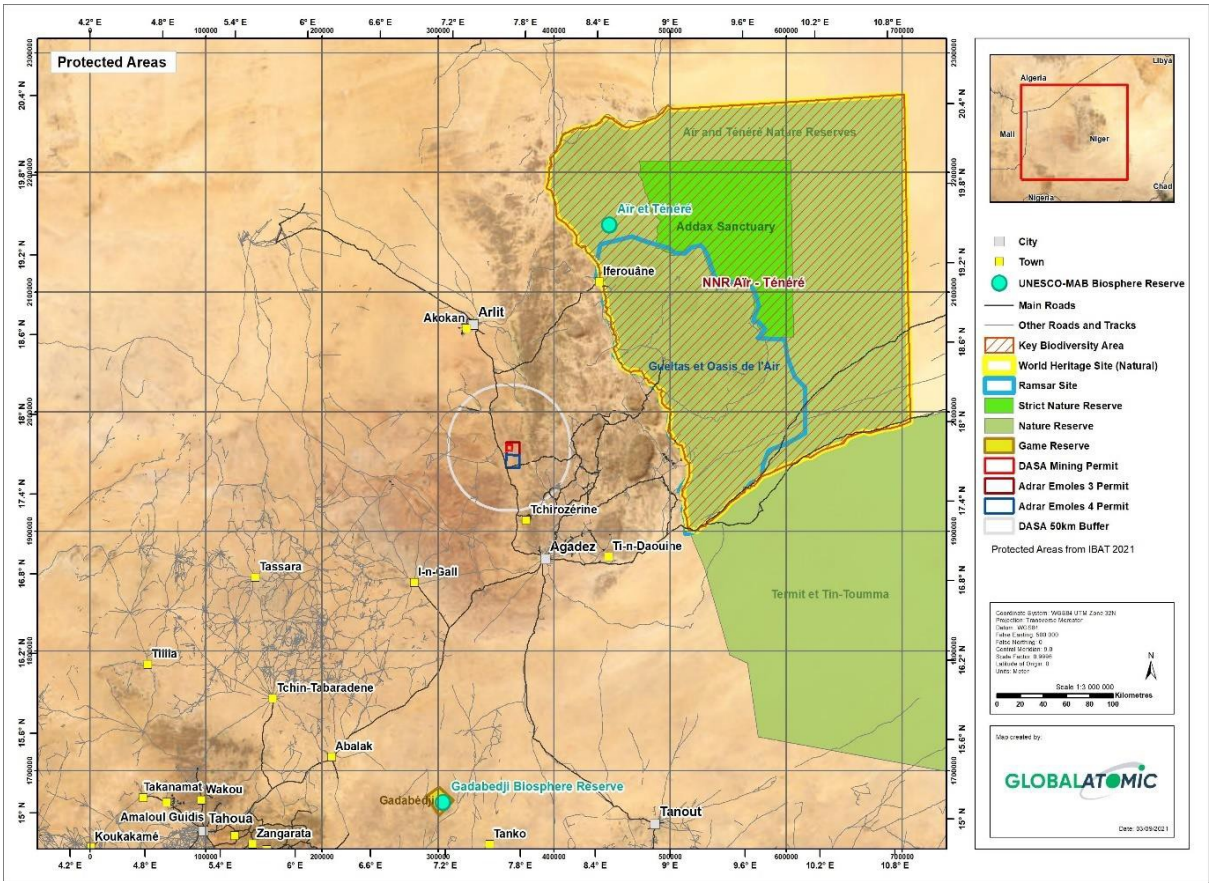
A “Landscape Study Area” (LSA) was identified for broad screening of biodiversity features which includes the DASA Project area, the entirety of the Adrar Emoles III and IV Exploration Permit Areas and any additional areas within a 50 km buffer around the Project location The assessment used spatial data, existing project related reports, publicly available biodiversity data, and the results of searches from internationally recognised biodiversity data sources (including the Integrated Biodiversity Assessment Tool (IBAT)).

IFC PS6 requires the identification and assessment of “Modified” or “Natural Habitat”; either of these may also be identified as “Critical Habitat” if they support certain high biodiversity values.

Seven legally protected areas have been identified during biodiversity studies, but all are understood to be more than 100 km from the Project site. The sites are:

- Aïr et Ténéré MAB UNESCO World Heritage Site;

- Aïr and Ténéré Natural Reserve UNESCO World Heritage Site;
- National Nature Reserve of the Aïr and the Teneré, Key Biodiversity Area and Important Bird Area. This shares the same boundary as the Aïr and Ténéré Natural Reserve;
- Gueltas et Oasis de l'Aïr Ramsar site;
- Addax Sanctuary, an IUCN Management Category Ia site and Strict Nature Reserve within the Aïr and Ténéré Natural Reserve;
- Termit et Tin-Toumma Natural Reserve; and,
- Gadabedji MAB UNESCO designation.



Legally Protected and Internationally Recognized Areas (Source: TEC/AGC Report 2021, IBAT 2021

The CH screening assessment was completed using a range of desktop sources. Thirteen species of conservation concern listed under the IUCN Red List of Threatened Species were conservatively assessed as having the potential to occur within the LSA based on overlap with the species IUCN distribution and/or the likely presence of suitable habitat. Of these species, three nomadic/ wide ranging mammals, North-west African Cheetah, Addax, and Dama Gazelle, have the potential to qualify the area as Critical Habitat. This potential required further field assessment which was carried in the dry and wet seasons (2021-2022).

Based on GIS spatial assessment, desktop CH screening, historical and current fieldwork

there is no critical habitat in the project's area of influence; defined as a 50 km circle around the mine site under IFC PS6 IBAT Report criteria.

Field surveys and GIS analysis confirmed that areas of perennial vegetation exist in association with koris and in lowland areas. The extent of vegetation cover is similar across both the dry and wet seasons, suggesting areas of permanent (likely woody) vegetation. The study carried out in the radius of 7 km, 15 km and surrounding areas established the baseline situation with regard to vegetation. A total of 29 species were recorded in and around the permit area in the dry season, including 17 herbaceous and 12 woody; whereas in the wet season 38 species were recorded, including 25 herbaceous and 13 woody. No species of conservation concern listed in the IUCN Red List have been identified from previous reports.

During the dry season, a total of 54 animal species were observed, including 34 birds, 13 mammals and 7 reptiles. These included Dorcas Gazelle and Aoudad which are classified as Vulnerable on the IUCN Red List, and the Spiny tailed lizard which is classified as Near Threatened.

Bird species included the Lappet-faced Vulture and the Egyptian Vulture which are classified as Endangered on the IUCN Red List, and appear in CITES Appendix II and CMS Appendix II/I for the Egyptian Vulture and CMS Appendix I for the Lappet-faced Vulture.

The rainy season survey identified 49 animal species including 34 birds, 10 mammals and 4 reptiles. Virtually the same mammals were recorded during the two missions. The only difference is the distribution, due to the abundance of grazing during the wet season.

The field surveys confirmed the following species of conservation concern to be present in the study area:

- Dorcas Gazelle *Gazella dorcas* (VU);
- Aoudad *Ammotragus lervia* (VU);
- Egyptian Vulture *Neophron pernopterus* (EN);
- Lappet-faced Vulture *Torgos tracheliotos* (EN); and,
- Tawny Eagle *Aquila rapax* (VU).

A full CH assessment has not been completed to determine if there are any CH qualifying species, but all five species are noted as unlikely to trigger CH due to being wide ranging species. High level mitigation measures for the vultures/raptor are included in the Biodiversity Management Plan.

Baseline surveys have not confirmed any alien invasive species in the study area. Future surveys will continue to monitor for the presence of alien invasive species, and procedures will be put in place to prevent future accidental spread of such species.

An ecosystem services assessment was carried out, focusing on the different uses of vegetation (for food, medicine, fuel wood, grazing, etc.) and animals by local communities. This revealed that despite the food, economic, ecological, pharmaceutical, etc. services it provides for local communities, biodiversity is now threatened in the project area. The main causes are from human actions (degradation and/or destruction of wildlife habitat, overexploitation of animal and plant resources, etc.) and climate change

(decrease in rainfall, recurrent droughts, poor distribution of rainfall, extreme temperatures). This results in a decrease in plant and animal diversity and consequently in ecosystem services, which could lead to increased food and nutritional insecurity, increased poverty, and a decline in pastoral activities.

Population

The population of the Agadez region was estimated at 487,620 inhabitants in the 2012 general population and housing census. Based on the region's natural growth rate (3.6% per year), this population is estimated to be 669,004 in 2022, 51% male and 49% female.

During the study, it was established that 14,830 people live in the villages 15 km from the centre of the deposit. Approximately 10,000 of these are permanent residents, compared to 4,830 seasonal residents. The villages are also more populated during the hot dry season. There are no permanent residents within the 40 km^2 operational zone around the core area or the fenced 2 km^2 area. This population of Tuareg origin is made up of several tribes belonging to the Kel Ewey Confederation. These tribes belong to three chiefdoms: Sultan, Anastafidat and Imakitan, which range beyond the Agadez and Timia communes. The nomadic Tuaregs have historical connections with their natural environment and temporarily migrate between regions and between departments in search of pasture and seasonal jobs. It is mainly the men who travel while the women stay in their village. The social group hierarchy remains very much intact; the elders and opinion leaders react, talk, and make decisions on behalf of the group.

The Tuareg, or Kel Tamashek, are recognised as an indigenous people by UNHCR’s World Directory of Minorities and Indigenous Peoples. The greatest number of Tuaregs, around one million, live in Niger, mostly south and west of Air Massif in the vicinity of the Dasa project. Tuareg society is highly stratified and consists of several castes including nobles, a free but subordinate group, a religious group and workers, who help tend the palm groves and vegetable gardens. These sources acknowledge that many Tuareg, although having suffered marginalization in the past, now live interspersed alongside other ethnicities throughout the country and have a long history of coexistence with these other groups. In the region of the project, the population and administrative structures are dominated by Tuaregs, and form a key part of the workforce at the uranium mines in Arlit where they are represented in managerial, semi-skilled and un-skilled positions. The Prime Minister of Niger from 2011 to 2021 was a Tuareg from the Agadez region.

Socio-economic activities

In the area of the Adrar Emoles 3 research permit, livestock breeding is the main activity of the population, due to the abundance, availability and accessibility of grazing land as well as the presence of water points in the area, which are used daily. Livestock consists of camels, donkeys, horses, sheep and goats, with a total of around 15,000 animals. The water infrastructure includes pastoral wells, traditional wells, boreholes and temporary ponds. Despite its vast size, the region is subject to a reduction in pastoral areas and fodder resources due to the exploitation of subsoil resources and increased agriculture.

The Agadez region has significant potential for market gardening and fruit growing, particularly in the many valleys of the Aïr. In the project area, only market gardening is practised by the population in the valleys along the koris. The estimated area under cultivation is 7.29 ha in 2020/21. The main crops are vegetables, lettuce, peppers,

cabbage, carrots and watermelons. The crops are partly consumed locally and the rest sold at the markets of Arlit, Tchirozérine and Agadez. They provide substantial income to local communities, enabling them to improve their livelihoods.

In the permit area, commercial activities are mainly based on small-scale trade, in particular the sale of livestock products, market gardening, woodcutting and charcoal making. There are two main markets in the main towns of the communes (Dannet and Tchirozérine) as well as many others in the villages of the area such as Tindawene, Azzel, etc. in the commune of Tchirozérine.

Archaeology and cultural heritage

Interviews with local communities around the Adrar Emoles 3 exploration licence, coupled with site visits, have helped to highlight the existence of cultural and archaeological heritage in some villages in the area. These include fossil dinosaur tracks, prehistoric rock carvings, and historic and cultural ruined mosques and old cemeteries. Only the Dabous giraffe is known worldwide. It is managed by the community and has a warden guide. Other sites are known by the communities but are not visited and have no management mechanism except for the Gani (Mouloud) cultural space. The state of conservation of these sites is acceptable despite some natural (erosion, wind) and human threats of denaturation. The ancient cemetery of Tagaza, two newer grave areas and the site of the ancient mosque of Eghatrak, are located within 7 km of the centre of the deposit. Apart from Gani (Mouloud) in Tagaza, all other sites are located within 15 km of the site. A procedure for chance finds is in place.

Access to water and sanitation

In the permit area, more than 150 water points of all categories were identified in the commune of Tchirozérine and 83 modern water point equivalents in Dannet. Access to sanitation is poor, with the majority of households in the region (54%) having no provision, 20% having basic services and only 10% having optimal facilities.

Access to health services

The health infrastructure identified in the commune of Tchirozérine includes a SONICHAR hospital, one functional CSI, 13 functional health posts, one public pharmacy, and one private pharmacy. In the rural commune of Dannet, there is an integrated health centre and 12 health posts.

The types of recurrent diseases include dermatitis, chickenpox, and vector-borne diseases such as malaria and yellow fever, and food- and water-borne diseases such as cholera, diarrhoea and gastroenteritis. The ratio of doctors to population in 2019 in the region is 1:14,419 (WHO standard 1:10,000). The ratio of nurses to population is 1:1,529 (WHO standard 1:5,000). The number of women of childbearing age per midwife is 1:6,729.

Education

The commune of Tchirozérine has four secondary schools with 1,071 pupils. At the primary level, there are 91 primary schools, including 67 "traditional" schools, six "community" schools and two "bilingual" schools (French-Tamasheq), 15 Franco-Arabic schools and one public school. These schools have a total of 7,801 pupils, including 3,502 girls (45%) and 4,299 boys. In addition, this commune has 34 functional literacy centres

for a total of 850 learners. These centres operate with the support of partners such as UNICEF and AFRICAIRE. The rural commune of Dannet has six General Education Colleges (CEG) and 30 primary schools for a total of 984 primary school pupils, including 536 boys and 448 girls.

Gender-based violence assessment

Stakeholder interviews undertaken identified child labuor on gold panning sites, sexual abuse, rape, sexual assault, unwanted pregnancies, physical violence, marital violence, child marriage, psychological violence and economic violence as potentially occurring in the region. According to the results of the survey, the types of GBV that could be encountered at the project site are sexual abuse, physical violence, exploitation, child marriage, sexual assault and psychological violence. GBV clauses will be integrated into contracts for the project.

Policy, legal and institutional framework

Policy framework

The national policy framework for the project includes key Nigerien legislation as follows:

- National Policy on Environment and Sustainable Development, 2016;
- National Environment Plan for Sustainable Development (PNEDD),1998;
- Sustainable Development and Inclusive Growth Strategy (SDDCI Niger 2035);
- Economic and Social Development Plan (PDES) 2022-2026;
- National Spatial Planning Policy: 2014;
- Framework document of the National Occupational Safety and Health Policy 2017; and,
- National Mining Policy (PMN 2020-2029): 2020.

International legal framework

The international legal framework is made up of the international texts signed and ratified by Niger and which can be activated within the framework of the activities of the project.

Title of the agreement	Signature date / entry into force	Date of signature / ratification by Niger
Convention on the World Cultural and Natural Heritage	16 November 1972	23 November 1974
Convention on Biological Diversity	11 June 1992 / 24 March 1994	11/06/92 / 25/07/95
International Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification	14 October 1994 / 19 January 1996	14 October 1994 / 19 January 1996

Title of the agreement	Signature date / entry into force	Date of signature / ratification by Niger
United Nations Framework Convention on Climate Change	11 June 1992 / 24 March 1994	11/06/92 / 25/07/95
Stockholm Convention on the Protection of Human Health and the Environment from Persistent Organic Pollutants (POPs)	22 May 2001 / 17 May 2004	Niger joined on 12 April 2006
Bamako Convention on the Ban of the Import into Africa of Hazardous Wastes and on the Control of Transboundary Movement and Management of Hazardous Wastes products in Africa.	30 January 1991 / 20 March 1996	30 June 1991 / 27 July 1996
The Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam	10/09/1998 / 24/02/2004	Accession by Niger on 16/02/2006
Work Environment (Air Pollution, Noise and Vibration) Convention No. 148	20 June 1977	28 July 1979
Convention No. 155 on Occupational Safety and Health	22 June 1981	Ratified by Niger and entered into force 11 August 1983.
Convention No. 161 on occupational health services	25 June 1985	Ratified by Niger and entered into force on 17 February 1988
Convention No. 187 on the Promotional Framework for Safety and Health at Work.	15 June 2006	Ratified by Niger and entered into force on 20 February 2009
Equal Remuneration Convention No. 100	29 June 1951 / 23 May 1953	9 August 1966 / 9 August 1968
Convention No. 102 concerning Minimum Standards of Social Security	28 June 1952 / 27 Apr 1955	9 August 1966 /9 August 1968
Convention 138 on the minimum age for employment	26 June 1973 / 19 June 1976	4 December 1978 / 4 December 1980

Title of the agreement	Signature date / entry into force	Date of signature / ratification by Niger
Worst Forms of Child Labour Convention No. 182	17 June 1999 / 19 Nov. 2000	23 October 2000 / 23 October 2001

IFC Environmental and Social Sustainability Performance Standards

IFC's PS are an integral part of its Sustainability Framework and outline its strategic commitment to promoting sustainable development. They are intended to provide guidance to clients in identifying risks and impacts and are designed to help them avoid, mitigate and manage risks and impacts in order to operate in a sustainable manner. In this regard, they also cover the clients' obligations to collaborate with stakeholders and communicate information about project-level activities.

Of these eight standards, all are applicable to the project.

Equator Principles

The Equator Principles (EP) are intended to provide a common basis and framework for financial institutions to identify, assess and manage environmental and social risks in project finance. There are ten (10) principles that apply globally and across all business sectors. The table below outlines how the EP will be applied to the project.

Principle	Applicability to the project
EP1: Review and Categorisation	As this project has major potential impacts, it is classified as category A in accordance with this principle.
EP2: Environmental and Social Assessment	In order to comply with the provisions of this principle, the 2021 ESIA has been carried out and assessed the environmental and social risks and impacts associated with the project and to propose mitigation measures. Also, specialised studies have been carried out on biodiversity, cultural heritage, air quality, climate change, impacts on human rights (e.g. GBV issues).
EP3: Applicable environmental and social standards	The ESIA was carried out in accordance with the national texts in force on the subject and the provisions of the Equator Principles which in turn refers to the IFC PS.
EP4: Environmental and Social Management System (ESMS) and Equator Principles Action Plan (EP Action Plan)	In order to comply with the provisions of this principle, an Environmental and Social Management Plan (ESMP) has been drafted. It includes measures to manage the environmental and social risks and impacts that will be associated with the implementation of the project.
EP5: Stakeholder participation	As part of the ESIA a stakeholder consultation process was carried out (administrative, communal and customary authorities, local populations, etc.) and enabled their opinions, concerns and recommendations to be taken into account in relation to the implementation of the project. In

Principle	Applicability to the project
	addition, a Stakeholder Engagement Plan was drawn up.
EP6: Grievance mechanism	In order to bring the project into line with this principle, a Complaints Mechanism has been developed which will allow anyone who feels aggrieved by the implementation of the project to register their complaint so that it can be dealt with in a fair and equitable manner.
EP7: Independent review	The project to exploit the deposits of the Adrar Emoles research permit will be subject to this obligation in order to comply with the provisions of these principles.
EP8: Covenants	An ESAP or EPAP will be agreed between the financing parties and the company and implemented over the course of the construction and operation of the project, and audits will be carried out by an Independent Environment and Social Consultant (IESC) appointed by the project Lenders.
EP9: Independent Monitoring and Reporting	The Niger Government through the National Environmental Assessment Office will carry out periodic evaluations (every 6 months) of the implementation of the ESMP. In addition, the IESC appointed by the Project Lenders will conduct periodic evaluations during the tenure of their Loans.
EP10: Reporting and Transparency	The project that has undergone an ESIA in accordance with the provisions of PS 1 will take all necessary steps to comply with the provisions of this principle.

International Atomic Energy Agency standards

Niger is a member state of the International Atomic Energy Agency (IAEA) which establishes safety standards and measures for protection against ionizing radiation. The following references are applicable for strategies and protocols for the location, design, construction, operation and closure of facilities necessary to protect the workforce, the public and the environment from the impacts of radioactive waste resulting from mining and crushing of ores (including tailings, waste rock, mineralized waste rock, process water, leach solutions, precipitation, seepage from stockpiles, and uranium mill areas):

- Basic Safety Principles for the Protection of People and the Environment (IAEA, 2006);
- International Basic Standards (IAEA, 2014); and,
- The Safety Guide (IAEA, 2002).

In addition, the IAEA (2012) establishes the Regulations for the Safe Transport of Radioactive Material, which includes the requirement to establish a radiation protection programme for the transport of radioactive material to ensure safety and to protect

persons, property and the environment from the effects of radioactivity in the transport of radioactive material.

The requirements of these documents will be implemented through site specific occupational health and safety procedures and associated monitoring of workplaces.

National legal framework

Many national laws will apply to the project, ranging from the Constitution to laws on public utility, environmental management, cultural heritage, forestry, mining, labour, environmental assessment, public health, water and the control of hazardous materials and activities.

A number of Ministries are involved in aspects of the project, namely Ministry of Environment and Combating Desertification; Ministry of Employment, Labour and Social Protection; Ministry of Public Health, Population and Social Affairs; Ministry of Mines; Ministry of Water and Sanitation; Ministry of the Interior and Decentralisation; High Atomic Energy Authority (HANEA); Nuclear Safety and Regulation Authority (ARSN); and the National Environment Council for Sustainable Development.

Civil society organisations

Civil society organisations with an interest in the project include:

- Association Nigérienne des Professionnels en Études d'Impact Environnemental (ANPÉIE): a non-political, non- profit organisation formed in 1999 to promote the inclusion of environmental concerns in development policies, plans, strategies, programmes and projects;
- Groupe de Réflexion et d'Action sur les Industries Extractives (GREN): a network of Nigerien civil society organisations working in the extractive sector to promote good governance and environmental protection;
- Réseau des Organisations pour la Transparence et l'Analyse Budgétaire (ROTAB, Publish What You Pay Niger): a collective of several associations, NGOs and trade unions in Niger that collaborate to actively participate in the global Publish What You Pay campaign; and,
- Association des Femmes du Secteur des Industries Extractives du Niger (AFSIEN): promotes women in the extractive sector and improving the living and working conditions of women working in extractives or living on extractive sites.

Assessment of impacts

The approach used to identify the impacts on the environment is based on:

- Description of the project, which identifies the activities which can be sources of impacts during different phases;
- Description of the environment, which provides an understanding of the environmental and social context of the project, and consultations with stakeholders, which identify concerns associated with the project; and,
- The interrelationship between the impact-causing activities and the components (biophysical and human) of the environment likely to be affected by the project activities.

Activities causing impacts

Impact-causing activities are defined as all activities that are likely to modify positively or negatively the components of the biophysical and human environment. This covers Construction, Operation and Closure. Likely activities are listed below.

Construction: Construction/development of access roads/tracks, site preparation for temporary equipment, installation of temporary infrastructure and equipment, borrow pits and quarrying (sand, gravel, laterite, etc.), movement of construction equipment and the supply of construction materials and equipment to the site, preparation of the rights of way for permanent project facilities, construction/installation of surface works and equipment, underground mine development and support services, maintenance of fixed and mobile equipment on site, fuel storage and supply, recruitment of labour, and operation of the base camp.

Operations: Recruitment and presence of the workforce on site (owners team, contractors and subcontractors), extraction of ore from underground (drilling, blasting, transport of ore to the primary crusher, conveying to surface), supply truck movements, storage of reagents (chemicals including sulphur, hydrocarbon products, etc.), operation of workshops (maintenance of machinery and equipment) and the acid plant, ore storage, crushing and conveying to the plant, ore processing, dewatering and storage of tailings as cemented backfill or on surface, storage of effluent in ponds, construction of new ponds, borrow pits for laterite and gravel, loading and shipping of uranate, periodic maintenance of the plant, movement of project and subcontractor equipment.

Closure: Dismantling of facilities, site clean-up, site redevelopment/restoration, movement of machinery.

Impact assessment methodology

The methodology for assessing impacts is based on the nature of the impact (positive or negative), its intensity, extent and duration.

The value of an environmental component expresses its relative importance in the environmental and social context of the area concerned. Its evaluation is based on the appreciation of its intrinsic environmental value as well as its social value. The social value assesses the popular or political will to preserve the integrity or the particular character of an environmental component.

The degree of disturbance expresses the extent of the modifications that affect the characteristics of an environmental component. It can be low, medium or high.

Significance of impact is determined by combining the intensity, scope, and duration of impact, taking into account the value of the receptor and degree of disturbance. The significance is classified as major, medium, or minor.

Impact assessment

This is a descriptive and qualitative assessment, not based on numerical or predictive modelling. The following table summarises the results of the impact assessment.

Component	Intensity	Scope	Duration	Significance (I+S+D)
Construction phase				
Soil resources	Medium	Limited	Short	Minor
Soil pollution	Medium	Local	Short	Medium
Air quality	Medium	Local	Short	Medium
Water resources	Medium	Local	Short	Medium
Fauna	Medium	Specific	Medium	Medium
Flora	High	Specific	Medium	Medium
Landscape	Medium	Specific	Short	Medium
Worker H&S	High	Local	Short	Medium
Jobs and economy	High	Regional	Medium	Major +
Noise & vibration	Medium	Specific	Short	Medium
Grazing	Medium	Specific	Long	Medium
Traditions & culture	Low	One off	Short	Minor
Archaeology	Low	Specific	Medium	Minor
Operations				
Soil resources	Medium	Local	Long	Medium
Air quality	Medium	Local	Long	Medium
Water resources	Medium	Local	Long	Medium
Water pollution	Medium	Local	Long	Medium
Fauna	Medium	Specific	Long	Medium
Flora	Medium	Local	Long	Medium
Landscape	Medium	Local	Long	Medium
Health & Safety	Medium	Local	Long	Medium
Jobs and economy	High	Regional	Long	Major +
Noise & vibration	Medium	Local	Long	Medium
Grazing	Low	Local	Long	Medium
Traditions & culture	Medium	Local	Long	Medium
Archaeology	Low	Local	Long	Medium
Closure				
Soil during closure	Low	One-off	Short	Minor
Soil after closure	High	One off	Long	Major +
Air during closure	Medium	Local	Medium	Medium
Air after closure	Medium	Local	Long	Medium+
Water quality	Medium	Local	Short	Medium
Fauna during closure	Low	Specific	Short	Minor
Fauna after closure	Medium	Local	Long	Medium+
Flora	High	Local	Long	Major +
Landscape	Low	Local	Long	Medium+
Health & safety	Medium	Local	Short	Medium
Jobs and economy	High	Regional	Long	Major
Noise & vibration	Low	Local	Short	Minor
Grazing	Low	Specific	Long	Minor
Traditions & customs	Low	One-off	Short	Minor
Archaeology	Low	One-off	Short	Minor

Human rights risks of the project

The constitution of Niger gives every citizen the right to a healthy environment and the

duty to contribute to its protection and improvement. Despite being a real opportunity for the local populations, the project may have negative environmental and social impacts in terms of respect for human rights. These include the consumption of water and the disruption of the local hydrological regime, the alteration of water quality, reduced air quality, the destruction of vegetation and the disturbance of fauna that provide ecosystem services. In terms of social aspects, this project will generate health risks, including radiological contamination for workers and local populations, the reduction of available grazing, the risk of destruction of cultural and archaeological sites, the degradation of the visual quality of the landscape and the risk of gender-based violence.

Vulnerability to climate change

Climate change is significantly affecting the frequency, incidence and duration of extreme events such as droughts, floods, high winds, etc., which have negative impacts on development infrastructure. In Niger, six categories of extreme weather events are considered: droughts, heavy rains/floods, sand and/or dust storms, high temperatures, locust invasions and bushfires/fires which have impacts on agriculture, livestock, fisheries, health, environment and industry including mining.

In terms of the project, the infrastructure (water management, tailings management facilities, roads and access tracks, telecommunications infrastructure, etc.) could be affected by climate change, particularly during the mining and post-mining phases. These include degradation, failure or destruction due to temperature variations, heavy rainfall and high winds. High humidity could also affect the structural and functional performance of structures. Permanent infrastructure that will be built as part of the mine rehabilitation will be more vulnerable to climate change because it will be in operation for many years after mine closure, compared to infrastructure that will be dismantled at the end of its useful life.

Planning and design of structures and management of mining activities must take into account historical weather data but also climate change induced variability. This has been incorporated into the project design in the Feasibility Study, in the selection of return periods and the calculation of flood lines. This has influenced the siting of infrastructure (for example the TSF) and the design of infrastructure.

Project Alternatives

The mine and non-mine options were evaluated, and the mine option selected as bringing more benefits than impacts. Alternatives to operational aspects considered include:

- Ore processing method – various different flow sheet options were considered and the process optimized for recovery;
- Power supply – alternatives to grid power include diesel generation, solar and battery back-up;
- Mine water supply – different aquifers were tested and water management measures to minimize fresh water make up incorporated;
- Staff accommodation and services – the development of a new camp with improved facilities over expanding the old one is preferred;
- Management of waste rock and mine tailings – reuse of as much mined material as possible has been selected, including the use of cemented backfill in the

underground workings to provide support and store part of the tailings stream; alternative tailings disposal sites and methods were evaluated;

- Management of non-mining waste – alternatives to disposal, such as reuse and recycling is preferred, using licensed carriers and sites;
- Wastewater treatment – different treatment and management methods considered, conventional sewage treatment plants will be used at the mine and the camp;
- Stormwater management – management of sediment in storm water using settling ponds has been adopted in the design; and,
- Redevelopment, rehabilitation, and management of the site post closure – various options for closure management have been considered, as well as uses for the site (existing facilities) post closure.

Mitigation of impacts

The initial assessment of impacts illustrates the worst-case scenario should impacts not be mitigated. Throughout the development and design of the project, opportunities to apply the mitigation hierarchy have been explored. This means that as far as possible, impacts have been anticipated and avoided, minimised or reduced. The impacts remaining when these principles have been applied are the residual impacts, and these are managed, compensated or offset.

Mitigation measures are proposed for the preservation of soils, air, water, flora and fauna, landscape, noise and vibration, health and safety, economic impacts, grazing, traditions and customs and archaeological and cultural sites during construction, operations and closure, and residual impacts are rated.

Mitigation measures are aligned with good international industry practice (GIIP) and will be further elaborated and implemented through a series of policies, management plans and procedures, all controlled by an Environmental & Social Management System.

The table below summarizes pre- and post-mitigation impact ratings. Note the methodology used for assessment does not allow for 'Minor' ratings for anything other than short duration, low intensity and one-off impacts. Therefore, elimination of an impact through mitigation measures (or on closure) will still rank as medium. This means that even with mitigation measures applied, the impact rating does not often change.

Valued environmental and social component	Construction		Operation		Closure	
	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated
Physical elements						
Soil	Medium	Medium	Medium	Medium	Minor	Medium +
Air	Medium	Medium	Medium	Medium	Medium	Medium +
Water	Medium	Medium	Medium	Medium	Medium	Medium
Wildlife	Medium	Medium	Medium	Medium	Medium +	Medium+
Flora	Medium	Minor	Medium	Medium	Major +	Major +
Human elements						
Landscape	Minor	Minor	Medium	Medium	Medium +	Medium +
Health & Safety	Medium	Medium	Medium	Medium	Medium	Medium
Economy	Major +	Major +	Major +	Major +	Major	Medium
Noise & vibration	Medium	Minor	Medium	Medium	Medium +	Medium +

Pastoral	Medium	Medium	Medium	Medium	Minor +	Minor +
Traditions	Minor	Minor	Medium	Medium	Minor	Minor
Archaeology	Minor	Minor	Medium	Minor	Minor	None

The single Major negative impact in the above table relates to the loss of employment upon mine closure. To mitigate the loss of jobs and income associated with the closure, the measure that will be implemented is a study on the retraining of workers in other occupations. This may be expected to identify a range of transferrable skills that workers have that could increase their chances of employment in other industries, and or setting up their own businesses.

A programme of demobilization, identifying and delivering training requirements, is likely to be implemented. The Closure Plan, which will be reviewed and updated regularly during operations (at least every five years and three years before planned closure) will include consideration of the social aspects of closure, in terms of direct workers, indirect livelihoods and associated communities (those with a high proportion of workers or suppliers of goods and services) to ensure that the impacts of closure are mitigated as far as possible.

Cumulative Impacts

Cumulative impacts have been identified for the project. It is recognized that many environmental and social management challenges arise as a result of impacts from several activities, either project related, other projects, or by third parties. Individually, these impacts are typically insignificant; however, cumulatively they can have regional or even global repercussions.

The Cumulative Impact Assessment (CIA) draws on baseline data and the impact assessment undertaken for all environmental and social disciplines as well as data gathered during site visits and consultations undertaken.

Other active Projects in the region have been identified and shared environmental and social receptors reviewed. These include the following:

- Cominak mine - Uranium mine located close to the town of Arlit, approximately 110km north of Dasa. The mine closed on 31 Mar 2022 having operated since 1978 and is now in the closure phase, which focuses on technical issues, employees and affected communities. Closure is expected to take 11 years, with a 5 year environmental monitoring phase to follow;
- Somair uranium mine – Open pit mine, owned by Orano, also near Arlit. Began operating in 1971, and predicted to continue producing until at least 2035;
- Imouraren project - Located about 50 miles south of Arlit this deposit, discovered in 1966, contains one of the largest uranium reserves in the world. Following a 2007 feasibility study, Orano was awarded an operating permit in early 2009. Work to bring the site into production has been suspended pending more favourable market conditions. Annual production capacity of 5,000 tons and lifespan of 35 years;
- Madouela project - Owned by Goviex, situated 10 km south-east of Arlit. Feasibility Study released in Sep 2022, for a 19-year open pit plus two underground operations with a life of 19 years. Molybdenum may be produced as a by-product; and,

- Sonichar coal mine and power station - 80km to the south of Dasa, the open cast coal mine is around 2 km from the power station. Principal consumers have been the Cominak and Somair mines in Arlit. The mine, in operation since 1980, uses borehole water from 30 km away for cooling. Water is also reticulated to Tchirozérine but not surrounding villages. Water from the mine and plant are discharged to the environment without treatment; effluents show very high levels of sulphates, aluminium, iron, manganese, nickel and selenium. It is not known if the power plant has any pollution control measures on stack emissions.

The following table summarises the cumulative impacts.

Impact	Receptors and spatial extent	Temporal extent
Environmental pollution (air quality, noise)	Local and regional area, key communities (Arlit, Tchirozérine)	Mid-term (construction and operational phase)
Impacts to water resources	No permanent surface water courses in the area but should all projects come on stream at the same time, there may be regional effects on groundwater flow. These are thought to be influenced by the Aïr Massif to the east of all the projects. All mines are located in the Niger river catchment.	Mid-long term (construction, operation, closure and post-closure)
Impacts to Biodiversity	While impacts on vegetation are localised, some of the animal species of conservation concern identified as being present in the Dasa area have huge ranges which could also include the other mines. Further assessment to the nearby protected area, namely the Aïr massif, may be required.	Long term (construction, operation, closure and post-closure)
Greenhouse Gas Emissions and Climate Change	National and Global reaches.	Long term
Socioeconomics and Employment	Local, regional and national levels of receptors. The extent of these impacts could cover Agadez region as well as more widely in Niger.	Long term
Accommodation	Arlit region, particularly for workers moving to the area to find jobs.	Mid-long term (construction, operation)
Tourism Industry	Potential rejuvenation of tourism to the cultural heritage sites (e.g. the Dabbous giraffe) and Aïr mountains	Long term
Community Health, Safety and Human Rights	Vulnerable groups, key community members and existing residents located in surrounding villages and towns.	Mid-long term (construction, operation)
Road Traffic Network	Main route RN25 from Arlit to Agadez, particularly the northern stretch.	Mid-term (construction and operation)

Impact	Receptors and spatial extent	Temporal extent
	Increased risk of RTAs, noise and air pollution.	
Ecosystem services	Increased population pressures on habitats, water resources, soils and grazing. Habitats might become degraded or destroyed in order to graze more animals or grow more crops.	Mid-long term (construction, operation)
Social structures	Increased economic activity might result in induced migration, where job seekers from elsewhere in Niger or neighbouring countries travel to find work and find lodgings in local communities. Alternatively, young people might move away from rural areas to the nearby towns to find work and better living conditions.	Mid-long term(construction, operation)

Cumulative impacts associated with the project are not expected to significantly hinder either the development of the project itself or other planned or ongoing projects in the region. Management and mitigation for cumulative impacts will be covered in topic specific management plans and the Environmental and Social Management System (ESMS). Specific requirements regarding cumulative impacts will be considered within the Biodiversity Management Plan, Water Management Plan and the Conceptual Mine Closure Plan.

Community Engagement & Support

GAFC has been engaging with local communities since their arrival in the area in 2007. Initiatives generally consist of informal engagement with village elders and is ongoing.

Formal consultation engagement undertaken as part of the 2020 ESIA took the form of a series of meetings in the communities around the project area, including Tagaza, Agatara, Issakanan, Sikiret/Tadant, Oufound, Mizeine, Ghalab, the Kelezeret Tribe and Inolamane.

Environmental concerns noted included potential effects of uranium mining, contamination of the food chain, human and animal health risks, occupation and loss of pastoral areas and crop lands, destruction of vegetation and loss of wildlife habitat, impacts to water resources, management of waste from the mining operations and restoration and rehabilitation of the mine.

Social concerns included population displacement, marginalization of local communities, the security of cultural and tourist sites, employment opportunities for young people from the local communities and management of labour risks.

Additional consultation took place around the 2022 ESIA, focusing on the villages of Issakanan, Inolamane, Tagaza, Temil Daabous, Eghatrak, Galelo, Oufoud and Gados. The 2022 engagement also included regional authorities, town hall and the prefecture. These consultations raised a number of concerns regarding the project, many of which

are addressed by the impact assessment and associated Management Plans, and a list of development goals for their areas of jurisdiction. In many cases, these are basic infrastructure needs that are more commonly provided by the state.

The comments received have been used to develop current community support programs which cover food security, medical support, infrastructure, local business support/procurement and regional and national procurement. Future development support will be delivered in partnership with NGOs currently active in country and will provide targeted benefits to women including enhanced irrigation, training and support of existing market gardening initiatives, support for development of goods and services related to workers apparel and PPE and associated education, training, and mentoring programs.

Environmental and social management plan

The Environmental and Social Management Plan (ESMP) is a management tool that defines the operational arrangements for implementing the proposed measures. It describes the measures required to prevent, minimise, mitigate or compensate for negative environmental and social impacts or to enhance positive impacts.

The project ESMP, developed to address project impacts and agreed with the Ministry of Environment, is structured around:

- Impact mitigation and/or enhancement programme;
- Environmental monitoring programme;
- Environmental inspection programme; and,
- Capacity building programme for stakeholders.

This plan brings forward the mitigation measures identified in the ESIA and also identifies those responsible for implementation, implementation indicators and an indicative cost. GAFC is in the process of developing a series of management plans to align the requirements with other project documentation. These plans will be part of the ESMS and will ensure that all potential impacts are managed and monitored during all stages of the project life.

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP: Drinking water supply

AFSIEN: Association of Women in the Extractive Industries Sector of Niger

IAEA: International Atomic Energy Agency

ANPÉIE: Association Nigérienne des Professionnels en Etude d'Impacts Environnemental

ARSN: Autorité de Régulation et de Sûreté Nucléaire

ASN: Autorité de Sureté Nucléaire

BNEE: National Environmental Assessment Office

ECOWAS: Economic Community of West African States

CEG: Colleges of General Education

CES: Secondary Education Complex

CES/DRS: Water and Soil Conservation/Soil Defence and Restoration

CH: Critical Habitat

CNEDD: National Environment Council for Sustainable Development

CNSS: National Social Security Fund

CORAC: French Accreditation Committee

IHC: Integrated Health Centre

DEM/EC: Directorate of Mining Environment and Settlements

DGSD: Directorate General for Sustainable Development

DGEF: Directorate General of Water and Forests

DGT: Directorate General of Labour

DMC: Direction des Mines et des Carrières

DNHPES: National Directorate of Public Hygiene and Health Education

DR INS: Regional Directorate of the National Institute of Statistics

DRE/LCD: Direction Régionale de l'Environnement et de la Lutte Contre la Désertification

DSST: Occupational Safety and Health Directorate

ESIA: Environmental and Social Impact Assessment

EPC: Collective Protection Equipment

PPE: Personal Protective Equipment

ESMS: Environmental and Social Management System

GAC: Global Atomic Corporation

GAFC: Global Atomic Fuels Corporation

GIS: Geographic Information Systems

GREN: Reflection and Action Group on Extractive Industries

H2S: Hydrogen Sulphide

HANEA: High Nigerien Atomic Energy Authority

IBAT: Integrated Biodiversity Assessment Tool

IFC: International Finance Corporation

INS: National Institute of Statistics

STI/HIV/AIDS: Sexually Transmitted Infections/Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

IT: Labour Inspection

ME/LCD: Ministry of the Environment and the Fight against Desertification

MH/A: Ministry of Water and Sanitation

NO2: Nitrogen dioxide

NP: Performance Standards

SDGS: Sustainable Development Goals

OHADA: Organisation for the Harmonisation of Business Law in Africa

WHO: World Health Organization

CSO: Civil Society Organisations

PC: Cemented wells

PDDE: Ten-Year Education Development Programme

PDES: Economic and Social Development Plan

WMP: Waste Management Plan

ESMP: Environmental and Social Management Plan

PM: Particular materials

TDC: Human Powered Pump

PMN: National Mining Policy

PNAT: National Spatial Planning Policy

PNEDD: National Environment Plan for Sustainable Development

POI: Internal Operations Plan

PROSEHA: Water, Sanitation and Hygiene Sector Programme

PSEF: Education and Training Sector Programme

RNNAT: National Nature Reserve of Aïr and Ténéré

ROTAB: Network of Organisations for Transparency and Budget Analysis

CSR: Corporate Social Responsibility

SDDCI: Sustainable Development and Inclusive Growth Strategy

SOMIDA: Societe Miniere de DASA

SO2: Sulphur dioxide

GER: Gross Enrolment Rate

UEMOA: West African Economic and Monetary Union

IUCN: Union for Conservation of Nature

UNICEF: United Nations Children's Fund

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INTRODUCTION

A Sahelian country of 1,267,000 km^2 and a population estimated at around 20 million inhabitants in 2017 (INS, 2017), Niger faces multiple challenges in terms of socio-economic development, including access to drinking water, quality education, health, energy, various development infrastructures, etc.

To meet these challenges, several strategic development documents have been drawn up and implemented by the government. These include the Sustainable Development and Inclusive Growth Strategy (SDDCI Niger 2035), the Economic and Social Development Plan (PDES 2022-2026), the National Mining Policy adopted in 2020 and covering the period 2020-2029, etc.

Thus, through the implementation of these strategic instruments, the government plans to make the mining sector, particularly uranium, a real lever for development while creating favourable conditions for investment in the sector.

It is within this framework that Global Atomic Corporation (GAC), through *Global Uranium Niger Inc, is* considering the implementation of the "*Adrar Emoles 3"* research permit uranium mining project.

In accordance with the texts in force in terms of environmental management, in particular law n°98-56 of 29 December 1998 on the framework law relating to environmental management, law n°2018-28 of 14 May 2018 determining the fundamental principles of environmental assessment in Niger and its implementing decree n°2019-027/PRN/MESU/DD of 11 January 2019, the project was the subject of an environmental and social impact study sanctioned by an environmental compliance certificate issued by the Ministry in charge of the Environment.

In order to comply with the Equator Principles and the International Finance Corporation (IFC) Performance Standards, the ESIA report has been updated.

The approach adopted included the preparatory meeting, the document review, the development of data collection tools, the field mission, the analysis and interpretation of the data and the drafting of the report structured around the following points

- Introduction;
- Full project description;
- Analysis of the initial state of the site and its environment;
- Outline of the policy, legal and institutional framework;
- Assessment of likely changes;
- Analysis of possible alternatives to the project;
- Impact mitigation and/or enhancement measures;
- Environmental and Social Management Plan
- Conclusion;
- Appendices.

1. FULL DESCRIPTION OF THE PROJECT

1.1. Background and justification of the project

Niger has significant mining potential which has long remained unexploited or under-exploited. These include uranium, oil, gold, mineral coal, cassiterite, etc. Indeed, the uranium reserves, located in the Tim Mersoi basin covering more than 500,000 km^2, have been exploited since the early 1970s in Arlit by the French group ORANO, through its entities SOMAÏR and COMINAK (now in the process of being closed).

The extractive industries have a prominent place in the country's economic and social development planning. However, the weight of the extractive sector in the Gross Domestic Product (GDP) fell from 10.8% in 2013 to 6.2% in 2017. This decline could be explained by the decrease in mining production. In addition to the decline in volume, the uranium sector has also seen a sharp drop in its price, from 73,000 FCFA in 2013 to 56592 FCFA in 2014. This downward trend unfortunately continues today. Indeed, although the sector, particularly uranium, accounts for more than half of exports, its share of GDP remains around 6%. For the period 2011-2015, it generated revenues of around 258 billion CFA francs. To improve the impact of mining on poverty reduction, the state introduced a provision in the mining law in 2006 that devotes 15% of all mining revenue to the communes of the regions concerned.

Also, with the aim of diversifying its partners in the mining sector in general and ensuring the safeguarding of the uranium sector in particular, the Government of Niger has decided to facilitate and support any initiative aimed at opening new mines. It is within this framework that Global Atomic Fuels Corporation, through its Nigerien company "*Global Uranium Niger Inc.*", plans to start production of its project called "***ADRAR EMOLES 3" research permit*** by 2022-2023.

1.2. Presentation of the promoter

Global Atomic Corporation, a Canadian company, holds six (06) mining exploration permits for uranium and related substances. It has been present in Niger since 2007 where it conducts mining exploration activities in the Agadez region from its country office located in Niamey and its liaison office located in Agadez.

In accordance with the provisions of the Treaty of the Organisation for the Harmonisation of Business Law in Africa (OHADA), the company's operations in Niger are managed by a company under Nigerien law called *Global Uranium Niger Inc. which was* created in 2009.

The address of this company is

- Headquarters: Koira Kano North, Block 5724
- BP: 10.539 Niamey, Niger
- Tel: 0022720370013
- Fax: 0022720370014
- Website: www.globaatomiccorp.com

The company's staff is essentially made up of Nigeriens trained in the fields of geology, mining, prospecting, logistics, accounting, labour law, etc. During all the years of its presence in Niger, the company's staff numbered around fifty (50) permanent employees and several dozen temporary jobs. The company's technical partners are mainly local companies providing services in the fields of drilling, geophysics, analysis, consulting, transport, transit, security, audits, etc.

The concept of corporate social responsibility (CSR) is increasingly a concern in all development projects, particularly mining projects. This is why in Niger, the government has given pride of place to this concept by including provisions in the mining conventions that require mining companies to contribute to the development of local communities. Thus, since its installation in the Agadez region, the Global Atomic Corporation has made a significant contribution to local development by financing actions to benefit the populations living near its exploration sites. ***The funds invested in these actions (rehabilitation and construction of hydraulic works, food donations, ambulance and medical equipment donations) for several rural communes, villages and nomadic camps amount to nearly 291 million CFA francs***.

Global Atomic Corporation has identified seven (7) principles representing its core values and responsibilities.

These are:

- ***Social responsibility and respect for diversity***
    - Global Atomic Corporation believes that the achievement of the greater good can be facilitated by a company that demonstrates, through its corporate citizenship practices, its support for human rights, social justice and environmental stewardship, and is poised to thrive in an increasingly competitive marketplace.
    - Global Atomic Corporation will be committed to supporting and strengthening local communities;
    - Global Atomic Corporation will encourage and support partnerships and cooperation to strengthen social and economic resources;
    - Global Atomic Corporation will respect the multicultural diversity of local communities;
    - Global Atomic Corporation will involve the public and local community leaders in the planning and implementation of its project
- ***Responsible exploration and exploitation***
    - This Statement of Corporate Values and Responsibilities reflects the obligations and partnerships that naturally accompany the various licenses Global Atomic Corporation receives to operate in countries and communities with varying degrees of economic development. These licences are generally subject to review and renewal and must therefore be continually earned.
- ***Leadership***
    - Global Atomic Corporation will strive to excel in good corporate citizenship towards governments, international agencies, partners, host communities,

employees, contractors and stakeholders.

- ***The human person, our true wealth***
  - o Global Atomic Corporation will respect the dignity of every individual and the rights of all people to pursue their ambitions.
- ***Continuous staff training and secure and decent jobs***
  - o Global Atomic Corporation shall be committed to the principle that people at its project sites and offices work in safe and healthy conditions and receive fair compensation;
  - o Global Atomic Corporation will give its staff equal opportunities, without discrimination, to improve their living conditions and to acquire knowledge, skills and experience.
- ***Environmental responsibility and innovation***
  - o Global Atomic Corporation believes that people have a right to a healthy environment, clean air and clean water.
  - o Global Atomic Corporation is committed to implementing best environmental management practices to achieve internationally recognised levels of environmental, health and safety performance.
- ***Integrity and transparency***
  - o Global Atomic Corporation shall be committed to promoting honesty, integrity and accountability in its business activities;
  - o Global Atomic Corporation will require good professional and ethical conduct from its employees, agents and directors;
  - o Global Atomic Corporation will make information and communication with all stakeholders its credo.

1.3. Presentation of the Project

The Canadian company Global Atomic Corporation, which has been conducting mining research in Niger since 2007, is considering the exploitation of the uranium deposit it has discovered in the "Adrar Emoles 3" research permit.

The area of the exploitation permit, which is the subject of this project, covers an area of 25.01 km² and is located in the rural commune of Tchirozérine (Department of Tchirozérine, Agadez Region). The geographical coordinates (Latitude/Longitude, ADINDAN - Clarke 1880) of the limits of the licence area are given in Table 1 below. Figure 1 illustrates this on a topographic background.

Table 1 Coordinates of the vertices of the exploitation perimeter

Point	Longitude	Latitude
A	7° 39' 8''	17° 50' 08''
B	7° 42' 50''	17° 50' 08''
C	7° 42' 50''	17° 47' 26''
D	7° 39' 8''	17° 47' 26''

The Project is known as the Dasa Mine. The Mine License Area has been transferred into a Nigerien subsidiary Company; SOMIDA, which is owned 80% by Global Atomic Fuels Corporation and 20% by the Niger Government. Global Atomic Fuels Corporation is a 100% owned subsidiary of Global Atomic Corporation. Phase I operations anticipate the underground mining of approximately 45 million pounds U308 ("Yellowcake") over a 12-year mine life. The Dasa Mine will be run by an experienced uranium mining team previously responsible for running the Cominak Uranium Mine located approximately 100 kilometres north of the Dasa Mine. Mining operations will be run with a priority focus on mine safety and will adhere to international best practices. Air and Water baseline studies have been conducted and will be updated on a regular basis going forward.

The Niger Government has deemed yellowcake a "strategic product" and as such Dasa Mine production will be transported from the mine site to the Port of Cotonou, Benin by the Niger Government's transportation company: National Company for the Transport of Strategic Products ("CNTPS") in Company owned trucks and accompanied by armed security. From the point of collection at the mine, the transport of yellow cake is the responsibility of the CNTPS.

CNTPS has been responsible for yellowcake transportation from nearby Areva Mines for many years over which time it has developed comprehensive accident prevention, contingency and spill management plans aligned with IAEA guidance.

Since beginning exploration in 2008 Global Atomic Fuels Corporation and now SOMIDA has engaged in community social relations ("CSR") programmes including famine relief, medical assistance, improvements existing community water wells and the drilling of new community water wells, local procurement, training and employment opportunities. In addition to the above listed initiatives, SOMIDA has prioritized two key CSR programmes;

1) training and apprenticeship programmes focused on the local population and
2) support of local market gardening initiatives in collaboration with the Dov Centre; a long standing in- country NGO to provide agricultural training, infrastructure and irrigation.

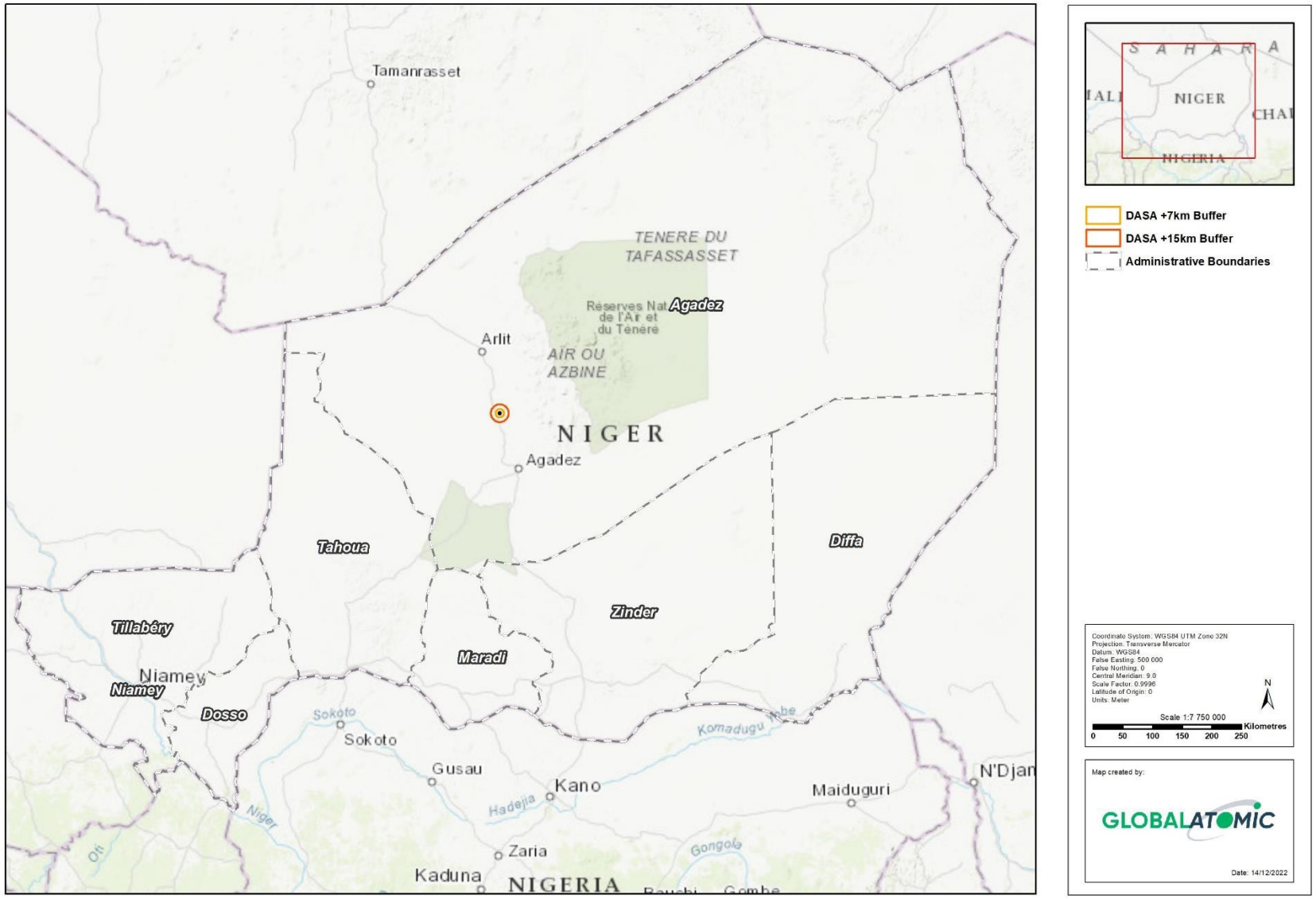

Figure 1 Location Map

1.3.1. Project objectives

The overall objective of the project is to develop the uranium deposit discovered in the "Adrar Emoles 3" exploration permit.

The specific objectives are:

- Construct and install the permanent surface infrastructure (base camp, buildings including administrative and technical blocks, sanitary installations, water and electricity networks, ponds, various workshops and garages, shops and warehouses for various products and equipment, etc.);
- Construct the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) and all associated facilities (garage, workshops, crushing plant, various cables, signalling, instructions, etc.);
- Build the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouses, various networks, contact for the production of sulphuric acid, hydraulic works, sluices, various input storage areas, etc.);
- Processing the ore to uranate, smelting it and transporting it to potential markets;
- Create temporary and permanent jobs and contribute to the improvement of people's living conditions;
- To contribute significantly to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors;
- Redevelop all the sites operated at the closure of the project.

1.3.2. Expected results

The main results expected from the implementation of the project are:

- the permanent surface infrastructure (base camp, administrative and technical buildings, sanitary facilities, water and electricity networks, ponds, various workshops and garages, shops and warehouses for various products and equipment, waste rock and tailings disposal areas, etc.) are built and/or installed within a 3.5km radius operational area of, within which areas proximal to surface infrastructure will be fenced;
- the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) and all associated facilities (garage, workshops, crushing plant, various cables, signalling, instructions, etc.) are constructed and/or installed;
- the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouse, various networks, contact for the production of sulphuric acid, hydraulic works, slurry pits, slurry pits, various storage areas for inputs, etc.) are built;

- the ore extracted is processed, the uranate obtained is smelted and transported to potential outlets;
- temporary and permanent jobs are created and the living conditions of the people in the area are improved;
- a significant contribution to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors is made;
- all operated sites are redeveloped at project closure.

1.3.3. Description of the deposit

All known uranium deposits in Niger are located in sandstones and conglomerates of the Tim Mersoi basin. They are all classified as belonging to the tabular sedimentary types.

Sandstone-hosted uranium deposits are marked by epigenetic concentrations of uranium in fluvial/lacustrine or deltaic sandstones deposited in fluvial continental environments frequently in transition zones from higher to lower flow regimes, such as along paleo ridges or domes. Roll-front deposits contain impermeable shales or mudstones overlying or underlying or separating the mineralised sandstones and ensuring that fluids move along the sandstone bodies.

In sandstone-type deposits, uranium is usually precipitated by oxidising fluids from reducing agents such as plant material, amorphous humate, sulphides, iron minerals and hydrocarbons. The oxidation and reduction facies display typical colours and can assist in the selection of exploration targets. Fluid migration and deposition of uranium leaves a colour change from red hematite (oxidised) to grey-green (reduced). The main uranium minerals in most sandstone-type deposits are uraninite, pitchblende, coffinite

In general, it can be noted from north to south in eastern Niger that uranium mineralisation appears to occur in increasingly younger strata. This is most likely a combination of a change in source zones and uranium supply over time, and the fact that in the south the younger strata are exposed at the surface, necessitating increasingly deeper drilling in the southern areas (e.g. Carboniferous - older targets).

The best grade and tonnage of uranium in the Adrar Emoles 3 deposit is found in the sandstone of the Tchirezrine 2 formation, the same formation that also contains the large ORANO Imouraren deposit, located about 40 km northwest of Adrar Emoles 3.

In contrast to the carboniferous mineralisation in the Arlit area, the uranium in the Tchirezrine 2 formation occurs mainly as hexavalent uranium minerals in an oxidised environment. Uranophane is the most abundant mineral. It can form small aggregates or appear as a continuous coating parallel to the layering. Uranophane is commonly associated with chrysocolla and in small quantities also with boltwoodite. Metatyuyamunite has also been found. Coffinite exists in the residual reduced areas, as well as chalcocite and native copper. Pitchblende was observed in small quantities. This mineralisation occurs in two main forms: interstitial in the sandstones, and massive sulphide mineralisation in the microcracks with galena and blende.

1.3.4. Mineral resource and reserve estimates

The mineral resources of the deposit have been estimated based on the proposed mining method, which is ***underground mining***. They are summarised in Table 2 below.

Table 2 Resource and Mineral Reserve Estimates

Disconnection	Category	Tons	eU3O8	Metal content
eU3O8 pm		Mt	ppm	Mlb
100	Proven	81,6	718	129,1
	Probable	96,1	606	128,4
300	Proven	34,4	1146	109,6
	Probable	37,6	1260	104,6
1000	Proven	9,6	3885	82,1
	Probable	10,2	3308	74,2
2000	Proven	4,6	6624	66,8
	Probable	4,5	5713	56,8
2500	Proven	3,6	7849	61,9
	Probable	3,4	6838	51,4
5000	Proven	1,6	13186	46,8
	Probable	1,6	10805	37,2
10000	Proven	0,6	24401	31,1
	Probable	0,8	14598	25,3
15000	Proven	0,3	34236	24,3
	Probable	0,1	21493	4,0

1.3.5. Key production data

The main production data for the "Adrar Emoles 3" exploration permit is shown in Table 3 below.

Table 3 Production profile

Life in the mine	Years	12
Total ore production	Million tonnes	4,13
Total treatment plant	Million tonnes	4,03
Total sterile production	Million tonnes	0,99
Cut-off grade	Ppm	5396
Global recovery shredder	%	92
Resource consumption	Drinking water	For the record
	Industrial water	55 m^3 /h
	Electrical energy	10 MW
	Fuel	2000 l/d
	Processing reagents	93 t/d
Jobs	Direct	307
	indirect	500

The total number of direct and indirect jobs during the operation of the mine will be 307 and 500 respectively. However, it should be noted that during the construction phase of the mine, the project will generate over 450 direct and indirect jobs.

1.3.6. Financial and economic impact of the project.

The implementation of the project will generate financial and economic impacts in terms of improved tax revenues from the payment of various taxes and mining royalties that will improve investment levels and economic development in general. In addition, the creation of direct and indirect employment opportunities (especially through subcontracting) will improve income, tax revenues and economic development. Global Atomic Corporation has already, during its exploration activities, made repeated use of local service providers, including ENYSA, LEGENI, ESAFOR, SAHEL LAB SA, EMIG, EMAIR, to name but a few.

Ultimately, the project would generate the following financial flows expressed in millions of US dollars:

- *Tax revenue* *92*
- *Mining royalties* *141*
- *Nigerien labour costs* *64*
- *Expenditure on corporate social responsibility (CSR)* *1,2*

1.3.7. Project activities

The main activities that will be implemented within the framework of the "Adrar Emoles 3" exploration permit are given in Table 4 below.

Table 4 Project activities

PROJECT PHASES	ACTIVITIES
Development (Preparation and construction)	- Construction/development of access roads/tracks and fencing of, areas proximal to surface infrastructure will be fenced - Site preparation (stripping or removal of overburden) for the construction of temporary facilities - Installation of temporary infrastructures and equipment that will contribute to the construction of the project (living quarters for the personnel of the construction companies, equipment base, etc.) - Borrowing and quarrying (sand, gravel, laterite, etc.) - Preparing the right-of-way for the facilities - Construction/installation of surface structures and equipment (employee living quarters, administrative and technical blocks, plant and support services including machine maintenance and reconditioning workshops/garages, boiler rooms, pneumatics, etc., input warehouses, contact workshop for sulphuric acid production, ponds, dams, boreholes, tailings facility, waste treatment facilities, power generation system, etc.)

PROJECT PHASES	ACTIVITIES
	- Construction of the underground mine (ramps, galleries, ventilation holes) and its support services at the bottom (garage, workshops, crushing plant, various networks, signposts and instructions, etc.).
Operation	- Extraction of ore from the underground mine (drilling, blasting, transport of ore to the primary crusher, conveying to daylight through a conveyor belt) - Storage of inputs (chemicals including sulphur, hydrocarbon products, etc.) - Operation of workshops (maintenance of machinery and equipment, reconditioning of machinery, manufacture of spare parts, etc.) - Ore storage, crushing and conveying to the plant - Plant level ore processing (crushing, grinding and classification, etching, liquid/solid separation, clarification, precipitation, purification, uranate drying/calcination and smelting) - Storage of tailings from ore processing - Loading and shipping of uranate - Periodic maintenance of the plant
Closing	- Dismantling of facilities - Site clean-up - Site redevelopment/restoration

1.3.8. Main project infrastructure

The main infrastructure to be built under the project:

- the living quarters: staff housing, sanitary, social, cultural, educational, electrical and drinking water infrastructures, roads, fencing of areas proximal to surface infrastructure will be fenced.
- the mining area: mine access roads, overburden, ore heaps, explosives storage, mechanical workshops, storage shops, truck loading facilities and other related infrastructure such as internal roads, buildings (administration, changing rooms, etc.) and services.
- the ore processing plant, the contact workshop for the production of sulphuric acid and the solvent extraction process for uranium.
- transport tracks, service corridors, overhead power lines and water pipes.
- Tailings storage facilities and waste rock piles - Tailings from the mill will be stored dry in a clay-lined tailings storage facility. Mine waste rock will be dumped in waste rock piles.

1.3.9. Equipment and materials of the project

The main equipment and materials required for the implementation of the project are given in Table 5 below.

Table 5 Project infrastructure/equipment

EQUIPMENT/MATERIALS	NUMBER
Bulldozers	1
Backhoe loaders	1
Graders	2
Drills	6
Trucks	6
Loaders	4
Conveyor belts	2
Tanker trucks	1
Crushers	1
Shredders	1
Sprayers	0
Injection and dewatering pumps	2
Maintenance and repair materials and equipment	2
Workpiece turning machines	1
Welding machines	5
Laboratory materials and equipment	1
Extraction materials and equipment	Not determined at this stage
Filtration and washing materials and equipment	Not determined at this stage
Materials and equipment for purification, drying and fume removal	Not determined at this stage

1.3.10. Water supply and efficiencies

The supply of industrial and drinking water will be based on the capture of aquifers identified for this purpose. These are mainly the water table of the Téloua geological formation and secondarily that of Tchirozérine 2. However, dewatering water from the mine will also be injected into the industrial water pumping circuit.

The hydrogeological programmes carried out on the permit have also highlighted the possibility of exploiting other aquifers such as the Gezouman and Tarat.

Pumping tests carried out by Global Atomic Corporation on boreholes tapping the Teloua aquifer have given flow rates varying between 15 and 25 m^3 /h.

According to the December 2021 Definitive Feasibility Study, the Dasa process plant is estimated to require 64.1 m^3/hour.

Item	Parameter	Units	Value
1	Pug Leaching including water in Reagents	m^3/h	4.2
2	Belt Filtration Tails Washing & Flocculants	m^3/h	32.0
3	Solvent Extraction & Precipitation Processes	m^3/h	4.8
	TOTAL (for process plant)	**m^3/h**	**41.0**
4	Services (dust suppression, acid plant etc)	m^3/h	23.1
	TOTAL (plant & Services)	**m^3/h**	**64.1**

In addition to this, the underground mine area will require on average 30.4 m^3/h for dust suppression, drilling, cleaning, etc. and the camp will only require 3.3 m^3/h, based on 400 persons at camp and 200 liters per person per day.

To summarize, approximately 100 m^3/hr of water will be required at the site.

As described in the 2021 Definitive Feasibility Study, extensive testwork has been completed to provide the optimized flow sheet at the Dasa process plant.

In the back-end of the process plant, the uranium is precipitated from the loaded strip liquor solution as sodium di-uranate followed by solid-liquid separation. The precipitation of uranium as sodium di-uranate and recycling of the barren liquor to strip provide the following benefits:

- Reduces reagent consumption
- Improves the water balance

The majority of the Semi Autogenous Grinding (SAG) mills operating around the world utilise water to move the broken ore particles as a slurry through the process plant. In contrast, the Dasa SAG mill will be a dry milling arrangement, thus reducing water use in the grinding circuit.

As described in Section 1 above, to reduce GHS emissions the intention is to install 13.5 MW_{DC} of solar panels. The installation of the solar panels is yet another example of the resource efficiencies being designed into the Dasa mine and mill.

1.3.11. Electricity supply and efficiency

Electricity supply during the construction phase will be provided by diesel generators, including for the water supply systems. Diesel for the generators will be stored in a protected area equipped with spill kits and associated oil/water separators.

In the operational phase, the needs will be provided by the SONICHAR network together with back-up diesel generators, battery storage and solar power. To this end, electrical lines connecting the site to the existing line which runs along the main road between Agadez and Arlit, a distance of around 5km, and an associated substation within the

operational area will be built. The power line and substation are the only Associated Facilities identified for the project.

The options available to SOMIDA for the Dasa Mine include the combination of the following power sources:

- Coal-fired power plant at SONICHAR supplying to the grid
- On-site diesel power generation
- On-site solar power generation

Based on the work completed to-date has estimated its base-case operations-phase GHG emissions as 65,395 tonnes per annum (tpa) which includes 12,477 tpa scope 1 emissions and 52,919 tpa scope 2 emissions and assumes that the majority of the Project's electricity will be provided by coal-fired power via the Nigerien national grid, and that vehicles will be fueled by diesel.

There is an optimized plan to install solar photovoltaic (PV) panels linked to battery storage and back-up diesel, with the intent of providing approximately 20% of the Project's total requirement as renewable energy. This would reduce the total estimated GHG emissions to 52,871 tpa to include 21,275 tpa scope 1 emissions and 31,596 tpa scope 2 emissions. Furthermore, there is a conceptual plan to reduce the mine site power demand from 12 megawatts (MW) to 9 MW which, coupled with solar PV and battery storage, and back-up diesel, would target a reduction in GHG emissions to 43,000 tpa; a 34% reduction from the base case scenario to include 18,691 tpa scope 1 emissions and 24,422 tpa scope 2 emissions.

Regardless, GHG emissions will exceed 25,000 tpa and will therefore need to be measured and reported on an annual basis in order to comply with IFC PS3. Power for the construction phase power is expected to be provided via diesel fuel (vehicles and generators).

UN Sustainable Development Goal #7 is to ensure access to affordable, reliable, sustainable and modern energy for all. According to the European Nuclear Society, Fuel comparison - ENS (euronuclear.org) one kg of natural uranium following a corresponding enrichment and used for power generation in light water reactors is equivalent to 14,000 kg of coal and enables the generation of 45,000 kWh of electricity.

The Dasa Phase 1 mine is expected produce approximately 45 million pounds of U_3O_8 in yellowcake. This yellowcake, after enrichment, will be transformed into 17,580,000 kg of natural uranium. This amount of natural uranium can replace 246 million tonnes of coal. A Climate Change Risk Assessment will be carried out ahead of construction.

1.3.12. Determination of geographical boundaries and types of impacts

Taking into account the environmental and social issues related to this type of project, three main impact zones were defined. These include the direct impact zone, the intermediate impact zone and the diffuse impact zone.

- *Zone of direct impact:* This corresponds to the deposit area, the exploitation permit area (which is a regulatory limit defined by the four points of the exploitation permit granted to GAC) up to 15 km in all directions. Indeed, the deposit area will be the focus of all the work that will take place in the context of the implementation of the project (construction of the mine, related infrastructure and equipment) as well as the exploitation. This includes a 40 ha buffer zone within which a 2ha area proximal to surface infrastructure will be fenced and from which domestic animals and community members will be excluded. Within this area, disturbances will be caused to elements of the biophysical and human environment including risks associated with pollutant emissions. In this area, which includes the villages of Gados, Issakanane, Tagaza, Egatrak, Timelt- Abouss and Ouford, direct and indirect impacts of the project are assessed.
- *Intermediate impact zone:* This corresponds to the zone beyond the 15 km radius and includes the commune or even departmental level. Within this zone, certain positive (in terms of job creation, economic development, health, education, water supply, etc.) and negative (emissions) impacts of the project will be felt or perceived.
- *Diffuse impact zones:* this is a sufficiently large zone in which the project's impacts will be perceived on a regional or even national scale, particularly in relation to the improvement of tax revenues (through various taxes and fees), which are the basis for investments in basic social sectors. This will also include consideration of any potential transboundary effects associated with the mine, for example air shed and catchment considerations. Other than the overall contribution of the project to greenhouse gas levels in the atmosphere, no potential transboundary effects have been identified.
- In addition, cumulative impacts will be considered. This includes other industries or development projects which might be taking place in the area, may add to pollution loads or stresses on the environment and communities or enhance positive effects such as economic development.

2. INITIAL STATE OF THE SITE AND ITS ENVIRONMENT

2.1. Location of the project

The "Adrar Emoles 3" uranium mining project is located in the Agadez region, which itself is situated in the northern part of Niger between longitudes 6° and 15° and latitudes 16° and 22°. It is located 100 km north of the town of Agadez, the capital of the region, and is accessible via the RN 25. Figure 2 below shows the location map of the project.

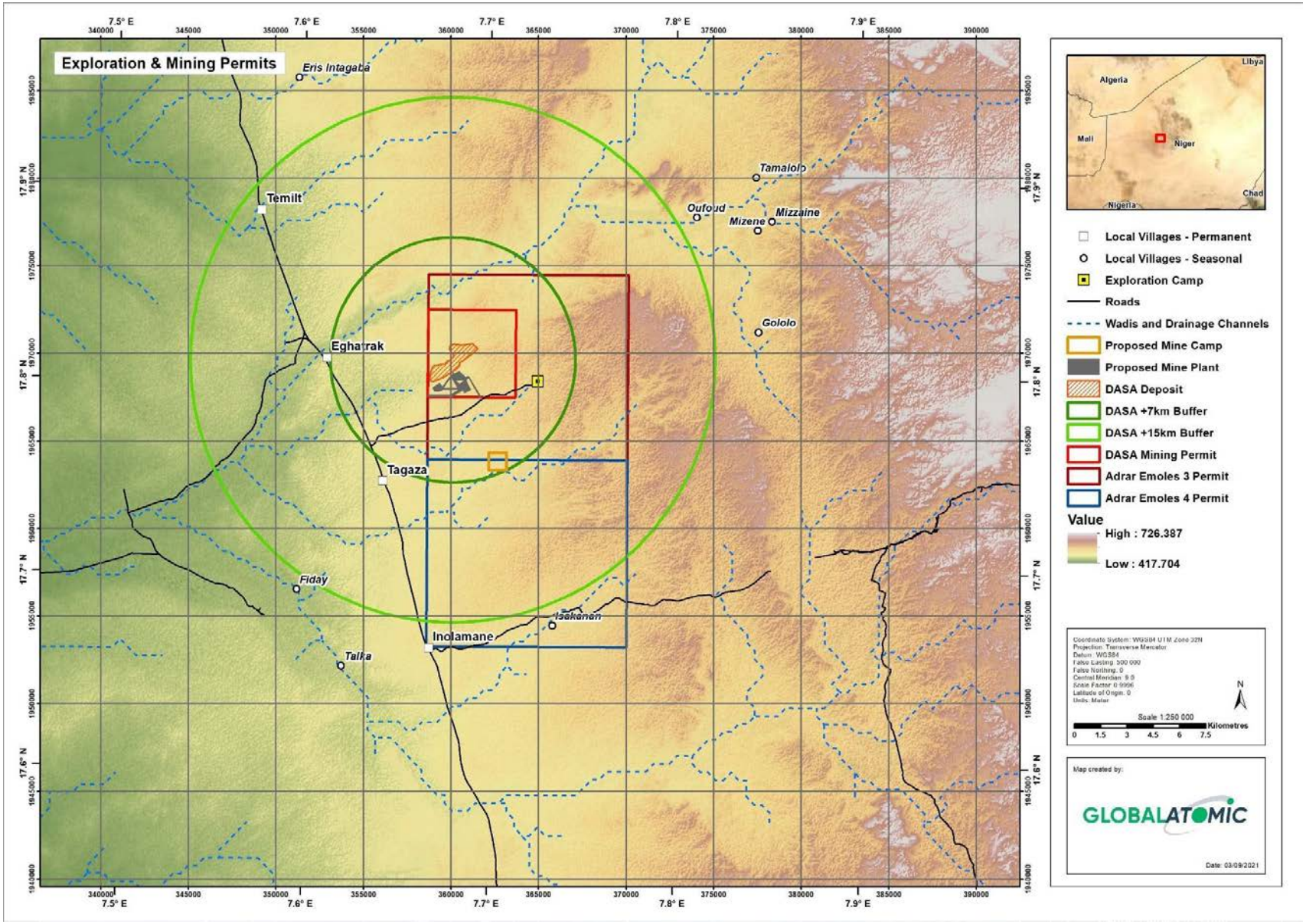

Figure 2 Location map of the project site

2.2. Biophysical environment

2.2.1. Relief

The relief of the Agadez region is characterised by seven (7) major geomorphological zones which are:

- the Aïr Massif: Drainage valleys and surface water reclamation which extends over the departments of Tchirozérine, Arlit and Iférouane;
- the Irhazer plain and regs broken by granite rocky hills in the South (Issaraydagan) and in the North-East which extends over the departments of Ingall and Arlit;
- talak and tamesna: on the Ingall department which is a spreading plain, favourable to wheat cultivation, Irhazer project, pastoral activities (salt cures) on the Ingall department;
- the Kawar in the Bilam and Dirkou department, which is a dune complex containing oasis basins for the production of dates, market gardening, citrus fruits and the breeding of small ruminants;
- the North Tadress plateaus extending over the departments of Aderbissinat and moving north-eastwards towards the Ergs of the Sahara;
- the Ténéré Desert extending over the departments of Arlit, Bilma and Iférouane
- and the Oases of Kaouar and the North-East plateaus in the department of Bilma.

The relief of the study area is heterogeneous and is characterised by plateaus, plains fed by koris, mountain ranges crossed by koris (Aïr massif) and by sandy areas in the East.

2.2.2. Climate

The climate of the Agadez region is tropical and sub-desert, characterised by a very high level of aridity. There are two main seasons (a long dry season from November to May and a very short rainy season from June to September), which can be broken down into four (4) main periods: a dry and cold period (November to March), a hot season (April to June), a rainy season from June to September, and an intermediate transition period (September to November).

According to the ten (10) year record obtained from the National Meteorological Directorate for the Tchirozérine station, it can be seen that seven (07) years out of ten (10) have recorded rainfall in excess of 100 mm and three (03) years out of ten (10) have rainfall of less than 100 mm. The maximum recorded during this period is 271.6 mm in 2015 and the minimum 48.8 mm in 2013 (see Figure 3 below).

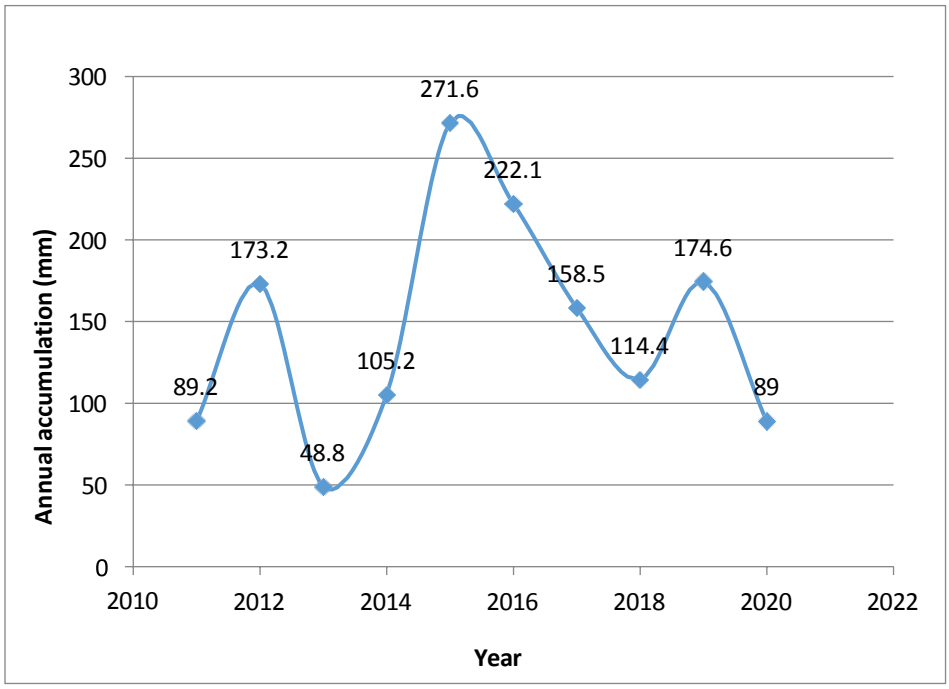

Figure 3 Ten-year rainfall

With regard to temperatures, the maximum and minimum recorded during 2021 are illustrated in figures 4 below.

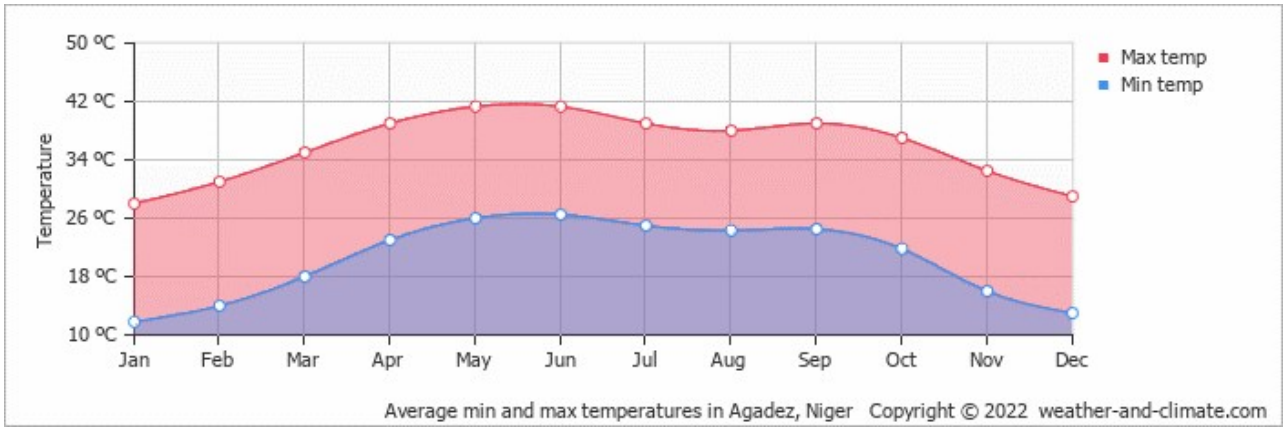

Figure 4 Minimum and Maximum temperatures Agadez, Niger

2.2.3. Soils

The region can be divided into seven (7) agro-ecological zones, whose lithology follows the main relief features. The soil resources of these features have the following textures:

- classified soils, granitic mountains, sandy soils with silty hooves in the deep valleys for the Aïr area;
- iso-humic, calc-magnetic and sodic soils in the alluvial plains with outwash and temporary swamps in IRHAZER;
- sandy to sandy-clay soils in the lowlands of the TADRESS;
- clayey loam soils in the TALAK and TAMESNA;

- shallow sandy soils in the KAWAR:
- and the shifting sandy soil (eolian accumulation) of the TENERE.

These soils are relatively poor, saturated and sometimes overexploited and their agricultural development requires significant amendments (mineral fertilisers and organic matter).

The project area is located in a soil context belonging to the Quaternary deposits which are composed of:

- sands: they are the result of water erosion in the Aïr and wind erosion in the Ténéré;
- Gravels: these are largely the result of erosion of the Aïr. These deposits are generally found within the beds of koris,
- clays with detrital elements: these clays correspond in part to the fine particles transported by the koris and also result from the erosion of the Irhazer.

The mineralogical composition of these soils, which can be considered similar to that of the soils of the Imouraren permit (30 km from the permit), is given in Table 6 below.

Table 6 Mineralogical composition of soils

Metals	Concentrations
Cu	Between 3 and 55 mg/kg DM
Fe	Between 10 000 and 40 000 mg/kg DM
S	< 500 mg/kg DM
Mg	Between 100 and 780 mg/kg DM
Pb	Between 100 and 780 mg/kg DM
Zn	Between 10 and 42 mg/kg DM
As	< 5 mg/kg DM
Nor	Between 3 and 26 mg/kg DM
Cr	Between 10 and 50 mg/kg DM
Mo	< 5 mg/kg DM
Go to	Between 12 and 76 mg/kg DM
Cd	< 0.5 mg/kg DM
Hg	Between 0.02 and 0.09 mg/kg DM
Al	Between 2 and 40 mg/kg DM
Co	Between 4 and 14 mg/kg DM

Source: *EIA, Imouraren Niger 2008, AREVA*

2.2.4. Geology of the project area

The geological context of the project area is marked by two major groups: the basement (Air crystalline massif) which occupies the eastern part of the Agadez region and the sedimentary basin (Tim Mersoi basin) which occupies the western part of the region.

- ✓ ***The base***

Known as the Air Massif, the base belongs to the immense Hoggar mountain range, of which it is an entity in the same way as the Adrar des Iforas, its western counterpart. It is formed of crystallophyllous rocks of Precambrian age and granite intrusions. The various volcanic phenomena and tectonic movements have led to a shape whose characteristics derive from the lithological nature of the terrain.

- ✓ ***The Tim Mersoi Basin***

It is essentially made up of clay, clay-sandstone and sandstone sequences whose age is between the Carboniferous and the Lower Cretaceous. This basin is a subset of the Iullemmeden basin. The Iullemmeden basin is a huge basin located south of the Hoggar and is bordered to the north by the Adrar des Iforas, Hoggar and Air basement. In the south, it extends as far as the rise of the basement at the level of the major cities of Niger: Niamey, Maradi and Zinder. The northern part of this vast structural basin is divided by the submeridian ridge of In Guezzam into two basins: the Tamesna basin (to the west) and the Tim Mersoi basin (to the east). The following stratigraphic log summarises the characteristics of the main geological formations. The different series dated from the Lower Viséen to the Lower Cretaceous are, in chronological order of deposition: the Teradah series, the Tagora series, the Izegouandane series, the Aguelal series, the Goufat series, the Wagadi series, the Dabla series, and the Tegama group (cf. Figure 6 below).

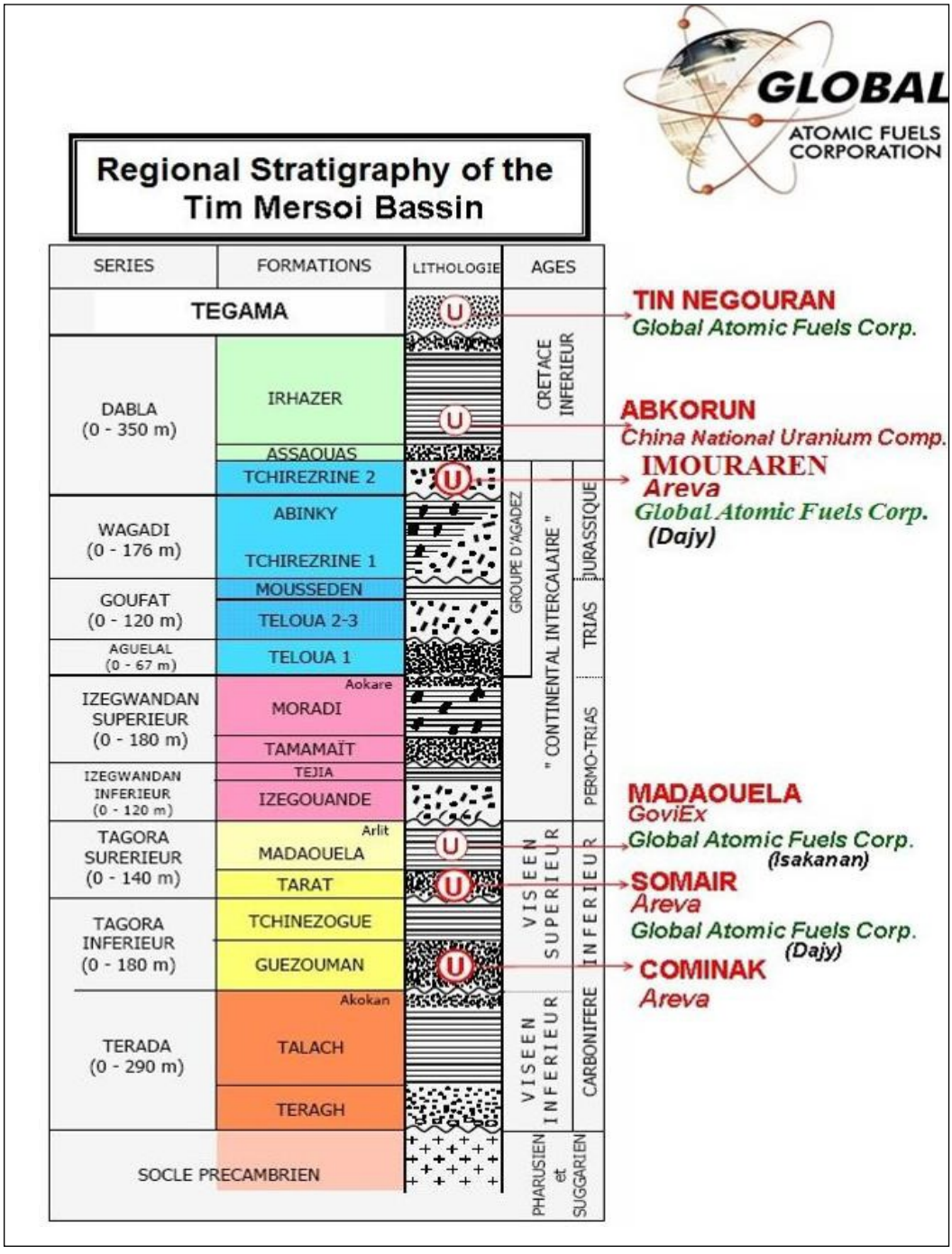

Figure 5 General stratigraphic log of the eastern part of the Tim Mersoi Basin

Within the perimeter of the permit, sedimentary formations outcrop, mainly Carboniferous and Permo-Triassic. These are mainly Carboniferous formations containing the uranium mineralisation of the Akouta and Arlit deposits.

Structurally, the perimeter of the 'Adrar Emoles 3' permit is characterised by its location on the eastern flank of the Arlit Flexure-Fault. The major tectonic structures that intersect it are the Azouza NE-SW regional fault (on which the Azelik uranium deposit is located)

and the Adrar Emoles NNE-SSW flexure. Figure 7 below illustrates the litho-structural setting of the site and surrounding licences.

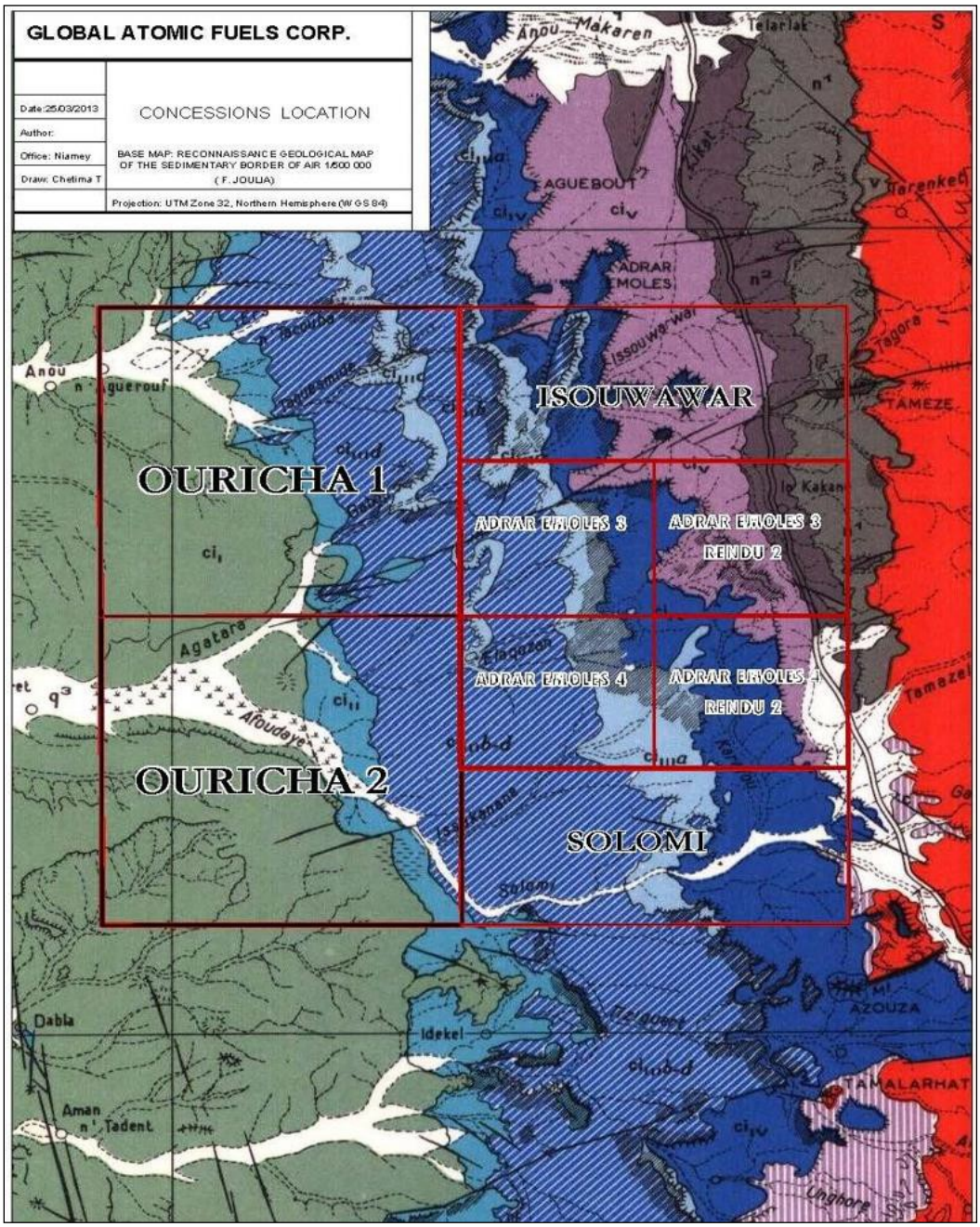

Figure 6 Litho-structural framework of the site and surrounding permits

2.2.5. Water resources

Water resources in the Agadez region consist of surface and groundwater. Surface water flow in the wider region is towards the southwest. and the Niger river, which passes through western Niger southwards to Benin and Nigeria.

2.2.5.1. Surface water

The surface waters are made up of the more temporary streams particularly known as koris and semi-permanent streams. The koris are seasonally flowing valleys that drain the western slopes of the Air massif and flow into the three (3) major collectors of the region which are:

- The Anou Zangarène;
- The Anou Makarene;
- The Irhazer Wan Agadez.

These three (3) collectors converge about 200 km west of AIR to form the AZAOUAK, which marks the location of an ancient river that flows into the Dallol Bosso.

The Koris de Téloua is one of the best known of all the Koris that crosses the city of Agadez and which is assumed to recharge the Téloua aquifer that currently supplies the city of Agadez.

The semi-permanent watercourses are located in the irhazer valleys and in the fracture zones of the AIR, the main ones being the ponds of Tchintaborak, Aderbissanat and the artificial pond of Bilma created by an artesian well and the springs of Azelik, Toubak, Geleli and the thermal spring of Tafadek.

2.2.5.2. Groundwater

The hydrogeology of the region is formed by a multi-layered aquifer system comprising the Guezouman aquifer, the Tarat aquifer and the Izégouandane water table in the eastern part of the In-Azaoua-Arlit fault. In the western part, these nappes are surmounted by a permeable horizon which hosts the Tchirozérine aquifer and the Téloua aquifer, the subject of the study in the permit area.

✓ *Gezouman aquifer*

The Guézouman aquifer is contained in the sandstone levels of the Guézouman, a deposit that hosts the uranium mineralisation exploited by COMINAK (Bigotte and Obellianne, 1968). The reservoir is characterised by significant lateral variations in thickness and facies, with the Talak clay formation as the wall and the Chinézogue formation as the roof (Joulia, 1959; Joulia and Obellianne, 1976; Yahaya, 1992). The direction of flow is currently SSE (south-southeast) to NNW (north-northwest). It is captive as a whole.

✓ *Tarat aquifer*

This aquifer is made up of coarse to medium sandstones, limited at the base by microconglomeratic sandstones with clayey intercalations (Dodo, 1992; SCETAGRI, 1985; AMAN, 2013). These formations also host the uranium mineralisation to be mined by SOMAÏR. The wall of the Tarat aquifer is constituted by the impermeable clays of the Chinézogue and its roof is constituted by the Madaouéla siltstone. Flow rates in the permit area of around 30 m^3 /h, or even more (Roufai and faiçal).

✓ *The Izégouadane aquifer*

This aquifer overlies the Carboniferous and is more important from south to north in the study area. It is generally made up of arkosic sandstone. It is not very productive in the study area but offers flows of up to 30 m3/h towards the north (Arlit).

- ✓ *Teloua aquifer*

This aquifer, generally composed of feldspathic sandstones, overlies the Moradi clays, unlike the first three layers mentioned, it widens from south to north and is composed of three successive levels: Teloua I, Teloua II and Teloua III, as well as the Mousseden and Tchirezerine I. It offers good flows of 20 m3/h in our area (Roufai and Faiçal).

- ✓ *Chirozerine 2 aquifer*

This geological formation is practically composed of coarse to medium arkosic sandstone, which also outcrops in the study area before disappearing from the north to the south. It offers very low flows in the area (Roufai and Faiççal)

2.2.6. Hydrodynamic parameters

The hydrodynamic parameters in the study area are given in Table 7 below.

Table 7 Summary of Hydrodynamic Parameters of the Study Area

Aquifers	NS: Static level (m)	Q: Flow rate (m3/h)	Specific flow rate Q/s (m3/h/m)	Transmissivity T (m2/s)	Permeability: K (m/s)	Storage coefficient: S (%)
The Chirozerin II layer	30 à 45	Low productivity				
The Teloua Nappe (Tchi I, Teloua 1, 2 and 3)	30 à 80	20	0,46	2.10-4	5.10-6	
The izegouanda aquifer	25 à 45	3	0,02	3.3.10-5	1.4.10-6	1.5.10-5
The Tarat aquifer	30 à 50	30	0,82	1,02.10-4	3.10-6	4.10-4

2.2.6.1. Hydrodynamic characteristics of the aquifers in the study area

To better understand the flow regimes of the aquifers, piezometric data from the steady state period (non-pumping conditions) were used to determine the general trend of the piezometry on the one hand, and to study the potential lateral and vertical exchanges between the four aquifers on the other. The monitoring of water levels thus makes it possible to understand the effect of anthropogenic or natural modifications on the reserve in place, and therefore on the availability of the resource. Piezometric monitoring carried out between 2013, 2018, 2021 and 2022 has shown that fluctuations in levels are negligible. This shows that there is not a lot of abstraction in the area and that rainwater does not affect the water levels of the aquifers too much. These aquifers are considered to be fossilised, but we believe that they are recharging at a very low level.

2.2.6.2. Hydrochemistry of the study area

Both physico-chemical and bacteriological analyses were carried out on the water samples from boreholes GIHF 1, GIHF 2 and GIHF 4 in accordance with WHO standards. The results are shown in Table 8 below.

Table 8 Results of physico-chemical analysis of water samples from the boreholes and the camp borehole

DETERMINATIONS	SAMPLE CAMP	SAMPLE GIHF1	SAMPLE GIHF2	SAMPLE GIHF4	STANDARDS WHO
Sodium (mg/l)	" "	87	50	200	<=200mg/l
Potassium (mg/l)	1	0,05	" "	1	<= 12 mg/l
Calcium (mg/l)	2	8	" "	1,60	<= 20mg/l
Magnesium (mg/l)	1,2	2,4	" "	0	<= 50 mg/l
Total hardness of CaCO3(mg/l)	" "	" "	" "	4	<=200mg/l of CaCO3
Chlorides (mg/l)	21	11	150	24,85	<=250mg/l
Fluorides (mg/l)	0,09	0,22	0,04	**4,18**	<= 1.5mg/l
Total iron (mg/l)	0,07	0,05	" "	0,05	<= 0.3mg/l
Nitrates (mg/l)	17,6	16	5	0	<= 50 mg/l
Nitrite (mg/l)	0,033	0,01	0,03	0,23	<= 3 mg/l
Sulphates (mg/l)	13	17	" "	132	<=250mg/l
Manganese (mg/l)	0	" "	0,004	0	<= 0.4mg/l
Copper (mg/l)	0	" "	" "	0,02	<= 1 mg/l
Nitrous nitrogen (N)	" "	" "	0,006	" "	0.50mg/l
Bicarbonates	" "	213,5	" "	" "	

2.2.7. Hydrogeological conceptual model

For the conceptual hydrogeological model of the area, there is a lack of data, but the broad outlines can be defined only for the Teloua aquifer, as this is the only aquifer for the moment that has been the subject of a fairly in-depth study in the area and which will be affected by future exploitation. The data available for the design of this model are as follows:

- ✓ *Water withdrawals*

Water abstraction in the area is insignificant compared to the billions of m3 of water available, however there is also abstraction from other companies that are located to the southwest of the site but this is not felt on the site as with monitoring carried out in 2013, 2018, and 2022 there was no change in the piezometric surface in the area. This can be explained by the numerous faults in the area which can act as screens for the aquifers.

- ✓ *Inputs from rivers or rainwater*

The study area being a purely desert zone, watercourses are very rare and the few that exist are seasonal and flow in a brutal manner (a few hours only) in the sector and the soil is sandstone with very consolidated cement; this makes it almost impossible for water to infiltrate the sector. The contributions if they exist, are very insignificant, whether they come from watercourses or from rainwater. This is confirmed above with the data from the piezometric monitoring over a period of 5 months and during the period of rising water, where a maximum variation of 7 cm was noted in the Chirezerine II water table, 33 cm in the Teloua water table, 6 cm in the Tarat water table and 23 cm in the Iezgaounda water table.

- ✓ *Interactions between aquifers*

In the project area, no link has been established between the different aquifers, although

extensive studies have not been carried out in this respect, but through the few boreholes carried out as part of the identification of the aquifers, all the aquifers are separated by impermeable layers, which implies that exchanges between them are non- existent.

However, there are fractures that can facilitate this exchange. On the other hand, in the grabben area (the area of the deposit), signs of exchange between the aquifers have been noted, as there are areas of geological unconformity in these places.

2.2.8. Hydrogeological Synthesis

The hydrogeological summary of the project area is given in Table 9 below.

Table 9 Hydrogeological summary

Aquifers	**Geological formation**	**Formation thickness (m)**	**NS: Static level (m)**	**Q: Flow rate (m3/h)**	**Specific flow rate Q/s (m3/h/m)**	**Transmissivity T (m2/s)**	**Permeability: K (m/s)**	**Storage coefficient: S (%)**
The Chirozerin II layer	Chirozerin II	25 à 40	30 à 45	Not very productive				
The Teloua Nappe (Tchi I, Teloua 1, 2 and 3)	Chirozerin I, Teloua1,2 and 3	30 à 50	30 à 80	20	0,46	2.10^{-4}	5.10^{-6}	
The izegouanda tablecloth	Izegouanda	80 à 120	25 à 45	3	0,02	$3.3.10^{-5}$	$1.4.10^{-6}$	$1.5.10^{-5}$
The Tarat slick	Tarat	20 à 40	30 à 50	30	0,82	$1,02.10^{-4}$	3.10^{-6}	4.10^{-4}

2.2.9. Air quality

The analysis of the initial air quality status concerned sulphur dioxide (SO2), nitrogen dioxide (NO2), fine and coarse particulate matter (PM), heavy metals in aerosols and black carbon while establishing air quality limits and/or quantities that are expected to increase as a result of site emissions.

Standards used for comparison are WHO standards for PM10 and PM2.5, Dust deposition monitoring was not carried out, as the site is located in a desert and is subject to sandstorms and the Harmattan wind from the Sahara. Therefore, any baseline readings would exceed any recognised standards for dust deposition. Sensitive receptors are located several kilometers from the mine site. For this reason, air quality modelling has not been carried out, but mitigation measures are built into project procedures. An Air Quality Management Plan will be developed ahead of construction.

The collection of particulate matter samples on the PM2.5 and PM10 filters was carried out at four measurement points around the site. These are:

- Site 1 (north side base camp): 17°47'58" north latitude and 7°45'44" east longitude;

- Site 2 (south side base camp): 17°47'52'' north latitude and 7°43'34'' east longitude;
- Site 3 (Tagaza): 17°48'36'' north latitude and 7°36'45'' east longitude;
- Site 4 (Egatrak): 17°44'45'' north latitude and 7°48'37'' east longitude.

The data collection period is from 9 to 15 December 2021. The measurement time for each point is 24 hours and each equipment allows the simultaneous realization of PM10 and PM2.5 and only the Camp site (base camp) was sampled every day for 5 days. On the other hand, the Tagaza and Egatrak sites were sampled once (1) each. The wind direction was north-east. The results are provided by XRF analysis in ppm and are converted to ug/m^3.

2.2.9.1. Field materials/equipment

Two (2) types of particulate matter (PM10 and PM2.5) receptors were used. These are:

- a low-flow sampler (18 litres/min) of the Gent Stacked Filter unit type, equipped with two PM10 and PM2.5 heads, enabling the fine fraction (PM2.5) and the coarse fraction (PM10) to be sampled separately. The filters are made of polycarbonate (spi and whatman) placed in series with a porosity of 8µm for the first and 0.4µm for the second respectively for PM10 and PM2.5. The duration of the sampling is 24 hours per filter, the flow rate, the volume of air drawn in and the meteorological parameters were recorded on each sampling day. The collected filters were conditioned in a desiccator (oven) and the weighing of the filters before and after each sampling was carried out in a laboratory environment. The following Photo 1 shows the measuring device (GENT) used in this work.

Photo 1 GENT measuring device

- A low flow sampler (2.3 m^3 /hour) KLEINFILTERGERAT (LECKEL GmbH) (see

Photo 2) equipped with a PM2.5 head. The filters are made of microfibre glass with a diameter of 47 mm and a porosity of 0.4 um (whatman).

Photo 2 Measuring device LECKEL GMBHMeasuring device LECKEL GMBH

- A DAVIS-type weather station was used to collect meteorological parameters such as temperature (degrees Celsius), relative humidity (%), rainfall (mm), pressure (hPa), wind speed (m/s) and direction. The device is illustrated in Photo 3 below.

Photo 3 DAVIS weather measuring device

2.2.9.2. Measurement results

✓ *Concentration of particulate matter*

The results of the measurements for particulate matter (PM2.5 and PM10) are presented in Table 10 below. Exceedances of the WHO standards are highlighted.

Table 10 Average concentration of particulate matter (PM2.5 and PM10)

PM10, PM2.5 CONCENTRATION IN $\mu G/M^3$				WEATHER VALUES	
WEBSITE	**PARTICLES**	**AVERAGE**	**WHO STANDARD/DAY**	**TEMPERATURE IN °C**	**WIND SPEED IN (KM/H)**
Site 1	PM2.5	54,65	25	32	1,44
Site 2	PM10	113,27	50	29	1,44
	PM2.5	22,24	25		
	PM2.5/PM10	0,196	<0.5		
Site 2	PM10	68,73	50	32	4,68
	PM2.5	14,10	25		
	PM2.5/PM10	0,205	<0.5		
Site 3	PM10	61,84	50	33	6,48
	PM2.5	32,74	25		
	PM2.5/PM10	0,529	<0.5		
Site 4	PM10	135,70	50	29	4,78
	PM2.5	23,95	25		
	PM2.5/PM10	0,176	<0.5		

In general, the average concentration of deposited mass is relatively higher in PM10 than in PM2.5. However, it is noted that the concentration of fine particles is much more dominant at site 1 (54.65 µg/m^3), which is still higher than the WHO standard (25µg/day) due to the harmattan winds and the factories in Agadez, including the Sonichar power station at Tchirozerine, located approximately 60km to the south.

It should also be noted that on specific days, the PM10 concentrations are very high due to the variation of meteorological conditions at the base and EGHATRAK (113.27 and 135.70 respectively).

Finally, it should be noted that the higher the wind speed, the lower the concentration of particles, which proves that the wind favours their dispersion (see Figure 7).

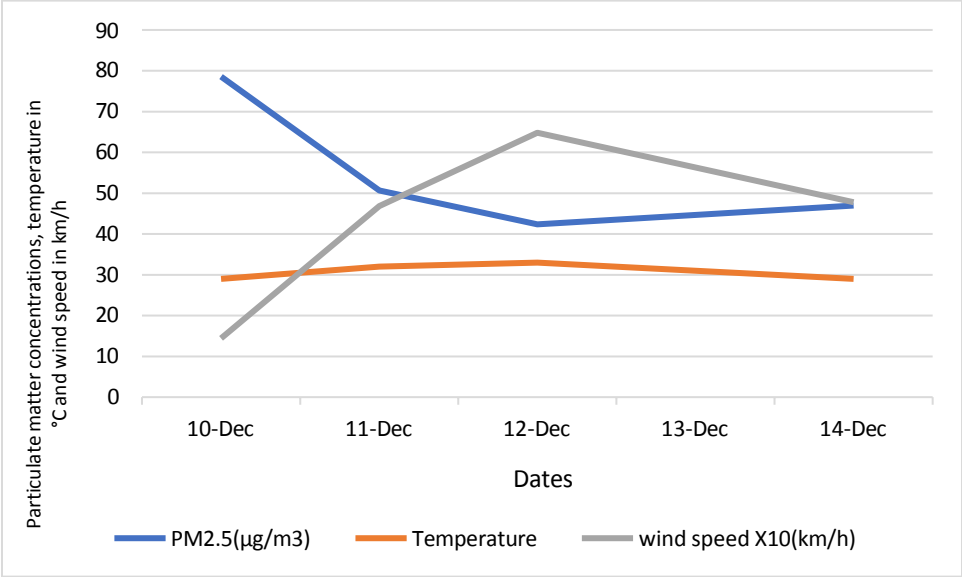

Figure 7 Influence of meteorological parameters on PM2.5 at site 1

On the other hand, for sites 2, 3 and 4, the PM10 concentration is clearly higher than that of PM2.5 due to terrigenous inputs and the resuspension of large particles in the air by desert winds.

Nevertheless, the fine particles vary little under the influence of wind, and the temperature remains almost constant throughout the sampling period (see figure 8).

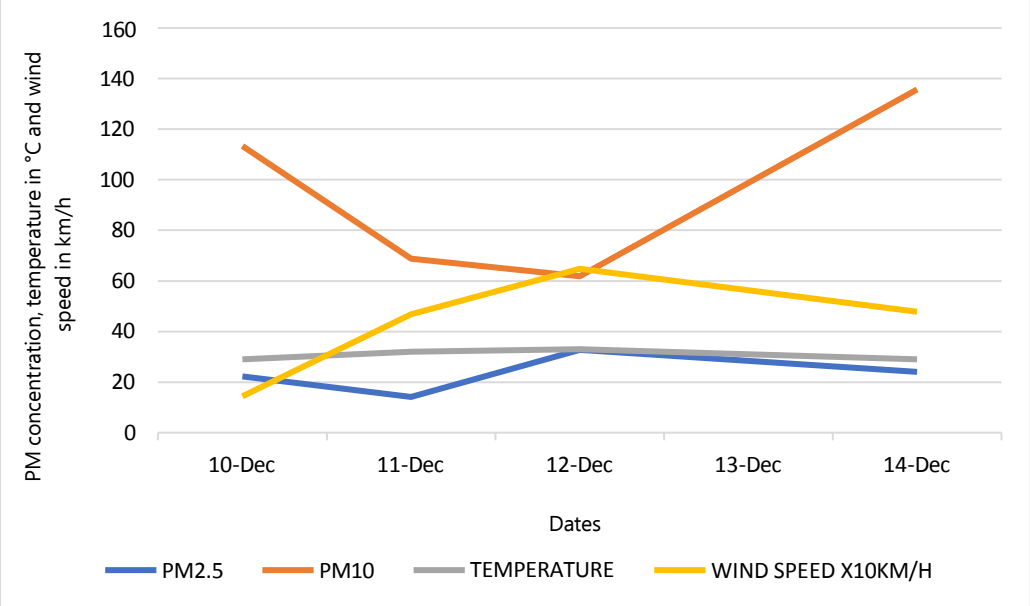

Figure 8 Influence of meteorological parameters on PM at sites 2, 3 and 4

✓ *Elemental chemical composition (heavy metals)*

Within the framework of the study eight (8) main elements were analysed by nuclear

analysis techniques (X-ray fluorescence). The results of the PM2.5 analysis of site 1 show that the most abundant element is zinc followed by vanadium, barium and titanium (see table 11 below).

Table 11 Concentration of heavy metals at site 1

ELEMENTS	MAX	MIN	AVERAGES	WHO/EU/IARC STANDARDS (µg/m³) ANNUAL
Ba	1,4457	0,7289	0,9563	-
Cr	0,1497	0,0511	0,0997	0,0002
Fe	0,8800	0,2605	0,4483	-
Mn	0,1580	0,0000	0,0395	70
Sr	0,0862	0,0377	0,0550	10
Ti	1,7129	0,1080	0,9179	120
V	1,8150	1,0424	1,2588	500
Zn	4,5964	2,3817	3,1122	3000

It should be noted that all the values obtained for heavy metals are clearly below the WHO, EU and IARC standards, with the exception of chromium (0.0997 µg/m3), which is above the WHO standard (0.0002 µg/m3).

Finally, apart from iron and manganese which are considered to be of natural origin, the other elements (Ba, Mn, Sr, Ti, V and Zn) are of anthropogenic origin probably transported by the wind coming from Arlit. Figure 10 below shows the variation in elemental concentrations at this site as a function of the sampling days. Thus, it should be noted that on the first day of sampling (10/12/21), the concentrations of the elements (Ti, V, Fe, Zn and Ba) are higher and a slight constancy is observed on the following days (11 to 13/12/21) except for Zinc which increases and Ti which decreases on the last day.

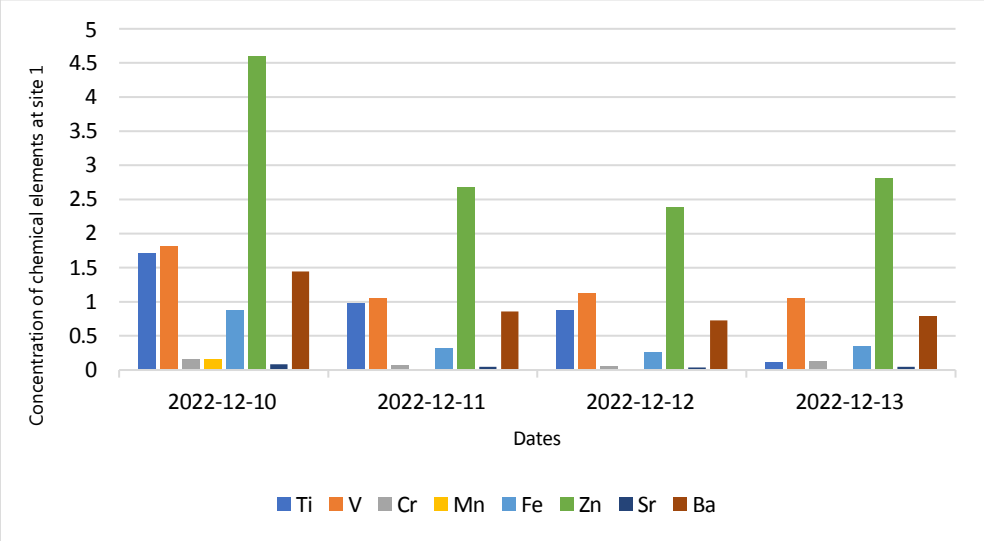

Figure 9 Variation in elemental concentration (site 1)

Concerning sites 2, 3 and 4, the concentrations of these elements are given in Table 12

below. Thus, at the base of life, Tagaza village and Egatrak (respectively sites 2, 3 and 4), five (5) elements were identified, of which iron is the only one of natural origin present in the two (2) fractions and more abundant in the PM10. While titanium is only present in PM10, the elements Chromium, Zinc and Barium are present in small quantities in both fractions.

Table 12 Concentration of elements at the sites

SITES	ELEMENTS	Ti	Cr	Fe	Zn	Ba
1	PM2.5	64000	7225	30755	227000	69400
2 south	PM10	-	-	31300	983	4969
	PM2.5	-	773	6427	-	-
2 North	PM0	8125	-	24900	-	-
	PM2.5	-	-	10100	358	-
3	PM10	5611	1392	31000	677	-
	PM2.5	-	-	6831	-	-
4	PM10	-	-	15300	582	5573
	PM2.5	-	-	582	-	5573

The variations in concentrations at these sites are illustrated in Figure 10 below. It should be noted that iron is the most abundant element followed by titanium and barium during the sampling period while chromium and zinc are present in low concentrations.

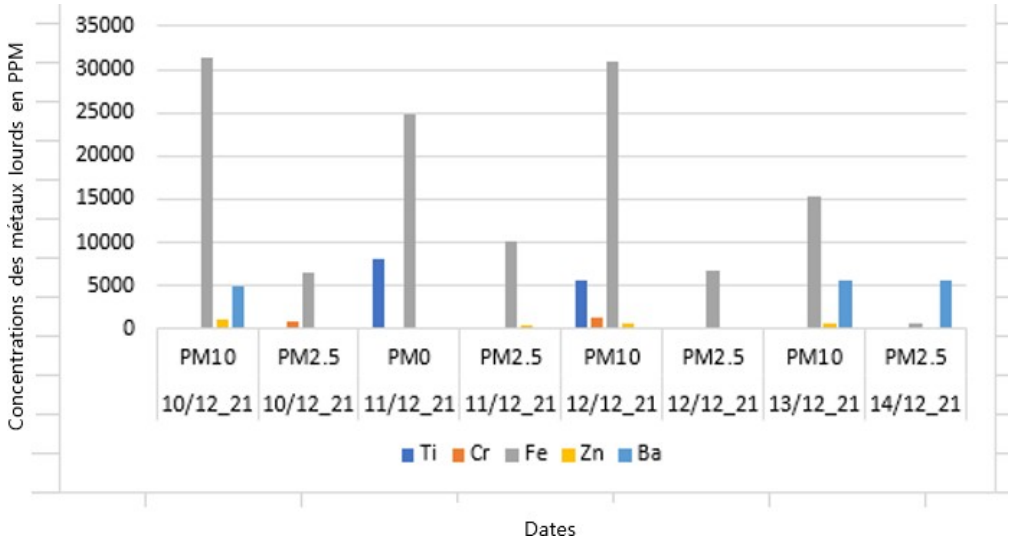

Figure 10 Variation in metal concentration at sites 2, 3 and 4

✓ *Black carbon concentration*

The average values of black carbon in fine and coarse particles are shown in Table 13 below. The maximum value is 1.84 at TAGAZA (Site 3); it slightly exceeds the WHO standard of 1.8 µg/m^3.

Table 13 Concentration of black carbon in particles

WEBSITES	CATEGORIES	ug/m³)
Site 1	BC (PM2.5)	1,1208
Site 2 South	BC (PM10)	1,3382
	BC (PM2.5)	0,3153
	BC (PM10)	0,6062
Site 2 North	BC (PM2.5)	1,0969
Site 3	BC (PM10)	1,8423
	BC (PM2.5)	0,1026
Site 4	BC (PM10)	0,4668
	BC (PM2.5)	0,6178

Source: Field survey (FEED), 2021

The trends in terms of variations illustrated in the table above show that at sites 2 south, and 3, the values obtained show that the concentration of black carbon in coarse particles (PM10) is higher than in fine particles (PM2.5).

At sites 1, 2 north and 4, the concentrations of carbon in fine particles are more dominant.

2.2.9.3. Vulnerability of the project area to sandstorms

Located in the Agadez region, the area is subject to sandstorms that often originate in the Sahara. In general, this phenomenon is favoured by the low vegetation cover of the ecosystems. Thus, in case of sandstorms, almost 70% of the total area of the region has a *"very high"* level of vulnerability. Figure 11 below shows the vulnerability map of the Agadez region to sandstorms.

In the project area, this phenomenon mainly affects the movement of people with disruption of visibility.

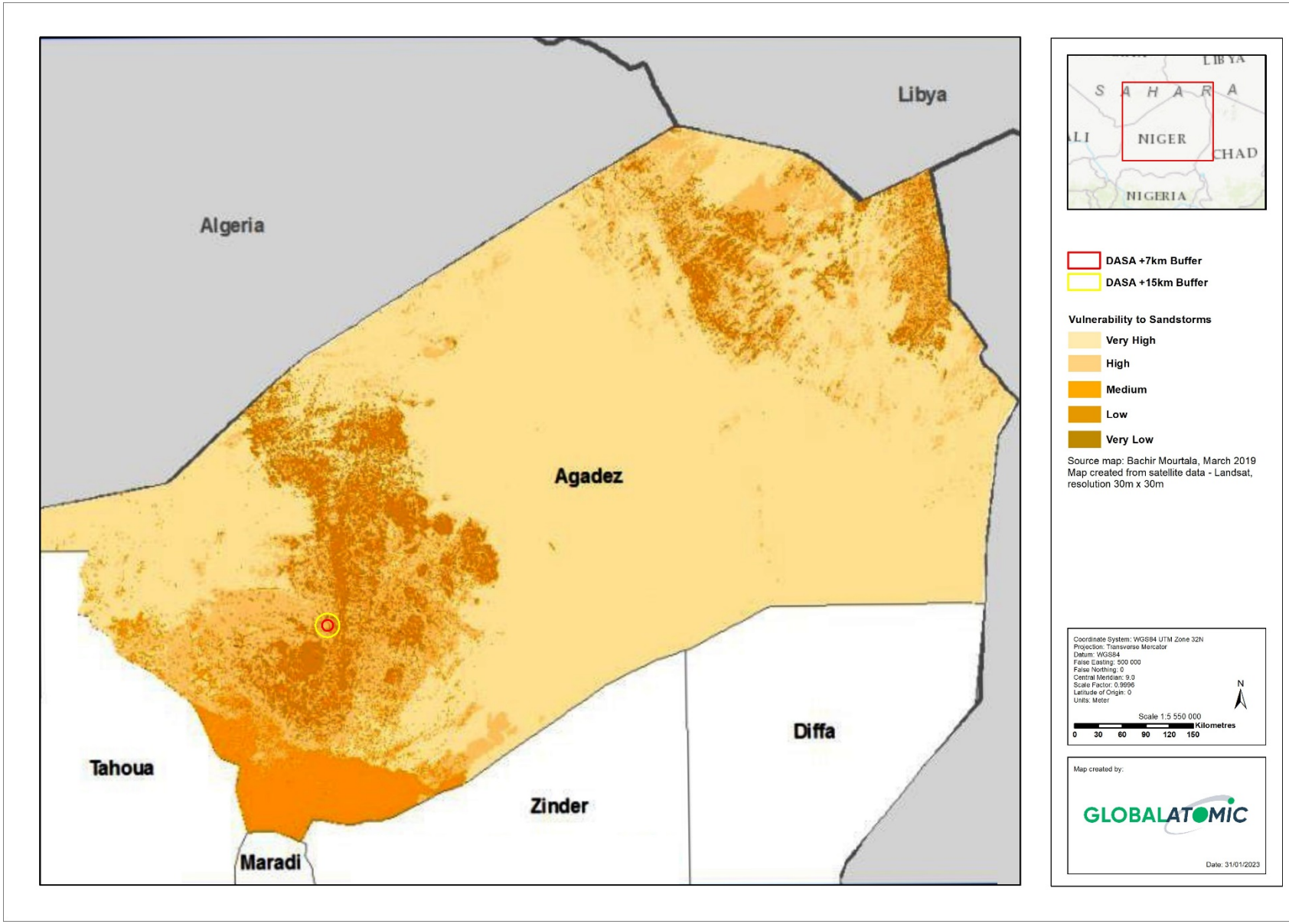

Figure 11 Vulnerability map of the area to sandstorms (Source: PDIPC, 2019)

2.2.10. Noise environment

✓ *Receptor potentials*

During the implementation of the project, the noise that will be generated by the fixed and mobile machinery will cause a change in the sound environment with the following potential receptors: the workers who will be involved in the different phases and levels of implementation of the project, the populations surrounding the sites and those of the localities located along the roads that will be used by the trucks transporting the raw materials to supply the plant and the shipment of the uranate.

✓ *Measurement results*

Ambient measurements were carried out at the sites with a sound level meter. The choice of these sites was based on the direction of the prevailing winds. The values obtained vary from 29.1 to 57.9 dB as shown in Table 14 below. It should be noted that at the heart of the deposits (length 17°47'82''; lat. 7°41'123''; altitude 483m), the readings on 12 December 2021, gave a maximum of 64.4 dB and a minimum of 28.9 dB at 11:01.

Table 14 Noise levels measured at the stations

Sites	Recorded noise level in decibels			
	MIN.	MAX.	MOY.	WHO Standard
1	36,6	51,1	43,85	55/Day
2 North	36,6	51,1	43,85	55/Day
2 South	46,8	**72,5**	59,65	55/Day
3	29,1	37,1	33,1	55/Day
4	29,6	**57,9**	43,75	55/Day
Core of the deposit	**28,9**	**64,4**	**46,65**	45/Night

The ambient sound quality limits according to the WHO Environmental Noise Guidelines (WHO, 1999) are 55 during the day and 45 at night. However, the maximum values recorded at the core of the deposit and at sites 2 south and 4 are above the WHO standards.

Finally, it should be mentioned that the values above the WHO standards are either related to the proximity of the measuring station to the RTA road or to varying meteorological conditions such as wind speed. Finally, the low noise values are explained by the fact that there are no noise generating activities within the perimeter of the permit.

2.2.11. Background radiation

The Project area is located in a region of elevated background radiation due to the natural presence of high concentrations of uranium in the rocks and soils. Key exposure (dose) routes for workers and local residents are based on external atmospheric radiation, external radiation received from the ground; inhaled dust and gases; ingestion of

radionuclides on foodstuffs and contained in drinking water.

The initial radiological status of the site and its surroundings is very important for monitoring the radiological impacts associated with the implementation of the Adrar Emoles 3 exploration permit. The elements of the initial radiological status are:

- measurements of external exposure dose rates at several points in and around the uranium deposit area and along two perpendicular directions that pass approximately through the centre of this area;
- measurements on soil samples at certain points;
- measurements on water samples from all the supply points (wells and boreholes) of the villages and camps within a radius of 20 km of the deposits (see Figure 12 for sampling points and radioactivity measurements).

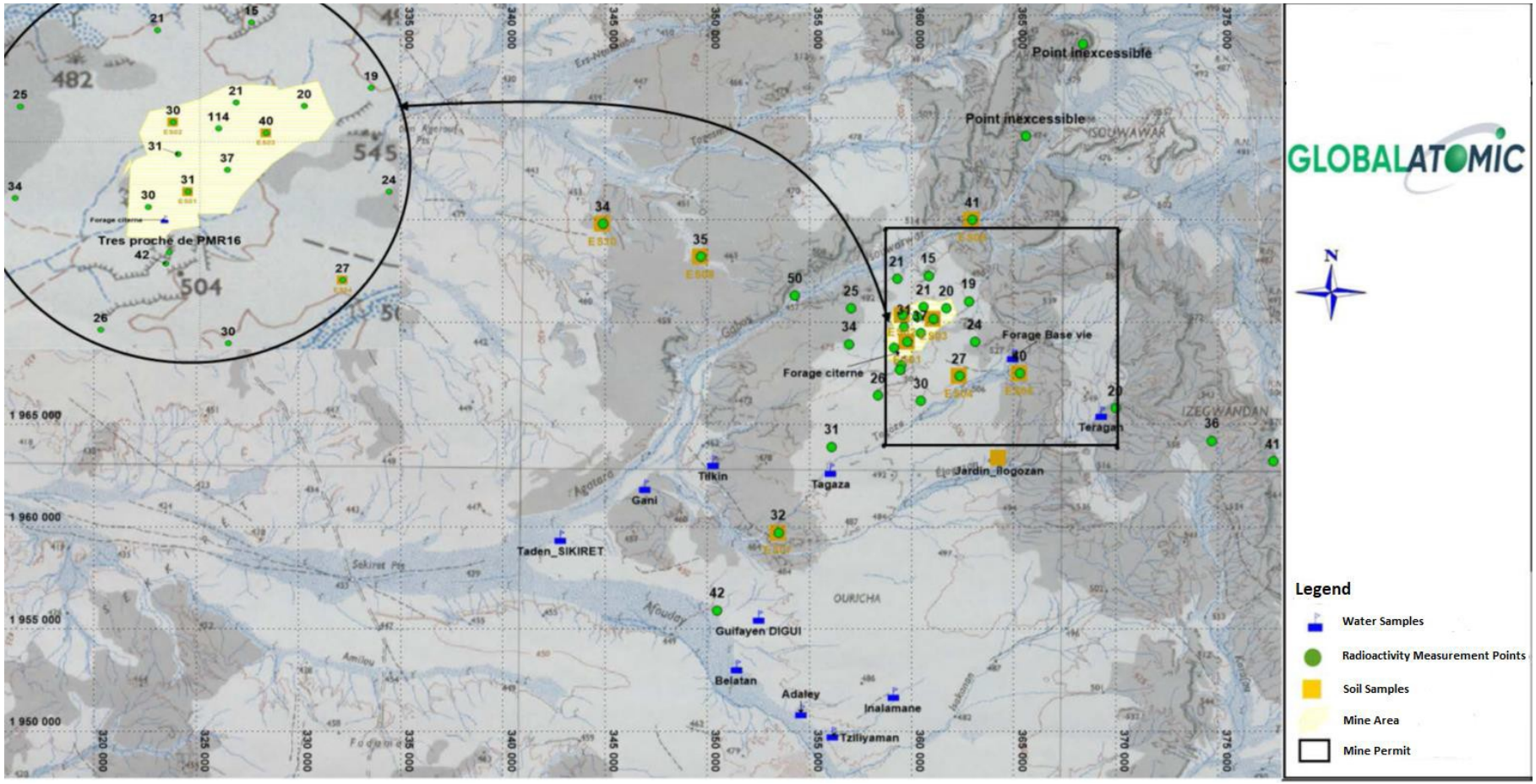

Figure 12 View of the sampling and measurement points for radioactivity (Source: REIES GAC, 2021)

2.2.11.1. External exposure dose rate measurements

The devices used were a GPS (brand GARMIN, etrex 10) to geo-reference the points and a radiation meter (brand ATOMTEX AT6130, serial number S/N: 20378) to measure the external exposure dose rates, at about one metre from the ground surface. The results are presented in Tables 15 and 16 below.

Table 15 External exposure dose rate measurement points on and around the left-hand deposits

Point number		1	2	3	4	5	6	7
Contact details Geographic in UTM	**X**	359149	359803	360453	359496	359642	359557	360303
	Y	1968752	1969047	1969452	1967989	1969763	1970370	1970248
Ambient dose rates at 1 m in nSv/h		**110**	**140**	**130**	**ND**	**130**	**80**	**320**
Point number		8	9	10	11	12	13	14
Contact details Geographic in UTM	**X**	361086	360596	361709	362810	360841	359275	357049
	Y	1970166	1970741	1970680	1971022	1972270	1972099	1970668
Ambient dose rates at 1 m in nSv/h		**100**	**130**	**60**	**80**	**70**	**80**	**230**
Point number		15	16	17	18	19	20	
Contact details Geographic in UTM	**X**	356964	359441	358370	360462	362345	363104	
	Y	1968919	1967671	1966411	1966154	1967353	1969041	
Ambient dose rates at 1 m in nSv/h		**160**	**90**	**160**	**200**	**120**	**140**	

Table 16 External exposure dose rate measurement points in and around the right-hand deposits

ITEM		*GISEMENT, SOUTH-EAST*				*DEPOSIT, NORTH WEST*		
Point number		21	22	23	24	25	26	27
Contact details Geographic in UTM	**X**	365300	370000	374700	377703	354300	349700	344900
	Y	1967500	1965800	1963206	1962500	1971300	1973200	1974800
Ambient dose rates at 1 m in nSv/h		**100**	**70**	**110**	**100**	**170**	**110**	**130**
ITEM		*DEPOSIT, NORTH-EAST*				*DEPOSIT, SOUTH-WEST*		
Point number		28	29	30		31	32	33
Contact details Geographic in UTM	**X**	363000	365600	368400		365100	353500	350500
	Y	1975000	1979100	1983600		1963900	1959700	1955900
Ambient dose rates at 1 m in nSv/h		**240**	**-**	**-**		**250**	**160**	**180**

In addition to the originally planned points, external exposure dose rate measurements were carried out at other points where water samples were taken. The coordinates of these points and the results of the measurements are presented in Tables 17 and 18 below.

Table 17 Additional measurement points and water sampling

VILLAGE OR CAMP		TILKIN	TADEN	GUIFAYEN DIGUI	ADALEY	BELATEN	TZILIYAMAN TEGAZAOU	TERAGAN
Contact details Geographic in UTM	X	350281	342822	352314	354592	351429	356137	369277
	Y	1963089	1959424	1955531	1950913	1953108	1949834	1965506
Ambient dose rates at 1 m in nSv/h		110	230	100	110	80	70	100

Table 18 Additional measurement points and water sampling (continued)

VILLAGE OR CAMP		GANI	INOLAMANE	TAGAZA	ELAGOZAN ''GARDENS	GLOBAL ATOMIC CAMP	DRILLING WATER SUPPLY
Contact details Geographic in UTM	X	346950	359125	356044	364311	364950	359420
	Y	1961916	1951762	1962722	1963373	1968322	1968508
Ambient dose rates at 1 m in nSv/h		110	110	140	160	100	130

Note: Based on the results of recorded external exposure dose rate measurements, the annual natural external exposure dose that would be received by a member of the public living in the area varies between 2.20 mSv (with a continuous dose rate of 250 nSv/h) and 0.53 mSv (with a continuous dose rate of 60 nSv/h).

2.2.11.2. Measurements of the radiological level of soils

Soil surface samples with a thickness of between 0 and 5 mm were taken, using a small shovel and plastic sample holders, at certain points in the area of the deposit and in the environment. These samples are intended for radiological analysis, specifically to determine the mass concentrations or mass activities of uranium-238 and radium-226. The sampling concerned the Elagozan gardens (7.94 km), points PMR21 (5 km), PMR26 (10 km), PMR27 (15 km), PMR28 (5 km), PMR32 (10 km), points PMR2, PMR6 and PMR8 located on the deposit and PMR19 which is in its immediate vicinity. The samples were coded as shown in Table 19 below.

Table 19 Sampling points and codes for sand samples

Sampling point	PMR2	PMR6	PMR8	PMR19	PMR21	Elagozan ''Gardens	PMR32	PMR26	PMR28	PMR27
Sample code	ES01	ES02	ES03	ES04	ES05	ES06	ES07	ES08	ES09	ES10

✓ *Results of radiological analysis of soil samples*

Soil samples taken in the project area were analysed by the Laboratoire d'Analyses Environnementales (LAE) of ALGADE, located in Bessines-sur-Gartempe, France, to determine the mass concentrations of uranium. The results of the analyses of the ten samples vary from minus 0.99 mg/Kg to 4.28 mg/Kg (the result sheets are attached to this report).

2.2.11.3. Measurement of the radiological level of water points (wells and boreholes)

All villages or nomadic settlements in the area within 20km of the deposit were visited and water samples were taken from wells and boreholes. Plastic bottles with a capacity of 1.5 litres each were used for this purpose. Thirteen samples were taken for radiological analysis to determine the volume concentrations of alpha and beta activity and the total indicative dose (TID).

The geographical coordinates of the wells and boreholes where samples were taken are presented in Tables 20 and 21 below.

Table 20 Sampling points and codes for water samples (village and type of structure).

VILLAGE OR CAMP	TILKIN	TADEN SÉKIRET	GUIFAYEN DIGUI	ADALEY	BELATAN	TZILIYAMAN TEGAZAOU
Work	Well	Drilling	Drilling	Well	Well	Well
Sample code	EE03	EE02	EE05	EE06	EE13	EE07

Table 21 Continuation of sampling points and water sample codes (village and type of structure).

VILLAGE OR CAMP	TERAGAN	GANI	INOLAMANE	TAGAZA	ELAGOZAN ''GARDENS	GLOBAL ATOMIC CAMP	DRILLING WATER SUPPLY
Work	Well	Well	Drilling	Drilling	Well	Drilling	Drilling
Sample code	EE01	EE04	EE08	EE09	EE11	EE10	EE12

✓ *Results of radiological analysis of water samples*

Water samples taken from the drinking water supply points (boreholes and wells) in the project area were analysed by the Laboratoire d'Analyses Environnementales (LAE) of ALGADE, located in Bessines-sur-Gartempe, France. This is a recognised laboratory for the measurement of radioactivity in the environment, approved by the French Nuclear Safety Authority (ASN) and accredited by the French Accreditation Committee (COFRAC).

The results of the analyses of samples EE01 to EE10, as published by the LAE laboratory, are appended to this report. It should be noted that, without any disturbance of the environment resulting from human activity, the overall alpha activity concentrations, in comparison with the World Health Organisation (WHO) recommendation (0.50 Bq/l), are high in three wells (Gani, Tilkin, Adelay) and two boreholes (Base Vie, Taden Sikiret). The same is true for the overall beta activity concentration in the Taden Sikiret borehole, compared to the 1 Bq/l recommended by the WHO. It should also be noted that, apart from Adaley which is isolated, all the water points with high radiological levels are on the same *Base Vie-Taden Sikiret* strip.

2.2.11.4. Recommendations

The results of the ambient dose rate measurements are highly variable and reflect the heterogeneous nature of the terrain. They provide a good baseline, but in order to complement them and also to comply with the requirements for radiological environmental

monitoring, it would be necessary to implement a programme over a period of twelve consecutive months, subdivided into four monitoring periods of three months each. This is very important as the regulatory dose limits for exposure to ionising radiation are set in national regulations and international standards for a period of one year.

Based on the results to date, the annual natural external exposure dose which would be received by a member of the public living in the area varies between 2.80 milli Sieverts (mSv) at a continuous dose rate of 320 nSv/h) and 0.53 milli Sieverts (mSv) at a continuous dose rate of 60 nSv/h).

GAC established four dosimeter stations to monitor alpha, beta, gamma and radon on a quarterly basis for a period of twelve12 months. With the baseline data complete, an (Appendix 6). An additional assessment of potential exposure will be calculated and compared with exposure rates elsewhere to Naturally Occurring Radioactive Materials (NORM) and health-based dose rates. This assessment will consider the nomadic characteristics of some of the local population and their reliance on their livestock for milk, cheese, and meat. A realistic exposure scenario will be defined with the relevant state institutions in order to establish a formula for calculating the cumulative exposure doses that these populations are likely to receive in a year including increased exposure attributable to the uranium mining operations. This work will be carried out ahead of mining operations.

2.3. Biodiversity

A desktop-based biodiversity GIS review and Critical Habitat (CH) Screening Assessment were undertaken in 2021 (Treweek Environmental Consultants (TEC) Ltd and Abell Geospatial Consulting (AGC) Ltd, 2021), with the aim of further aligning the Project with the requirements of IFC PS6, building on information and fieldwork provided by Groupe Art & Génie (2020).

The CH screening included identification and initial assessment of biodiversity features present within, or potentially impacted by the development of the Adrar Emoles III project and was conducted in accordance with the requirements of the International Finance Corporation Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC PS6) and the accompanying Guidance Note 6 (GN6).

A “Landscape Study Area” (LSA) was identified for broad screening of biodiversity features which includes the DASA Project area, the entirety of the Adrar Emoles III and IV Exploration Permit Areas and any additional areas within a 50km buffer around the Project location (Figure 14). The assessment used spatial data provided by GAC, existing Project related reports, publicly available biodiversity data, as well as the results of searches from internationally recognised biodiversity data sources (including the Integrated Biodiversity Assessment Tool (IBAT)) were also consulted and reviewed.

IFC PS6 requires the identification and assessment of three classes of area based on habitat condition. Land areas may be defined as “Modified” or “Natural Habitat” and either of these classes may also be identified as “Critical Habitat” if they support certain high biodiversity values. Habitat mapping has not yet been completed for the Project to allow this assessment to be completed.

Definitions of the three classes of habitat are outlined below.

Natural Habitat is defined as: '*areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition'*[1]. Natural Habitat is not restricted to pristine habitats. It is assumed that the majority of habitats designated as natural will have undergone some degree of historic anthropogenic impact.

Modified Habitat is defined as: '*areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition'*[2]. For example, areas managed intensively for agriculture, forest plantations, settlements and urban areas. Definitions of what might constitute a modified or degraded area vary, are location specific and may be influenced by the broader landscape context.

Critical Habitat is defined as '*areas of Natural and/or Modified Habitat that support high biodiversity value'* based on the presence of one or more of the following[3]:

Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species; Criterion 2:

Endemic and/or restricted-range species;

Criterion 3: Globally significant concentrations of migratory and/or congregatory species;

Criterion 4: Highly threatened and/or unique ecosystems; and/or

Criterion 5: Areas associated with key evolutionary processes.

The presence of any one of these types of biodiversity features in the LSA may "trigger" a determination of Critical Habitat, based on their extent or abundance within an Ecologically Appropriate Area of Analysis (EAAA) defined for each feature. For Criteria 1 to 3, presence of CH is confirmed by assessment against quantitative thresholds. Expert judgement is needed to determine presence of CH for Criteria 4 and 5. Legally Protected Areas and Internationally Recognised Areas may also qualify an area as CH depending on the reasons for designation.

2.3.1. Legally protected areas and international recognised areas

Seven legally protected areas have been identified during biodiversity studies, but all are understood to be more than 100 km from the Project site (Figure 14).Aïr et Ténéré MAB covers an area of almost 24 million hectares and is designated as an UNESCO World Heritage Site. The flora of the area comprises about 300 higher plants, while the fauna boasts an outstanding variety of wild animals including three threatened antelope species, the Loder's gazelle (Gazella leptoceros), Dama gazelle and Addax.Aïr and Ténéré Natural Reserve is listed as a UNESCO World Heritage Site. It is one of the largest protected areas in Africa and covers more than 7.7 million ha. It represents a small, isolated pocket of Sahelian plant life with Sudanese and Saharo-Mediterranean elements. One sixth of its total area is classified as a protected sanctuary.National Nature Reserve of the Aïr and the Teneré is classified as a Key Biodiversity Area and

[1] IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources 2012, Paragraph 13.
[2] IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources 2012, Paragraph 11.
[3] IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources 2012, Paragraph 16.

Important Bird Area. This protected area shares the same boundary as the Aïr and Ténéré Natural Reserve described above.

The Gueltas et Oasis de l' Aïr Ramsar site was designated in 2005 and covers an area of 49,241 km2 within the Aïr and Ténéré Natural Reserve. The site is a complex of permanent and temporary streams, oases and marshes at the centre of Niger's part of the Sahara Desert. This isolated area hosts a number of threatened species such as the Cheetah (CR), Dorcas Gazelle (CR), Addax (CR) and Barbary Sheep (VU). The site hosts 290 species of flowering plants and 150 bird species, including permanent residents and Palearctic migrants.

The Addax Sanctuary is an IUCN Management Category Ia site and a Strict Nature Reserve within the Aïr and Ténéré Natural Reserve. It covers an area of approximately 12,800 km2 and exists to protect habitat for the Critically Endangered Addax.

Termit et Tin-Toumma Natural Reserve is located to the south of the Aïr and Ténéré Natural Reserve. It covers an area of 90,507 km2 and is assigned to the IUCN management category IV. This natural reserve contains a large variety of desert habitats and is home to one of the last remaining wild populations of the critically endangered Addax, Dama Gazelle, North-west African Cheetah and Barbary Sheep.

Gadabedji MAB is located over 250 km south of the Project area. It covers an area of 1,413,625 ha and comprises a mosaic of savannas, depressions, pits and sand dunes. The fauna is diverse and includes large mammals such as the Dorcas Gazelle, Pale Fox and Golden Jackal.

2.3.2. Field Surveys

The CH screening assessment was completed using a range of desktop information sources including the ECS and ESIA reports previously compiled for the Project, IBAT Report, GIS data, Protected Planet, and scientific literature. Thirteen species of conservation concern listed under the IUCN Red list of threatened species were conservatively assessed as having the potential to occur within the LSA based on overlap with the species IUCN distribution and/or the likely presence of suitable habitat. Of these species, three nomadic/ wide ranging mammals: North-west African Cheetah, Addax and Dama Gazelle have the potential to qualify the LSA as Critical Habitat under Criterion 1 (Critically Endangered and Endangered species). The potential for threatened species to be present within the study area required further field assessment and in 2021 FEED Consult were commissioned to undertake field surveys in the dry and wet seasons (2021-2022).

Based on GIS spatial assessment, desktop CH screening, historical and current fieldwork there is no critical habitat in the project's area of influence; defined as a 50 kilometer circle around the mine site under IFC PS6 IBAT Report criteria.

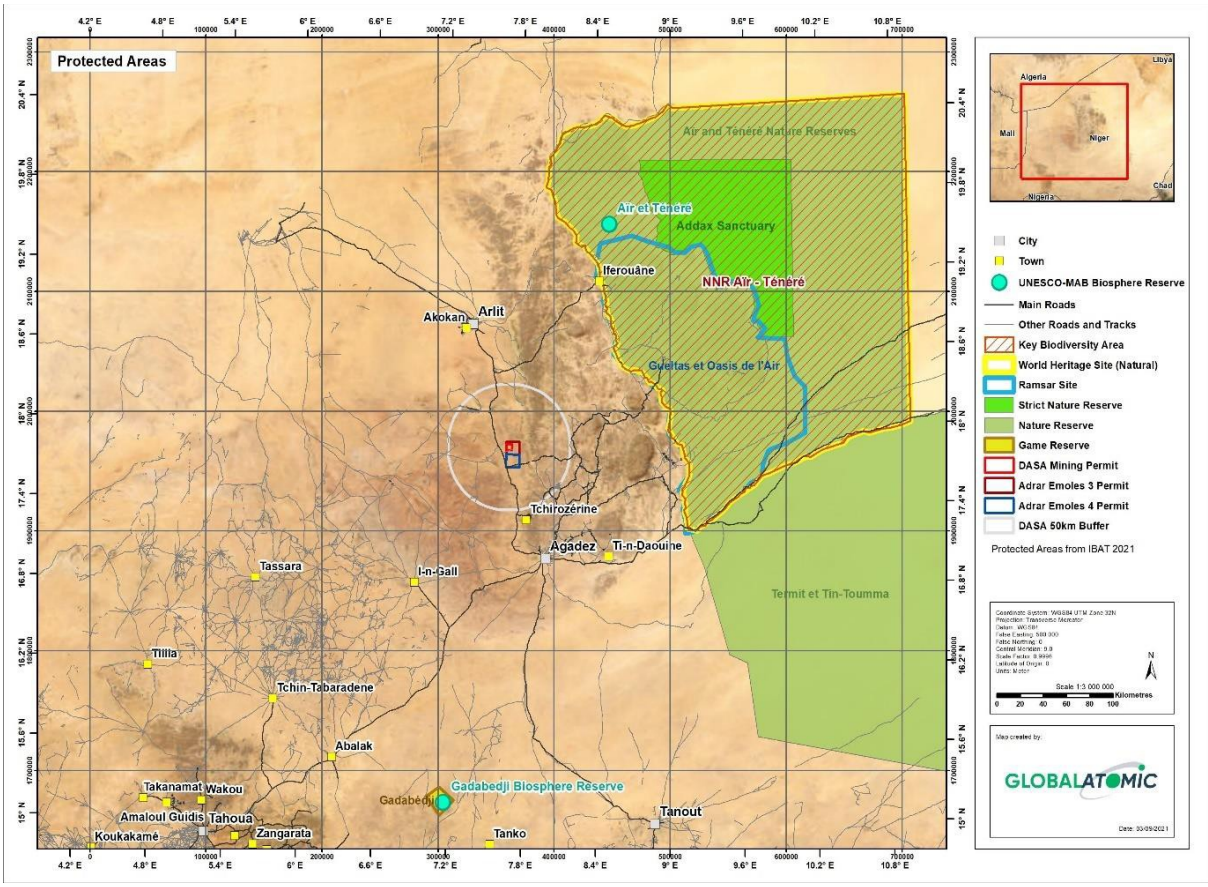

Figure 13 Legally protected areas and internationally recognised areas (Source: TEC/AGC Report 2021, IBAT 2021)

2.3.3. Vegetation

Field surveys and GIS analysis confirmed that areas of perennial vegetation exist in association with koris and in lowland areas. The extent of vegetation cover is similar across both the dry and wet seasons, suggesting areas of permanent (likely woody) vegetation.

Woody plant species previously listed as present in the Project area (Groupe Art & Génie, 2011 & 2020) include: V. flava (syn. Acacia Ehrenbergiana), V. tortilis (syn. Acacia tortilis), V. tortilis subsp. raddiana (syn. Acacia raddiana), Balanites aegyptiaca, Boscia senegalensis, Calotropis procera, Zizyphus mauritiana, Maerua crassifolia, Leptadenia pyrotechnica and Salvadora persica. The exotic species, Prosopis juliflora is also present around koris and lowland areas. The herbaceous layer is largely dominated by Panicum turgidum, however Cornulaca monacantha, Stipagrostis pungens and Schouwia thebaica were also noted as present (Groupe Art & Génie, 2011).

There is no regulation in Niger covering the protection of threatened plant species. A tree abatement restriction is defined in Act No 74 of March 04, 1974. This Act determines the rules for managing national forests, classified forests and protected forests and lists 15 tree species that are protected against abatement, unless authorised. Only one of these 15 species has been identified in the Project area: Desert Date (Balanites aegyptiaca),

which is described as being of average abundance (Groupe Art & Génie, 2020).

No species of conservation concern listed in the IUCN Red List have been identified from previous reports.

In 2021 and 2022 FEED Consult carried out surveys (dry and wet seasons) to characterize the vegetation of the Project area and the field findings are described below.

The natural vegetation of the region is located along the Koris, around the wadis or on a drainage area. Generally speaking, the woody species present are essentially concentrated in the Aïr and the plains. The vegetation groups thus formed form important forest massifs, the main ones being: the Tamazalak forest, the Dabaga forest, the Kerbouibou forest, the Afassas forest, the Tidène Egandawel forest, the Boughel forest and finally the Abardak forest (DR INS Agadez, 2017) This characteristic vegetation becomes rarer as one moves from south to north and remains a function of the orogeny and edapho-climatic characteristics.

In the permit area, the study carried out on the radius of 7 km, 15 km and surrounding areas established the baseline situation with regard to vegetation. It covered two seasons (dry and rainy).

Thus, during the study conducted in the dry season, 31 habitat points were traversed across the different geomorphological units within a radius of 15 km from the exploitation permit and surrounding areas and allowed the identification of pastoral zones (grassy steppe and tree steppe), agricultural production zones (modified habitats) listed, and heavily vegetated zones (valley, plain).

2.3.3.1. Results of the field surveys

- ✓ *Habitat characterisation*

The characterisation of the habitats in terms of terrain geomorphology, floristic composition, type of formation, average height of the flora as well as geographical coordinates and altitude is given in Table 22 below.

Table 22 Characterisation of habitats along the transects

REPORTS	READING POINTS	GEOMORPHOLOGY	FORISTIC COMPOSITION	TYPE OF TRAINING	AVERAGE HEIGHT OF the flora	LATITUDE	LONGITUDE	ALTITUDES (M)
R1	T1	Valley / sandy-clay soil	*Balanites aegyptica, Acacia raddiana, Panicum turgidum, Acacia ehrenbergiana, Cyperus conglomeratus*	Gallery forest	6 m	17,94736111	7,5845833	449,8628467
R2	T1	Rocky plateau	*Panicum Trigidium , Phragmites australis, Acacia ehrenbergiana*	Panicum steppe	2 m	17,7985	7,7358056	502,2858884
R3	T1	Rocky plateau	*Panicum turgidum, Phragmites australis*	rocky expanse	--	17,79619444	7,7455556	513,8677233
R4	T1	Plain	*Acacia ehrembergiana, Balanites aegyptiaca, hyphaene thebeica, Panicum turgidum, Phragmites australis*	Steppe with *Panicum turgidum*	3 m	17,75669444	7,7692222	504,7241695
R5	T1	Rocky plateau	*Phragmites australis, Panicum turgidum, Acacia ehrembergiana*	Grassy steppe	2 m	17,74330556	7,7985	522,0969217
R6	T1	Sandy soil	*Acacia ehrembergiana, Panicum trigidium*	--	5 m	17,72716667	7,8192222	-
R7	T2	Rocky Plateau	*Acacia ehrenbergiana, Phragmites australis*	Serum on the mineral soil part	3 m	17,82325	7,7799722	505,3337397
R8	T2	Mineral soil	*Balanites aegyptica, Maerua crassifolia, Panicum turgidum, Acacia ehrenbergiana, Calotropis procera,*	---	6 m	17,862	7,7880833	485,8274916
R9	T2	Raw mineral soil plain	*Calotropis procera, Acacia ehrenbergiana, Balanites aegyptiaca, Panicum turgidum*	Steppe with *Panicum turgidum* and *Calotropis procera*	6 m	0	0	-
R10	T2	Sandy clay soil	*Bossia senegalensis, Balanites aegyptiaca, Acacia ehrenbergiana, Panicum turgidum*	Gallery forest	6 m	17,86008333	7,7111111	464,1877476
R11	T2	Rocky plateau	*Balanites aegyptiaca, Acacia ehrenbergiana, Panicum turgidum*	Sparse formation	3 m	17,85252778	7,6754722	473,6360866
R12	T2	Rocky plateau	*Acacia Ehrenbergiana, Panicum turgidum, Cyperus conglomeratus, Aristida funiculata or Aristida hordeacea*	Steppe with *Panicum turgidum*	2 m	17,88113889	7,6848889	501,6763182
R13	T3	Koris	*Acacia ehrenbergiana, Calotropis procera, Maerua crassifolia, Balanites aegyptiaca, Ziziphus mauritiana, Hyphaene thebeica, Panicum turgidum, Corchorus depressus*	Tree steppe with Calotropis and Panicum	6 m	17,75544444	7,7252222	480,9509296
R14	T3	Plateau covered with mineral soil	*Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum, Phragmites australis*	Steppe with Panicum turgidum	3 m	17,76811111	7,7084722	492,5327644

REPORTS	READING POINTS	GEOMORPHOLOGY	FORISTIC COMPOSITION	TYPE OF TRAINING	AVERAGE HEIGHT OF the flora	LATITUDE	LONGITUDE	ALTITUDES (M)
R15	T3	Plateau covered with raw mineral soil	*Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum, Phragmites australis, Balanites aegyptiaca*	steppe with Panicum turgidum	6 m	17,77513889	7,6873333	480,3413593
R16	T3	Sandy plateau tray	*Panicum turgidum, Phragmites australis, Cyperus conglomeratus, corchorus depressus*	Panicum steppe	2 m	17,78677778	7,6817222	494,9710454
R17	T3	Sandy plateau	*Panicum turgidum, Phragmites australis, Maerua crassifolia, Acacia ehrenbergiana, ziziphus mauritiana*	Panicum steppe	3,5 m	17,80333333	7,6551111	462,3590369
R18	T3	Sandy plateau	*Panicum turgidum, Maerua crassifolia, Phragmites autralis, Cyperus conlomeratus*	Serum on the mineral soil part	3 m	17,85416667	7,6211667	467,2355989
R19	T3	Rocky plateau	*Acacia ehrenbergiana, Phragmites australis, Panicum turgidum*		2 m	17,81461111	7,6083056	457,1776897
R20	T4	Rocky plateau	*Phragmites australis, Panicum turgidum, Acacia ehrrenbergiana, Maerua crassifolia*		2 m	17,79441667	7,6006667	470,2834502
R21	T4	Rocky plateau	*Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum, Phragmites autralis, Cyperus conglomeratus*	Panicum steppe	4 m	17,76497222	7,6324444	465,102103
R22	T4	Valley	*Balanites aegyptiaca, Acacia ehrenbergiana, Panicum turgidum, Maerua crassifolia, Phragmites australis, Eragrostis tremula*	Gallery forest	6 m	17,75966667	7,6529444	469,0643097
R23	T4	Plateau	*Panicum turgidum, Phragmites australis, Acacia ehrenbergiana*	Sparse vegetation	2 m	17,74325	7,6649444	479,1222188
R24	T4		*Cyperus conglomeratus, Phragmites australis, Panicum turgidum, Acacia ehrenbergiana, Maerua crassifolia*	Panicum steppe	5 m	17,73730556	7,687	469,6738799
R25	T5	Plateau	*Phragmites australis, Cyperus conglomeratus, Panicum turgidum, Acacia ehrrenbergiana, Maerua crassifolia*	Grassy steppe	3 m	17,693	7,6416389	465,4068881
R26	T5	Rocky plateau	*Phragmites australis, Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum*	Steppe with trees open to the sandy parts of the plateau	3m	17,70947222	7,62275	462,3590369
R27	T5	Plateau	*Pragmites australis*	Phragmites Steppe	60 cm	17,76183333	7,5638333	436,4523011
R28	T5	Valley	*Denine, Balanites aegyptica, Acacia ehrenbergiana*	Forestry gallery	6 m	17,75094444	7,5828889	437,6714416
R29	T5	Plain	*Acacia ehrenbergiana stand*		5 m	17,76172222	7,5650278	443,462359

REPORTS	READING POINTS	GEOMORPHOLOGY	FORISTIC COMPOSITION	TYPE OF TRAINING	AVERAGE HEIGHT OF the flora	LATITUDE	LONGITUDE	ALTITUDES (M)
R30	T5	Plateau	*Corchorus depressus, Phragmites australis, Acacia ehrenbergiana*	Localized herbaceous vegetation in depressions	4 m	17,25819444	7,5011111	453,8250533
R31	T5	Plateau	Phragmites australis, Cyperus conglomeratus	----	--	17,81983333	7,5216944	442,2432185

✓ *Floristic composition*

A total of 29 species were recorded in and around the permit area: 17 herbaceous and 12 woody. The woody species are divided into 7 families including Mimosaceae (4 or 33%), Arecaceae (2 or 17%), Capparaceae (2; 17%), Zygolaceae (1 or 8%), Asclepiadaceae (1; 8%), Rhamaceae (1 or 8%) and Burseraceae (1 or 8%) (see Table 23 below).

Table 23 Woody species identified in the project area

WOODY	FAMILY
Acacia ehrenbergiana	Mimosaceae
Acacia raddiana	Mimosaceae
Accacia nilotica	Mimosaceae
Accacia Senegal	Mimosaceae
Balanites aegyptiaca	Zygophyllaceae
Boscia senegalensis	Capparidaceae
Calotropis procera	Asclepiadaceae
Commiphora Africana	Burseraceae
Hyphaene thebaica	Arecaceae
Maerua crassifolia	Cappariacae
Phoenix dactylifera	Arecaceae
Ziziphus Mauritania	Rhamnaceae

The status of woody species according to IUCN and national texts is shown in Table 24 below.

Table 24 Status of woody species

SCIENTIFIC NAME	FAMILY	LOCAL NAME	IUCN STATUS	NIGER STATUS
Acacia ehrenbergiana	Mimosaceae	Tamat	Least Concern	--
Acacia raddiana	Mimosaceae	Afagak	Least Concern	--
Accacia nilotica	Mimosaceae	tiggaert	Least Concern	Protected in Niger
Accacia senegal	Mimosaceae	dibshi	Least Concern	Protected in Niger
Balanites aegyptiaca	Zygophyllaceae	Aborak	Least Concern	Protected in Niger
Boscia senegalensis	Capparidaceae	Tedent	Least Concern	--
Calotropis procera	Asclepiadaceae	Tirza	Least Concern	--
Commiphora africana	Burseraceae	Adäras	Least Concern	--
Hyphaene thebaica	Arecaceae	Taggeyt	Least Concern	Protected in Niger
Maerua crassifolia	Cappariacae	Agar	Least Concern	--
Phoenix dactylifera	Arecaceae	Talizouk	Least Concern	--
Ziziphus mauritania	Rhamnaceae	Abaka	Least Concern	Protected in Niger

As for the herbaceous plants, they are distributed in 10 families, of which the Graminae represent the most important (7 species or 41%), Caesalpiniaceae (1 species or 6%), Amaranthaceae (1 species or 6%), Poaceae (1 species or 6%), Capparidaceae (1 species or 6%), Tiliaceae (2 species or 11%), Cyperaceae (2 species or 11%), Fabaceae (1 species or 6%), and Aizoaceae (1 species or 6%) (see Table 25).

Table 25 Herbaceous areas inventoried in and around the permit area

Herbaceous	**Family**
Andropogon gayanus	Gramineae
Aristida Sp	Gramineae
Cassia obtusifolia	Caesalpiniaceae
Celosia trigyna	Amaranthaceae
Cenchrus bilorus	Poaceae
Chrysopogon aucheri	Graminae
Cleome africana	Capparidaceae
Corchorus depressus	Tiliaceae
Corchorus olitorius	Tiliaceae
Cymbopogon sp	Gramineae
Cyperus Alopecuroides	Cyperaceae
Digitaria Horizontalis	Gramineae
Eragrostis tremula	Gramineae
Indicofera Nummulariifolia	Fabaceae
Limeum Viscosum	Aizoaceae
Panicum turgidum	Gramineae
Schoenoplectus corymbosus	Cyperaceae

Figure 14 below shows the floristic composition map of the permit area.

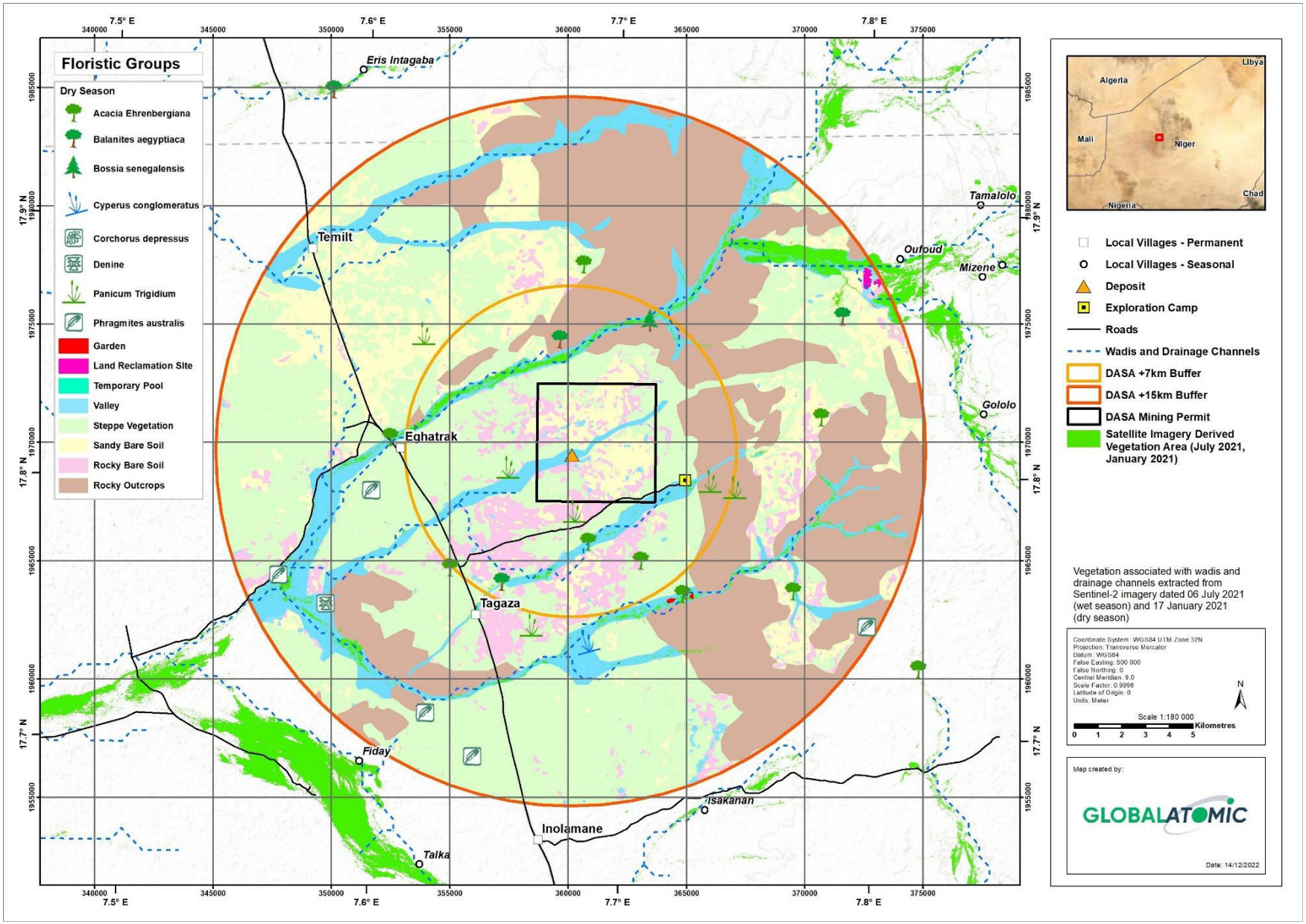

Figure 14 Floristic composition of the permit area

During the rainy season, the biodiversity (flora) survey identified a total of 38 species (25 herbaceous and 13 woody) in and around the area compared to 29 species in December 2021 (dry season). This difference is due to the rainy season, which allowed the identification of certain herbaceous species. The woody species are distributed in 8 families including Mimosaceae (4 or 30%), Arecaceae (2 or 15%), Capparaceae (2; 15%), Zygolaceae (1 or 7%), Asclepiadaceae (1; 7%), Rhamaceae (1 or 7%) and Burseraceae (1 or 7%), Tiliaceae (1 or 7%) (see table 6 below).

Compared to the December 2021 mission, there is little change in woody species. In addition, the phenology of the trees is completely green and regeneration is observed at some survey points.

Table 26 below shows the status of the species recorded during the two (2) seasons.

Table 26 Plant species recorded during the two seasons

SPECIES	DRY SEASON	RAINY SEASON
Acacia ehrenbergiana	X	X
Acacia raddiana	X	X
Accacia nilotica	X	X
Accacia senegal	X	X
Andropogon gayanus	X	X
Aristida Sp	X	X
Balanites aegyptiaca	X	X
Boerhavia repens		X
Boscia senegalensis	X	X
Calotropis procera	X	X
Cassia italica		X
Cassia mimosoides		X
Cassia obtusifolia	X	X
Celosia trigyna	X	X
Cenchrus bilorus	X	X
Chrysopogon aucheri	X	X
Citrillus colocynthis		X
Cleome africana	X	X
Cleome viscosa		X
Commiphora africana	X	X
Corchorus depressus	X	X
Corchorus olitorius	X	X
Cryptolepis sanguinolenta		X
Cymbopogon sp	X	X
Cyperus Alopecuroides	X	X
Digitaria Horizontalis	X	X
Eragrostis tremula	X	X
Euphorbia aegyptiaca		X

SPECIES	DRY SEASON	RAINY SEASON
Grevia tenax	X	X
Hyphaene thebaica	X	X
Indicofera Nummulariifolia	X	X
Indigofera cordifolia		X
Limeum Viscosum	X	X
Maerua crassifolia	X	X
Panicum turgidum	X	X
Phoenix dactylifera	X	X
Schoenoplectus Corymbosus	X	X
Ziziphus mauritania	X	X

- ✓ *Vegetation cover of the permit area*

The average cover of vegetation during the dry season is between 1 and 75%. The highest cover is found in R1, R3, R8, R9, R14, R20, R23, R29, R31, which varies between 50-75%. The lowest cover is found in R2, R5, R6, R10, R12, R16, R18, R21, R22, R25, R27, R30, with a cover of between 1-5%. Table 27 below gives the overlap per survey.

Table 27 Vegetation cover (dry season)

TRANSECTS	SECTOR	PLANT COVER
T1	R1	50 - 75 %
T1	R2	1 - 5 %
T1	R3	50 - 75 %
T1	R4	20 - 50 %
T1	R5	1-5%
T2	R6	1 - 5 %
T2	R7	20 - 50 %
T2	R8	50 - 75 %
T2	R9	50 - 75 %
T2	R10	1 - 5 %
T2	R11	20 - 50 %
T2	R12	1 - 5 %
T3	R13	> 75 %
T3	R14	> 75 %
T3	R15	20 - 50 %
T3	R16	1 - 5 %
T3	R17	20 - 50 %
T3	R18	1 - 5 %
T3	R19	1 - 5 %
T3	R20	50 - 75 %
T3	R21	1 - 5 %
T4	R22	1 - 5 %

TRANSECTS	SECTOR	PLANT COVER
T4	R23	50 - 75 %
T4	R24	5 - 20 %
T4	R25	1 - 5 %
T4	R26	5 - 20 %
T4	R27	1 - 5 %
T4	R28	5 - 20 %
T5	R29	50 - 75 %
T5	R30	1 - 5 %
T5	R31	50 - 75 %
T5	R32	5 - 20 %
T5	R33	5 - 20 %
T5	R34	5 - 20 %

During the rainy season, the vegetation cover situation is shown in Table 28 below.

Table 28 Vegetation cover (rainy season)

SURVEY	PLANT COVER
R1	1 - 5 %
R2	50 - 75 %
R3	1 - 5 %
R4	20 - 50 %
R5	1 - 5 %
R6	1 - 5 %
R7	> 75 %
R8	50 - 75 %
R9	1 - 5 %
R10	> 75 %
R11	> 75 %
R12	50 - 75 %
R13	50 - 75 %
R14	20 - 50 %
R15	5 - 20 %
R16	20 - 50 %
R17	5 - 20 %
R18	50 - 75 %
R19	50 - 75 %
R20	20 - 50 %
R21	1 - 5 %
R22	> 75 %
R23	50 - 75 %
R24	> 75 %
R25	> 75 %

SURVEY	PLANT COVER
R26	20 - 50 %
R27	5 - 20 %
R28	> 75 %
R29	> 75 %
R30	1 - 5 %
R31	20 - 50 %
R32	> 75 %
R33	> 75 %
R34	> 75 %
R35	20 - 50 %
R36	50 - 75 %
R37	> 75 %

It should be noted that the average recovery ranges from 1 to over 75%. Thus, the lowest overlap, which is 1-5%, is recorded at R1, R3, R5, R6, R9, R21, R31 while the highest, which is over 75%, is recorded at R7, R10, R11, R22, R24, R25, R29 and R32 (see Table 28 above).

✓ *Floristic groups*

During the dry season survey, seven (7) floristic groupings associated with the morphology of the land were observed. They are given in Table 29 below and represented in Figure 15 below.

Table 29 Plant groups associated with the morphology of the land (dry season)

FLORISTIC GROUPING	CHARACTERISTIC SPECIES	GEOMORPHOLOGY	GEOGRAPHICAL COORDINATES	
G1	*Acacia ehrenbergiana, Acacia tortilis, Panicum turgidum, Balanites aegyptiaca*	Valley	N 17°56'50.5''	E 007°35'04.5''
G2	*Calotropis procera, Acacia ehrenbergiana, balanites aegyptiaca*	Plain	N 17°45'19.6''	E 007°43'30.8''
G3	*Balanites aegyptiaca, Acacia ehrenbergiana*	Plain	N 17°45'34.8''	E 007°39'10.6''
G4	*Balanites aegyptiaca, Acacia ehrenbergiana, Boscia senegalensis*	Valley	N 17°51'36.3''	E 007°42'40.0''
G5	*Phragmites australis* (specific stand)	Plain	N 17°45'42.6''	E 007°33.49.8''
G6	*Acacia ehrenbergiana* (specific stand)	Plain	N 17°45'42.2''	E 007°33'54.1''
G7	*Panicum turgidum, Phragmites australis, Acacia ehrenbergiana*	Sandy plateau / rocky plateau	N 17°46'05.2''	E 007°42'30.5""

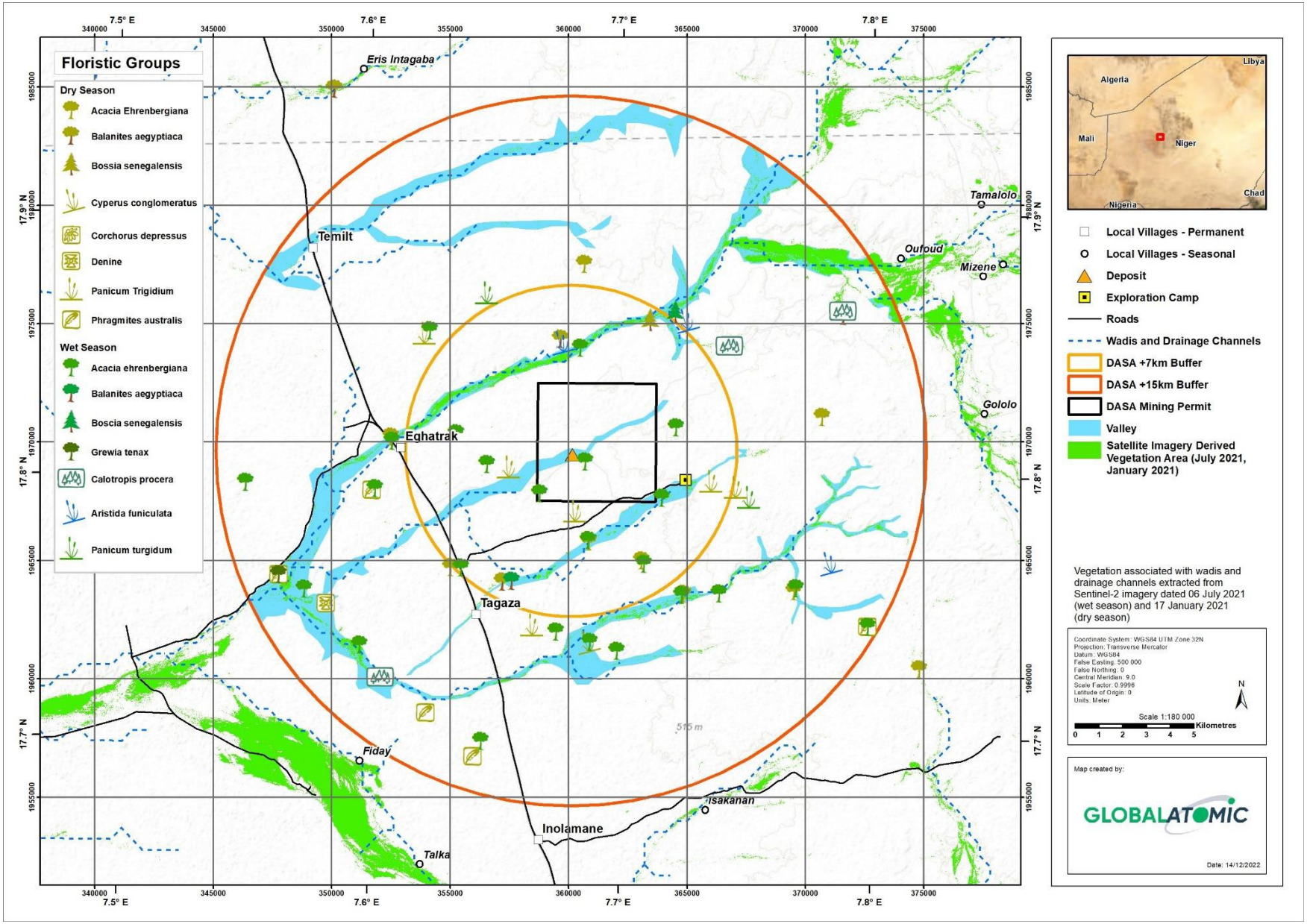

Figure 15 Floristic groups in the permit area

Photos 4, 5 and 6 illustrate some of the associations observed in terms of clustering in the permit area.

Photo 4 Tree steppe with a herbaceous carpet

Photo 5 Specific grassy steppe of Panicum turgidum

Photo 6 Stand of Acacia ehrenbergiana

The study on biodiversity conducted during the rainy season revealed seven (7) types of plant associations or groupings indicated in Table 30 below. These are distributed in the three (3) geomorphological units which are *the Plateaux, Plains and Valleys.*

Table 30 Plant groups associated with the morphology of the terrain (rainy season)

FLORISTIC GROUPING	CHARACTERISTIC SPECIES	GEOMORPHOLOGICAL UNITS	CONTACT DETAILS	
G1	- *Acacia ehrenbergiana,* - *Acacia radiana,* - *Panicum turgidum,* - *Balanites aegyptiaca*	Valley	N 17°56'50.5''	E 007°35'04.5''
G2	- *Calotropis procera,* - *Acacia ehrenbergiana,* - *Balanites aegyptiaca*	Plain	N 17°45'19.6''	E 007°43'30.8''
G3	- *Balanites aegyptiaca,* - *Acacia ehrenbergiana*	Plain	N 17°45'34.8''	E 007°39'10.6''
G4	- *Balanites aegyptiaca,* - *Acacia ehrenbergiana,* - *Boscia senegalensis*	Valley	N 17°51'36.3''	E 007°42'40.0''
G5	- *Aristida finiculata (specific stand)*	Plain	N 17°45'42.6''	E 007°33.49.8''
G6	- *Acacia ehrenbergiana (specific stand)*	Plain	N 17°45'42.2''	E 007°33'54.1''
G7	- *Panicum turgidum,* - *Aristida finiculata,* - *Acacia ehrenbergiana*	Sandy plateau/rocky plateau	N 17°46'05.2''	E 007°42'30.5""

Figure 16 below shows the combined floristic groups for the dry season.

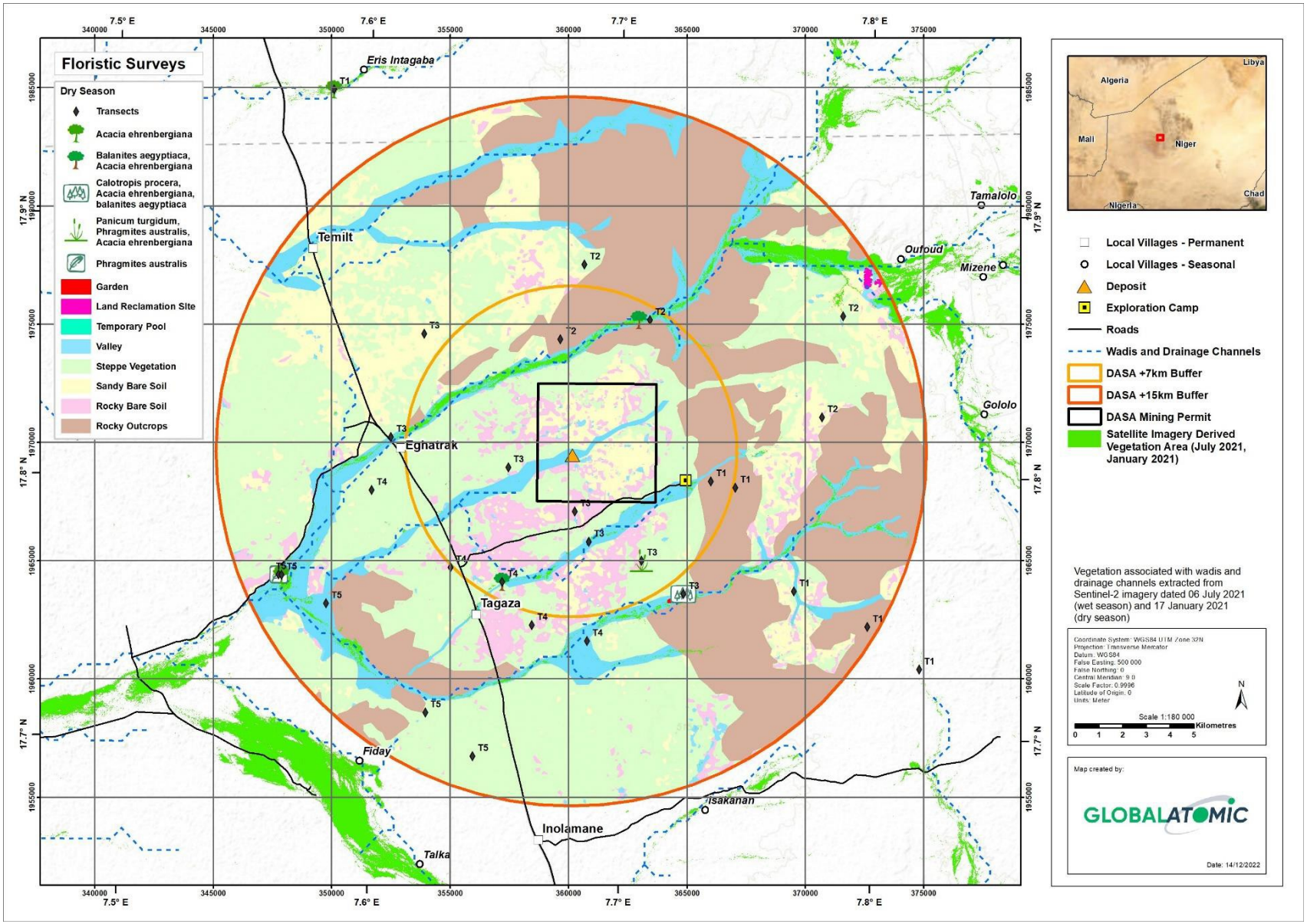

Figure 16 Floristic survey points

2.3.4. *Services provided by flora to local communities*

As part of this update of the Environmental and Social Impact Assessment (ESIA) of the Adrar Emoles 3 Exploration Permit, an assessment of ecosystem services was carried out and concerned the different uses of vegetation (food, medicine, fuelwood, grazing, etc.) by local communities. The results are shown in Table 31 below.

Table 31 Services provided by flora to local communities

SCIENTIFIC NAME	FAMILY	LOCAL NAME	Animal FOOD	HUMAN FOOD	PHARMACOPHY	OTHER
Woody species						
Acacia ehrenbergiana	Mimosaceae	Tamat	Yes	Yes	Yes	Firewood, construction
Acacia raddiana	Mimosaceae	Afagak	Yes	No	No	Firewood
Accacia nilotica	Mimosaceae	tiggaert	Yes	No	Yes	Firewood
Accacia senegal	Mimosaceae	dibshi	Yes	No	Yes	Firewood
Balanites aegyptiaca	Zygophyllaceae	Aborak	Yes	Yes	Yes	Firewood, Handicrafts
Boscia senegalensis	Capparidaceae	Tedent	Yes	Yes	Yes	Firewood
Calotropis procera	Asclepiadaceae	Tirza	Yes	No	Yes	Firewood
Commiphora africana	Burseraceae	Adäras	ND	ND	ND	Firewood
Hyphaene thebaica	Arecaceae	Taggeyt	Yes	Yes	Yes	Firewood
Maerua crassifolia	Cappariacae	Agar	Yes	No	Yes	Firewood
Phoenix dactylifera	Arecaceae	Talizouk	Yes	Yes	Yes	Firewood
Ziziphus mauritania	Rhamnaceae	Abaka	Yes	Yes	Yes	Firewood
HERBACEOUS VEGETATION						
Andropogon gayanus	Gramineae	Katagoêts	ND[4]	ND	ND	ND
Aristida Sp	Gramineae	Tazmei	ND	ND	ND	ND
Cassia obtusifolia	Caesalpiniaceae	Abaezzey	Yes	Yes	Yes	ND
Celosia trigyna	Amaranthaceae	Tajelanghitayt.	ND	ND	ND	ND
Cenchrus bilorus	Poaceae	Wajjag	Yes	No	No	ND
Chrysopogon aucheri	Graminae	Taezmé	ND	ND	ND	ND
Cleome africana	Capparidaceae	Taedak	ND	ND	ND	ND
Corchorus depressus	Tiliaceae	Amadghos	ND	ND	ND	ND
Corchorus olitorius	Tiliaceae	Melahya	Yes	Yes	Yes	ND
Cymbopogon sp	Gramineae	Tebéremt	Yes	No	Yes	ND
Cyperus Alopecuroides	Cyperaceae	ND	ND	ND	ND	ND
Digitaria Horizontalis	Gramineae	Ishibaen	yes	yes	ND	ND

[4] Not determined

SCIENTIFIC NAME	FAMILY	LOCAL NAME	Animal FOOD	HUMAN FOOD	PHARMACOPHY	OTHER
Eragrostis tremula	Gramineae	Tegit	yes	ND	ND	ND
Indicofera Nummulariifolia	Fabaceae	Agarof	Yes	Yes	Yes	ND
Limeum Viscosum	Aizoaceae	Tamasalt	ND	ND	ND	ND
Panicum turgidum	Gramineae	Afazo	Yes	No	No	Construction secko
Schoenoplectus corymbosus	Cyperaceae	Alögi	ND	ND	ND	ND

2.3.5. Wildlife

Groupe Art & Génie (2011 & 2020) describe the presence of animal species at a widespread regional scale. Populations of wild animals within the Tchirozerine department and Agadez region have substantially declined in recent years as a result of poaching and habitat destruction. Most residual wildlife populations have taken refuge in, and are now confined to the Aïr Mountains and nature reserves.

The Agadez region is the ideal zone for Sahelo-Saharan fauna, which plays important roles for local communities, particularly in terms of food, money, culture and science. Indeed, the region constitutes a strategic territory in the migratory movements of the Addax (*Addax nazomaculatus*), of which Niger is the only country in the world still hosting a viable wild population (DR INS Agadez, 2017).

In addition, the Aïr and Ténéré National Nature Reserve (RNNAT) is formed by the major part of the Aïr mountain massif occupying an area of 77,360 km² (6,807,070 ha), and which includes a central zone of 928,300 ha of integral reserve called the Addax sanctuary. Finally, the reserve presents a natural ensemble of exceptional quality in terms of landscape, vegetation, fauna and habitats. It contains important sites of cultural, historical and wildlife interest in the Aïr.

Following on from the CH screening assessment and in order to have the initial baseline situation of the fauna in the permit area, a specific field study was carried out as part of the ESIA update. It covered the radii of 7 km, 15 km and surrounding areas from the centre of the deposits to be exploited under the project. It was conducted during the two (2) seasons (dry season and rainy season).

The methodological approach included the following stages: (i) reconnaissance and mapping of the terrain; (ii) systematic monitoring based on five (5) north-west-south-east transects spaced 5 km apart; (iii) use of photographic traps (Reconyx cameras) and a Mavic pro 2 type drone; (iv) socio-ecological surveys in eight (8) villages (Tagaza, Gololo, Temilt-dabous, Oufoud, Inolamane, Gados, Issakanane).

2.3.5.1. Results of the field observations

During the monitoring mission, direct and indirect observations were made and recorded. In practice, these observations mainly concerned the most easily observable mammals, birds and reptiles.

The two (2) photographic traps used during five (5) nights, i.e. 10 different positions, allowed the field team to record some carnivores that were difficult to observe during the day.

In addition, the socio-ecological surveys allowed us to confirm the presence of certain species in the area.

Thus, during the dry season, a total of 54 animal species were observed, including 34 birds, 13 mammals and 7 reptiles. Figure 17 below illustrates the observation points of the species (mammals, reptiles, birds).

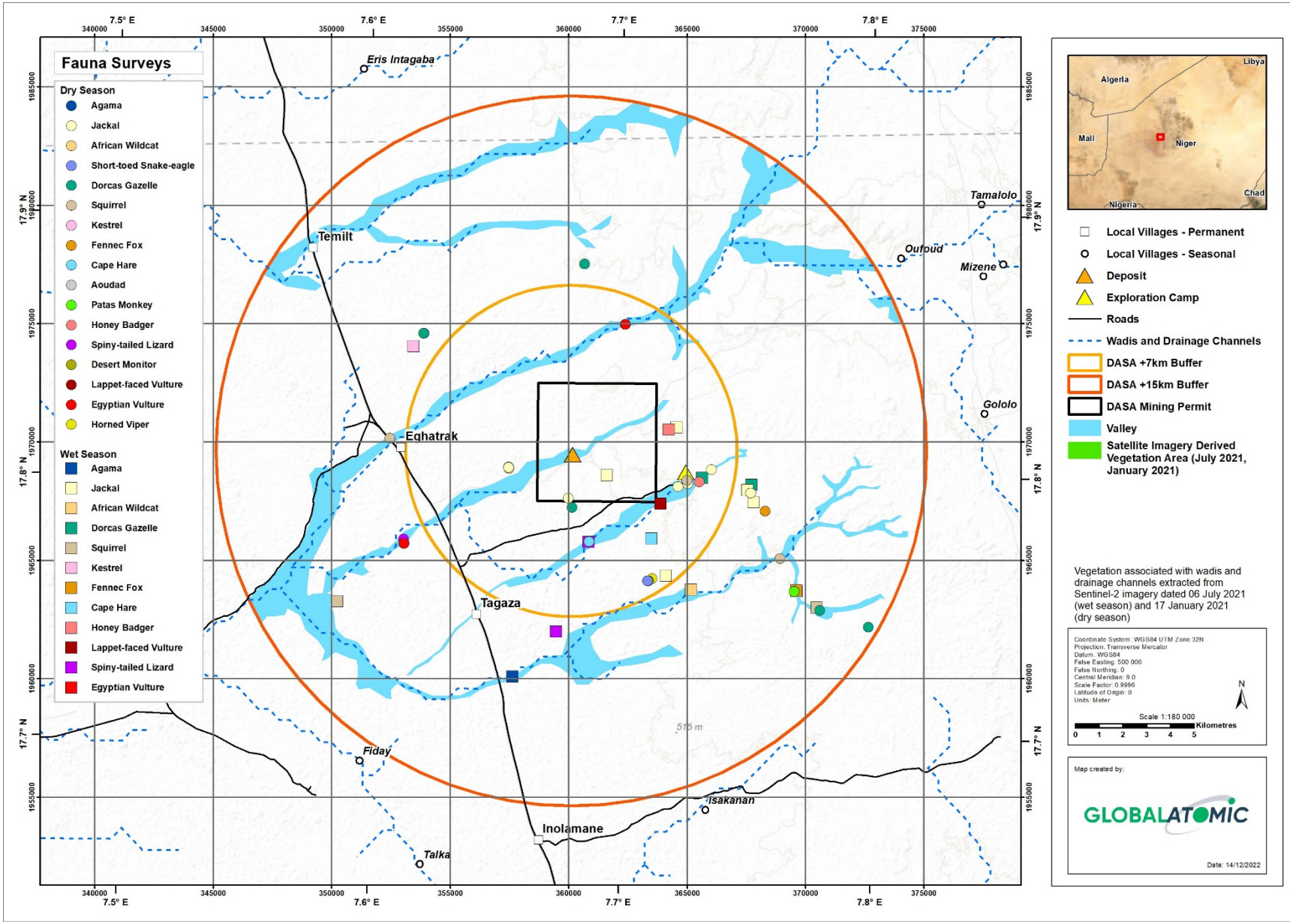

Figure 17 Wildlife observation points

✓ *Mammals and reptiles*

During this mission 6 Dorcas gazelles were observed in two direct observations with a flight distance of about 300-500 m, plus 4 squirrels, 1 Golden jackal and 5 Cape hares.

Indirect observations included Dorcas gazelles, Aoudad, Patas monkeys, Golden jackal, Fennec, Pale fox, and African wildcat. Photo 7 below shows a Fennec photographed by a camera trap.

Of these mammals, only the Dorcas Gazelle and the Aoudad are classified as vulnerable on the IUCN red list.

Photo 7 Fennec photographed by the camera

As far as reptiles are concerned, among the species inventoried are snakes including the Horned Viper, Cobra, Sand Boa, plus the Uromastix (see Photo 8 below) and the common lizards.

Photo 8 View of a Uromastyx (direct observation)

The IUCN status of these species (mammals and reptiles) is given in Table 32 below.

Table 32 Status of mammal and reptile species

SPECIES	SCIENTIFIC NAME	LOCAL NAME	IUCN STATUS
Squirrel	*Xerus erytropus*	KolanKolan	Least Concern
Fennec	*Vulpeszerda*	Ezagaz	Least Concern
Dorcas	*Gazella dorcas*	Azankat	Vulnerable
Cape Hare	*Lepus capensis*	Tamarwarlt	Least Concern
Aoudad	*Ammotragus lervia*		Vulnerable
Common Patas Monkey	*Erythrocebus patas*		Least Concern
Ratel	*Mellivora capensis*		Least Concern
African Wildcat	*Felis lybica Felis silvestris*		Least Concern
Golden Jackal	*Canis aureus*		Least Concern
Lesser jerboa	*Jaculus jaculus*		Least Concern
Crested Porcupine	*Hystrix cristata*	Takonichit	Least Concern
Pale Fox	*Vulpes pallida*		Least Concern
Desert Hedgehog	*Paraechinus aethiopicus*		Least Concern
Uromastyx (Spiny tailed lizard)	*Uromastyx geyri*	Amakachaw	Near Threatened
Common Agama	*Agama agama*		Least Concern
Desert Monitor	*Varanus griseus*		Least Concern
Cobra	*Najanigri collis*	Safaltas	Least Concern
Horned Viper	*Cerastes ceraste*	Tachile	Least Concern
Western Yellow Bellied sand Snake	*Psammophissibilansor Psammophissubtaeniatus*	Koumoetcho	Least Concern
Sand Boa	*Eryx j.*		Least Concern

✓ *Birds*

Several bird species were observed in the project area. Identification was made using the Birds of Western Africa guide, 2ème edition by Nik Borrow and Ron Demey and resulted in 34 species being identified. The raptors observed were the Lappet-faced Vulture, Egyptian Vulture, Great Horned Owl, Short-toed Eagle and Kestrel. The following pictures 9 and 10 illustrate respectively a Lappet-faced Vulture and an Egyptian Vulture observed in the project area.

Photo 9 Lappet-faced Vulture

Photo 10 Egyptian vulture

Of these birds, only the Lappet-faced Vulture and the Egyptian Vulture are classified as endangered on the IUCN Red List (see Table 33 below), in CITES Appendix II and CMS

Appendix II/I for the Egyptian Vulture and CMS Appendix I for the Lappet-faced Vulture.

Table 33 Status of bird species in the project area

COMMON NAME	SCIENTIFIC NAME	IUCN STATUS
Black-scrub Robin	*Cercotrichos podobe*	Least Concern
Rufous-tailed Scrub-robin	*Cercotrichas galactotes*	Least Concern
Striolated bunting	*Emberiza striolata*	Least Concern
Hornbill	*Tockus nasutus*	Least Concern
Crested Lark	*Galerida cristata*	Least Concern
African Silver Bill	*Euodice cantans*	Least Concern
Greater Blue-eared Starling	*Lamprotornis chalybaeus*	Least Concern
Short-toed Snake-eagle	*Circaetus gallicus gallicus*	Least Concern
Brown-necked Raven	*Corvus ruficollis*	Least Concern
Fan-tailed Raven	*Corvus rhipidurus*	Least Concern
Pied Crow	*Corvusalbus*	Least Concern
Blue-napped mousebird	*Urocolius macrourus*	Least Concern
Fulvus Babbler	*Turdoides fulvus*	Least Concern
Kestrel	*Falco tinnunculus*	Least Concern
Chestnut-bellied Sandgrouse	*Pterocles exustus*	Least Concern
Lichtensteins Sandgrouse	*Pterocles lichtensteinii*	Least Concern
African Hoopoe	*Upupa epops senegalensis*	Least Concern
Pharaoh Eagle-owl	*Bubo ascalaphus*	Least Concern
Common Hoopoe	*Upupa epops*	Least Concern
Little Swift	*Apus affinis*	Least Concern
Golden Sparrow	*Passer luteus*	Least Concern
Black-crowned Sparrow-lark	*Eremopterix nigriceps*	Least Concern
Egyptian Vulture	***Neophron percnopterus***	**Endangered**
Green Bee-eater	*Merops orientalis*	Least Concern
Iberian Grey Shrike	*Lanius meridionalis*	Least Concern
Speckled Pigeon	*Columba guinea*	Least Concern
Helmeted Guinea Fowl	*Numida meleagris*	Least Concern
Laughing Dove	*Streptopelia senegalensis*	Least Concern
Namaqua Dove	*Oena capensis*	Least Concern
Mourning Collared Dove	*Streptopelia decipens*	Least Concern
White-crowned Wheatear	*Oenanthe leucopyga*	Least Concern
Desert Wheatear	*Oenanthe desertii*	Least Concern
Isabelline Wheatear	*Oenanthe isabelline*	Least Concern
Lappet Faced Vulture	***Torgos tracheliotos***	**Endangered**

- ✓ *Threatened or extinct species*

Interviews with local communities suggested that Dama gazelle (Nanger dama), Oryx and

Common Ostrich (Struthio camelus) were once present in the area, but have completely disappeared due to poaching, drought and climate change.

Today, these species have completely disappeared due to poaching, combined with drought and climate change.

2.3.6. Results of the observations for the dry and rainy seasons

The rainy season faunal survey identified 49 animal species including 34 birds, 10 mammals and 4 reptiles.

Tables 34 and 35 below show the species (avian, mammal and other) recorded during the two (2) seasons (dry and rainy).

Table 34 Bird species recorded during the two seasons (dry and wet)

SPECIES	SCIENTIFIC NAME	DRY SEASON	RAINY SEASON	RESIDENCE STATUS
Black scrub robin	*Cercotrichos podobe*	X	X	Resident
Rufous-tailed scrub robin	*Cercotrichas galactotes*	X	X	Resident
Tawny Eagle (Vulnerable)	*Aquila rapax*		X	Resident
Red-billed Firefinch	*Lagonosticta senegala*	X	X	Resident
Striolated bunting	*Emberiza striolata*	X	X	Resident
Hornbill	*Tockus nasutus*	X	X	Resident
Crested lark	*Galerida cristata*	X	X	Resident
African silverbill	*Euodice cantans*	X	X	Resident
Greater blue-eared starling	*Lamprotornis chalybaeus*	X	X	Resident
Short-toed snake eagle	*Circaetus gallicus gallicus*	X		Migratory
Brown-necked Raven	*Corvus ruficollis*	X	X	Resident
Fan-tailed Raven	*Corvus rhipidurus*	X	X	Resident
Pied Crow	*Corvusalbus*	X	X	Resident
Blue-naped Mousebird	*Urocolius macrourus*	X	X	Resident
Fulvous Babbler	*Turdoides fulvus*	X	X	Resident
Kestrel	*Falco tinnunculus*	X	X	Migratory
Chestnut-bellied Sandgrouse	*Pterocles exustus*	X	X	Resident
Lichtenstein's Sandgrouse	*Pterocles lichtensteinii*	X		Resident
White-throated Bee-eater	*Merops albicollis*		X	Migratory
African Hoopoe	*Upupa epops senegalensis*	X	X	Migratory/resident
Pharaoh Eagle-owl	*Bubo ascalaphus*	X	X	Resident
Eurasian hoopoe	*Upupa epops*	X	X	Resident
Little Swift	*Apus affinis*	X	X	Resident
Golden Sparrow	*Passer luteus*	X	X	Resident
Black-crowned Sparrow-lark	*Eremopterix nigriceps*	X	X	Resident
Spotted Thick-knee	*Burhinus capensis*		X	Resident
Egyptian Vulture	*Neophron pernopterus*	X	X	Migrant/Resident
Green Bee-eater	*Merops orientalis*	X	X	Resident
Iberian Grey Shrike	*Lanius meridionalis*	X	X	Resident

SPECIES	SCIENTIFIC NAME	DRY SEASON	RAINY SEASON	RESIDENCE STATUS
Speckled Pigeon	*Columba guinea*	X	X	Resident
Helmeted Guineafowl	*Numida meleagris*	X	X	Resident
Laughing Dove	*Streptopelia senegalensis*	X	X	Resident
Namaqua Dove	*Oena capensis*	X	X	Migratory/resident
African Mourning Dove	*Streptopelia decipens*	X	X	Resident
White-crowned Wheatear	*Oenanthe leucopyga*	X	X	Resident
Isabelline Wheatear	*Oenanthe isabellina*	X	X	Migratory
Lappet-faced Vulture	*Torgos tracheliotos*	X		Resident

It should be noted from Table 34 above that among the birds recorded, some species were observed during the two (2) missions, most of which are residents, which explains their presence throughout the year, and other species are migratory, such as the White-throated Bee-eater, the Short-toed Snake Eagle and the Kestrel, which are seasonal species that are only observed during their migration period. Other species are partially migratory and resident at the same time (e.g. Egyptian Vulture).

For mammals and other species recorded during the two (2) seasons (dry and rainy), the situation is given in Table 35 below.

Table 35 Mammals and others recorded during the two seasons (dry and rainy)

SPECIES	SCIENTIFIC NAME	DRY SEASON	RAINY SEASON
Squirrel	*Xerus erytropus*	X	X
Fennec	*Vulpeszerda*	X	X
Dorcas	*Gazella Dorcas*	X	X
Cape Hare	*Lepus capensis*	X	X
Aoudad	*Ammotragus lervia*	X	X
Common Patas Monkey	*Erythrocebus patas*	X	X
Ratel	*Mellivora capensis*	X	X
African Wildcat	*Felis lybica Felis silvestris*	X	X
Golden Jackal	*canis aureus*	X	X
Lesser Jerboa	*Jaculus jaculus*	X	X
Crested Porcupine	*Hystrix cristata*	X	X
Pale Fox	*Vulpes pallida*	X	X
Desert Hedgehog	*Paraechinus aethiopicus*	X	X
Uromastyx (Spiny-Tailed Lizard)	*Uromastyx geyri*	X	X
Common Agama	*Agama agama*	X	X
Desert Monitor	*Varanus griseus*	X	X
Cobra	*Najanigri collis*	X	X
Horned Viper	*Cerastes ceraste*	X	X
Western Yellow Bellied Sand Snake	*Psammophissibilansor Psammophissubtaeniatus*	X	X
Sand Boa	*Eryx jaculus*	X	X
Emperor Scorpion	*Pandinus imperator*	X	
Agile Frog	*Rana dalmatina*		X

From Table 35 above, it should be noted that practically the same mammals were recorded by direct or indirect observation during the two (2) missions. The only difference is the distribution which is much more important during the last study conducted in the rainy season. This is due to the abundance of grazing during the said season.

2.3.6.1. Summary of Wildlife Species

The field surveys conducted in the dry and wet season (2021-2022) confirmed the

following species of concern to be present in the study area:

- Dorcas Gazelle *Gazella dorcas* (VU)
- Aoudad *Ammotragus lervia* (VU)
- Egyptian Vulture *Neophron pernopterus* (EN)
- Lappet-faced Vulture *Torgos tracheliotos* (EN)
- Tawny Eagle *Aquila rapax* (VU).

Cheetah, Oryx, Addax and Dama Gazelle were not found and interviews with local communities suggested the species are no longer present in the study area. While a full CH assessment has not been completed to determine if there are any CH qualifying species to trigger CH. However, all five species above are noted as unlikely to trigger CH due to being wide ranging species. High level mitigation measures for the vultures/raptor are included in the Biodiversity Management Plan.

Alien invasive species

Baseline surveys have not confirmed any alien invasive species in the study area. Future surveys will continue to monitor for the presence of alien invasive species, and procedures will be put in place to prevent future accidental spread of such species. In addition, eradication and control measures will be identified in a biosecurity plan/invasive species management plan which will be developed and implemented by the project.

2.3.7. Use of wildlife by local communities

The different uses of wildlife (ecosystem services) in the project area were obtained through consultations with local communities. The related results are given in Table 36 below.

Table 36 Services provided by wildlife to local communities

N°	SPECIES	SCIENTIFIC NAME	LOCAL NAME	USES/SERVICES
1	Squirrel	*Xerus erytropus*	KolanKolan	--
2	Fennec	*Vulpeszerda*	Ezagaz	--
3	Dorcas	*Gazella Dorcas*	Azankat	Consumption
4	Cape Hare	*Lepus capensis*	Tamarwarlt	Consumption, ornament of nature
5	Aoudad	*Ammotragus lervia*	--	Consumption
6	Common Patas monkey	*Erythrocebus patas*	--	--
7	Ratel	*Mellivora capensis*	--	Snake hunter
8	African Wildcat	*Felis lybica Felis silvestris*	--	--
9	Golden Jackal	*canis aureus*	--	Traditional medicine
10	Lesser Jerboa	*Jaculus jaculus*	--	--
11	Crested Porcupine	*Hystrix cristata*	Takonichit	--
12	Pale Fox	*Vulpes pallida*	--	--

N°	SPECIES	SCIENTIFIC NAME	LOCAL NAME	USES/SERVICES
13	Desert Hedgehog	*Paraechinus aethiopicus*	--	--
14	Uromastyx (Spiny-tailed Lizard)	*Uromastyx geyri*	Amakachaw	Traditional medicine
15	Common Agama	*Agama agama*	--	--
16	Desert Monitor	*Varanus griseus*	--	Traditional medicine
17	Cobra	*Najanigri collis*	Safaltas	--
18	Horned Viper	*Cerastes ceraste*	Tachile	--
19	Western yellow-bellied sand snake	*Psammophissibilans or Psammophissubtaeniatus*	Koumoetcho	--
20	Sand Boa	----------	--	--
21	Emperor Scorpion	*Pandinus imperator*	Tazardimet	--

2.3.8. Vulnerability of ecosystem services

Despite the food, economic, ecological, pharmaceutical, etc. services it provides for local communities etc., biodiversity (flora and fauna) is now threatened in the project area. The main causes are between human actions (degradation and/or destruction of wildlife habitat, overexploitation of animal and plant resources, etc.) and climate change (decrease in rainfall, loss of biodiversity). The main causes are between human actions (degradation and/or destruction of wildlife habitat, overexploitation of animal and plant resources, etc.) and climate change (reduced rainfall, recurrent droughts, poor distribution of rainfall in time and space, extreme temperatures, etc.). This results in a decrease in plant and animal diversity and consequently in ecosystem services, which could lead to increased food and nutritional insecurity, increased poverty, a decline in pastoral activities, etc.

Thus, at the end of the interview with the communities, it emerged that certain plant species such as *Acacia nilotica* are rare in the area. Also, certain animal species that existed have disappeared completely. These include the dama gazelle (*Nanger dama*), the Oryx and the Red-necked Austria *(Struthio camelus*).

2.4. Human environment

2.4.1. Population

The population of the Agadez region was estimated at 487,620 inhabitants in the 2012 general population and housing census. Based on the region's natural growth rate (3.6% per year), this population is estimated to be 585,737 in 2018 (INS 2018) and 669,004 in 2022, of which 341,019 will be male and 327,985 female (INS, 2019).

Within a radius of 7 km from the center of the project's deposits and 15 km from the centre of the project's deposits, 14,830 people live in the villages surveyed during the course of the study, 10,000 of whom are permanent residents, compared to 4,830 seasonal residents (Source: field survey, 2021). These villages are also more populated during the hot dry season (see Table 37). It should also be noted that there are no permanent residents within the 7km zone around the core area or the subset 3.5km radius operational area of which areas proximal to surface infrastructure will be fenced. This population of Tuareg origin is made up of several tribes belonging to the Kel Ewey Confederation. These tribes belong to three chiefdoms: Sultan, Anastafidat and Imakitan, which range beyond Agadez and Timia communes.

The nomadic Tuaregs have historical connections with their natural environment and temporarily migrate between regions and between departments in search of pasture and seasonal jobs. It is mainly the men who travel while the women stay in their village. The social group hierarchy remains very much intact with the Tuaregs. The elders and opinion leaders react, talk, and make decisions on behalf of the group.

With the decline in traditional livelihoods, young people migrate to urban areas in search of alternative lifestyles. Economic activities are traditional and mostly based on livestock. The Tuareg were true nomads and followed their herds following source of browse, mostly in or near wadis. Many Tuaregs live in tented camps near kouris and some move seeking pasture for their livestock.

Table 37 Population living near the site (residents and seasonal)

TYPES OF RESIDENTS	VILLAGES								Total
	DABOUS-TEMILT	EGATRAK	GADOS	GALELO	ISSAKANAN	OUFOUD	TAGAZA	INOLAMANE	
Permanent	3,000	400	200	500	600	300	1,000	4,000	**1,0000**
Seasonal workers	1,000	200	100	100	200	30	200	3,000	**4,830**
Total	**4,000**	**600**	**300**	**600**	**800**	**330**	**1,200**	**7,000**	**14,830**

Source: Field survey (FEED), 2021

The local population is predominantly Tuareg or Kel Tamashek who are recognised as indigenous people by UNHCR's World Directory of Minorities and Indigenous Peoples and the World Directory of Minorities and Indigenous Peoples. The greatest number of Tuaregs, around one million, live in Niger, mostly south and west of Air Massif in the vicinity of the Dasa project. Tuareg society is highly stratified and consists of several castes including nobles, a free but subordinate group, a religious group and workers, who help tend the palm groves and vegetable gardens. These sources acknowledge that many Turaeg, although having suffered marginalization in the past, now live interspersed alongside other ethnicities throughout the country and have a long history of coexistence with these other groups. In the region of the project, the population and administrative structures are dominated by Tuaregs, and form a key part of the workforce at the uranium mines in Arlit where they are represented in managerial, semi-skilled and un-skilled positions. The Prime Minister of Niger from 2011 – 2021 is a Tuareg from the Agadez

region.

PS7 is applicable due to the presence of the Tuareg population, but the requirement for free, prior, informed consent (FPIC) is deemed not to be triggered as the conditions outlined in paragraphs 13 – 17 of PS7 are not met.

2.4.2. Socio-economic activities

2.4.2.1. Breeding

Livestock breeding is the main activity of the people of the Agadez region, who have many grazing areas with high fodder potential that are dependent on climatic hazards. This situation places the region in a cycle of almost annual fodder deficit. The region has a large livestock population consisting mainly of camels, goats, sheep, donkeys and cattle. This livestock population was estimated in 2013 at 1,536,430 head, all species combined, of which 240,758 head were raised in sedentary mode and 1,295,672 in nomadic mode (DR INS Agadez, 2017). In 2019, there are 1,824,328 head, or 173 livestock units (DRE, Agadez).

In the area of the Adrar Emoles 3 research permit, livestock breeding is also the main activity of the population. Indeed, due to the abundance, availability and accessibility of grazing land as well as the presence of water points in the area, the latter constitutes a daily focal point for the herders who drive their flocks there.

As in the region, the livestock in the project area consists of large animals (cattle, camels, donkeys and horses) and ruminants (sheep and goats).

Table 38 below shows that the area has 15,0167 head of livestock, of which 33% are goats, 28.49% sheep, 19.76% camels and 18.92% other species.

Table 38 Livestock in the study area

LIVESTOCK	VILLAGES								Total	%
	DABOS	EGATRAK	GALELO	GADOS	ISSAKANAN	OUFOUD	TAGAZA	INOLAMANE		
Cattle	600	1,000	50	20	2,000	300	2,000	700	**6,670**	**4.4**
Sheep	2,000	6,000	2,000	250	7,000	3,000	20,000	2,500	**42,750**	**28.5**
Goats	2,000	6,000	1,000	300	6,000	1,500	30,000	2,500	**49,300**	**32.8**
Camels	2,000	3,000	300	80	4,000	300	10,000	10,000	**29,680**	**19.8**
Donkeys	300	5,000	100	100	5,000	250	1,000	5,000	**16,750**	**11.1**
Horses	0	0	0	0	5	0	4	8	**17**	**0.01**
Total	6,900	21,000	3,450	750	24,005	5,350	63,004	20,708	**150,167**	**100**

Source: Field survey (FEED), December 2021

The water infrastructure that constitutes the watering points for livestock in the area are essentially pastoral wells, traditional wells, boreholes and the temporary ponds of Gololo and Temilt. It is important to note that all the villages surveyed in the framework of the study have at least one type of water facility, except for the village of Issakanan, which does not have any in the camp.

Thus, the inhabitants of this village water their animals in the villages of Inolamane and Tagaza.

As far as grazing is concerned, the following plant species are found in the project area:

Panicum tirgidum, *Chrysopogon Aucheri, Acacia raddiana, Balanites aegyptiaca*, *Boscia Senegalensis*) which are palatable to animals, and which unfortunately are moderately available all year round due to overloading (the heavy weight of the herd leading to overexploitation) and the scarcity of rainfall.

Furthermore, as regards pastoral rangelands (passage corridors), there are none in the project area in accordance with its vocation as a "pastoral zone" in accordance with the provisions of Law No. 61-05 of 26 May 1961 setting a northern limit for crops and Ordinance No. 93-015 of 2 March 1993 setting the guiding principles of the Rural Code.

Finally, it should be noted that despite its vast size, the region is subject to a reduction in its pastoral areas due to the exploitation of subsoil resources but also to the advance of the agricultural front. The region is also facing strong pressure on its fodder resources, leading to epizootic diseases and the multiplication of conflicts around water points (DR INS Agadez, 2017).

In the Project area, it is understood that the east-northeast to west-southwest trending koris are used as transit or nomadic herding corridors on a limited basis, in connection with the “Cure Salee”, a meeting of Kel Tamashek (Tuareg) from around the region which celebrates the end of the rainy season and is held at the Town of In-gal, located approximately 150 km south-west of Dasa.

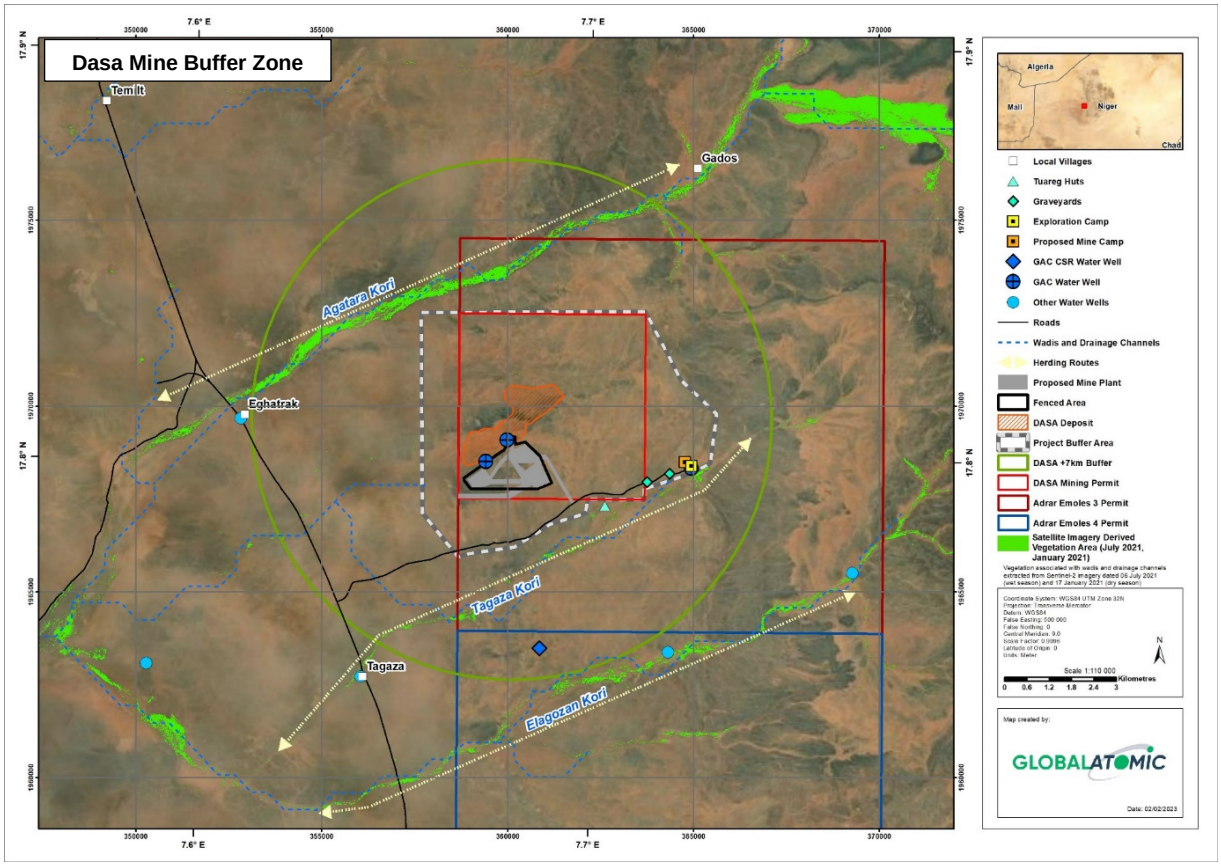

Figure 18 Dasa Mine Buffer Zone

In the Project vicinity, the vast majority of the population lives in villages, of which Eghatrak and Tagaza are nearest to the Project site, more than 5 km to the west. The area surrounding the mine site is sparsely populated, with small clusters of huts occupying land along the koris. Settlement within the koris is limited to families with small groups of animals on an approximate 200-300 m spacing. The inhabitants typical live within the kori during April to June and September to December. During the wet season from July to September and winter season from December to March, the inhabitants move to the edges of the koris where it is dryer and warmer respectively. The nearest settlement to the Project site is a collection of three huts approximately 1.5 km to the east-southeast. A fenced area of approximately 2km^2 will surround surface infrastructure, outside of which is a 40 km^2 buffer area. Access through this buffer area will not be restricted, although longer-term occupancy (e.g. building camps) will be discourage via public consultation and awareness raising. There are not believed to be any permanent residents within the buffer area around the site.

2.4.2.2. Agriculture

The Agadez region has significant potential (land, water) for market gardening and fruit growing, particularly in the many valleys of the Aïr.

Agriculture in the Agadez region is intended for cash cropping or market gardening. However, the region is not agriculturally homogeneous and can be subdivided into i) an area of rainfed crops and flood recession cereals and peri-urban market gardening around the town of Agadez, ii) irrigated crops, the majority of which are grown in the south and centre of the Aïr (Tabelot, Dabaga, Timia, Tchirozérine), with a predominance of onions and local specialisations for other crops (garlic, potatoes, tomatoes, etc.), including fruit crops (citrus fruits, dates, vines, mandarin trees), iii) cereals, the majority of which are grown in the north of the region (Tabelot).) including arboriculture (citrus, dates, vines, mandarin), iii) cereals, which are in the majority in the northern part of the Aïr (Iférouane) with a tendency towards a decrease in production and an increase in irrigated crops, and iv) basin or oasis crops in the rest of the region.

According to the results of the evaluation of the 2020 agricultural season and the 2020/2021 Food Outlook, the areas, yields and production of certain crops in the Agadez region are given in Table 39 below.

Table 39 Area, production and yield of crops

VARIABLES	SPECULATION						
	MIL	SORGHUM	BUT	COWPEAS	OKRA	ONION	TOMATO
Area	97	159	705	127	5	2 902	414
Performance	636	753	1042	361	20 875	30272	21 874
Production	62	120	734	46	104	87 850	9 056

Source: MA/EL, 2020

Despite the above findings, the Agadez region has tens of thousands of hectares of undeveloped fertile land in the Irhazer, Talak, Tamesna, Tadress plains and in the mouths and oases of the Ténéré desert (DR INS Agadez, 2017).

In the project area, only market gardening is practised by the population in the valleys along the koris. During the study, the estimated area under cultivation was 7.29 ha. The main crops are vegetables, lettuce, peppers, cabbage, carrots, watermelons, etc. The agricultural production is partly consumed locally and the rest sold at the markets of Arlit, Tchirozérine and Agadez.

It provides substantial income to local communities, enabling them to improve their incomes. Photo 11 below shows a farm developed at the Elagozan kori. This activity has been carried out in a rudimentary manner due to lack of resources and therefore requires support, including supervision, in order to modernise the sector and thus enable optimal development of the farms.

Photo 11 Market gardening in the Elagozan valley

2.4.2.3. Trade

Tourism and handicrafts are two sectors of activity that make a significant contribution to the socio-economic life of the Agadez region. Their dynamism is reflected, among other things, in the volume of activities, the diversity of products and services offered, the jobs provided and the wealth created.

The handicraft sector employs several thousand people of both sexes, young people and adults, spread throughout the region. This activity concerns leather goods, vanilla, weaving, pottery, blacksmithing, etc. Thus, the Aïr is extremely well known in this sector, through the blacksmiths who essentially work with silver and leather: a collection of 21 crosses, symbols of Nigerien cities (towns), of which the best known and most celebrated is the cross of Agadez.

There are several tourist sites in the region, including: the city of Agadez with its famous mosque, the Aïr massif, the Timia Oasis, Assodé, the former capital of the Aïr, the Adrar Bous mountain, the Temet Dunes, the Ténéré, known as the desert of the Paris-Dakar

Rally, a vast expanse of sand, and Fachi, a city that hosts the Taghlamt (salt caravan) once a year. In addition to these sites, there are also: the Bilma oasis, the Djado plateau, the Bianou, the Aïr festival, the Cure Salée, etc. (INS, 2016).

2.4.2.4. Tourism and crafts

Trade in the Agadez region is characterised by the predominance of the informal sector in which a multitude of retailers and a few semi-wholesalers operate. The towns of Agadez and Arlit are the two main commercial centres of the region, through which there are about ten rural markets where the rural populations buy supplies. The growing importance of the market gardening sector (notably onions) necessitated the creation in 2003 of two important rural markets in Dabaga and Tabelot in the Aïr oasis zone (INS, 2016).

In the permit area, commercial activities are mainly based on small-scale trade, in particular the sale of livestock products, market gardening and woodcutting (wood cutting, charcoal making, etc.) and basic necessities. There are two main markets in the main towns of the communes (Dannet and Tchirozérine) as well as many others in the villages of the area such as Tindawene, Azzel, etc. in the commune of Tchirozérine.

2.4.2.5. Archaeolgical heritage

2.4.2.5.1. Heritage potential of the region

Niger has an immensely rich heritage in terms of both its diversity and its originality and authenticity in all regions, including Agadez.

A pre-Saharan land, the Agadez region was green and humid millions of years ago, as shown by the presence of crocodile skulls, silicified tree trunks and a dinosaur cemetery.

In fact, human presence has been attested for several millennia. Thus, prehistoric man has left us images on the rocks, through drawings and engravings which allow us to retrace the history of ancient settlements.

In Niger from independence to the present day, few inventories have been carried out by the Ministry of Culture in the field of cultural heritage. The most important are those carried out in 1979-1980 and 1989-1990.

Thus, the 1979-80 inventory focused on the safeguarding of the archaeological cultural heritage and the 1989-90 inventory on sites, historical monuments, movable objects, sacred and cult places, mystical tombs, traditional festivals and sports.

In the Agadez region, Paleolithic industry is mentioned in several areas, notably in Kawar and Djado between 30,000 and 17,000 years ago.

Regarding the Neolithic, a 10,000-year-old Neolithic site was discovered on Mount Bagazan, which is one of the earliest examples of the domestication of nature by man.

During this Neolithic period, the lithic industry reached its peak, particularly in the perfection of the tools produced in the countless workshops in the desert areas. It was during this period that rock engravings and paintings made their appearance.

The mastery of metallurgy in the region is of great importance and one of the great moments of human civilisation.

The results of the research carried out have made it possible to attest to the presence of a 4,000 year old copper metallurgy (Afunfun, Tiguidit cliff). To the east of the Tiguidit valley, the presence of bronze metallurgy was noted.

The considerable achievements of the ancient populations who had lived in the desert in terms of metallurgy, Neolithic, lithic industries, rock art and painting show how important a focus of civilisation this area really was.

The main areas of archaeological research have been palaeontology, prehistory, post Neolithic, early metal age and contemporary.

In all these areas, research and discoveries were carried out under the administrative guidance and/or scientific and technical collaboration of the Institute for Research in Human Sciences (IRSH).

Among these discoveries we can note:

- deposits of dinosaurians and crocodilians among the most important in the world dating from 150 million to 100 million years ago in the south of the Air Massif, in particular at Gadafoua to the south-east of Agadez, by Philippe TAQUET of the Paris Museum of Natural History from 1965 to 1975, by Neumann in 1983 and by Paul SERENO from 1993;
- environmental and climatic pale deposits in the Air and Téneré, Tafassasset, Kawar and Djado massifs by researchers from ORSTOM, CNRS;
- Paleolithic Aterian deposits in the Adrar Bous and especially in the Kawar and Djado;
- Paleolithic Acheulean deposits dating from 34 thousand to 60 thousand years ago;
- prehistoric research in the Ténéré, the eastern edges of the Massif de l'Air on the paleoclimate, Acheulean, Neolithic, rock art and the beginnings of iron metallurgy;
- rock art stations of the Air and Djado Massif by Christian DEPUIS of CRNS;

2.4.2.5.2. Description of the cultural and archaeological potential identified in the permit area

Interviews with local communities around the Adrar Emoles 3 exploration licence, coupled with site visits, have helped to highlight the existence of cultural and archaeological heritage in some villages in the area, as shown in Table 40 below. The description of these sites is given in the appendix in the report on cultural and archaeological heritage.

Table 40 Cultural and archaeological sites in the project area

NAME OF THE VILLAGE	NAME OF THE SITE	TYPE OF SITE	GEOGRAPHICAL COORDINATES
Tagaza	Gani (Mouloud)	Cultural space	N : 17°43.88' E : 07°33.53'
	Engravings (Ali Gourane)	Prehistoric	N : 17°43.76' E : 07°37.30'
	Old Cemetery	Cultural	N : 17°45.40' E : 07°38.75'

NAME OF THE VILLAGE	NAME OF THE SITE	TYPE OF SITE	GEOGRAPHICAL COORDINATES
	Dinosaur tracks	Paleontological	N : 17°47.85' E : 07°36.36'
	Old well site with trough supports (the stone blocks)	History	N : 17, 77217° E : 07,68478°
Eghatrak	Rock engravings	Prehistoric	N : 17°49.71' E : 07°37.32'
	Old mosque (ruins)	Cultural	N : 17°48.60' E : 07°35.88'
	Dinosaur tracks	Paleontological	N : 17°42.85' E : 07°35.81'
Temilt -Dabous	Rock engravings (Dabous Giraffes)	Prehistoric	N : 17°53.23' E : 07°37.70'
Gados	Rock engravings (Giraffes)	Prehistoric	N : 17°52.15' E : 07°44.10'
	Rock engravings (Tifinagh)	Prehistoric	
	Old cemetery	Cultural	N : 17°52.45' E : 07°43.62'

2.4.2.5.3. General considerations and status in relation to the operating permit

Of all the cultural and archaeological sites identified in the project area, only that of the great giraffes of Dabous is known worldwide as it attracts visits from tourists and schoolchildren. It is also managed by the community and has a warden guide. The other sites are known by the communities but are not visited and have no management mechanism except for the Gani (Mouloud) cultural space. They have a public status as they belong to the whole community. The state of conservation of these sites is acceptable despite some natural (erosion, wind) and human threats of denaturation.

Regarding the location of the mining permit, none of the cultural and archaeological sites are located there. The following sites: the ancient cemetery of Tagaza, the site of the ancient mosque of Eghatrak, are located within 7 km of the centre of the deposit. Finally, apart from Gani (Mouloud) of Tagaza, all the other sites are located within 15 km of the centre of the deposit (see Figure 19 below).

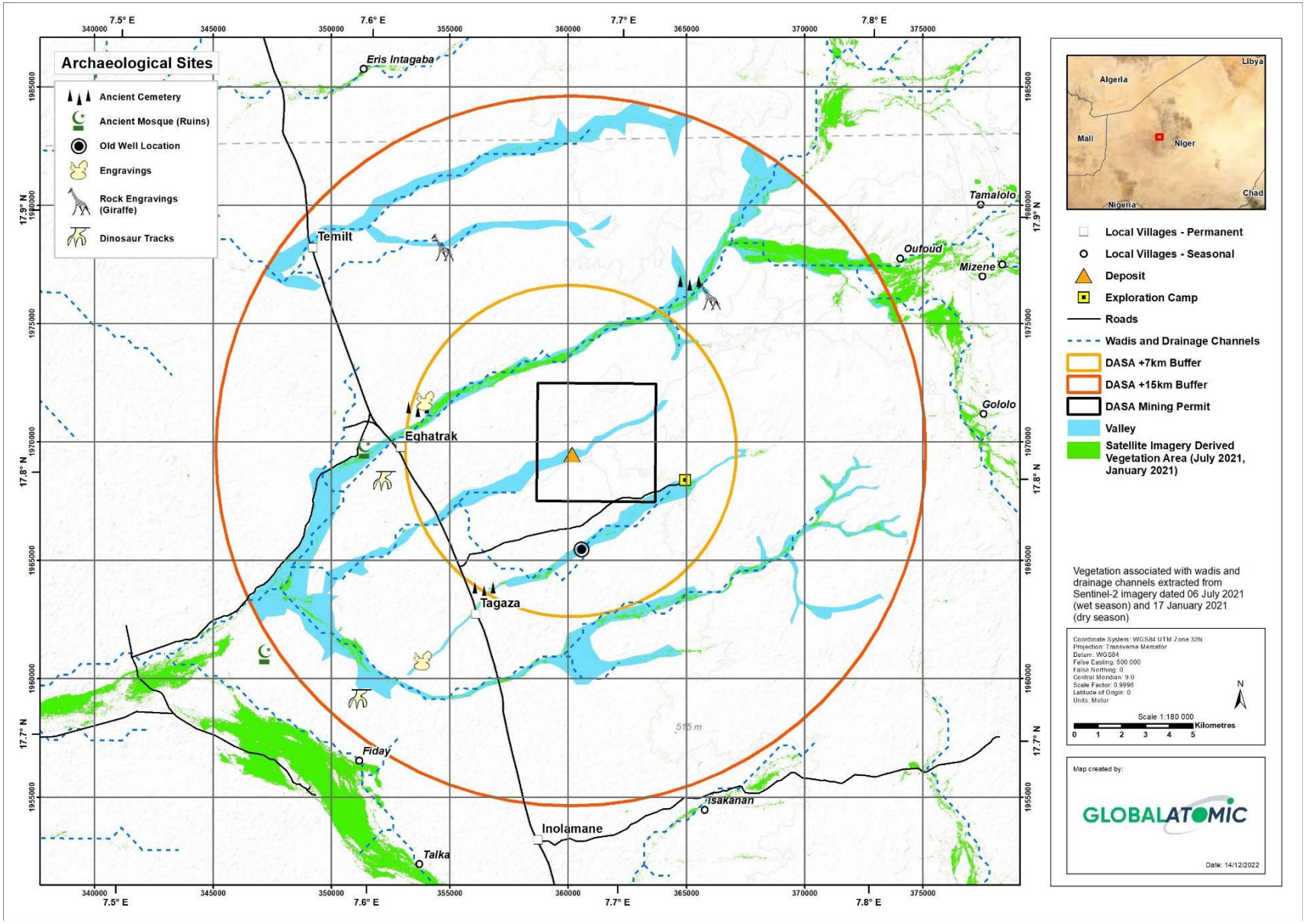

Figure 19 Location of archaeological sites in relation to the mining licence

2.4.2.5.4. Procedures for incidental findings

Given the richness and diversity of the project area's heritage and the activities to be carried out, chance discoveries could be made during the works and operations. To this end, the provisions of law n°97-22 of 30 June 1997 relating to the protection, conservation and enhancement of the national cultural heritage and its implementing decree n°97-407/PRN/MCC/MERST/A of 1 November 1997 are activated. Thus, the procedure includes the following stages:

- ***Suspension of works:*** In accordance with the provisions of Article 51 of law n°97-002 of 30 June 1997, when, as a result of the work or any other event, monuments, ruins, substructions, mosaics, elements of ancient piping, remains of ancient dwellings or burials, inscriptions or generally objects that may be of interest to paleontology, prehistory history, art, archaeology or numismatics, are uncovered, the company in charge of the work must immediately stop the said work, inform the supervisor of the work who reports directly to the head of the site who must immediately inform the administrative authorities who will immediately notify the Directorate of Cultural Heritage and the Directorate of Research.
- ***Delimitation of the discovery site:*** The company is obliged to delimit and secure a perimeter around the discovered property. It will limit access within this perimeter, and work may only be resumed after authorisation from the Directorate of Cultural Heritage.
- ***Securing the site to prevent damage or loss of removable objects:*** In the event of the discovery of removable antiquities or sensitive remains, a night watchman must be present until the responsible local authorities and the Ministry of Culture take over. The costs of securing the site of the find are charged to the contract.
- ***Incidental finding report:*** The company is required to prepare an incidental finding report providing information on the date and time of the discovery, the location of the discovery, the estimated weight and dimensions of the item discovered, and the temporary protection measures put in place. This report must be submitted to the supervisor of the works, the head of the site, the Directorate of Cultural Heritage, the Ministry in charge of research, the Prefect and the Governor of the region.

The Research and Culture administrations must visit the place where the discovery was made and prescribe any useful measure in accordance with the provisions of the last paragraph of Article 51 of the above-mentioned law.

- ***Arrival of the cultural services and action taken:*** The Cultural Heritage Directorate will arrange to send a representative to the site of the discovery within a reasonable time of notification and determine the action to be taken, which may include
    - ✓ Removal of physical cultural property deemed important and further work on the discovery site;
    - ✓ Continued work within a specified radius of the discovery site;
    - ✓ Enlargement or reduction of the area delimited by the company in charge of the works;

Decisions on how to deal with the finding should be taken by the responsible authorities in the Ministry of Culture. This could include conservation, preservation, restoration or recovery.

The implementation of the decision concerning the management of the finding must be communicated in writing by the Ministry in charge of Culture.

If the cultural services do not send a representative within a reasonable period of time, the Works Engineer, together with the Head of the site, will request the company to take mitigating measures in accordance with the provisions of the specifications and resume work while preserving or avoiding the discovered property.

2.4.3. Basic social services

2.4.3.1. Access to water and sanitation

Access to water for the population plays an important role in improving their living conditions. Thus, to improve access to this resource as well as the monitoring of related indicators, the government has developed and implemented programmes and projects, the latest of which is the Water, Sanitation and Hygiene Sector Programme (PROSEHA) developed since 2016 and covering the period 2016-2030. Under this programme, the notion of Household Served (HD) is developed as the main unit for planning the needs for new drinking water supply facilities. Thus, a HD is characterised by 10 persons as the number of users with a specific consumption of 20 L per person per day in rural areas and 75 L per person per day in urban areas (MH/A, 2019).

For the Agadez region, the rates of household access to the various water services in 2018 compared to the national average are shown in Figure 20 below.

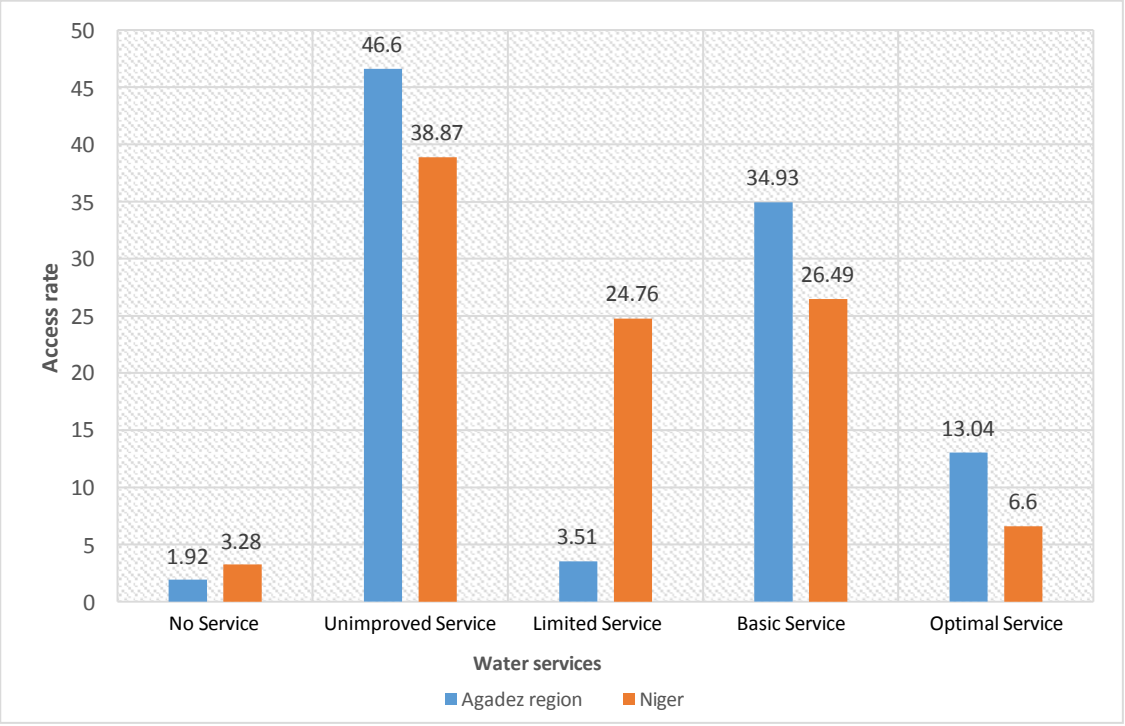

Figure 20 Households' access rate to different water services in 2018 (NSI, 2019)

The investments made have enabled an increase in the Theoretical Access Rate (TAR) to drinking water in rural areas, from 44.85% in 2018 to 46.09% in 2019. These rates are lower than the national averages which were 46.31% and 46.85% in 2018 and 2019 respectively.

The Geographical Coverage Rate (GCR) for drinking water increased from 55.05% in 2018 to 56.44% in 2019, an increase of 0.17%. These rates are higher than the national average of 1.39 percentage points (NSI, 2020).

In terms of infrastructure, 142 and 145 boreholes equipped with Human Powered Pumps (HPP) were recorded in 2018 and 2019 respectively. The number of cemented wells increased from 667 in 2018 to 673 in 2019.

In the permit area, more than 150 water points of all categories were identified in the commune of Tchirozérine and 83 modern water point equivalents (PC, PME, Mini AEP and SPP) in Dannet.

In terms of sanitation, the rate of household access to different services in 2018 compared to the national average is illustrated in Figure 21 below.

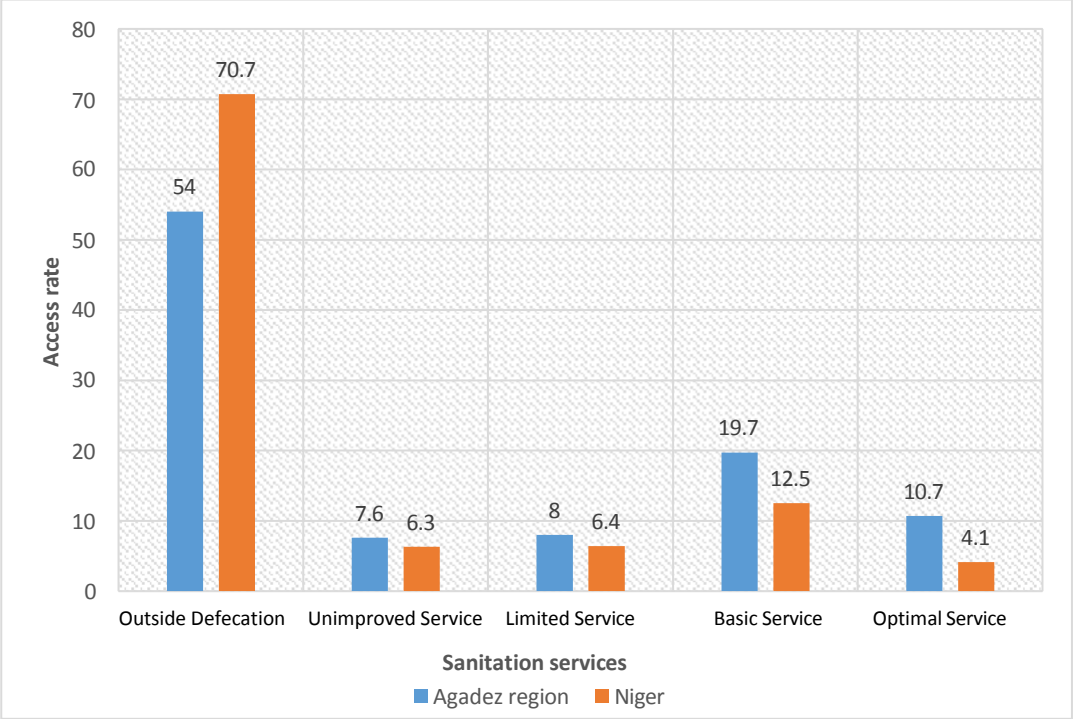

Figure 21 Household access rate to sanitation services in 2018 (MH/A, 2019)

At the regional level, analysis of the figure above shows that the rate of household access to the optimum sanitation service in 2018 is 10.7%, well above the national average of 4.1%. The basic service (19.7%) is also above the national average of 12.5%. The rate of open defecation is 54%, lower than the national rate of 70.7%. Finally, the rate of access to unimproved services is 7.6%, above the national average of 6.3%.

2.4.3.2. Access to health services

In the field of health, the State's objective is to improve health coverage and the quality of care through the construction of infrastructures and the strengthening of personnel.

Thus, in the project area, the health coverage rate in PMA (Minimum Activity Package) in 2018 is 68.35%. It was the same in 2017 (INS, 2020).

In terms of health infrastructure, in 2017, the region has: 1 Regional Hospital, 2 District Hospitals, 49 Integrated Health Centres I, 25 Integrated Health Centre II, 133 Health Centres.

The health staff in 2018 is composed of 22 doctors, 49 qualified midwives, 85 state-qualified nurses, 84 certified nurses, 1 registered nurse, 4 social assistants, 2 hygiene officers, 5 hygiene and sanitation technicians (INS,2020).

In the permit area, the health infrastructure identified in the commune of Tchirozérine includes: 1 Tchirozérine health district based in Agadez, 1 SONICHAR hospital, 1 functional CSI, 13 functional health huts, 1 public pharmacy, 1 private pharmaceutical depot. In the rural commune of Dannet, these infrastructures consist of 1 IHC, 12 health huts.

The types of recurrent diseases at the Tchirozerin IHC and the RTA (Dannet) IHC are measles, respiratory infections (coughs, colds, pneumonia, tuberculosis), vomiting, dermatitis, chickenpox, and vector-borne diseases such as malaria and yellow fever, and food- and water-borne diseases such as cholera, diarrhoea and gastroenteritis.

The ratio of doctors to population in 2019 is 1/14419 in the region (the WHO standard is 1/10000). As for the ratio of nurses to population, it is 1/1529 in the same year (the WHO standard is 1/5000). Finally, the number of women of childbearing age per midwife was 1/6729 (NSI, 2020).

2.4.3.3. Education

Like the national level, the education system in the Agadez region is characterised by a pyramid structure comprising pre-school, primary education, secondary education, vocational and technical education and higher education.

To ensure the development of this sector, Niger has developed several documents, notably the Ten-Year Education Development Programme (PDDE) 2003-2013 and the Education and Training Sector Programme (PSEF) 2014-2024.

The implementation of these programmes has led to significant results in the various educational sectors.

At the level of primary education, during the 2016-2017 school year, the region had 674 schools (public, private and community), 3124 classrooms including 3,006 public, 12 community and 106 private for a total of 96,570 pupils. The Gross Enrolment Rate (GER) was 97.4% during the same period (INS, 2018).

As regards traditional lower secondary education (CEG), during the 2016-2017 school year, the region had 52 public and private establishments, 736 classes (public and private) for a total of 22 622 pupils, 18 813 of whom were public and 3 809 private. At the level of traditional upper secondary education (Lycée), there were 29 public and public schools, 134 classes and 5,090 pupils (INS, 2018).

In 2016-2017, vocational and technical education totalled 3 health schools (with 22 classes and 290 students) and 33 technical training institutions (with 76 classes and 2,724 students).

Finally, at the level of higher education, the University of Agadez has 396 students, including 369 boys and 27 girls in the 2017-2018 academic year.

In the project area, the commune of Tchirozérine has one secondary school complex (CES) and three secondary schools with 1,071 pupils. At the primary level, there are 91 primary schools, including 67 "traditional" schools, 6 "community" schools and 2 "bilingual" schools (French-Tamasheq), 15 Franco-Arabic schools and one public school. These schools have a total of 7,801 pupils, including 3,502 girls (45% of the total) and 4,299 boys. In addition, this commune has 34 functional literacy centres for a total of 850 learners. These centres operate thanks to the support of certain partners such as UNICEF, AFRICAIRE, etc. Finally, the rural commune of Dannet has 6 General Education Colleges (CEG) and 30 primary schools for a total of 984 primary school pupils, including 536 boys and 448 girls.

2.4.4. Gender-based violence assessment

Gender-based violence refers to any act directed against a man or a woman as a result of unequal social relations governing the community and disadvantaging a group.

Gender-based violence is a generic term for any harmful/harmful act perpetrated against the will of others, and which is based on socially prescribed differences between men and women/girls and boys.

The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) defines it as "any act of gender-based violence that results in, or is likely to result in, physical or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life."

Thus, following the interview with stakeholders as part of the update of the Environmental and Social Impact Assessment of the Adrar Emoles 3 research permit, the types of GBV identified in the Agadez region are Child labor on gold panning sites through pounding, sifting and washing, sexual abuse, rape, sexual assault, unwanted pregnancies, physical violence, marital violence, child marriage, psychological violence and economic violence.

According to the results of the data collection, the types of GBV that could be encountered at the site of the "Adrar Emoles 3" research permit are sexual abuse, physical violence, exploitation, child marriage, sexual assault and psychological violence.

In order to take them into account, "GBV clauses" developed and annexed to this report will be integrated into the specifications of the companies.

3. OUTLINE OF THE POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1. Policy framework

The policy framework for the implementation of the Adrar Emoles 3 Exploration Licence is as follows

- **National Policy on Environment and Sustainable Development** adopted by Decree N°2016-522/PRN/ME/DD of 28 September 2016. It covers all the key dimensions of development relating to technical, institutional and organisational aspects, capacity building and resource mobilisation, particularly domestic. It is structured around four (4) strategic areas of intervention, namely: sector governance, sustainable land and water management, sustainable environmental management and biodiversity management.
- **National Environment Plan for Sustainable Development (PNEDD)**, elaborated in 1998, which serves as Agenda 21 for Niger. The PNEDD establishes the objectives of Niger's policy on environmental protection and sustainable development. Its aim is to implement the three (3) post-Rio Conventions by putting in place conditions favourable to the long-term improvement of the living conditions of the population and the economic development of the country.
- **Sustainable Development and Inclusive Growth Strategy (SDDCI Niger 2035): the** objective of this strategy is to build a modern, democratic and united country, well governed and peaceful, open to the world, as well as an emerging economy, based on a balanced sharing of the fruits of progress. It is based on six (06) strategic axes, namely territorial security, the development of a dynamic private sector, the control of fertility and infant mortality, the dynamisation and modernisation of the rural world, the development of human capital and the transformation of the administration.
- **Economic and Social Development Plan (PDES) 2022-2026**: this development instrument allows Niger to truly return to the exercise of economic planning after several decades of weakening the planning function. Based on the profound ambitions of the Niger Renaissance Programme, of which it is the main instrument for implementation in the short and medium term, the PDES is based on the Prime Minister's General Policy Declaration, from which it draws its substance, its main orientations and its strategic axes.
- **National Spatial Planning Policy:** the National Spatial Planning Policy (PNAT) was adopted by decree n°2014-319/PRN/MPAT/DC of 02 May 2014. Its general objective is to promote balanced and sustainable spatial development that reduces inter- and intra-regional disparities based on the country's natural potential, the creation of regional development poles, the reduction of social deficits, the preservation of the environment and the dynamics of regional integration. The PNAT's orientations and areas of intervention are: (i) National and regional integration; (ii) Territorial and institutional efficiency; (iii) Social development; (vi) Promotion of regional development poles and areas of activity; (v) Sustainable management of natural resources; (iv) Risk and disaster reduction.
- **Framework document of the National Occupational Safety and Health**

Policy adopted by Decree No. 2017-540/PRN/MET/PS of 30 June 2017. Its purpose is to prevent accidents and damage to health at work or the conditions in which it is performed. Thus, the general objective is to protect and ensure the safety and health of workers through the prevention of occupational accidents and diseases in all sectors.

- **National Mining Policy (PMN 2020-2029):** adopted on 3 July 2020, this policy is based on the reference frameworks at the international (ODD), continental (AU Agenda 2063), regional and sub-regional (ECOWAS Vision 2020, ECOWAS Mining Directive and Policy, WAEMU Community Mining Policy) and national levels (Constitution of 25 November 2010, the DPG, PDES 2017- 2021, etc.) It also takes into account other commitments specific to the mining sector to which Niger has subscribed as well as good practice benchmarks in the mining industry.

3.2. Legal framework

3.2.1. International legal framework

The international legal framework is made up of the international texts signed and ratified by Niger and which can be activated within the framework of the activities of the Adrar Emoles 3 Exploration Permit. Table 41 below provides a summary of these texts.

Table 41 International legal framework

TITLE OF THE AGREEMENT	SIGNATURE DATES /ENTRY INTO FORCE	DATE OF SIGNATURE/ RATIFICATION BY NIGER	CONTEXTUAL REFERENCES
Convention on the World Cultural and Natural Heritage	16 November 1972	23 November 1974	**Article 4**: "*Each State Party to this Convention recognises the duty to ensure the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural [...], scientific and technical heritage*".
Convention on Biological Diversity	Signed on 11 June 1992 in Rio de Janeiro, Brazil, and entered into force on 24 March 1994	Signed by Niger on 11/06/92 and ratified on 25/07/95	**Article 14**(a) and (b) of the Convention provides that each Contracting Party to the Convention shall, as far as possible (a) adopt procedures to require environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding and minimizing such effects, and, where appropriate, allow for public participation in such procedures; and (b) take steps to ensure that due account is taken of the environmental effects of its programmes and policies that are likely to have significant adverse effects on biological diversity.
International Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification	Adopted in Paris on 14 October 1994 and entered into force on 19 January 1996	Signed by Niger on 14 October 1994 and ratified on 19 January 1996	*Article 5 of the Convention obliges drought-affected countries to commit themselves to giving due priority to combating desertification and mitigating drought, and to allocating adequate resources commensurate with their situation and capabilities.*
United Nations Framework Convention on Climate Change	Signed on 11 June 1992 in Rio de Janeiro, Brazil, and entered into force on 24 March 1994	Signed by Niger on 11/06/92 and ratified on 25/07/95	*"The use of EIA (Article 41t) to minimise the adverse effects of climate change on health, the economy, etc."*
Stockholm Convention on the Protection of Human Health and the Environment from Persistent Organic Pollutants (POPs)	Adopted in Stockholm on 22 May 2001, entered into force on 17 May 2004	Niger joined on 12 April 2006	It aims to protect human health and the environment against Persistent Organic Pollutants.

TITLE OF THE AGREEMENT	SIGNATURE DATES /ENTRY INTO FORCE	DATE OF SIGNATURE/ RATIFICATION BY NIGER	CONTEXTUAL REFERENCES
Bamako Convention on the Ban of the Import into Africa of Hazardous Wastes and on the Control of Transboundary Movement and Management of Hazardous Wastes products in Africa.	30 January 1991 in Bamako and entered into force on 20 March 1996	30 June 1991 27 July 1996	The convention aims to improve and ensure the environmentally sound management of hazardous waste, as well as the cooperation of the African states involved. Article 4: "General obligations *3. Ban on the import of hazardous waste [...]* *4. Prohibition of dumping of hazardous waste in the sea, inland waters and waterways [...].* *Waste generation in Africa ... "...*
The Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam	10/09/1998, entered into force 24/02/2004	Accession by Niger: 16/02/2006	Promote shared responsibility and cooperation to protect human health and the environment from harm and to contribute to their use in an environmentally sound manner.
Work Environment (Air Pollution, Noise and Vibration) Convention No. 148	International Labour Organisation (ILO) 20 June 1977	28 July 1979	Article 6: *"Employers shall be liable for responsible for the implementation of the prescribed measures. Whenever two or more employers are simultaneously engaged in activities at the same workplace, they shall have a duty to co-operate with a view to applying the prescribed measures, without prejudice to the responsibility of each employer for the health and safety of the workers employed by him. In appropriate cases, the competent authority shall prescribe the general procedures by which such collaboration shall take place.* Article 11, paragraph 1*: "The state of health of workers exposed or likely to be exposed to occupational risks due to air pollution, noise or vibration at the workplace shall be subject to surveillance at appropriate intervals in the circumstances and in accordance with the procedures laid down by the competent authority...*

TITLE OF THE AGREEMENT	SIGNATURE DATES /ENTRY INTO FORCE	DATE OF SIGNATURE/ RATIFICATION BY NIGER	CONTEXTUAL REFERENCES
Convention No. 155 on Occupational Safety and Health	22 June 1981	Ratified by Niger and entered into force 11 August 1983.	Article 16 (paragraph 1, 2 and 3)*: "Employers shall be required to ensure that, so far as is reasonable and practicable, workplaces, machinery, equipment and work processes under their control do not present a risk to the safety and health of workers. Chemical, physical and biological substances and agents under their control shall not present a risk to health where appropriate protection is provided. Employers shall be required to provide, where necessary, appropriate protective clothing and equipment to prevent..., the risk of accidents or adverse health effects".* Article 18: *"Employers shall be required to provide, where necessary, measures to deal with emergencies and accidents, including adequate facilities for the administration of first aid".*
Convention No. 161 on occupational health services	25 June 1985 by the ILO	Ratified by Niger and entered into force on 17 February 1988	Article 12: *"Work-related health surveillance must not entail any loss of earnings for workers; it must be free of charge and take place as far as possible during working hours".* Article 13: *"all workers must be informed of the health risks inherent in their work".* Article 15: *"Occupational health services shall be informed of cases of illness among workers and of absences from work for health reasons. Staff providing occupational health services shall not be required by employers to verify the validity of the reasons for absence from work".*
Convention No. 187 on the Promotional Framework for Safety and Health at Work.	15 June 2006 by the ILO	Ratified by Niger and entered into force on 20 February 2009	Article 2 (paragraphs 1, 2 and 3) states that*: "1. Each Member ... shall promote the continuous improvement of occupational safety and health in*

TITLE OF THE AGREEMENT	SIGNATURE DATES /ENTRY INTO FORCE	DATE OF SIGNATURE/ RATIFICATION BY NIGER	CONTEXTUAL REFERENCES
			order to prevent work-related injuries, illnesses and deaths ..... Each Member shall take active steps towards the progressive achievement of a safe and healthy working environment Each Member shall, in consultation with the most representative employers' and workers' organizations, periodically consider what steps could be taken to ratify the relevant ILO Conventions on occupational safety and health.
Equal Remuneration Convention No. 100	Adoption: Geneva, 34ème ILC session (29 June 1951) / Entry into force: 23 May 1953	9 August 1966 / entry into force 9 August 1968	Article 1: "For the *purposes of this Agreement :* *(a) the term remuneration includes the ordinary, basic or minimum wage or salary and any other benefits, paid directly or indirectly, in cash or in kind, by the employer to the worker by reason of the latter's employment;* *(b) the term equal pay for male and female workers for work of equal value refers to rates of pay set without discrimination on the grounds of sex.*
Convention No. 102 concerning Minimum Standards of Social Security	Geneva, 35ème ILC session (28 June 1952) / Entry into force: 27 Apr 1955	9 August 1966 /9 August 1968	*Article 32: "The contingencies covered shall include the following when caused by prescribed occupational injuries or diseases:* *a) morbid condition ;* *(b) incapacity for work resulting from a morbid condition and leading to the suspension of earnings as defined by national legislation;* *(c) total loss of earning capacity or partial loss of earning capacity above a prescribed degree, where it is likely that such total or partial loss will be*

TITLE OF THE AGREEMENT	SIGNATURE DATES /ENTRY INTO FORCE	DATE OF SIGNATURE/ RATIFICATION BY NIGER	CONTEXTUAL REFERENCES
			permanent, or corresponding diminution of physical integrity; *(d) loss of livelihood suffered by the widow or children as a result of the death of the breadwinner; in the case of the widow, entitlement to the benefit may be subject to the presumption, in accordance with national legislation, that she is incapable of supporting herself.*
Convention 138 on the minimum age for employment	Adoption: Geneva, 58ème ILC session (26 June 1973) / Entry into force: 19 June 1976	4 December 1978/entered into force 4 December 1980	Article 3: "*The minimum age for admission to any type of employment or work which, by its nature or the conditions in which it is carried out, is likely to jeopardise the health, safety or morals of adolescents shall not be less than eighteen years.* *2. The types of employment or work referred to in paragraph 1 above shall be determined by national laws or regulations or the competent authority, after consultation with the employers' and workers' organisations concerned, if any.* *3. Notwithstanding the provisions of paragraph 1 above, national laws or regulations or the competent authority may, after consultation with the employers' and workers' organisations concerned, if any, authorise the employment or work of young persons from the age of sixteen years, provided that their health, safety and morals are fully guaranteed and that they have received adequate specific instruction or vocational training in the relevant branch of activity.*

TITLE OF THE AGREEMENT	SIGNATURE DATES /ENTRY INTO FORCE	DATE OF SIGNATURE/ RATIFICATION BY NIGER	CONTEXTUAL REFERENCES
Worst Forms of Child Labour Convention No. 182	Adoption: Geneva, 87ème ILC session (17 June 1999) / Entry into force: 19 Nov. 2000	23 October 2000/entered into force 23 October 2001	Article 3: "For *the purposes of this Convention, the term 'worst forms of child labour' includes* *(a) all forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom and forced or compulsory labour, including forced or compulsory recruitment of children for use in armed conflict;* *(b) the use, procuring or offering of a child for prostitution, for the production of pornography or for pornographic performances;* *(c) the use, procuring or offering of a child for illicit activities, including for the production and trafficking of drugs, as defined in the relevant international conventions;* *(d) work which, by its nature or the conditions in which it is carried out, is likely to harm the health, safety or morals of the child.*

3.2.2. IFC Environmental and Social Sustainability Performance Standards

IFC's Environmental and Social Sustainability Performance Standards (PS) are an integral part of its Sustainability Framework and outline its strategic commitment to promoting sustainable development. They are intended to provide guidance to clients in identifying risks and impacts and are designed to help them avoid, mitigate and manage risks and impacts in order to operate in a sustainable manner. In this regard, they also cover the clients' obligations to collaborate with stakeholders and communicate information about project-level activities.

Of these eight (8) standards, all are applicable to the project. The objectives and the context of their application are given in Table 42 below.

Table 42 Applicability of the IFC Performance Standards to the project

PERFORMANCE STANDARDS	OBJECTIVES	APPLICABILITY TO THE PROJECT
PS 1: Assessment and management of environmental and social risks and impacts	- Identify and assess the environmental and social risks and impacts of the project: - Adopt a hierarchy of mitigation measures so as to anticipate and avoid impacts, or where this is not possible, to mitigate as much as possible, and where residual impacts remain, to compensate for the risks and impacts faced by workers, affected communities and the environment; - Promote better environmental and social performance of clients through effective use of management systems; - Ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately; - Promote and provide the means for meaningful dialogue with affected communities throughout the project cycle to cover issues that may affect them and ensure that relevant environmental and social information is disclosed and disseminated.	In order to comply with the provisions of this standard, this environmental and social impact study has been carried out and has made it possible to identify and assess the risks and impacts associated with the implementation of the project. Measures have also been proposed to avoid, mitigate and, if necessary, compensate for them. This will ensure a better environmental and social performance of the project. Consultation with local communities has been taking place since 2008 for close to 15 years and these communities have been fully informed about the project and the nature of activities to be carried out. Broad Community Support (BCS) has been demonstrated at the Village and Regional levels. In addition, a Stakeholder Engagement Plan and associated Grievance Management Mechanism has been developed and allows any stakeholder who feels aggrieved by the implementation of the project to lodge a complaint so that it can be appropriately addressed.
PS 2: Workforce and working conditions	- Promote fair treatment, non-discrimination and equal opportunities for workers; - Establish, maintain and improve relations between workers and management; - Promoting compliance with national labour and employment law ; - Protect workers, including vulnerable categories of workers such as children, migrant workers, third party workers and workers in the client's supply chain; - Promote safe and healthy working conditions and protect workers' health;	The measures planned as part of the environmental and social impact assessment in accordance with PS1 include those relating to working conditions (health and safety, and specifically measures around occupational exposure to radioactive materials). More importantly, at the end of this study, labour management (human resources) procedures have been developed that will address the risks associated with the workforce and proportionate management measures.

PERFORMANCE STANDARDS	OBJECTIVES	APPLICABILITY TO THE PROJECT
	- Avoid the use of forced labour.	
PS 3: Resource efficiency and pollution prevention	- Avoid or reduce negative impacts on human health and the environment by avoiding or reducing pollution generated by project activities; - Promote more sustainable use of resources, including energy and water; - Reduce project-related GHG emissions.	This Environmental and Social Impact Assessment has proposed measures that will allow for the rational use of resources and the prevention of deterioration of air quality, ground and surface water quality and use, and waste management. A number of measures have been integrated into project design to reduce water use and GHG emissions. A Climate Change Risk Assessment will be carried out ahead of the start of construction.
PS 4: Health, safety and security of communities	- Anticipate and avoid, during the life of the project, negative impacts on the health and safety of affected communities that may result from ordinary or non-ordinary circumstances, - Ensure that the protection of personnel and property is carried out in accordance with applicable human rights principles and in a manner that avoids or minimises risk to affected communities.	With regard to local communities, the planned measures take into account their concerns, including health and safety issues. A Human Rights Risk Assessment will be carried out ahead of construction.
PS 5: Land acquisition and involuntary resettlement	- Avoid, and wherever possible limit, involuntary resettlement by considering alternative designs for projects; - Anticipate and avoid, or where avoidance is not possible, limit negative social and economic impacts resulting from land acquisition or restrictions on land use by : o providing compensation for the loss of assets at replacement cost and by o ensuring that resettlement activities are accompanied by appropriate provision of information, informed consultation and participation of those affected; - To improve or at least restore the livelihoods and living conditions of displaced people;	The project to exploit the deposits of the Adrar Emoles 3 research permit will not result in the physical displacement of populations.

PERFORMANCE STANDARDS	OBJECTIVES	APPLICABILITY TO THE PROJECT
	- Improve the living conditions of physically displaced people through the provision of adequate housing with security of tenure in resettlement sites.	
PS 6: Conservation of biodiversity and sustainable management of living natural resources	- Protecting and conserving biodiversity; - Maintaining the benefits of ecosystem services ; - Promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	This Environmental and Social Impact Assessment has provided a baseline of the biodiversity and living natural and modified resources (koris) in the area, and habitat mapping. A Critical Habitat screening process has been completed and no critical species identified. An ecosystem services baseline assessment has been completed, to include biodiversity risks and impacts of the project and proposed measures to address them as described under PS1. This will enable the project to comply with the provisions of this performance standard.
PS 7: Indigenous Peoples	- Avoidance of adverse impacts, consultation and informed participation - Impacts on Traditional or Customary Lands under Use, including relocation, impacts to or use of critical cultural heritage, requiring FPIC - Provision of fair and equitable sharing of benefits with IPs	Consultation and informed participation of local predominantly Tuareg communities has been taking place since 2008 for close to 15 years, and more recently, Broad Community Support has been demonstrated both at the local village level and the highest levels of the regional administration. As no adverse impacts, relocation, or impacts to or use of natural or critical cultural heritage will take place, the requirement for FPIC is not triggered. Benefits to local communities will accrue through education and training and associated local procurement and hiring, enhancement of water provision (refurbishment and maintenance of wells and consideration of the provision of additional fresh water

PERFORMANCE STANDARDS	OBJECTIVES	APPLICABILITY TO THE PROJECT
		from the mining operation (dewatering), improved agricultural opportunities and practices and the enhancement of health care. These initiatives are in addition to the benefits that will accrue to the local and regional population from the payment by GAC of mining royalties and tax revenue, a portion of which will be returned to local and regional authorities.
PS 8: Cultural heritage	- To protect cultural heritage from the negative impacts of project activities and support its preservation and to promote the equitable distribution of benefits from the use of cultural heritage.	To comply with the provisions of this performance standard, the initial baseline of the cultural and archaeological heritage of the area has been established. The risks and impacts that the project is likely to generate have been identified and assessed, and appropriate measures will be undertaken under PS1.

3.2.3. Good Industry Practice/Standards

3.2.3.1. International Finance Corporation Performance Standard 6

IFC PS6 and its accompanying Guidance Note (GN6) present the standards that an IFC compliant project must meet regarding the conservation of biodiversity and the sustainable management of living natural resources. The performance standard is recognised as the global benchmark for best practice in biodiversity assessment and management.

IFC PS6 requires the identification and assessment of three classes of area based on habitat condition. Land areas may be defined as “Modified” or “Natural Habitat” and either of these classes may also be identified as “Critical Habitat” if they support certain high biodiversity values.

Definitions of the three classes of habitat are outlined below.

Natural Habitat is defined as: ‘areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area’s primary ecological functions and species composition’. Natural Habitat is not restricted to pristine habitats. It is assumed that the majority of habitats designated as natural will have undergone some degree of historic anthropogenic impact.

Modified Habitat is defined as: ‘areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area’s primary ecological functions and species composition’. For example, areas managed intensively for agriculture, forest plantations, settlements and urban areas. Definitions of what might constitute a modified or degraded area vary, are location specific and may be influenced by the broader landscape context.

Critical Habitat is defined as ‘areas of Natural and/or Modified Habitat that support high biodiversity value’ based on the presence of one or more of the following:

- Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species;
- Criterion 2: Endemic and/or restricted-range species;
- Criterion 3: Globally significant concentrations of migratory and/or congregatory species;
- Criterion 4: Highly threatened and/or unique ecosystems; and/or
- Criterion 5: Areas associated with key evolutionary processes.

The presence of any one of these types of biodiversity features in the landscape may “trigger” a determination of Critical Habitat, based on their extent or abundance within an Ecologically Appropriate Area of Analysis (EAAA) defined for each feature. For Criteria 1 to 3, presence of CH is confirmed by assessment against quantitative thresholds. Expert judgement is needed to determine presence of CH for Criteria 4 and 5. Legally Protected Areas and Internationally Recognised Areas may also qualify an area as CH depending on the reasons for designation.

Implementation of the mitigation hierarchy is required for compliance with IFC PS6. This is typically described as:

- Avoid Impacts, and
- Minimize impacts, and
- Restore conditions (abate, rectify, repair), and
- Where residual impacts remain, Offset impacts

Operations are required to achieve a Net Gain outcome for Critical Habitat (Paragraphs 17-19 of IFC (2012) and IFC, 2019).

In impacted areas of Natural Habitat, mitigation measures are to be designed, adopting the mitigation hierarchy where feasible, to achieve a No Net Loss outcome for biodiversity (paragraph 15 of IFC (2012).

To align with IFC PS6 general requirements include:

Demonstrate an absence of alternatives that would avoid damage to Natural and Critical Habitat. This will be considered as part of the Biodiversity Impact Assessment.

Apply the mitigation hierarchy with a view to achieving “No Net Loss” or a Net Gain of biodiversity in areas of Natural and Critical Habitat respectively. The Project-related direct and indirect impacts will not jeopardize the long-term persistence of the biodiversity value for which Critical Habitat was designated. This will be outlined in a Biodiversity Action Plan (BAP).

Undertake robust habitat mapping to determine areas of Critical and Natural Habitat and underpin appropriate application of the mitigation hierarchy such as identifying requirements for strict avoidance or minimisation of footprint. Habitat mapping is currently being completed and will be applied in the BAP.

Design and implementation of a Biodiversity Monitoring and Evaluation Program (BMEP).

3.2.3.2. International Finance Corporation Standard Performance Standard 7

In addition to the text in Table 42 above, the following provides further detail on the applicability of PS7 without triggering the requirement for FPIC.

Paragraph 14 relates to ‘adverse impacts’, in this case limited to the prevention of grazing in the fenced 2 km^2 portion of the 40 km^2 buffer zone, represents approximately 2ha. This is not considered significant in relation to the extensive areas of vegetation elsewhere, with water sources, that are available to the largely sedentary local population. There are no cultural sites of significance or other natural resources present within the buffer zone, so it is considered that there are no adverse impacts on local communities.

Paragraph 15 relates to the relocation of indigenous people from lands and natural resources; this will not be carried out by the Dasa project. Communities will remain as they are, and traditional herding routes unaffected. The project has committed to the following: Water wells will be refurbished and maintained, and additional water may be made available to local communities as a result of dewatering (pumping out groundwater to allow mining access). Market gardening and the growth of fodder crops

to increase areas under cultivation and yields and improve the seasonal availability of grazing and fodder will be developed by the project proponent in consultation with the communities and the participation of local agricultural experts. Other community development aspirations will be discussed with communities on an ongoing basis.

Paragraph 16 & 17 relate to critical cultural heritage, which has not been identified in the project area, so these are not applicable.

In terms of other PS7 paragraphs, these will be addressed in the following ways:

- Consultation and informed participation of local predominantly Tuareg communities has been taking place since 2008, and more recently, Broad Community Support has been demonstrated both at local village level and the highest levels of regional administration. A Stakeholder Engagement Plan and associated Grievance Mechanism has been developed and is being implemented in the local area.
- Benefits to local communities will accrue through education and training programmes and associated local procurement and hiring, enhancement of water provision (refurbishment and maintenance of wells and consideration of the provision of additional fresh water from the mining operation (dewatering), improved agricultural opportunities and practices, and the enhancement of health care. This is in addition to the benefits that will accrue from the payment of tax revenue, a portion of which will be returned to the local authority.

3.2.4. Equator Principles

The Equator Principles are intended to provide a common basis and framework for financial institutions to identify, assess and manage environmental and social risks in project finance. There are ten (10) principles that apply globally and across all business sectors. The titles of these principles, their objectives and applicability to the project are given in Table 43 below.

Table 43 Applicability of the Equator Principles to the project

PRINCIPLES	OBJECTIVES	APPLICABILITY TO THE PROJECT
EP1: Review and Categorisation	Categorise the project (A, B, or C) according to the magnitude of the risks and potential environmental and social impacts	As this project has major potential impacts, it is therefore classified as category A in accordance with this principle and national texts, in particular law n°2018-28 of 14 May 2018 and its implementing decree n°2019-027/PRN/MESU/DD of 11 January 2019.
EP2: Environmental and Social Assessment	Conduct an Assessment process to analyse the extent of environmental and social impacts and risks associated with the proposed project and propose measures to minimise, mitigate and, where residual impacts remain, compensate/remediate the risks and	In order to comply with the provisions of this principle, the present environmental and social impact study has been carried out and has made it possible to assess the environmental and social risks and impacts associated with the project and to propose measures. Also, specialised studies have been carried out, notably in terms of

PRINCIPLES	OBJECTIVES	APPLICABILITY TO THE PROJECT
	impacts on Workers, affected Communities and the environment, in a manner that is relevant and appropriate to the nature and scale of the proposed project.	biodiversity, cultural heritage, air quality, etc. Finally, within the framework of the study, issues related to climate change, impacts on human rights (e.g. GBV issues) were addressed.
EP3: Applicable environmental and social standards	Assess compliance with the necessary laws, regulations and permits relating to environmental and social issues in the host country concerned and the applicable provisions of the principles.	The environmental and social impact study, which is the subject of this report, was carried out in accordance with the national texts in force on the subject and the provisions of the Equator Principles.
EP4: Environmental and Social Management System (ESMS) and Equator Principles Action Plan (EP Action Plan)	Establish and maintain an environmental and social management system and an Environmental and Social Management Plan to address the issues raised in the Assessment process and to incorporate the measures required to meet the applicable standards.	In order to comply with the provisions of this principle, an Environmental and Social Management Plan (ESMP) has been developed as a result of this environmental and social impact assessment. It includes measures to manage the environmental and social risks and impacts that will be associated with the implementation of the project.
EP5: Stakeholder participation	Ensure effective stakeholder participation through a continuous and structured process adapted to the local culture of the affected communities, workers and, where appropriate, other stakeholders	As part of the environmental and social impact study, which is the subject of this report, a stakeholder consultation process was carried out (administrative, communal and customary authorities, local populations, etc.) and enabled their opinions, concerns and recommendations to be taken into account in relation to the implementation of the project. In addition, a Stakeholder Engagement Plan was drawn up.
EP6	Establish a grievance mechanism to receive and facilitate the resolution of concerns and grievances related to the environmental and social performance of the project	In order to bring the project into line with this principle, a Complaints Mechanism has been developed which will allow anyone who feels aggrieved by the implementation of the project to register their complaint so that it can be dealt with in a fair and equitable manner
EP7: Independent review	Provide independent review of the assessment process, including the ESMP, ESMS and Stakeholder Participation process documents to assist EPFI in conducting its due	The project to exploit the deposits of the Adrar Emoles research permit will be subject to this obligation in order to comply with the provisions of these principles

PRINCIPLES	OBJECTIVES	APPLICABILITY TO THE PROJECT
	diligence and assessing compliance with the Equator Principles	
EP8: Covenants	The client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits. For all Category A and B Projects, the client will covenant in the financial documentation: to comply with the ESMPs and EPAP (where applicable) during the construction and operation of the Project; and to provide periodic reports in a format agreed with the EPFI, at least annually or as agreed, prepared by in-house staff or third party experts, that document compliance with the ESMPs and EPAP and compliance with relevant local, state and host country environmental and social laws, regulations and permits; and to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.	An ESAP or EPAP will be agreed between the financing parties and the company and implemented over the course of the construction and operation of the project, and audits will be carried out by an Independent Environment and Social Consultant (IESC) appointed by the project Lenders.
EP9: Independent Monitoring and Reporting	Ensure independent monitoring and reporting by an independent Environmental and Social Consultant to assess the project's compliance with the Equator Principles after financial close and during the life of the loan.	The Niger Government through the National Environmental Assessment Office will carry out periodic evaluations (every six (6) months) of the implementation of the ESMP. In addition, the IESC appointedd by the Project Lenders will conduct periodic evaluations during the tenure of their Loans.
EP10: Reporting and Transparency	• Ensure that, as a minimum, a summary of the ESIA is accessible and available online and that it includes a summary of human rights and climate change risks and impacts, where relevant	The project that has undergone an environmental and social impact assessment in accordance with the provisions of PS 1 will take all necessary steps to comply with the provisions of this principle.

PRINCIPLES	OBJECTIVES	APPLICABILITY TO THE PROJECT
	• Make public, once a year, the GHG emission levels (Type 1 and Type 2 emissions combined and, if applicable, the GHG efficiency factor 12) during the operational phase of projects emitting more than 100,000 tonnes of CO2 equivalent per year. • Make non-commercially sensitive project-specific biodiversity data available to the Global Biodiversity Information Facility (GBIF) and relevant national and global databases, in formats and under conditions that allow access to and re-use of these data in future research and decision-making	

3.2.5. International Atomic Energy Agency standards

Niger is a member state of the International Atomic Energy Agency ("IAEA") which establishes safety standards and measures for protection against ionizing radiation. The following references are applicable for strategies and protocols for the location, design, construction, operation and closure of facilities necessary to protect the workforce, the public and the environment from the impacts of radioactive waste resulting from mining and crushing of ores (including tailings, waste rock, mineralized waste rock, process water, leach solutions, precipitation, seepage from stockpiles, and uranium mill areas):

- Basic Safety Principles for the Protection of People and the Environment (IAEA, 2006);
- International Basic Standards (IAEA, 2014);
- The Safety Guide (IAEA, 2002).

In addition, the IAEA (2012) establishes the Regulations for the Safe Transport of Radioactive Material, which includes the requirement to establish a radiation protection programme for the transport of radioactive material to ensure safety and to protect persons, property and the environment from the effects of radioactivity in the transport of radioactive material.

The requirements of these documents will be implemented through site specific occupational health and safety procedures and associated monitoring of workplaces.

3.2.6. National legal framework

At the national level, the Adrar Emoles 3 Exploration Permit project falls within the framework of the national texts summarised in Table 44 below.

Table 44 National legal framework of the project

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
Constitution of the 7ème Republic of Niger	25 November 2010	Citizens' rights and duties	Article 28: *"Everyone has the right to property. No one shall be deprived of his property except in the public interest, subject to fair and prior compensation*. Article 35: "*The State has the obligation to protect the environment in the interest of present and future generations. Everyone is obliged to contribute to the safeguarding and improvement of the environment in which he or she lives [...] The State shall ensure the assessment and control of the impact of any development project and programme on the environment*." Article 37: *"National and international companies have the obligation to respect the legislation in force in environmental matters. They are obliged to protect human health and to contribute to the safeguarding and improvement of the environment".*
Law N°61-37 regulating expropriation for public utility and temporary occupation as amended and completed by Law N°2008-037 of 10 July 2008	24 November 1961	Expropriation in the public interest	Article 1 (new): "*Expropriation is the procedure by which the State may, in the public interest and subject to fair and prior compensation, compel any person to surrender to it the ownership of real property".* According to Article 13/bis (4) (Article 2 of the amending law): *"affected persons shall be compensated at replacement cost without depreciation, prior to taking ownership of land or property".*
Law N°66-33 on dangerous, unhealthy and inconvenient establishments	24 March 1966	Dangerous, Unhealthy or Unsuitable Establishments	*This law, in its articles 1 and 2, places under the supervision of the administrative authority, workshops, factories, shops, building sites and all industrial or commercial establishments which present dangers or inconveniences, either for the safety, health or convenience of the neighbourhood, public health or for agriculture.*
Law No. 97-002 on the protection, conservation and enhancement of the national cultural heritage	30 June 1997	National cultural heritage	Article 57: "*The Ministry in charge of cultural heritage has the prerogative to assume, among others, the following functions [...] To organise the control of archaeological excavations, to ensure the*

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
			conservation "in situ" of certain cultural property and to protect certain areas reserved for future archaeological research [...]".
Law No. 98-56 on the framework law for environmental management	29 December 1998	Environmental management	Article 31: "*Activities, projects and development programmes which, due to their size or impact on the natural and human environment, may affect the latter, are subject to prior authorisation by the Minister in charge of the environment.* *This authorisation is granted on the basis of an assessment of the consequences of the activities, project or programme updated by an environmental impact study drawn up by the promoter and approved by the ministry responsible for the environment.* Article 58, paragraph 1 and 2: *"The holders of mining or quarrying titles have the obligation, under the control of the competent administration, to restore the exploited sites.* *However, the holders of these titles may choose to pay the financial cost of the restoration operations carried out by the competent administration.*
Law n°2001-32 on the orientation of the Territorial Development Policy	31 December 2001	Spatial planning	Article 34: *"The State shall ensure that the environmental dimension is taken into account in the formulation of programmes and projects, in particular by including environmental impact studies that integrate ecological, socio-economic and cultural aspects.* *It also ensures that all development actors respect international conventions in this area.*
Law n° 2004-040 on the forestry regime in Niger	8 June 2004	Forestry regime	Article 37: "*Any clearing of a portion of forest larger than a given area, fixed by regulation, is subject to prior authorisation by the Minister in charge of forests, after consulting the local authorities concerned. It must be preceded by an environmental impact assessment carried out in accordance with the legislation in force.*

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
Law N°2006-26 modifying Ordinance n°93-16 of 2 March 1993 on the Mining Law, completed by Ordinance n°99-48 of 5 November 1999	9 August 2006	Mining Code	Article 99 (new): "*Mining or quarrying operations are considered as commercial acts.* *They must be conducted in such a way as to ensure the rational exploitation of national resources and the protection of the environment in accordance with the laws and regulations in force.* *To this end, companies must carry out their work using proven mining industry techniques and take the necessary measures to preserve the environment, treat waste and preserve the forest heritage and water resources. [...]. "*
Law n°2012-45 on the Labour Code in the Republic of Niger	25 September 2012	Labour regulations	Article 2: *"For the purposes of this Code, a worker shall be [...]. In determining the status of worker, no account shall be taken of the legal status of the employer or of the employee. However, persons appointed to a permanent post in a public administration are not subject to the provisions of this Code.* Article 136: *"To protect the life and health of employees, the employer is required to take all useful measures that are appropriate to the operating conditions of the enterprise. In particular, he shall arrange the installations and organise the work in such a way as to protect employees as far as possible from accidents and illnesses. Where sufficient protection against the risk of accident or damage to health cannot be provided by other means, the employer shall provide and maintain such personal protective equipment and protective clothing as may reasonably be required to enable employees to perform their work safely.* *Articles 145 and 146 are also mentioned and can be taken into account in the context of employment contracts.* Article 155: *"Stress, smoking, alcoholism, drug addiction and HIV/AIDS are the emerging health risks in the world of work. Every employer shall be obliged to inform and raise the awareness of his*

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
			workers about emerging risks and to provide psychosocial assistance." Article 156: *"Under no circumstances may an employer require a job seeker to undergo an HIV-AIDS or sickle cell test on the occasion of recruitment.*
Law No. 2014-63 prohibiting the production, import, marketing, use and storage of bags and packaging made of low-density flexible plastic	5 November 2014	Flexible low density plastic bags and packaging	Article 1: "*It is forbidden to produce, import, market, use and store, throughout the territory of the Republic of Niger, bags and packaging made of low density flexible plastic. However, for scientific, sanitary or experimental reasons, a special authorisation may be granted for the production, import, use and storage of bags and packaging made of low density flexible plastic*.
Law n°2018-28 determining the fundamental principles of Environmental Assessment in Niger	14 May 2018	Environmental assessment	Article 3: "*Policies, strategies, plans, programmes, projects or any other activities, which, due to the importance of their dimensions or their repercussions on the biophysical and human environments, may affect the latter, are subject to prior authorisation by the Minister in charge of the environment*".
Ordinance No. 93-13 establishing the Public Health Code	2 March 1993	Hygiene code	Article 4: "*Any person who produces or holds waste under conditions likely to create harmful effects on the soil, flora and fauna, to degrade the landscape, to pollute the air or water, to generate noise and odours and, in general, to harm human health and the environment, shall be required to ensure or have ensured the elimination of such waste in accordance with the provisions of this Ordinance under conditions likely to avoid the aforementioned effects [...]*. Hygiene protection for establishments is provided for in Articles 80, 81, 82, 84 and 86. Thus, it is clear from the terms of Article 80 that "every establishment must be provided with a waste disposal system". Articles 83 to 85 prohibit the mixing of industrial waste and other toxic or dangerous products with household waste.

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
			Articles 88 and 90 state that it is forbidden to discharge waste water into the environment without prior treatment or to burn combustible waste in the open air that may cause a nuisance.
Ordinance n°2010-09 on the water code in Niger	1er April 2010	Water Code	Article 6: "*This Ordinance recognises that water is an ecological, social and economic asset, the preservation of which is of general interest and the use of which in any form whatsoever requires that everyone contribute to the efforts of the community and/or the State to ensure its conservation and protection*. Article 12: "*Those who by virtue of their activities use water resources must contribute to the financing of water management, according to their use, by virtue of the "polluter pays" principle, notwithstanding the right to water of every citizen set out in Article 4 of this Ordinance*. Article 13: "*when the activity of natural or legal persons is likely to cause or aggravate water pollution or the degradation of the aquatic environment, the promoters of this activity shall bear and/or contribute to the financing of the measures that the State and the local authorities must take against this pollution, with a view to compensating for the effects, and to ensure the conservation of water resources in accordance with the "polluter-pays" principle.*
Decree No. 76-129 /PCMS/MMH, on the implementation of Law No. 66-033 of 24 March 1966 on the ÉDII	31 July 1976	Dangerous, Unhealthy or Unsuitable Establishments	This decree specifies the application of the principles laid down by the law for all establishments that present dangers or inconveniences either for the safety, health or convenience of the neighbourhood and public health. Article 28 provides that, in application of law n°61-32 of 19 July 1961 (article 10), a tax for services rendered called "tax for the control of dangerous, unhealthy or inconvenient establishments (EDII) is instituted and is payable by the companies subject to control". [...] ".

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
Decree N°2006-265/PRN/MME, setting out the modalities for the application of the mining law	18 August 2006	Mines	Article 57: *"Any holder of a quarry is obliged to rehabilitate the exploited sites as they progress. [...]. "* Article 60, paragraph 2: *"The holder of an authorisation to open and exploit a permanent or temporary quarry is obliged to fence off the perimeter allocated to him/her with sufficiently rigid fencing or ropes".*
Decree 2009- 229 PRN/MU/H, setting the modalities of application of the specific provisions of law n°61-37 of 24 November 1961 regulating expropriation for public utility and temporary occupation as amended and completed by law n°2008-37 of 10 July 2008, relating to involuntary displacement and resettlement of populations	12 August 2009	Expropriation in the public interest	Article 14 states that the Resettlement Plan is the design and planning of the displacement and involuntary resettlement of populations after consultation and with the participation of the populations. Accordingly, the RP includes measures to minimise the negative impacts associated with the expropriation and displacement of affected populations and maximise the benefits to them. It also sets out the content and methods of compensation considering the losses suffered by the affected people.
Decree n°2011-404/PRN/MH/E determining the nomenclature of developments, installations, works and activities subject to declaration, authorisation and concession for water use	31 August 2011	Water resource development	Article 1: *"This decree determines the nomenclature of developments, installations, works and activities subject to declaration, authorisation and water use concessions, as shown in the annex.* *Annex: "Developments, installations, works and activities subject to declaration, authorisation and concession concern all permanent or temporary water uses, in particular* - *human food;* - *agriculture and livestock;* - *aquaculture, fisheries and fish farming;* - *forestry and logging;* - *energy, industry and mining;* - *the craft industry;*

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
			- *navigation;* - *transport and communications;* - *tourism and leisure;* - *public works and civil engineering (dams, roads, bridges, etc.)*
Decree n°2011-405/PRN/MH/E setting the modalities and procedures for declaration, authorisation and concession of water use	31 August 2011	Methods and procedures for obtaining authorisations for the construction and/or operation of hydraulic works.	Article 1: "*Developments, installations, works and activities subject to declaration or authorisation and operations subject to water use concession are those set out in Decree No. 2011-404/PRN/MH/E of 31 August 2011, determining the nomenclature of developments, installations, works and activities subject to declaration, authorisation and water use concession*."
Decree n°2012-358 /PRN /MFPT setting the minimum wages by professional category of workers governed by the interprofessional collective agreement	17 August 2012	Minimum wage	Article 1 of this decree sets the minimum wages for workers governed by the Interprofessional Collective Agreement.
Decree n°2015-321/PRN/MESU/DD determining the modalities of application of law n°2014-63 of 5 November 2014, banning the production, import, marketing, use and storage of bags and packaging made of low density flexible plastic	25 June 2015	Flexible low density plastic bags and packaging	Article 3: *"The types of flexible low density plastic bags and packaging that may be produced, imported, marketed, used or stored within the meaning of Article 1 paragraph 3 of Law No. 2014-63 of 5 November 2014 are:* - *bags and flexible plastic packaging certified as biodegradable or oxo-degradable (materials that disintegrate under the action of light, heat or another oxidant) by the competent services recognised by the State, in accordance with the standards in force;* - *medium and high density plastic bags and packaging certified as compliant by the relevant state-recognised authorities;*

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
			- *plastic bags and packaging thicker than 15 microns for industrial use for plastic film for handling and transporting manufactured products from the producer or consumer, for agricultural use for the production, storage, packaging and transport of agricultural products and for sanitary use for the collection and transport of waste.*
Decree 2015-541/PRN/MET/PS of 15 December 2015 amending and supplementing Decree No. 65-117/PRN/MFP/T of 18 August 1965 determining the rules for the management of the scheme for the compensation and prevention of occupational accidents and diseases by the CNSSS	15 December 2015	Management of the compensation and prevention scheme for accidents at work and occupational diseases	Article 117 determines the list of diseases considered as occupational as well as the time limits for coverage by the National Social Security Fund (CNSS).
Decree n°2015-541/PRN/MET/SS/MEF amending and supplementing decree n°65-117/PRN/MFP/T of 18 August 165, determining the rules for the management of the scheme for the compensation and prevention of accidents at work and occupational diseases by the National Social Security Fund	15 December 2018	Compensation and prevention of accidents at work and occupational diseases	Article 117 (new): *"The list of diseases considered to be occupational as well as the time limits for coverage by the National Social Security Fund (CNSS) and the indicative list of the main jobs likely to cause them are set out in Annex IV to this decree*.
Decree n°2017-682/PRN/MET/PS on the regulatory part of the Labour Code	10 August 2017	Labour Regulations	Article 212: "*The employer is required to take all necessary measures to ensure the safety and protect the life and health of the workers he employs, as well as of all workers present in his undertaking. These measures include actions to prevent occupational risks, information and training, as well as the establishment of an organisation and appropriate means. He shall ensure that these measures are adapted to take account of changing circumstances and aim to improve existing situations*. Article 216: "*The general assessment of the risks to which workers are exposed must include an identification of the risks, a quantitative*

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
			assessment and a draft of prevention measures. The prevention programme shall comprise a set of precise coherent actions, with realistic and achievable objectives, well-defined strategies and well-determined means. In order to ensure continuous and adequate prevention of health risks, the employer must update the general assessment of health risks and the programme to combat them every two (2) years.
Decree n°2018-191/PRN/ME/DD determining the modalities of application of law n°2004-040 of 8 June 2004, on the forest regime in Niger	16 March 2018	Forestry regime	*Article 2 of this decree defines the felling tax as the tax collected on the occasion of the issuance of the felling permit.* Article 113: " *The rate of the felling tax for timber or service wood with a diameter greater than 20 cm, with the exception of that of the rônier and the doum palm, is set out in Annex II of this decree.* *For planted trees, the felling tax is set by order of the Minister in charge of forests.*
Decree No. 2019-027 MESUDD on the modalities of application of Law No. 2008-28 determining the fundamental principles of Environmental Assessment in Niger	11 January 2019	Environmental Assessment	This decree determines the modalities of application of the Law n°2018-28 of 14 May 2018 determining the fundamental principles of the Environmental Assessment in Niger. It determines the environmental and social impact assessment procedure through Articles 14 to 24.
Interprofessional collective agreement	15 December 1972	Labour law	This agreement regulates relations between employers and employees as defined in paragraphs 2 and 5 of article 1er of the Labour Code in all companies operating on the territory of the Republic of Niger and falling within the following professional branches (without being exhaustive): auxiliary transport, banks, building and public works, trade, all types of industries, general mechanics, road transport.

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
Order n°00037/MMH regulating the inspection and surveillance of dangerous, unhealthy or unsafe establishments	8 October 1979	Regulations on the inspection and monitoring of dangerous, unhealthy or unsafe establishments	This decree establishes and specifies the modalities for the inspection and monitoring of dangerous, unhealthy or inconvenient establishments (EDII). Article 3 specifies that controlled establishments must be inspected whenever necessary and at least once every six months.
Order n°0099/ME/SU/DD/SG/BEEEI/DL on the organisation and functioning of the National Environmental Assessment Office, its National Directorates and determining the powers of their managers	28 June 2019	Organisation and functioning of the NESO	Article 2: "*The National Environmental Assessment Office (BNEE) is a decision-making body whose mission is to promote and implement Environmental Assessment in Niger. It has competence at the national level, on all policies, strategies, plans, programmes, projects and all activities, for which an Environmental Assessment is compulsory or necessary, in accordance with the provisions of the law n°2018-28 of 14 May 2008, determining the founding principles of the Environmental Assessment in Niger.* Articles 9, 10 and 11 specify the powers of the Director General of the National Environmental Assessment Office and the National Directors.
Order n°00342/MSP/SG/DGSP/DHP/ES on the approval of standards of potability of water intended for human consumption in Niger.	29 March 2021	Potability of water	Article 3: *"To be considered as drinking water, the water:* - *Must not be harmful to the health of the consumer;* - *Must have acceptable organoleptic properties;* - *Must comply with current standards.* Article 6: Drinking *water must not contain any pathogenic germs transmissible to humans. It must be colourless, odourless and tasteless.* Article 7 defines the microbiological quality standards that water intended for human consumption must meet. Article 10 defines the physico-chemical quality standards.

TITLE OF THE TEXT	ADOPTION DATES	AREA OF APPLICATION	CONTEXTUAL REFERENCES
Order n°00343/MSP/SG/DGSP/DHP/ES setting the standards for waste discharge into the natural environment	30 March 2021	Waste management	*In Section I (Chapter II), the general characteristics of the discharge standards for liquid effluents are defined.* Article 5 (section II) *states: "It is forbidden to discharge into the natural environment without prior treatment as defined by the regulations, wastewater from:* - *Industrial, craft or commercial units* *Chapter IV deals with discharge standards and conditions for the disposal of solid waste.*

3.3. Institutional framework

3.3.1. Ministry of Environment and Combating Desertification

According to article 29 of decree n°2021-319/PRN of 11 May 2021, specifying the attributions of the members of the Government, the Minister of Environment and Combat against Desertification, is in charge, in relation with the other concerned Ministers, of the conception, elaboration, implementation, follow-up and evaluation of the national policy in terms of environment and combat against desertification, in accordance with the orientations defined by the Government. In this respect, it exercises, among others, the following attributions

- the definition and implementation of policies and strategies in the fields of environmental restoration and preservation, combating desertification, climate change, biodiversity, biosafety, natural resources and wetlands management;
- the definition and application of environmental and sustainable development standards;
- Validation of environmental assessment reports for development programmes and projects, issuing environmental compliance certificates, carrying out environmental and ecological monitoring, audits and environmental reviews;

To do so, and in accordance with the provisions of Decree n°2021-351/PRN/ME/LCD of 27 May 2021, on the organisation of the Ministry of the Environment and the Fight against Desertification (ME/LCD), the said Ministry has general and technical directorates and attached services, including the National Environmental Assessment Office (NEAO), a structure in charge of ensuring the respect of the national environmental assessment procedure in Niger The BNEE is created by article 24 of law n°2018-28 of 14 May 2018 determining the fundamental principles of Environmental Assessment in Niger, and according to order n°0099/MESUDD/SG/BNEE/DL of 28 June 2019 on the organisation and functioning of the BNEE, its missions include examining and framing the terms of reference of environmental assessments, analysing the admissibility and conformity of environmental assessment reports, monitoring and controlling the implementation of the environmental and social specifications to be fulfilled by promoters, etc.

Thus, as part of the implementation of the ESMP for the Adrar Emoles 3 exploration permit, the NEB will be responsible for carrying out environmental monitoring and capacity building.

In addition, within the ME/LCD, there is a General Directorate of Water and Forests (DGEF) which includes National Technical Directorates, and which ensures, among other things, that forest legislation is respected through the deconcentrated services. Consequently, the deconcentrated services (Regional and Departmental Directorates of the Environment) will have to intervene for the inventory and the determination of tree felling tax rates as well as for the supervision and monitoring-evaluation of the compensation plantations that will be carried out in the framework of the project.

Finally, within the framework of the project, the Directorate General for Sustainable Development (DGSD) will also have responsibilities, particularly with regard to the management of waste that will be generated during the entire project cycle.

3.3.2. Ministry of Employment, Labour and Social Protection

According to Article 30 of Decree No. 2021-319/PRN of 11 May 2021, specifying the powers of members of the Government, the Minister of Employment, Labour and Social Protection is responsible, in relation to the other Ministries concerned, for the design, development, implementation, monitoring and evaluation of national policies and strategies in the area of employment and social protection, in accordance with the guidelines defined by the Government. It ensures compliance with the legal provisions (legislative and regulatory) in these areas. In addition, it exercises, among others, the following attributions

- the design, development, implementation, monitoring and evaluation of social protection policy for public officials and workers;
- managing relations with professional organisations of employers and workers in the public and Para public sectors;
- contributing to the definition, implementation and management of the institutional and legal framework for the management of industrial relations, social dialogue and collective bargaining.

To this end, this Ministry has been structured into general and national technical directorates, including the Directorate General of Labour (DGT), which has within it the Directorate of Occupational Safety and Health (DSST). Thus, the latter, through the deconcentrated services and the National Social Security Fund (CNSS), will be the lead agency in the process of recruiting the labour required for the project. The deconcentrated services must also ensure the working conditions of the personnel. Finally, they must participate in the monitoring and control missions for the implementation of the ESMP to ensure compliance with health and safety aspects at work.

3.3.3. Ministry of Public Health, Population and Social Affairs

According to article 8 of decree n°2021-319/PRN of 11 May 2021, specifying the attributions of the members of the Government, "the Ministry of Public Health, Population and Social Affairs is in charge, in relation with the Ministries concerned, of the conception, elaboration, implementation, follow-up and evaluation of national policies in the field of Public Health, notably in terms of improving health coverage, prevention and the fight against endemic diseases in accordance with the orientations defined by the Government". In this respect, it has, among others, the following attributions

- the design and implementation of public health programmes and projects;
- the definition of public health and hygiene standards and criteria, as well as the control and inspection of health services throughout the country;
- developing, implementing and monitoring the application of legislation and regulations governing the public health, population and social affairs sector.

As part of the implementation of this project, the Ministry will intervene through its relevant technical services, notably the National Directorate of Public Hygiene and Health Education (DNHPES) and the Tahoua Regional Directorate of Public Health.

3.3.4. Ministry of Mines

The Minister of Mines is responsible, in relation with the other Ministers concerned, for the design, development, implementation, monitoring and evaluation of national mining policy in accordance with the guidelines defined by the Government (Article 9 of Decree No. 2021-319/PRN of 11 May 2021, specifying the powers of the members of the Government)

In this capacity, it has the following responsibilities

- the initiation of studies for the development of rational exploitation of mineral resources, including in particular the carrying out of fundamental geological studies;
- the establishment of the basic geoscientific infrastructure of the national territory in relation with the relevant research institutions;
- the control, monitoring and evaluation of mineral exploration and exploitation activities;
- the effective implementation of environmental protection and restoration guidelines in the mining sector.

In accordance with the provisions of decree n°2021-326/326/PRN/MM of 13 May 2021, this ministry is organised into a central administration, deconcentrated and decentralised services as well as public programmes and projects. Thus, within the framework of the implementation of this project, the Directorate of Mines and Quarries and the Directorate of the Mining Environment and Classified Establishments (DEMEC) will be involved in the monitoring and environmental control of the implementation of the measures provided for in the Environmental and Social Management Plan (ESMP).

3.3.5. Ministry of Water and Sanitation

According to the provisions of article 3 (point 26) of decree n°2021-289/PRN of 04 May 2021 on the organisation of the government and fixing the attributions of the Ministers of State, Ministers and Ministers Delegate, the Minister of Water and Sanitation is in charge, in relation with the other Ministers concerned, of the conception, elaboration, implementation, follow-up and evaluation of the national policy in the field of Water and Sanitation in accordance with the attributions defined by the Government.

In this capacity, it designs, develops, implements and evaluates development strategies, programmes and projects in the fields of water, sanitation and hygiene.

Through the Directorate of Water Resources, this Ministry will be involved in environmental monitoring and control in order to assess the implementation of measures within its area of competence.

3.3.6. Ministry of the Interior and Decentralisation

According to Article 5 of Decree No. 2021-319/PRN of 11 May 2021, specifying the powers of members of the Government, the Minister of the Interior and Decentralisation, in relation with the other Ministers concerned, oversees the design, development, implementation, monitoring and evaluation of national policies in the area of territorial administration, public security, decentralisation, and deconcentration in accordance with the guidelines defined by the Government. In this respect, it exercises, among others, the following attributions

In the field of territorial administration:

- the organisation and administration of administrative districts;
- the management of national borders;
- the drafting and application of regulations on the movement of persons, public freedoms and the regime of associations;
- the organisation of the traditional chieftaincy and the management of its relations with the administration.

In the area of decentralisation and deconcentration:

- the general supervision and organisation of support for local and regional authorities;
- the operationalisation of the deconcentration-decentralisation process, mainly with regard to the transfer of competences and resources to local authorities;

In customary and religious affairs:

- the organisation of the traditional chieftaincy and the management of its relations with the administration;
- the promotion of local customs and traditions;
- the supervision and control of places and the exercise of worship;

This ministry supervises local authorities. Thus, created by law n°2008-42 completed by ordinances n°2010-54 of 17 September 2010 and ordinance n°2010-76 of 9 December 2010, the communes have legal personality and financial autonomy. They are equipped with technical services for the environment, agriculture, livestock, and a communal land commission, which are responsible for environmental and land issues (waste management, reforestation actions, environmental education and communication, etc.).

To this end, in accordance with Ordinance No. 2010-76 of 9 December 2010 amending and supplementing Ordinance No. 2010-54 of 17 September 2010, on the General Code of Local Authorities, the communes:

- ensure the preservation and protection of the environment;
- ensure the sustainable management of natural resources with the effective participation of all stakeholders;
- draw up, in accordance with the development options, local action plans and schemes for the environment and the management of natural resources;
- give their opinion on all infrastructure projects;
- intervene as members of expropriation commissions.

Within the framework of this project, the municipalities concerned will be involved, with a view to playing their roles in accordance with the texts in force.

3.3.7. Niger's High Atomic Energy Authority (HANEA)

According to article 2 of decree n°2019-085/PRN of 1st February 2019 amending decree n°2013-490/PRN, on the creation, attributions, organisation and functioning of

the Nigerien High Authority for Atomic Energy, "The Nigerien High Authority for Atomic Energy has as its main missions: the supervision, coordination and promotion of all peaceful applications including electronuclear and ionising radiations in relation with all the ministries and other institutions concerned.

In this capacity, it is responsible for:

- directing and/or managing the peaceful applications of nuclear science and technology;
- initiate and/or participate in the development and implementation of policies and strategies for the peaceful application of science and technology, in accordance with national guidelines and priorities;
- initiate and/or participate in the elaboration of policies and strategies in the field of nuclear security; define and implement nuclear security plans, in accordance with national guidelines and priorities;
- initiate and/or participate in the development of national policies and strategies for the development of nuclear energy resources;
- to initiate and/or participate in the elaboration and implementation of policies and strategies for human resource development, research and capacity building in the field of peaceful applications of nuclear science and technology and ionising radiation;
- to undertake, encourage and promote research and training in the peaceful applications of nuclear science and technology and ionising radiation;
- support nuclear research or training institutes and centres;
- develop and implement policies, strategies and communication plans for the promotion of peaceful applications of nuclear science and technology, as well as nuclear safety culture;
- coordinate, direct, monitor and harmonise nuclear security activities at national level;
- To be borne by the applicant or beneficiary:
  - the analysis and radiological control of consumer products throughout the country;
  - quality control of radiodiagnostic and nuclear medicine equipment;
  - radiological environmental monitoring ;
  - dosimetric monitoring of personnel and the environment in public and private organisations using ionising radiation;
- decide on all matters referred to it by the President of the Republic, the Government or the structures concerned.

Within the framework of the implementation of the project of exploitation of the deposits of the Adrar Emoles 3 research permit, this structure will have roles to play in accordance with its missions defined above.

3.3.8. Nuclear Safety and Regulation Authority (ARSN)

Created by Law No. 2016-45 of 06 December 2016, the ARSN is competent for the

regulation and control of nuclear and radiological activities to guarantee safety, security and environmental protection against the effects of ionising radiation throughout the national territory.

The ARSN's mission is to regulate activities and practices related to the use of nuclear or radioactive substances and materials, as well as those related to ionising radiation sources.

In this capacity, it is responsible for, among other things

- to establish and publish technical standards for Radiation Protection, Safety, Security and Safeguards;
- ensuring compliance with nuclear safety and security regulations and safeguards;
- take enforcement action in the event of violations of laws and regulations or in the event of an unsafe or potentially unsafe situation at any location where licensed activities are conducted;
- inform, educate and consult the public and all other stakeholders on the regulatory process and the safety, security, health and environmental aspects of these practical activities, including incidents, accidents and abnormal events;
- cooperate with all relevant structures to develop and maintain a plan for the preparedness and conduct of emergency response involving nuclear or other radioactive materials, in accordance with the national emergency plan;
- participate in the definition of the baseline threat for the application of security measures.

In accordance with its mission to regulate and control nuclear and radiological activities throughout the country, this structure will play an important role in the implementation of the project.

3.3.9. National Environment Council for Sustainable Development

Created by decree n°96-004/PM of 9 January 1996, modified and completed by decree 2000-272/PRN/PM of 4 August 2000, the CNEDD is a deliberative body whose mission is to elaborate, implement, monitor and evaluate the implementation of the PNEDD. It is especially responsible for ensuring that the environmental dimension is considered in Niger's socio-economic development policies and programmes. It is attached to the Prime Minister's office and the Director of the Cabinet chairs it. To ensure its functions as a national coordination body, the CNEDD has an Executive Secretariat which is supported at the central level by sectoral technical commissions created by Prime Ministerial Decree and at the regional level by regional environmental councils for sustainable development.

Within the framework of this project, the CNEDD will be invited to evaluate the environmental and social impact study report to ensure that the provisions of the United Nations Framework Convention on Climate Change, the Convention on Biological Diversity and the Convention to Combat Desertification are taken into account in countries seriously affected by drought, particularly in Africa.

3.3.10. Civil Society Organisations

The Civil Society Organisations (CSOs) that can be involved in the implementation of

this project to exploit the deposits of the Adrar Emoles 3 research permit include:

- Association Nigérienne des Professionnels en Études d'Impact Environnemental (ANPÉIE): Authorised to carry out its activities in Niger by decree n°117/MI/AT/DAPJ/SA of 29 April 1999, ANPÉIE is a non-political, non- profit organisation which aims mainly to promote the inclusion of environmental concerns in development policies, plans, strategies, programmes and projects. It intervenes in the field of training and sensitisation of the staff of design offices and projects, companies and local populations in the field of EA, monitoring and environmental follow-up of the implementation of environmental impact limitation plans in the framework of development projects.
- Groupe de Réflexion et d'Action sur les Industries Extractives: GREN is a network of Nigerien civil society organisations. It works in the field of extractive industries to promote good governance and environmental protection. It is also involved in informing and raising the awareness of stakeholders on the issue of extractive industries. Finally, it promotes and defends the rights of the sector throughout the country. Thus, GREN will have a key role to play in the framework of this project, particularly in terms of raising awareness among local populations about the issues related to its implementation.
- Réseau des Organisations pour la Transparence et l'Analyse Budgétaire (ROTAB, Publish What You Pay Niger): ROTAB is a collective of several associations, NGOs and trade unions in Niger that have decided to pool their knowledge and experience in order to actively participate in the global Publish What You Pay campaign to contribute to transparency in the extractive industry. Within the framework of the project, this network will have a watchdog role to play, particularly with regard to the transparent management of revenues generated by exploitation for the benefit of local populations.
- Association des Femmes du Secteur des Industries Extractives du Niger (AFSIEN): Created in October 2014, the main objective of this association is to promote women in the extractive industries sector while placing its actions within the framework of improving the living and working conditions of women working in the extractive industries or living on the sites of the activities concerned. In accordance with its remit, this association will play a key role in the implementation of the project.

4. ASSESSMENTS OF LIKELY CHANGES

The general approach used to identify the impacts on the environment is based on an approach structured around the three (3) phases below:

- the description of the project, which identifies the sources of impacts based on the characteristics and types of activities to be carried out during the different phases;
- the general description of the environment, which provides an understanding of the environmental and social context in which the project is to be implemented, and the consultations with stakeholders, which identify the concerns associated with the project's implementation;
- the interrelationship between the impact-causing activities and the components (biophysical and human) of the environment likely to be affected by the project activities.

4.1. Activities causing impacts

Impact-causing activities are defined as all activities planned within the framework of a project that are likely to modify positively or negatively the components of the biophysical and human environment of its insertion zone.

Thus, within the framework of the Adrar Emoles 3 Exploration Permit, the activities that are likely to cause impacts are shown in Table 45 below.

Table 45 Impact-causing activities by project phase

PROJECT PHASES	ACTIVITIES CAUSING IMPACTS
Construction preparation (Development)	Construction/development of access roads/tracks
	Site preparation for temporary equipment
	Installation of temporary infrastructure and equipment
	Borrowing and quarrying (sand, gravel, laterite, etc.)
	Movement of construction equipment and the supply of construction materials and equipment to the site
	Preparation of the rights of way for the permanent project facilities
	Construction/installation of surface works and equipment
	Underground mine construction and support services
	Maintenance of fixed and mobile equipment on site
	Fuel storage and supply
	Recruitment of labour and operation of the base camp
Operation	Recruitment and presence of the workforce on site (operation of project bases and subcontractors)
	Extraction of ore from the underground mine (drilling, blasting, transport of ore to the primary crusher, conveying to daylight through a conveyor belt)
	Truck movements for input supply

PROJECT PHASES	ACTIVITIES CAUSING IMPACTS
	Storage of inputs (chemicals including sulphur, hydrocarbon products, etc.)
	Operation of the workshops (maintenance of machinery and equipment, reconditioning of machinery, manufacture of spare parts, etc.) and the contact workshop
	Ore storage, crushing and conveying to the plant
	Ore processing at the plant
	Storage of tailings from ore processing
	Storage of effluent in ponds
	Construction of the new ponds
	Borrow pits for the site's laterite and gravel needs
	Loading and shipping of uranate
	Periodic maintenance of the plant
	Movement of project and subcontractor equipment
Closure	Dismantling of facilities
	Site clean-up
	Site redevelopment/restoration
	Movement of machinery
	Presence of the hand in the work

4.2. Impact assessment methodology

The methodology for assessing impacts is based on the parameters of the nature of the impact, its intensity, extent and duration. This allows them to be aggregated to give the significance/importance of the impacts.

Furthermore, impact assessment is inevitably a value judgment.

4.2.1. Evaluation parameters

- ✓ ***Nature***

The nature of an impact refers to the positive or negative nature of the effects of an activity on a given component of the environment, whether biophysical or human.

- ✓ ***Intensity***

The intensity of an impact expresses the relative importance of the environmental consequences of altering a component, taking into account its environmental value and the degree of disturbance (extent of structural and functional modifications). Thus, the greater the value of a component due to its special character, the greater the risk that its alteration will have a severe impact on the environment.

Intensity is therefore a major dimension of impact whose relative importance is weighted by the duration and extent of its effects.

✓ Value of an environmental component

It expresses the relative importance of an environmental component in the environmental and social context of the area concerned. Its evaluation is based, on the one hand, on the appreciation of its intrinsic value, as defined by its function, representativeness, frequency of use, diversity and rarity or uniqueness and, on the other hand, on its social value, which demonstrates its popular and political interest. The social value assesses the popular or political will to preserve the integrity or the particular character of an environmental component. It is expressed through popular appreciation or through laws and regulations.

Thus, actions to conserve or enhance the original character of a component will contribute to enhancing its environmental value.

- **Function:** This parameter assesses, from a biological point of view, the degree of usefulness or essentiality of an environmental component;
- **Representativeness**: Representativeness expresses the typical character of a component that should be protected because of its biological, social or heritage value;
- **Frequency:** This parameter determines the intensity and frequency of human use of an environmental component. It can be expressed in terms of density (variable proportion of a population) or frequency of occupation;
- **Diversity**: Diversity expresses the character of a component that has several aspects (e.g. different uses) simultaneously or successively. The diversity parameter will indicate the interest or quality of a component or environment;
- **Rarity or uniqueness:** The rarity parameter, which is a major discriminating index of the interest of an element, refers to the exceptional or extraordinary character of an environmental component;
- **Social value**: The elements that the different stakeholders, particularly the local populations and the project promoter, could be concerned about from the point of view of social value are **the creation of jobs, safety and health during the operation of the centre.**

✓ Degree of disturbance

It expresses the extent of the modifications that affect the structural and functional characteristics of an environmental component. It implies the notion of vulnerability of the affected component, which is essentially expressed in terms of the adaptive capacity (tolerance) of the communities and their biotope and the minimum functional area below which a system is unable to function adequately and thus loses its integrity. It can be low, medium or high.

- ***Low:*** when the impact only slightly modifies the quality of the component, not noticeably affecting its integrity or use;
- ***Medium:*** where the impact reduces the quality of the component somewhat, thus slightly affecting its integrity and use;
- ***High:*** when the impact results in the loss or modification of all the characteristics of the environmental component, thus strongly altering its quality and jeopardising its integrity.

The impact intensity value classes, which range from very high to low, are the products of the interaction of the environmental value of the component and its degree of disturbance. Table 46 below presents the impact intensity assessment grid.

Table 46 Impact intensity assessment grid

DEGREES OF DISTURBANCE	ENVIRONMENTAL VALUE		
	HIGH	AVERAGE	LOW
High	Strong	Average	Low
Medium	Strong	Average	Low
Low	Average	Low	Low

✓ ***Scope***

The extent of an impact corresponds to the scope or spatial extent of the effects generated by an intervention on the environment. The extent can be described as point, local or regional.

- Specific when the impact is limited to the immediate vicinity of the activity.
- Local where the impact is felt throughout the study area.
- Regional when the impact is felt outside the study area, e.g. throughout the country.

✓ ***Duration***

This is the time during which changes to a component will be felt. It is important to note that an intervention that takes place over a few weeks could have repercussions on certain components of the environment over several years. Therefore, the duration of an impact should refer to the recovery or adaptation period of the affected components. Impacts are categorized as long, medium and short term.

4.2.2. Significance of the impacts

Significance is determined by means of a summary indicator that allows an overall assessment of the impact that a component of the environment could suffer. Thus, the significance of an impact is assessed by combining the Intensity parameter, which links the environmental value of a component and its degree of disturbance, with two indicators characterising the impact itself, namely its extent and duration.

The correlation established between each of the indicators (Intensity, Extent and Duration), as presented in Table 49 below, allows the significance level of an impact to be determined.

The scale of significance of the impacts corresponds to three levels: Major, Medium and Minor.

An impact is considered major when it profoundly alters the nature and use of a highly vulnerable or very intolerant environmental component that is also highly valued. The lower the vulnerability and value of the affected component, the less significant the impact (medium and minor).

Impact significance is determined according to different possible combinations of criterion indices by applying one of two considerations:

- If the indices of two criteria have the same level of severity, the importance rating corresponding to this level is given, independently of the index given to the other criterion. For example, an impact of long duration and regional extent will have a major importance, regardless of the index of the intensity criterion.
- If, on the other hand, the indices of the three criteria are all at different levels, the importance rating is given to the median level, i.e. medium. For example, an impact of long duration, local extent and low intensity will be given a medium importance rating.

Once the significance of an impact has been determined for a given activity and environmental component, the result is entered into an impact assessment grid.

Table 47 Impact assessment grid (Fecteau, 1997)

INTENSITY	SCOPE	DURATION	ABSOLUTE SIGNIFICANCE OF THE IMPACT		
			MAJOR	AVERAGE	MINOR
Strong	Regional	Long			
		Average			
		Short			
	Local	Long			
		Average			
		Short			
	One-off	Long			
		Average			
		Short			
Average	Regional	Long			
		Average			
		Short			
	Local	Long			
		Average			
		Short			
	One-off	Long			
		Average			
		Short			
Low	Regional	Long			
		Average			
		Short			
	Local	Long			
		Average			
		Short			
	One-off	Long			
		Average			
		Short			

4.3. Interrelationship grid

In order to understand the interactions between the elements of the environment likely to be impacted and the activities causing the impacts, a matrix of interrelationships represented in Table 48 below was developed.

Table 48 Interrelationship matrix

PROJECT PHASES	ACTIVITIES CAUSING IMPACTS	COMPONENTS THAT WILL BE AFFECTED											
		BIOPHYSICAL ENVIRONMENT					HUMAN ENVIRONMENT						
		SOIL	AIR	WATER	WILDLIFE	FLORA	LANDSCAPE	SECURITY/ HEALTH	EMPLOYMENT / INCOME/ECO	SOUND AND VIBRATION	PASTORAL ACTIVITIES	USES AND CUSTOMS	HERITAGE
Development (Preparation and construction)	Construction/development of access roads/tracks	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(+)	(-)	(-)	(0)	(-)
	Site preparation for temporary equipment	(-)	(-)	(0)	(-)	(-)	(-)	(-)	(+)	(-)	(-)	(0)	(-)
	Installation of temporary infrastructure and equipment	(-)	(0)	(-)	(-)	(-)	(-)	(-)	(+)	(-)		(0)	(0)
	Borrowing and quarrying (sand, gravel, laterite, etc.)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(+)	(-)	(-)	(0)	(-)
	Movement of construction equipment and the supply of construction materials and equipment to the site	(-)	(-)	(0)	(-)	(-)	(-)	(-)	(+)	(-)	(-)	(0)	(0)
	Preparation of the rights of way for the permanent project facilities	(-)	(-)	(0)	(-)	(-)	(-)	(-)	(+)	(-)	(-)	(0)	(-)
	Construction/installation of surface works and equipment	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(+)	(-)	(0)	(0)	(0)
	Underground mine construction and support services	(-)	(-)	(-)	(0)	(0)	(0)	(-)	(+)	(0)	(0)	(0)	(0)
	Maintenance of fixed and mobile equipment on site		(0)	(-)	(0)	(0)	(0)	(-)		(0)	(0)	(0)	(0)
	Fuel storage and supply		(0)	(-)	(0)	(0)	(0)	(-)	(0)	(0)	(0)	(0)	(0)
	Recruitment of labour and operation of the base camp	(-)	(0)	(-)	(-)	(0)	(-)	(-)	(+)	(0)	(0)	(-)	(-)
Operation	Recruitment of labour and operation of project bases and subcontractors	(-)	(0)	(-)	(-)	(0)	(-)	(-)	(+)	(0)	(0)	(-)	(-)
	Extraction of ore from the underground mine (drilling, blasting, transport of ore to the primary crusher)	(-)	(-)	(-)	(0)	(0)	(0)	(-)	(+)	(-)	(0)	(0)	(0)

PROJECT PHASES	ACTIVITIES CAUSING IMPACTS	COMPONENTS THAT WILL BE AFFECTED											
		BIOPHYSICAL ENVIRONMENT					HUMAN ENVIRONMENT						
		SOIL	AIR	WATER	WILDLIFE	FLORA	LANDSCAPE	SECURITY/ HEALTH	EMPLOYMENT / INCOME/ECO	SOUND AND VIBRATION	PASTORAL ACTIVITIES	USES AND CUSTOMS	HERITAGE
	Truck movements for input supply	(-)	(-)	(-)	(-)	(-)	(0)	(-)	(+)	(-)	(-)	(0)	(0)
	Storage of inputs (chemicals including sulphur, hydrocarbon products, etc.)	(-)	(-)	(-)	(0)	(0)	(-)	(-)	(0)	(0)	(0)	(0)	(0)
	Operation of the workshops (maintenance of machinery and equipment, reconditioning of machinery, manufacture of spare parts, etc.) and the contact workshop	(-)	(-)	(-)	(0)	(0)	(-)	(-)	(+)	(-)	(0)	(0)	(0)
	Ore storage, crushing and conveying to the plant	(-)	(-)	(-)	(0)	(0)	(-)	(-)	(0)	(0)	(-)	(0)	(0)
	Ore processing at the plant	(-)	(-)	(-)	(0)	(-)	(0)	(-)	(+)	(-)	(-)	(0)	(0)
	Storage of tailings from ore processing	(-)	(-)	(-)	(-)	(0)	(-)	(-)	(0)	(0)	(-)	(0)	(0)
	Storage of effluent in ponds		(0)	(-)	(-)	(0)	(-)	(-)	(0)	(0)	(-)	(0)	(0)
	Construction of the new pools		(0)	(0)	(-)	(-)	(-)	(-)	(0)	(0)	(-)	(0)	(-)
	Borrowing for the site's laterite and gravel needs		(0)	(0)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(0)	
	Loading and shipping of uranate	(-)	(-)	(-)	(0)	(0)	(-)	(-)	(+)	(-)	(0)	(0)	(0)
	Periodic maintenance of the plant	(-)	(0)	(-)	(0)	(0)	(-)	(-)	(+)	(+)	(0)	(0)	(0)
	Movement of project and subcontractor equipment	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(0)	(-)	(-)	(0)	(-)
Closure	Dismantling of facilities	(-)	(-)	(-)	(0)	(0)	(+)	(-)	(-)	(-)	(+)	(0)	(0)
	Site clean-up	(+)	(0)	(0)	(0)	(0)	(0)	(-)	(0)	(-)		(0)	(0)
	Site redevelopment/restoration	(+)	(-)	(-)	(+)	(+)	(+)	(-)	(-)	(-)	(+)	(0)	(0)
	Movement of machinery	(-)	(-)	(-)	(-)	(0)	(0)	(-)	(0)	(-)	(0)	(0)	(0)

(-) Low interactions
(+) High interactions
(0) Minor interactions

4.4. Mitigation of impacts

This initial assessment of impacts illustrates the worst-case scenario should impacts not be mitigated. Throughout the development and design of the project, opportunities to apply the mitigation hierarchy have been explored. This means that as far as possible, impacts have been anticipated and avoided, minimised or reduced. The impacts remaining when these principles have been applied are the residual impacts, and these are managed, compensated or offset. Alternatives are considered in Chapter 5 of this document, and Mitigation measures in Chapter 6. Residual impacts are also considered in Chapter 6 and an illustration provided of how the impact ratings have been reduced.

4.5. Analysis and assessment of risks and impacts of the project

4.5.1. Impacts during the preparation and construction phase

4.5.1.1. On the biophysical environment

- ✓ *On the soil*

The Adrar Emoles 3 Exploration Permit Project will have negative impacts on the soil during the preparation/construction phase (development phase). These impacts are the disruption of its structure at the sites concerned, the modification of the topography, the risks of exposure to wind and water erosion and its pollution/contamination by the solid and liquid waste that will be generated.

Disturbance of the soil structure and modification of the topography of the land will be associated with the construction/development of access roads/tracks, site preparation (stripping or removal of overburden) for the construction of temporary facilities, the exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), the preparation of the rights-of-way for the permanent project facilities, etc.

In addition, the movement of machinery (vehicles, trucks, etc.) for the transport of labour and the supply of materials and equipment to the site will cause the soil to settle and consequently modify its structure. This will further expose it to the risks of water and wind erosion.

This impact will be of medium intensity, limited in extent to the project footprint and short in duration. It will therefore be of minor overall significance.

The risks of soil contamination during this phase will be related to the solid and liquid wastes that will be generated during the above-mentioned activities, to which must be added the installation of infrastructure and equipment, the construction/installation of surface structures and equipment, the construction of the mine, the maintenance of mobile and fixed site machinery, etc.

Thus, the solid and liquid waste that will be generated includes used oil from the emptying of mobile and fixed machinery (trucks, vehicles, excavators, generators, etc.), used oil or diesel filters, waste soiled with hydrocarbons, oily wastewater, plastics, ferrous metal scraps, paint, glue and varnish residues, mechanical soot, various packaging, etc.

In addition, the workforce that will be mobilised for the work will generate various types of waste (empty mineral water bottles, cans, plastics, food packaging, food scraps, waste water, etc.) that may pollute the soil on the site.

Finally, the storage of hydrocarbons and oils, their possible leakage from fixed and mobile machinery and their accidental spillage can also constitute potential sources of soil pollution/contamination.

In conclusion, the unmitigated impact of the project on the soil in terms of pollution/contamination will be of medium intensity, local extent and short duration. Its overall significance will therefore be medium.

- ✓ *On the air*

During the preparation and construction phase, the project will result in changes to the ambient air quality. This will result from dust generated during construction/access road/track development, site preparation (stripping or removal of overburden) for the construction of temporary facilities, quarrying (sand, gravel, laterite, etc.), preparation of permanent project facility rights-of-way, and construction/installation of surface structures and equipment.

In addition, the movement/circulation of machinery to transport labour and to supply the site with materials, equipment, etc., will generate dust and exhaust gases (combustion gases) that may contain carbon monoxide (CO), sulphur monoxide (SO), nitrogen monoxide (NOx) and hydrocarbon vapours, which will contribute to the modification of the ambient air quality. Finally, the operation of the generators during the works will be a source of polluting emissions that will alter the quality of the ambient air.

The unmitigated impact of the project on the air will be of medium intensitý, local extent and short duration. It will therefore be of medium overall significance.

- ✓ *On the water*

The project will have potential negative impacts on resources during the preparation and construction phase. These impacts include water consumption which could affect the available potential, modification of the natural drainage system and the risk of contamination/pollution from solid and liquid waste that will be generated.

Thus, in relation to water consumption, the main source activities are the construction/development of access roads/tracks which will require watering, consumption by staff in the operation of the base camp, civil works for the construction/installation of surface structures and equipment (workshop platforms, administrative and technical buildings, etc.), construction of the underground mine and downhole support services, etc.

The modification of the natural water drainage system will be linked to the construction of access tracks and the opening and operation of quarries and borrow pits.

Finally, the contamination/pollution of water during this phase will be associated with the solid and liquid wastes that will be generated during the activities, the maintenance of the fixed and mobile machines of the construction site and by the operation of the life base. Also, the storage of hydrocarbons and oils, their accidental spills and their leaks from the machines will generate water pollution by the phenomenon of runoff or infiltration.

Overall, the impact of the project on water resources will be medium in intensity, local in extent and short in duration. Its overall significance will therefore be medium.

- ✓ *On wildlife*

The potential negative impacts of the project on wildlife are the destruction of habitats,

noise disturbance, vehicle movements and the risk of poaching.

The activities that result in the destruction of soil and vegetation habitats are the construction/development of access roads/tracks, the preparation of sites (stripping or removal of overburden) for the construction of temporary facilities, the installation of temporary infrastructure and equipment that will contribute to the construction of the project (living quarters for the staff of construction companies, equipment base, etc.), the exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), the preparation of the right-of-way for the permanent project facilities and the construction/installation of surface works and equipment, in particular the construction of the road network.), the exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), the preparation of the right-of-way for the permanent project installations and the construction/installation of surface works and equipment, particularly civil engineering works.

Disturbance to fauna will be linked to the presence of the construction site in general, to the exploitation of the borrow pits and quarries and to the movements of machinery (vehicles, trucks) in the construction zone. This could lead to their migration to quieter habitats. There is also a risk of poaching due to the presence of personnel on the work sites.

This negative impact will be of medium intensity, punctual extent and medium duration. Its overall significance will therefore be medium.

- ✓ *On flora*

The potential negative impacts of the project on flora during this phase are the clearance/disturbance of vegetation for works to take place and the disruption of photosynthesis due to dust.

Thus, the activities that will destroy vegetation are the construction/development of access roads/tracks, the preparation of sites (stripping or removal of overburden) for the construction of temporary facilities, the installation of temporary infrastructure and equipment, the exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), the preparation of the right-of-way for the permanent project facilities, and the construction/installation of surface structures and equipment. Finally, the movement of construction machinery and the supply of construction materials and equipment to the site will result in the destruction of vegetation.

The disturbance of plant photosynthesis will be associated with the dust that will be generated during the above-mentioned works and with the exhaust fumes of the fixed and mobile construction machinery.

This potential negative impact of the project on flora will be of high intensity, punctual extent and medium duration. Its overall significance will therefore be medium.

4.5.1.2. On the human environment

- ✓ *On the landscape*

On the landscape, the project will result in the modification of its visual quality. The main source activities are the construction/development of access roads/tracks, the preparation of sites for temporary infrastructure and equipment and their installation, the exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), the movement of construction machinery and the supply of construction materials and equipment to the site, the preparation of the rights-of-way for the permanent project installations and

the construction/installation of surface structures and equipment.

The transitory storage of waste (construction waste and waste from the operation of the base camp) prior to disposal and poor organisation of the construction site can also affect the visual quality of the landscape.

This negative impact will be of medium intensitý, punctual in extent and of short duration. Its overall importance will therefore be minor

- ✓ *On safety and health*

The potential risks and negative impacts of the Adrar Emoles 3 Exploration Permit on the safety and health of workers and surrounding populations are: risks of accidents and physical injuries, respiratory diseases, sexually transmitted diseases, biological contamination, exposure to hot environments, risks of fire or explosion, risks of illnesses linked to changes in the sound environment, low back pain, risks of tension/conflict between local populations and workers, etc.

With regard to the risks of accidents and injuries, they will be associated with the following activities that will be carried out: the construction/development of access roads/tracks, the preparation of sites (stripping or removal of overburden) for the construction of temporary equipment, the installation of temporary infrastructure and equipment that will contribute to the construction of the project (living quarters for the personnel of the construction companies, equipment base, etc.), the exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), the movement of construction machinery and the supply of construction materials and equipment to the site, the preparation of the right-of-way for the construction of the project, and the construction of the site.), the exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), the movement of construction machinery and the supply of construction materials and equipment to the site, the preparation of the right-of-way for the project's permanent installations, the construction of the underground mine and underground support services, and the maintenance of the site's fixed and mobile machinery. Finally, the construction/installation of surface works and equipment are sources of accidents and injuries, particularly in the ore processing plant component which requires work at height. Finally, related activities such as welding, grinding, etc. that will be carried out as part of the installation of equipment will be a source of injury risks.

The risks of respiratory diseases will be linked to the modification of the ambient air quality by the dust that will be generated during the works. In addition, the exhaust gases (combustion gases) from the fixed and mobile machinery, which may contain carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx), sulphur oxides (SOx), etc., will contribute to the modification of air quality and consequently be a source of respiratory diseases, particularly for the workers. Depending on weather conditions such as winds, people in the surrounding villages may also be exposed. Also, fine particles from cement during civil works can cause respiratory diseases.

Sexually transmitted diseases such as STIs/HIV/AIDS could be encouraged by mixing with the local population, especially as the activities to be implemented may generate an influx of labour from various backgrounds. However, the workers will largely be drawn from the surrounding villages and towns and bussed in daily or on shift rotations and be housed at the mine camp.

The risks of biological contamination for workers will be associated with the non-respect of hygiene conditions in the use of common areas such as restaurants and toilets at the living bases. There is also a risk of COVID-19 contamination, especially

in the event of non-compliance with barrier measures.

The risks of exposure to thermal environments (cold or heat) will depend on the period or season during which the construction of the project takes place.

Explosion and fire risks will be associated with the storage and handling of hydrocarbons.

Noise generated on the construction site can have a health impact on workers. These include auditory effects (hearing fatigue, hearing loss), "extra-auditory" effects (sleep disturbance, stress, increased heart rate, increased blood pressure) which may, in the long term, lead to illness, depression, chronic fatigue, etc.

Low back pain in the context of the work will be linked to postural constraints, particularly for work that requires high demands on the limbs.

Finally, if local communities feel that they are being treated unfairly or insufficiently, especially in the recruitment of labour, this can lead to tensions and conflicts between them and project workers.

The unmitigated impact of the project on the safety and health of workers and surrounding populations will be of high intensitý, local in extent and short in duration. Its overall significance will therefore be medium.

- ✓ *On jobs/income and the economy*

During the preparation and construction phase, the project will have positive impacts on employment and income in the area. For example, during the works, a large skilled and unskilled workforce will be recruited. During this recruitment, priority will be given to local people. This will be a real opportunity for the young people of the localities concerned, particularly in terms of reducing unemployment and improving their income.

This phase will also have positive impacts on the local market with the purchase of locally available goods and services. This constitutes a real business opportunity for businesses and providers. Through the latter, several jobs will be created and will contribute to the improvement of incomes.

As part of the implementation of the project activities, subcontracting with local companies will be encouraged. This will contribute to the creation of indirect jobs and the improvement of the incomes of the people concerned as well as the turnover of these companies.

Furthermore, the exploitation of borrow pits and quarries will improve the tax revenues of the communes concerned and of the national treasury through the payment of the extraction tax and the surface royalty respectively, in accordance with the texts in force on the subject.

The positive impact of the project on employment and income will be of high intensity, regional scope and medium duration. It will therefore be of major positive overall importance.

- ✓ *On noise and vibration*

The impact of the project on the noise environment during the preparation and construction phase will concern their modification, which will constitute a nuisance for the workers and the populations surrounding the sites. This modification will be associated with the noise that will be generated during the works

(construction/development of access roads/tracks, preparation of sites for temporary and permanent infrastructures and equipment, exploitation of borrow pits and quarries (sand, gravel, laterite, etc.), installation works of infrastructures and equipment as well as by the movements of machinery.

This unmitigated impact will be of medium intensitý, arising from point sources and line sources and short in duration. It will therefore be of medium overall significance.

- ✓ *On pastoral activities*

The implementation of the project will have potential negative impacts on pastoral activities in the area. These impacts will firstly concern the limitation of access to forage resources within the 2ha fenced area inside the buffer zone. In addition, the activities that will be implemented during this phase as well as the movement of machinery will result in the destruction and reduction of forage potential.

In addition, soil contamination from the solid and liquid waste that will be generated or from oil or hydrocarbon leaks from machinery and their accidental spills will have potential direct negative impacts on the forage, which is its contamination.

The unmitigated impact of the project on pastoral activities will be of medium intensity, punctual extent and long duration. It will therefore be of medium overall significance.

- ✓ *On traditions and customs*

During the preparation and construction phase, the project will require the mobilisation of a large number of specialised and non-specialised local and foreign workers. Thus, the presence of the latter on the construction sites will favour interactions with the local populations. This will constitute a source of potential risks of degradation of local traditions and customs.

However, the impact of the project on customs and practices will be low in intensity, one-off and of short duration. It will therefore be of minor overall significance.

- ✓ *On cultural and archaeological heritage*

During the course of the study, sites of cultural and archaeological significance were identified in the project area. However, none of these sites are located within the mining permit.

However, there is a risk of total or partial destruction or degradation of these sites during the works, particularly due to the movements of machinery. Also, given the particularity of the area, it is possible that there will be chance discoveries during the various activities that will be carried out as part of the project development. This could pose the risk of workers collecting valuables in the event of such discoveries, in defiance of the legal provisions in force in this area.

The impact of the project on this component will be of low intensity, punctual extent and medium duration. It will therefore be of minor overall significance.

4.5.2. Impacts on the operational phase

4.5.2.1. On the biophysical environment

- ✓ *On the soil*

The implementation of the project will result in potential negative impacts on the soil, which are the modification of its structure and its pollution/contamination (modification

of its quality).

The modification/degradation of the soil structure will be associated with the construction of ponds during operation (effluent ponds, storm water ponds, etc.), machinery movements, etc. This structural modification of the soil will expose it more to wind and water erosion.

Concerning the risks of soil contamination/pollution, it will be associated with use of processing chemicals, fuels and lubricants and the solid and liquid waste that will be generated during the project activities, in particular: the operation of the base camp, the extraction of the ore, the operation of the workshops (maintenance of the machinery and equipment, reconditioning of the machinery, manufacture of spare parts, etc.), the processing of the ore (operation of the plant), the periodic maintenance of the plant, etc. Furthermore, inadequate storage of inputs (chemicals including sulphur, hydrocarbon products, etc.) used in the operation of the project could be a source of soil contamination. Finally, accidental hydrocarbon spills and other emissions of toxic pollutants, storage of effluents, production juices, ore processing residues may lead to soil pollution/contamination.

The deposition of dust from ore crushing, movement of machinery, tailings storage facilities, etc. may constitute a potential source of radiological pollution/contamination of the soil. Finally, the storage of effluents, production juices and processing residues can lead to soil pollution/contamination.

This unmitigated negative impact will be of average intensity, local extent and long duration. It will therefore be of medium overall significance.

- ✓ *On air quality*

The potential negative impact of the Adrar Emoles 3 Exploration Permit on the air will be the modification of its quality at the site and even beyond depending on the ambient meteorological conditions. This modification will be associated with the different types of pollutants generated during the activities associated with the extraction, transport and processing of ore. Thus, it will be associated with mobile, fixed and fugitive sources.

Mobile sources include machinery used in ore extraction operations, transport of ore to the crushing plant, cars transporting company and contractor staff to the mine site, trucks supplying the site with raw materials and those shipping the finished product, etc. The level of pollutant emissions from these sources depends on the fuel and operating condition of the equipment. They may include carbon dioxide, carbon monoxide, methane, nitrous oxide, sulphur dioxide, volatile organic compounds, etc. Mobile sources include power generation facilities, the contact workshop for the production of sulphuric acid, etc. To these must be added fugitive emissions whose sources include: ore storage and handling, storage of certain inputs such as sulphur, crushing, ore processing, storage of tailings from ore processing, etc.

This unmitigated impact will be of medium intensity, local extent and long duration. It will therefore be of medium significance.

- ✓ *On the water*

During the operational phase, the project will have potential negative impacts on water resources. These will include the lowering of groundwater levels associated with the continuous pumping (dewatering) of groundwater from the drifts to facilitate ore extraction. If dewatering occurs in aquifers that are exploited by local people through

boreholes or wells, it could lead to depletion of these waterworks. Water management at the site could therefore have a significant influence on the local hydrological and hydrogeological regimes of the site. In addition, the use of water for industrial purposes (ore processing, dust suppression, etc.) and for domestic purposes, particularly for the needs of the base camp (drinking water, showers, toilets, etc.), may lead to a lowering of the levels of the exploited water tables.

Finally, the presence of the mine may lead to an influx of people into the area in search of possible employment. This sudden increase in population may also lead to an increase in water consumption and thus pressure on the resource.

This unmitigated impact will be of medium intensity, local extent and long duration. It will therefore be of medium significance.

Water pollution/contamination will be caused by the reagents used in the ore processing chain. In addition, the presence of the effluent ponds are the main sources of radiological or chemical water pollution/contamination. In addition, acid rock drainage (ARD) (caused by oxidation of sulphide minerals including FeS2 pyrites and chalcopyrites) with a high potential for contamination constitutes a risk of groundwater contamination in the context of this project. These risks of acidic drainage may o occur in waste rock these storage areas.

Another potential source of water pollution/contamination during the operation of the project might be the discharge of untreated wastewater from the base camp into the environment. The latter may infiltrate and alter the quality of groundwater in the vicinity of drinking water wells.

This impact will be of average intensity, local extent and long duration. It will therefore be of medium significance.

- ✓ *On wildlife*

The operation phase of the project will have negative impacts on wildlife. These include the destruction of fauna habitats (soil and vegetation), disturbance and risks of poaching, risks of falling into the ponds and mortality.

The activities that cause the destruction of fauna and its habitats are: the construction of new ponds as the ore is extracted (effluent ponds, storm water ponds, etc.) and the use of borrow pits for maintenance work on the ponds, the construction of dams, the movement of machinery, etc.

The disturbance of wildlife will be associated with the noise that will be generated by the operation of the installations, the movements of the project machinery and subcontractors, etc. This noise is likely to cause animals to flee to quieter remote areas. The risk of poaching will be linked to the presence of personnel on the site and potential project induced migration to local villages. Finally, there are also risks of falls, intoxication and wildlife mortality due to the presence of ponds and other sunken storage areas.

Overall, certain groups of animals such as birds, small mammals (hares, rats) and reptiles could be considered as populations at higher risk of exposure to potential negative impacts of the project in the area.

This impact will be of medium intensity, punctual in extent and of long duration. It will therefore be of medium overall significance.

- ✓ *On flora*

During the operational phase, the project will have potential negative impacts on flora. These include the destruction of vegetation cover and the disruption of photosynthesis.

The destruction of the plant cover will be linked to the construction of new ponds as the project is operated (effluent ponds, storm water ponds, etc.) and to the operation of the borrow pits. The disruption of photosynthesis will be caused by polluting emissions from the project activities, including the movements of machinery and dust generation. These emissions will be deposited on the leaves of the plants and will disrupt the photosynthesis process.

The impact of the project on flora will be of medium intensity, local extent and long duration. It will therefore be of medium overall significance.

In terms of PS6, it is unlikely that Critical Habitat will be triggered by the five species of conservation concern which have been observed in the local area. Habitat mapping is likely to demonstrate the presence of Natural Habitat, which means that the project will demonstrate No Net Loss of biodiversity it it's progressive restoration plans and closure plan.

4.5.2.2. On the human environment

- ✓ *On the landscape*

The potential negative impact of the project on the landscape during this phase will be the degradation of its quality by the presence of surface infrastructure in a previously unoccupied environment, the presence of large equipment and vehicles, the deposition of tailings and waste rock from ore processing, the presence and construction of new ponds as mining proceeds (effluent ponds, storm water ponds, etc.), the exploitation of borrow pits etc. Facilities may be illuminated at night to permit safe vehicle movements and operation of the plant.

Finally, the temporary storage of solid waste (wood, rubber, scrap metal, glassware, plastics, etc.) in bunkers will disturb the visual quality of the landscape.

This impact will be of medium intensity, local extent and long duration. It will therefore be of medium overall significance.

- ✓ *On safety and health*

The potential negative impacts of the project on the safety and health of workers and the surrounding population are the risk of accidents and injuries, the risk of respiratory diseases, radiological contamination, the risk of poisoning, the risk of biological contamination, the risk of drowning, the risk of spreading sexually transmitted diseases, back pain, etc.

Indeed, mining projects are potential sources of several types of accident, both for workers and for neighbouring populations. For example, accidents related to: the movement of heavy machinery, explosives, the handling of machinery and the flammability of products, fire or explosion of pressurised equipment, explosions or burns during chemical reactions, falls from heights, electrocutions, asphyxiation, etc., could be feared.

Risks of respiratory diseases will be related to changes in air quality as a result of pollutant emissions (dust, gases, etc.). The main sources of emissions (gas, smoke, dust) which are likely to affect the quality of the ambient air are generally related to stacks, ore conveying, tailings deposition, movements of mining machinery, etc.

Heavy metals and toxic substances contained in the emissions (fluorine, cadmium, lead, silica and radioactive minerals such as uranium and its derivatives) will alter the air quality potentially resulting in respiratory diseases.

The risks of radiological contamination and its consequences are linked to exposure to radon in the mine (at the bottom) and to dust which may contain radioactive elements. Also, the contamination of soil and water by radioactive elements has an impact on the health safety of workers and people living near the site.

Concerning poisoning, it could be linked to gas leaks during the operation of the installations (e.g. H2S during the manufacture of sulphuric acid in the contact workshop) or other emissions linked to the use of toxic chemicals.

The risks of biological contamination and drowning will be linked respectively to the use of common areas (toilets, restaurants, etc.) and to the presence of the various ponds (effluent ponds, production juice ponds, hot water ponds, etc.). In addition to biological contamination, there are risks of COVID-19 contamination linked to the

The risks of the spread of sexually transmitted diseases will be linked to the potential influx of labour in search of work, which will give rise to interactions with local populations, the development of indirect activities, etc.

Finally, the risks of hearing impairment with loss of hearing in workers, linked in particular to the modification of the sound environment in the context of the project activities, should be noted. Finally, the risks of low back pain will be associated with poor posture, work involving high demands on the limbs, etc.

The unmitigated impact of the project on the safety and health of workers and surrounding populations will be medium intensity, local in scope and long lasting. It will therefore be of medium significance.

- ✓ *On employment/income and the economy*

The operation of the project will have significant positive impacts on employment, income and the economy at local, regional and national level.

With regard to employment and income, this implementation phase will require the mobilisation of a large skilled and unskilled labour force. In the context of this recruitment (especially for unskilled labour), priority will be given to local populations in order to allow them to benefit from certain advantages linked to the presence of the project in the area. This will therefore create jobs, reduce unemployment and improve the income and living conditions of the people concerned. The income generated and injected into the local circuit will provide a positive dynamic in terms of improving the income and well-being of the whole community, especially as it can indirectly promote the development of other small commercial activities.

Within the framework of the project activities, subcontracting with local companies and businesses will create jobs with positive effects on income, living conditions and well-being.

Furthermore, the purchase of locally available goods and services will contribute to the increased success of local businesses.

Also, in view of the enthusiasm shown by some local communities for market gardening activities, this phase of the project could trigger the development of this activity by supporting producers and purchasing their produce.

Concerning the economy in general, the exploitation phase of the project will be

characterised by significant positive impacts at the local, regional and national level through the payment of various taxes and royalties in accordance with the provisions of the texts in force. Indeed, the State, through law n°2006-26 of 9 August 2006 on the mining code, has taken measures to support local development for the benefit of the communities concerned. This law stipulates that: "*mining revenues made up of mining royalties, surface royalties, fixed fees, the product of the artisanal exploitation tax and the product of the sale of mining artisanal cards, less the rebates granted to agents of the Ministry of Mines, are distributed as follows: 84% for the national budget; 16% for the budget of the communes of the region concerned for the financing of local development".*

Finally, during the operational phase, there could be a development of small-scale trade in favour of the local economy.

The project's impact on employment/income and the economy will be high intensity, regional in scope and long lasting. Its overall significance will therefore be major.

- ✓ *On noise and vibration*

The potential negative impacts of the project during the operational phase will be the modification of the noise environment and vibrations. The main sources of noise are the extraction of ore associated with the movement of machinery (heavy and light), the operation of installations such as crushers, compressors, the ventilation system, the workshops, etc.

During the day, the operation of the installations will also be a source of noise that may affect the sound environment. These include the plant (crushers, mills, compressors, fans, etc.) and its associated facilities such as the workshops, garage, contact for the production of sulphuric acid, emergency generators in case of use, etc.

Finally, the movement of machinery (trucks, vehicles, shovels) for the transport of personnel and the supply of inputs and shipment of uranate will alter the noise environment. This will be a nuisance for workers and the surrounding population.

The unmitigated impact of the project on the noise environment will be of medium intensity, local extent and long duration. It will therefore be of medium overall significance.

- ✓ *On pastoral activities*

The exploitation phase of the project is likely to generate negative impacts on pastoral activities in the area. Indeed, livestock farming may be impacted through the occupation of space by the infrastructures that will be built, the destruction of forage potential by the movements of machinery, the accidental discharge of effluents into the environment that may contaminate the pasture, the risks of contamination/intoxication of animals, falling into effluent basins, traffic accidents involving machinery and vehicles that may impact the animals, etc. However, no significant additional areas will be added during operations as the facilities will be built, areas cleared, and fences installed during the construction phase. Therefore, limited additional impacts will occur during operations.

This unmitigated impact will be of low intensity, local extent and long duration. It will therefore be of medium significance.

- ✓ *On local traditions and customs*

The project may have potential negative impacts on the traditions and customs of local

people.

Indeed, the development of a mining project of this scale may be accompanied by induced migration of people from different backgrounds (search for jobs, associated commercial activities). Thus, people with totally different cultural diversities, beliefs, traditions, traditions and customs may find themselves living together with strong interactions with the local populations. This may result in the modification of the practices and traditions of the local populations.

This unmitigated impact will be of medium intensity, local extent and long duration. It will therefore be of medium significance.

- ✓ *On cultural and archaeological heritage*

The potential negative impacts of the project on cultural and archaeological heritage during this phase will be the risk of degradation or destruction of the said heritage as a result of the movement of machinery in the area and the collection of objects in the event of accidental discovery. However, it is unlikely that additional operational areas will be disturbed following the construction phase.

This unmitigated impact will be of low intensity, local extent and long duration. It will therefore be of medium overall significance.

4.5.3. Impacts during the closure phase

4.5.3.1. On the biophysical environment

- ✓ *On the soil*

During the closure phase, the Adrar Emoles 3 exploration permit project will have both negative and positive impacts on the land.

The negative impacts will concern the modification of its structure by the dismantling activities of the installations and the movements of the machines and its pollution by the solid and liquid waste that will be generated, including by the workers on the site. In addition, oil and hydrocarbon leaks from the machinery or accidental spills from the latter will be a source of soil contamination. Finally, the deposit of certain equipment or materials from the dismantling process may lead to radiological contamination of the soil.

This unmitigated impact will be of low intensity, one-off extent and short duration. It will therefore be of minor overall significance.

However, this phase will also have positive impacts on the soil, especially since after the dismantling works, the clean-up and redevelopment/reclamation of the sites will allow the soil to be stabilised.

This positive impact will be of high intensity, one-off extent and long duration. It will therefore be of major overall significance.

- ✓ *On the air*

During the closure phase, the project will result in changes to the ambient air quality. The main sources of this change will be dust and particles of various sizes as well as combustion gases, in particular nitrogen oxides, sulphur dioxide, carbon monoxide and volatile organic compounds. These pollutants will be emitted during the dismantling of infrastructure, the movement of mobile machinery, the operation of fixed machinery

and site rehabilitation work.

This negative impact will be of medium intensity, local extent and duration. It will therefore be of medium overall significance.

Once the closure activities are completed and the closure plan implemented, the sources of dust, particles and gases will be eliminated, so that impacts will no longer be evidenced.

This positive impact will be of medium intensity, local extent and long duration. It will therefore be of medium significance.

- ✓ *On the water*

During the closure phase, the dismantling of infrastructure and site rehabilitation activities will present a risk of water contamination. Indeed, accidental spills and/or leaks of hydrocarbon products from fixed and mobile machinery will be the main sources of this contamination. Also, inappropriate management of solid and liquid waste generated during the works will lead to water pollution.

In addition, as in the operational phase, water resources could be exposed to the release of radionuclides and other heavy metals in the waste rock and tailings disposal areas. However, testing indicates tailings and waste rock are non-acid generating and have low potential for leaching. Thus, after the cessation of operations, the quality of water resources is unlikely to deteriorate due to the risk of increased levels of radionuclides and metals through percolation of meteoric water and infiltration into the water table.

The unmitigated impact of the project on water during this phase will therefore be negative, medium in intensity, local in extent and short in duration. It is therefore of medium overall significance.

- ✓ *On the fauna*

During the dismantling of project infrastructure, the movement of machinery and the presence of personnel could constitute sources of disturbance for fauna during the works.

This impact will be negative, of low intensity, punctual extent and short duration. It will therefore be of minor overall significance.

Following site closure, the redevelopment/restoration of the sites will allow the stabilisation of the soil and the reconstitution of the vegetation cover which represent the habitats of the fauna and will consequently favour its return to the area.

The impact will be positive, medium in intensity, local in extent and long in duration. The relative importance of the impact will therefore be medium.

- ✓ *On flora*

The closure phase of the project will have significant positive impacts on flora. Indeed, the work related to the closure of the mine aims at the final restoration of the site. To this end, the infrastructures will be dismantled, freeing up spaces that will be redeveloped/restored. This will encourage the return of vegetation.

This impact will be positive, of high intensity, local extent and long duration. It will therefore be of major overall significance.

4.5.3.2. On the human environment

✓ *On the landscape*

The implementation of the Adrar Emoles 3 exploration permit project will lead to a change in the visual quality of the landscape in the permit area.

The closure phase, which will be characterised by the dismantling of the infrastructures put in place, will have positive impacts on this component. Indeed, the redevelopment/reclamation and site restoration work that will be carried out will allow the partial restoration of the initial (pre-project) visual quality of the landscape.

This positive impact will be of low intensity, local extent and long duration. It will therefore be of medium significance.

✓ *On safety and health*

During the closure phase, the project may have negative impacts on the safety and health of workers. These impacts are risks of accidents and injuries, risks of respiratory diseases, risks of radiological and biological contamination.

The activities that lead to accidents and injuries are the dismantling of facilities, site clean-up, redevelopment/reclamation and restoration of sites, movement of machinery that will be deployed, activities related to dismantling, etc.

The risk of respiratory diseases will be due to the dust that will be generated during the above-mentioned activities and to the exhaust fumes of the machinery.

Radiological contamination will be linked to inadequate or negligent protection during the work, given the environment in which it will take place. Finally, biological contamination, in particular with COVID-19, will be due to the failure to respect barrier measures.

The unmitigated impact on safety and health during this phase will be of medium intensity, local extent and short duration. It will therefore be of medium overall significance.

✓ *On employment, income and the economy*

The closure phase of the project will have potential negative impacts on employment, income and the economy in the area.

Indeed, the loss of jobs associated with the cessation of mining operations could have significant repercussions on the income of workers and, consequently, on the quality of life and social conditions of their households. This phase will also mark the loss of fiscal revenues (loss of taxes and royalties related to the operation of the mine) for the area concerned as well as the national treasury. It also represents a loss of opportunities for local businesses and companies hired as subcontractors for the operation of the project.

This unmitigated impact will be of high intensity, regional extent and long duration. It will therefore be of major significance.

However, for the subcontractors who will be recruited as part of the redevelopment of the sites, this represents a real opportunity in terms of improved turnover. In addition, through them, jobs will be created at local level.

This impact will be positive, of medium intensity, one-off and of short duration. It will therefore be of minor overall significance.

✓ *On noise and vibration*

The noise and vibration environment will be modified during this phase of the project due to the noise that will be generated by the following activities that will require the mobilisation of machinery. These are: dismantling of installations, site clean-up, redevelopment/reclamation and machinery movements.

Also, certain works such as welding, cutting of certain installations, etc. associated with the dismantling will modify the noise environment at the sites. This will be a particular nuisance for workers

The unmitigated impact of the project on the noise environment will be low, local in extent and of short duration. It will therefore be of minor significance.

Following the completion of closure activities, there will no longer be any significant sources of noise at the site.

The positive impact of the closed project on the noise environment will be low, local in extent and of long duration. It will therefore be of medium significance.

✓ *On pastoral activities*

The closure of the project will have positive impacts on pastoral activities in the area. Indeed, after the dismantling of the installations, the redevelopment/reclamation works that will be carried out will allow a return of the grass cover on the project sites. This will help to improve the availability of fodder in the area.

This positive impact will be of low intensity, specific extent and long duration. It will therefore be of minor overall significance.

✓ *On traditions and customs*

During this phase, additional teams dedicated to dismantling, cleaning, redeveloping and restoring the sites will be deployed. They may develop interactions with the communities, with the risk of not respecting local customs and traditions.

However, this impact will be of low intensity, one-off extent and short duration. It will therefore be of minor overall significance.

✓ *On cultural and archaeological heritage*

The main potential negative impact of the project on heritage during this phase is the risk of collecting archaeological or cultural remains, particularly in the event of accidental discovery. This will be linked to the presence of the workforce on the sites.

This impact will be of low intensity, one-off extent and short duration. It will therefore be of minor overall significance.

4.5.4. Human rights risks of the project

The constitution of the 7ème Republic of Niger gives every citizen the right to a healthy environment and the duty to contribute to its protection and improvement. Indeed, Article 35 stipulates: "*The State has the obligation to protect the environment in the interest of present and future generations. Everyone is obliged to contribute to the safeguarding and improvement of the environment in which he or she lives [...] The State shall ensure the assessment and control of the impact of all development projects and programmes on the environment*.

Despite being a real opportunity for the local populations, the project to exploit the

deposits of the Adrar Emoles 3 research permit may have negative environmental and social impacts in terms of respect for human rights. On the environmental level, these include the consumption of water and the disruption of the local hydrological balance, the alteration of water quality, the modification of ambient air quality, the destruction of vegetation, the disruption of the tranquillity of the fauna that provide services to the local communities, etc.

On the social level, this project will generate health risks, including radiological contamination for workers and local populations, the reduction of available forage potential, the risk of destruction of cultural and archaeological sites of importance to local communities, the degradation of the visual quality of the landscape, the risk of gender-based violence, etc.

In its activities, the project must ensure that the basic rights of workers and local communities are respected.

To this end, the implementation of the measures planned at the end of this study, coupled with the actions that fall within the framework of social and societal responsibility, will make it possible to achieve this objective and improve the ecological viability and social acceptability of the project.

4.5.5. Vulnerability to climate change

Climate change is significantly affecting the frequency, incidence and duration of extreme events such as droughts, floods, high winds, etc., which have negative impacts on development infrastructure.

In Niger, six (6) categories of extreme weather events are considered. These include: droughts, heavy rains/floods, sand and/or dust storms, high temperatures, locust invasions and bushfires/fires which have direct or indirect negative consequences on the various development sectors (agriculture, livestock, fisheries, health, environment, industry including mining, etc.).

In the context of the "ADRAR EMOLES 3" research permit uranium mining project, the infrastructure to be built (water management infrastructure, tailings management facilities, waste rock disposal facilities, transport infrastructure such as roads and access tracks, telecommunications infrastructure, etc.) could be affected by climate change, particularly during the mining and post-mining phases. These include degradation, failure or destruction due to temperature variations, heavy rainfall and high winds. In addition, the high humidity associated with climate change could also affect the structural and functional performance of infrastructure and structures. However, it should be noted that the infrastructure that will be built as part of the mine rehabilitation will be more vulnerable to climate change because of its permanent nature (it will be in operation for many years after mine closure) compared to the usual infrastructure that will be dismantled at the end of its useful life.

Thus, the planning, design of structures (including during site restoration) and management of mining activities must take into account not only historical weather data but also, and especially, climate change induced variability. This has been incorporated into the project design in the Feasibility Study, in the selection of return periods and the calculation of flood lines. This has influenced the siting of infrastructure (for example the TSF) and the design of infrastructure.

GHG Emissions Reductions

The options available to SOMIDA for the Dasa Mine include the combination of the following power sources:

i. Coal-fired power plant operated by SONICHAR supplying to the grid
ii. On-site diesel power generation
iii. On-site solar power generation and battery storage

Based on the work completed to-date it is estimated that 84,096 MWh of electricity are needed when the Dasa mine and process plant are in full operation. Based on information provided by the United States Energy Information Administration (Frequently Asked Questions (FAQs) - U.S. Energy Information Administration (EIA)), on average each kWh of electricity produced by coal results in 2.2 pounds (1 kilogram) of CO_2. Power produced by diesel generators produces an equivalent volume of CO_2 per kWh. Therefore if 100% of the electricity for Dasa was derived from the coal -fired SONICHAR power plant base-case operations-phase GHG emissions are estimated to be 65,395 tonnes per annum (tpa) which includes 12,477 tpa scope 1 emissions and 52,919 tpa scope 2 emissions. There is an optimized plan to install solar photovoltaic (PV) panels linked to battery storage and back-up diesel, with the intent of providing approximately 20% of the Project's total requirement as renewable energy. This would reduce the total estimated GHG emissions to 52,871 tpa to include 21,275 tpa scope 1 emissions and 31,596 tpa scope 2 emissions. Furthermore, there is a conceptual plan to reduce the mine site power demand from 12 megawatts (MW) to 9 MW which, coupled with solar PV and battery storage, and back-up diesel, would target a reduction in GHG emissions to 43,000 tpa; a 34% reduction from the base case scenario to include 18,691 tpa scope 1 emissions and 24,422 tpa scope 2 emissions. Scope 1 and 2 GHG emissions as a minimum will be tracked and reported in line with IFC PS requirements. A Resource Efficiency plan, which will include the collection and reporting of GHG monitoring data, will be developed ahead of production.

5. POSSIBLE ALTERNATIVES TO THE PROJECT

The analysis of possible alternatives to the project is enshrined in current environmental management legislation. It allows the selection of the technically, economically, environmentally and socially advantageous alternative.

Thus, in the context of the implementation of the Adrar Emoles 3 exploration permit project, the analysis first concerned the project options, i.e. the "option with project" and the "option without project", and then the alternatives linked to the exploitation of the deposits.

5.1. Analysis of options

The two options "with project" and "without project" have been analysed in terms of technical, economic, environmental and social advantages and disadvantages as shown in Table 49 below.

Table 49 Advantages and disadvantages of project options

OPTIONS	BENEFITS	DISADVANTAGES
With project	The benefits that will be associated with the implementation of the project are - Contribution to the development of the national mining potential - Direct and indirect job creation, fight against unemployment and improvement of the income of the people concerned - Improved tax revenues at local, regional and national level through the payment of taxes and fees, etc. - Contribution to local socio-economic development through increased purchases from local businesses and suppliers, - Improved access rates to basic social infrastructure (water, health, education) through investments to be made in the framework of social and societal responsibility and mining royalties to be collected	The disadvantages that will be associated with the implementation of the project are: destruction of vegetation prior to overburden removal as part of the construction of the infrastructure, destruction of fauna and its habitat and disturbance of its tranquillity, degradation of ambient air quality as a result of pollutant emissions, health and safety risks associated with the exploitation of the deposits, risks of lowering the water table as a result of pumping, risks of contamination of the water table, etc.
No project	The option without will have the advantage of allowing normal development to take place while avoiding potential negative impacts on the biophysical and human environment (destruction of vegetation, destruction of soil and its contamination, modification of ambient air quality, lowering of the water table and contamination by solid and liquid waste, health and safety risks, etc.).	The main disadvantage of the non-project option will be the compromise of the objectives of its development with the project (see project option).

As a result of the above comparative analysis, the "with project" option was chosen, in particular because of the multiple advantages it offers.

5.2. Alternatives related to the method of operation

The analysis of alternatives related to the exploitation of the deposits concerned open pit mining and underground mining. It should be noted that in the context of mining projects, the type of exploitation depends on several factors, in particular geological conditions such as the depth of the mineralisation, the geotechnical conditions of the surrounding rocks, the strength of the mineralisation and its spatial layout.

Thus, as part of this analysis, the advantages, and disadvantages of each of these alternatives have been considered as shown in Table 50 below.

Table 50 Analysis and disadvantages of alternative ways of exploiting the deposits

ALTERNATIVES	BENEFITS	DISADVANTAGES
Open-pit mining	- Method used in the area by SOMAIR with good results - Possibility of upgrading the low-grade ore contained in the various pits. - Economic exploitation method. - Less risk of chemical contamination of underlying aquifers	- Destruction of native vegetation prior to overburden removal as part of pit operations - Lower safety risks than underground mining - Significant reclamation of the surface as the operation progresses and/or at the end of the operation. - Waste rock management (waste rock storage areas, slope stability, potential for ARD). - Mine water management - Dust emissions from mining activity (machine traffic, crushing, blasting) in meteorological conditions (wind). - Significant landscape impact, particularly from the exploitation of the pits and the deposit of tailings and waste rock
Underground mining	- Methodology implemented by COMINAK in the area with good results - Provides the conditions for good selectivity - Little overburden removal as access to the deposits is via tunnels: less environmentally destructive method - Less landscape impact than an OLS because no waste rock dumping	- Significant dewatering of the water table with risks of resource depletion. - Requires more technicality - High operating costs - More radiation protection needed - Higher safety risks than open pit mining - Risk of destabilisation of the mechanical strength of the land.

Following the analysis, underground mining was chosen due to the multiple advantages it offers during the different phases of the project implementation. In addition, this alternative was considered because of the geological conditions and

the location of the deposit, particularly its spatial position and dimensions in terms of depth and power. It will allow for selective extraction of the ore, but also for the production of less waste rock and waste products, a significant reduction in the costs of transporting and processing the ore, and a reduction in the environmental impact due to a smaller tailings facility and waste rock piles.

In addition, the following aspects were considered during engineering studies:

- ore processing method;
- power supply;
- mine water supply;
- staff accommodation and services;
- management of waste rock and mine tailings;
- management of non-mining waste;
- wastewater treatment;
- stormwater management;
- redevelopment, rehabilitation, and management of the site post closure.

5.2.1. Alternative for the ore processing method

Many other options have been studied by Global as an alternative method of processing the ore.

The process circuit and treatment parameters are similar to those already applied in the uranium mines of the French group ORANO, which operates in Niger.

Thus, the main stages of the treatment plant include: ore crushing and grinding operations; attack, impregnation, maturation and disintegration; ore filtration and washing; extraction and re-extraction; and finishing and removal of the uranate.

As far as the treatment circuit is concerned, this involves the following aspects:

- ***Radiometric sorting of ore***: is a process used to reduce the amount of feed returning to the leaching circuit while losing only a small percentage of the uranium present in the feed. The implementation of a radiometric ore sorting system can reduce the size of several components of the treatment circuit (thus reducing CAPEX capital expenditures), reduce the amount of reagents required, reduce the size of pumps, etc. The process can be used to reduce the amount of feed returning to the leaching circuit while losing only a small percentage of the uranium present in the feed stream. (thereby reducing OPEX) and reduce the overall environmental footprint. Radiometric ore sorting tests indicated that, based on a synthetic feed mix of available stockpiled samples, approximately 45% of the feed material in an ore sorter could be released with a loss of <10% of the contained uranium.
- ***Ablation***: Ablation offers a low-cost method of concentrating uranium by applying a physical grain size separation procedure to the ore slurry without the addition of chemicals. Ablation Technologies conducted tests on Project samples focusing on optimizing the fragmentation stage of the treatment circuit, adding an ablation stage to reduce the amount of feed material requiring acid

leaching, increasing the uranium content and reducing the carbon content. Approximately 63% of the material subjected to the ablation process could be rejected with a loss of <10% of the uranium content. A key advantage of including radiometric ore sorting and ablation systems in the processing circuit is that approximately 80% of the ore feed material is removed from the procedure without the use of chemicals and prior to the acid leaching procedure.

The table below gives the approach as well as the inputs, outputs and wastes of the treatment operation.

Table 51 ***Process, inputs, outputs and waste from the treatment operation***

Steps in the operation of the treatment		Inputs (materials raw materials, water and energy)	Outputs (products intermediaries and products)	Waste (emissions, effluents and solid waste)
Preparation of the all- round feed	Crushing	100% of everything from P80 250 mm ore	100% of everything coming from 20 Ŕ 300 mm	Dust in the environment
	Radiometric sorting of the ore	100 % all-round 20 mm Ŕ 300 mm	55% of all coming	Low quantity of uranium waste in the tailings storage facility Dust in the environment
	Ablation	55% of all coming	20% of everything coming, 149 µm	Small amount of uranium waste in the tailings storage facility
Leaching circuit	Two-stage tank leaching	20 % of total 149 µm	Uranium	Gaseous emissions into the environment
Uranium recovery circuit	Removal of impurities	Metal-laden solution	Uranium- charged solution	Iron- and silica-rich waste to the tailings storage facility Gaseous emissions into the environment
	Uranium stripping	Uranium- charged solution	Uranium precipitation circuit	Filled solution for the start of the solvent extraction circuit Gaseous emissions into the environment

Source: Preliminary Economic Assessment 2020

The best option for Global is the treatment process described in the table above, as it is economically and environmentally suitable for the uranium industry.

5.2.2. Alternative energy source

Energy is a key factor in the development of major mining projects. Discussions with the State and local authorities are essential. It is obvious that Global Atomic Fuels Corporation can only develop the exploitation of its deposit within a development plan integrating the already existing infrastructures. Any use of non-fossil energy should be encouraged in view of the problems of climate change.

In Niger, the mining projects will seek energy supply solutions to operate according to public grid connection schemes, or alternatively develop their own energy source.

Global Atomic Fuels Corporation conducted a power supply study to evaluate the costs and benefits of alternative power draw options to SONICHAR, which is 100% coal fired, and therefore maximises greenhouse gas emissions. One alternative is to use diesel generators for power supply backup, which also ensure continuity of supply to the mine and mill. This will result in exhaust emissions and, consequently, air quality and noise problems, although these can be minimised and emit less CO2 per unit of energy than coal.

In addition to diesel back up, a solar photovoltaic farm and battery back-up will be installed at the project to further reduce reliance on fossil fuels and overall GHG emissions.

5.2.3. Alternative mine water supply

The water for the treatment plant will come from underground catchment operations that may be sufficient to meet water needs. This is mainly the Teloua and Tarat aquifers.

Pumping tests were carried out on the Teloua aquifer (15 and 25 $^{m3/h}$), the Guézouman aquifer (2 to 3 ^{m3} /h) and the Tarat with a flow rate of over $_{30}$ $^{m3/h}$.

Also, to meet the estimated needs of 55 $^{m3/h,}$ it is sufficient to drill two or three boreholes to capture the Teloua water table or to drill a large-diameter borehole to capture the Tarat water table, which can give a flow rate of 50m3/hour. As far as aquifer recharge is concerned, it should be remembered that these aquifers are classified as fossil aquifers that recharge very little or not at all.

The water consumption for the treatment facilities is estimated at 55 m3/hour. The boreholes will supply the water and the underground drainage pumps will direct it to the treatment plant via pipelines. Water not used by the treatment plant will be stored. The hydrogeological programmes carried out on the permit have also highlighted the possibility of exploiting other aquifers such as the Guézouman and Tarat. Several alternative locations and sources for water supply boreholes have been considered, the location of the boreholes and the aquifer have been chosen to ensure minimal impact on the aquifers which have been selected to ensure minimal drawdown. Also, water will be recycled and reused wherever possible to minimise withdrawals from aquifers.

This alternative is the most appropriate both economically and socially, avoiding potential conflicts of use with local communities.

5.2.4. Alternative accommodation for staff and services

During construction, a temporary camp (including canteens and leisure facilities) will be built on the project area to house staff. Finally, a base camp will be built for staff and management. This camp will replace the existing Global Atomic Fuels Corporation Camp, which will be relocated. The decision to relocate the current camp is motivated by the fact that it is located approximately 7 km from the deposit, therefore, within the direct area of influence of the mining operations. The standards for the installation of mining camps will be used as a guide. The buildings will be constructed with thermally insulated panels previously wired for electric current.

In addition to the employees' private quarters, the camp will include the following community buildings: administration and communications building; kitchen/refectory; complex/refrigerated/freezer rooms; first aid centre with cover for the ambulance; recreation centre; toilets.

5.2.5. Alternatives for tailings and waste rock management

The management of mine tailings and waste rock containing high concentrations of radionuclides is a significant health and safety issue. Waste rock, soil and rubble will be reused as far as possible as backfill material, or stored, during construction. Where appropriate, storage facilities will be covered with protective layers and soil containment techniques. Permanent and regular monitoring is necessary to ensure that the protective and containment layers play their role properly. The possibility of reclaiming these tailings and waste rock will be considered in order to integrate them into the environment in a permanent and sustainable manner, while limiting contamination.

As part of this project, the tailings storage facility will be designed according to current good practice. Dry stack tailings (dewatered before disposal) will be used which minimises water losses and the stability of the tailings will be maximized.

The tailings storage facility will be constructed with a clay liner to minimise migration of process water into the underlying layers and will be rehabilitated progressively with low uranium material released from the treatment circuit. Several alternative locations for the tailings storage facility have been considered. The selected location strategy is designed to mitigate the impact of the tailings storage facility on the environment. The Tailings Storage Facility is located as close as possible to the processing plant, minimizing the impact of the conveyor, while still ensuring a low permeability base layer.

The tailings cells will be developed and built one after the other as they fill, and the initial stripping and overburden will form the initial material.

The location and design of the waste rock piles will conform to internationally recognized standards in the uranium industry, such as the location of surrounding watercourses; the geochemical properties of the ore, waste rock and tailings produced by the project for example.

5.2.6. Alternative for the management of non-mining waste

Inert waste rock, soil, subsoil and rubble will be used as far as possible as backfill, or piled up, during construction. Other waste streams such as industrial waste (e.g. used oil, filters, aerosol cans and gas bottles) and plastic packaging, wood and crates and organic kitchen waste will be separated at source. Appropriate authorized sites for recycling or disposal in Niger will be identified as far as possible for each waste stream.

As regards household waste, the removal and disposal of household waste to local authority landfills will be entrusted to service providers approved by the Ministry of the Environment.

5.2.7. Alternative for the treatment of wastewater

Sewage collection and treatment facilities (including permanent water treatment and mobile toilets) will be available at the plant, in the camps and in the administrative buildings.

Global will use a proven technology for the treatment of domestic wastewater, i.e. the maceration process, bacterial decomposition and then destruction by chlorination of the effluent before final discharge into an organic matter holding tank. This treatment method was chosen because it is a proven approach in the West African region.

Other options that have been examined include:

- using wastewater pits that allow water to infiltrate into the groundwater. These pits are unhealthy and dangerous for the environment. Therefore, this option has not been taken into account;
- discharging wastewater directly into the tailings pond. This method is not appropriate because dry stack disposal methods will be used. The bacterial population in the wastewater is still "alive" and therefore capable of affecting and/or contaminating humans and animals that come into contact with it. This option has also been ruled out.

These two options have been discarded because of their inherent shortcomings.

5.2.8. Alternative for stormwater management

For stormwater management, a drainage system that will lead to sedimentation basins will be developed at key points in the stormwater circuit to mitigate the sediment load on the environment.

5.2.9. Alternatives for redevelopment, conversion and post-mining management

The goal is to ensure a safe and environmentally sustainable closure at the end of operations. It aims to comply with the regulations in force in Niger, as well as to integrate international best practices in this area. The plan focuses on the potential environmental risks associated with mine closure and the identification of specific measures to avoid or otherwise mitigate them. Its implementation aims to protect the general health and safety of the public, to minimise negative environmental impacts by reducing or preventing biophysical degradation of the environment, to restore the mine-affected area to a state that is compatible with stakeholder expectations and

technical and economic feasibility, and to ensure regulatory compliance of the site, in particular by obtaining the required closure certificate (quitus environnemental) from the Nigerien State.

5.2.10. Alternative for the redevelopment of underground operations

The equipment and associated surface area buildings will be dismantled at closure and the buildings demolished through the following operations:

- decontamination of buildings, equipment and surrounding soil;
- recovery of material for reuse/recycling/disposal;
- removal of any infrastructure including pipes and electrical conduits;
- destruction of walls and foundations from floor to ceiling ;
- transportation of demolition debris to underground facilities, and
- cleaning of cleared areas and revegetation where possible.

It is often necessary to keep a section accessible for inspecting and/or visiting the ramp and gallery entrances (water level surveys, geotechnical inspection, gas vents, monitoring of protected species, etc.). Thus it is often not useful to reclaim these structures completely. However, the areas around these points are cleaned and can be revegetated so that they can be optimally integrated into the restored site.

5.2.11. Alternative for the dismantling of infrastructures in the dismantling phase, good practice consists of:

- study all the possibilities for recycling excavated material and old equipment from dismantled infrastructures (museums, local industries, etc.);
- consider integrated deconstruction (allowing the recycling of a large part of the materials);
- labelling and evacuating the waste in the appropriate local channels.

The advantage of this option is that the assets will continue to have value for and benefit the community. The infrastructure assets that could be transferred are electricity, water, roads, accommodation units/villages, offices and workshops. Infrastructure that are likely to be withdrawn because of salvage value and safety concerns for the community are treatment facilities, treatment ponds, water reservoirs and tailings infrastructure. They will be dismantled in accordance with the closure activities listed below:

- decontamination of buildings, equipment and surrounding soil;
- removal of equipment and recovery of material for disposal;
- demolition of buildings;
- removal of any infrastructure including pipes and electrical conduits;
- destruction of walls and foundations;

- removal of access roads and reopening or recycling where appropriate;
- removal of safety barriers and recycling where appropriate;
- transport of non-hazardous demolition debris to underground shafts;
- placing a cover and/or growth support material if necessary.

5.2.12. Alternative for post-mining management

During the post-closure phase, Global Atomic Fuels Corporation will seek a follow-up/monitoring protocol with the relevant authorities that will determine the conditions for projection over time, in terms of:

- nature, duration and periodicity;
- costs;
- technical and financial responsibility.

6. IMPACT MITIGATION AND/OR COMPENSATION MEASURES

6.1. Measures in the preparation and construction phase

6.1.1. Measures on the biophysical environment

✓ *On the soil*

To mitigate the degradation of the soil structure and its pollution/contamination by solid and liquid wastes during the preparation and construction phase of the Adrar Emoles 3 exploration permit project, the following measures will be implemented

- Respecting the rights of way of the works to limit the disturbance of the soil structure;
- Removal of soils from project infrastructure footprint and stockpiling of soils for future re-use
- Restoration of all disturbed sites at the end of the works (borrow pits, base camp, plant etc.);
- Raising awareness of drivers on the strict respect of traffic lanes;
- Establish an emergency plan to prevent and/or deal with accidental spills and oil leaks;
- Establishment of a waste management system for the waste that will be generated during the works;
- Set up watertight platforms to ensure the storage and distribution of hydrocarbons as well as the maintenance of machinery. This platform must be equipped with a low wall to contain any oil and hydrocarbon leaks.

The residual impact to soils during construction will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On the air*

The project is located in an area where existing dust levels are very high due to the Harmattan winds and the desert environment. To mitigate the impacts of the project on ambient air quality, including its impairment, the measures to be implemented include:

- Suspension of the work in case of strong winds; this will reduce dust entrainment;
- Dust suppression by watering the site whenever necessary;
- Covering of trucks transporting construction materials ;
- Maintain fixed and mobile equipment in good working order to reduce air pollution emissions;
- Limiting the speed of the machines; this will reduce dust emissions.

The residual impact to air quality during construction will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On the water*

To mitigate or avoid the risk of water contamination and alteration of the drainage/flow system, the following measures will be implemented:

- Respecting the topography of the land during the works and restoring disturbed sites to avoid the risk of altering the drainage system
- Installing storm water management structures that are designed to manage the probable maximum flood and to allow sufficient retention time to allow suspended solids to settle out.
- Design site water management systems to separate clean from contact water and install appropriate treatment facilities
- Establish an emergency plan that will prevent and/or deal with accidental spills and leaks of oil and hydrocarbons;
- Installation of watertight platforms to ensure the storage and distribution of hydrocarbons. This platform must be equipped with a low wall to contain any oil and hydrocarbon leaks;
- Establishment of a watertight platform for the storage of used oils before their removal from the works site; this is an element of the management plan for the liquid waste that will be generated;
- Establishment of an effective management system for the solid and liquid waste that will be generated.

In order to ensure rational water management in the context of the works and to reduce the waste of the resource, the measure that will be implemented will consist of raising the awareness of workers in this area.

The residual impact to water quality during construction will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On wildlife*

During the preparation and construction phase of the Adrar Emoles 3 exploration permit, the measures that will be implemented to mitigate the destruction of wildlife habitats, the disturbance of its tranquility and the risks of poaching are

- Raising awareness of the importance of wildlife among workers;
- Respect for wildlife habitats during the works;
- Prohibition of all forms of poaching;
- Restoration of sites disturbed during the works.

The residual impact to wildlife during construction will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On flora*

To mitigate the impacts of the project on flora, the following measures will be implemented:

- Inventory of trees that will be cut on the sites during the works;
- Strict adherence to the work area in order to limit the destruction of vegetation;

- Raising awareness among workers on the need to conserve plant species considered "rare", protected, vulnerable or threatened;
- Planting and compensatory seeding at sites to be selected in collaboration with the relevant departments.

The residual impact to vegetation during construction will be of low intensity, specific extent and medium duration. It will therefore be of minor significance.

6.1.2. Measures on the human environment

✓ *On the landscape*

To mitigate the disturbance to the visual quality of the landscape during the works, the measures that will be implemented are:

- Restoration of any disturbed sites after the works;
- Directing lights away from communities and access routes as far as possible
- Setting up a good organisation of the construction site in order to reduce the disturbance of the visual quality of the landscape;
- Planting tree screens around some facilities, to reduce visibility
- Establishment of a management system for the solid and liquid waste that will be generated.

The residual impact to landscape during construction will be of low intensity, specific extent and medium duration. It will therefore be of minor significance.

✓ *On safety and health*

To mitigate the impacts of the project on the safety and health of workers and the surrounding population, the following measures will be implemented:

- Training of all workers in health and safety and safe working practices;
- Implementation of working practices and procedures in line with IAEA good practice guidance, including occupational health monitoring;
- Providing workers with appropriate Personal Protective Equipment (PPE);
- Provision of collective protective equipment (CPE) to sites;
- Establishment of an infirmary at the base;
- Setting up of first aid boxes on site;
- Organisation of a safety minute at each workstation before the start of the work;
- Putting up signs and safety instructions and posters at the work sites;
- Establishment of an Occupational Health and Safety Committee and its training to make it operational;
- Raising awareness of the risks associated with respiratory diseases;
- Watering regularly and wherever necessary to reduce dust;
- Raising awareness of STI/HIV/AIDS risks among workers and local communities;

- Staffing of workers with appropriate clothing according to the season;
- Setting up an Internal Operations Plan (IOP);
- Use of mechanical handling aids (hand truck, trolley, etc.) wherever necessary to reduce ergonomic risks;
- Creation of good working conditions in the offices, including adapted chairs;
- Provision of sufficient and appropriate toilets for employees and awareness raising on hygiene and sanitation;
- Establishment of a COVID-19 protocol and awareness-raising of workers and local communities on this disease;
- Setting up a consultation framework for the project

The residual impact to occupational health and safety during construction will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On employment and income and the economy*

The measures that will be implemented to enhance employment and income impacts are:

- Prioritisation of local labour in recruitment;
- Prioritisation of local companies in subcontracting;
- Regular payment of the extraction tax on loans to the municipalities concerned and of the surface fee to the State.

The residual positive impact to health and safety during construction will be of high intensity, regional extent and medium duration. It will therefore be of major positive significance.

✓ *On noise and vibration*

To mitigate the change in the noise environment during the project preparation and construction phase, the measures that will be implemented are:

- Maintaining equipment in good working order;
- Using noise screens around temporary stationary equipment if necessary;
- Prohibition of work at night and during rest hours.

The communities are located at considerable distance from the working areas, which provides considerable attenuation of noise levels. Therefore, residual impacts to noise during construction will be of low intensity, point source and medium duration. It will therefore be of minor significance.

✓ *On pastoral activities*

To mitigate the very limited negative impacts of the project on pastoral activities, the measures that will be implemented are:

- Carrying out the CES/DRS actions accompanied by the seeding of herbaceous plants. This will compensate for any losses due to the destruction of vegetation. This will be delivered through the Global Atomicsupport for agriculture programme already in development and will result in more opportunities to grow fodder crops.

- Support to pastoralists through the provision of Cattle Feed Banks;
- Refurbishment and maintenance of watering points.

The residual positive impact to grazing during construction will be of average intensity, local extent and medium duration. It will therefore be of medium positive significance.

✓ *On traditions and customs*

To mitigate the impacts of the project on the traditions and customs of the local populations, the measure that will be implemented is to raise awareness among the company's workers and subcontractors about respecting the traditional practices, customs and traditions of the local populations. Workers will be drawn from the local communities and bussed in and out or brought to the mine camp from nearby towns for shift patterns. Camp residents will be discouraged from entering local communities for recreational purposes. Workers will be required to adhere to a Code of Conduct.

The residual impact to traditions and customs during construction will be of low intensity, specific extent and medium duration. It will therefore be of minor significance.

✓ *On cultural and archaeological heritage*

The measures that will be implemented to mitigate the impacts of the project on cultural and archaeological heritage are:

- Training and awareness-raising of the company's workers and employees on the respect and preservation of the identified heritage;
- Strict prohibition on the collection of archaeological objects on the project sites during the works;
- Immediately inform the administration and/or the competent authorities of any archaeological finds in accordance with the GAC chance finds procedure

There are no known sites of cultural heritage within the mine footprint. The residual impact to cultural heritage during construction will be of low intensity, specific extent and medium duration. It will therefore be of minor significance.

6.2. Measures in the operational phase

6.2.1. On the biophysical environment

✓ *On the soil*

The measures that will be implemented to mitigate the impacts on the soil are:

- Development of a site redevelopment plan;
- Progressive rehabilitation of sites, particularly of borrow pits;
- Careful storage of topsoil from cleared areas, in mounds not exceeding 3 – 4m;
- Regular inspection of stored topsoil to ensure it does not deteriorate (erosion, weed growth, loss of structure and soil fauna etc
- Establishment of a solid and liquid waste management system through the SMP to be developed for this purpose;
- Implementation of spill management procedures;
- Establish preventive maintenance programmes to ensure that all machinery and

equipment that use or contain hazardous materials (including fuel, oil, etc.) are regularly maintained in good condition;

- Regular inspection and maintenance of ponds;
- Monitoring of soil physicochemical parameters.

The residual impact to soils during operations will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On the air*

In order to avoid or mitigate the deterioration of the ambient air quality, the measures that will be implemented are:

- Implementation of speed limit guidelines to reduce dust (coarse and fine);
- Development of dust mapping and a Dust Management Plan (including all abatement options and protective measures);
- Watering of haul roads, materials transfer points and other dusty areas;
- Restriction of machinery traffic to appropriate areas;
- Use of equipment meeting emission standards ;
- Periodic maintenance of equipment;
- Air quality monitoring.

The residual impact to air quality during operations will be of average intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On the water*

The potential negative impacts of the project on water will be mitigated through the following measures:

- Raising awareness on water efficiency to reduce water waste;
- Implementation of water saving measures, such as the use of dry stack tailings;
- Set up a wastewater treatment system and monitor it through bacteriological and other analyses;
- Monitoring the stability of structures such as ponds to detect possible failures and avoid water contamination;
- Monitor water sources such as wells and springs (levels, yields) and correlate results with dynamic water balance modelling;
- Carry out regular periodic quality monitoring in monitoring wells around the site, and at wells and springs in the local area, and correlate results with baseline qualities;
- Installation of HDPE at the bottom of the effluent storage basins and their securing to avoid the risks of soil and water pollution and animal incursion respectively;
- Monitoring of water quality in and around the project area.

The residual impact to water quality and quantity during operations will be of average intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On wildlife*

To mitigate the impacts of the project on wildlife during the operational phase, the measures that will be implemented are:

- Raising awareness of the importance of wildlife among workers;
- Carrying out CES/DRS actions together with seeding to improve wildlife habitat; sites will be selected in collaboration with the relevant technical services;
- Strict ban on poaching;
- Development and implementation of a waste and hazardous materials management plan.
- Progressive rehabilitation of areas no longer used, with local species which will stablise surfaces, attract wildlife and enhance biodiversity values.

The residual impact to biodiversity during operations will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On flora*

To mitigate the impacts on flora, the measures that will be implemented are:

- Raising awareness among the wider workforce and local communities about environmental protection and the conservation of certain plant species considered "rare", protected, vulnerable or threatened;
- Continue to implement an invasive species management plan and remove and destroy plants that threaten local habitats;
- Census of trees to be felled and payment of the felling fee;
- Respect for the rights of way of the works, particularly in the context of the construction of new ponds;
- Carrying out land restoration actions at sites in the area to be selected in agreement with the technical services concerned;
- Regular watering of sites to reduce dust generation.

The residual impact to flora during operations will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

6.2.2. On the human environment

✓ *On the landscape*

To mitigate the alteration of the visual quality of the landscape, the measures that will be implemented during this phase are

- Rehabilitation of disturbed sites ;
- Angling lighting away from communities and transit routes;
- If appropriate, planting tree or bush screens around some buildings;
- Selecting colours for buildings that blend with the landscape;
- Adequate management of the solid waste that will be generated in order to avoid its dispersion in the environment of the area.

The residual impact to landscape during operations will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On safety and health*

To mitigate the impacts of the project on the safety and health of workers and the surrounding population, the following measures will be implemented:

- Equipping workers with the appropriate Personal Protective Equipment (PPE) and sites with the necessary Collective Protective Equipment;
- Training and awareness raising of workers (company and subcontractor workers) on work-related health and safety risks;
- Elaboration of an Occupational Safety and Health Management Plan (safety and health of workers and neighbouring populations) which will include the necessary measures to be implemented to ensure the safety of workers and neighbouring populations. These measures must take into account the health monitoring of workers;
- Implementation of an Internal Operation Plan (IOP) at the site;
- Establishment of a chemical management procedure (the measures to be proposed will concern the following aspects: transport, storage, use, packaging management, management of obsolete chemicals, etc.);
- Regular watering to limit dust;
- Covering of the conveyor belt to reduce dust;
- Air-conditioning of machine cabs in order to keep them closed during work and thus avoid exposure of drivers to dust;
- Monitoring the food chain ;
- Health monitoring of workers through annual medical check-ups;
- Monitoring of workplaces for NORMs;
- Adherence to IAEA guidance documents on the Monitoring and surveillance of residues from the mining and milling of Uranium and thorium, and Occupational radiation protection in the Uranium mining and processing industry;

- Dosimetric monitoring of workers exposed to radioactive environments.

The residual impact to occupational health and safety during operations will be of average intensity, specific extent and medium duration. It will therefore be of medium significance.

✓ *On employment and income and the economy*

To enhance the positive impacts on employment, income and the economy, the measures to be implemented are:

- Prioritisation of local labour in recruitment, particularly for unskilled positions;
- Prioritisation of local companies and firms in the context of sub-contracting;
- Enhancement of local procurement opportunities for the providers of local goods and services;
- Regular payment of taxes and fees.

The residual positive impact to employment, income and the economy, both directly and indirectly, during operations will be of high intensity, regional extent and medium duration. It will therefore be of major positive significance.

✓ *On noise and vibration*

The impacts of the project on the noise and vibration environment will be mitigated by the following measures that will be implemented:

- Careful blast design during portal and ramp development to reduce noise and blast impacts;
- Noise monitoring;
- Monitoring of the sound environment at sensitive receptors;
- Installation of silencers at the level of machinery exhausts;
- Maintenance of equipment in accordance with manufacturers' recommendations.

The residual impact to noise and vibration during operations will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On pastoral activities*

During the exploitation phase, the impacts of the project on pastoral activities will be limited to the exclusion of grazing animals from the fenced areas around key installations (mine camp, plant, mine portal and waste management areas). An area of 2 ha has been used to estimate maximum effects to grazing access, within which areas proximal to surface infrastructure will be fenced. These effects will be mitigated through, the construction of pastoral works for the benefit of local communities in terms of improved irrigation and access to water, to increase the amount of fodder crops that can be grown to support the grazing herds and compensate for reduced access. In addition, a Livestock Food Bank (LFB) will be set up to benefit local communities. Also, the following measures will be implemented:

- Proper management of the waste (mine waste, hazardous waste and general waste) that will be generated;
- Setting up a monitoring system of leading and lagging indicators;

- Ongoing education and awareness around the exclusion zone;
- Training in agricultural techniques to maximise fodder crop yields and ways of harvesting and storing fodder;
- Raising drivers' awareness of the need to comply with the provisions of the highway code.

The residual impact to grazing during operations will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On traditions and customs*

In order to avoid the degradation of the traditions and customs of the local populations, the measure that will be implemented will consist of raising the awareness of workers, including those of subcontractors, about respecting the traditions and practices of the local communities. Support to cultural activities may also be considered by the mine.

The residual impact to traditions and customs during operations will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On cultural and archaeological heritage*

To mitigate impacts on cultural and archaeological heritage, the following measures will be implemented:

- Awareness raising on the respect of cultural and archaeological heritage in the project area;
- Establish an incidental findings procedure and train staff on how to recognise, deal with and respond to incidental findings.

The residual impact to cultural heritage and archaeology during operations will be of low intensity, specific extent and medium duration. It will therefore be of minor significance.

6.3. Measures during the closure phase

6.3.1. On the biophysical environment

✓ *On the soil*

On closure, soils that have been stockpiled will be spread on reclaimed areas as infrastructure is removed or made safe (tailings and waste rock storage). This should result in a minor positive impact as the soils are vegetated and support improved soil fauna, increase biodiversity and act as a carbon sink. To mitigate the risks of loss of soils and degradation of the soil structure and its pollution by the solid and liquid waste that will be generated, the following measures will be implemented:

- Soil handling techniques implemented to minimise damage during site restoration;
- Rapid revegetation of placed soils to reduce erosion;
- Integration of suitable slope design and drainage features in the closure design to minimise runoff and erosion;
- Implementation of the closure plan and associated aftercare;

- Limitation of work to rights of way;
- Appropriate management of the waste that will be generated and maintenance of machinery in good condition to avoid oil and hydrocarbon leaks.

The positive residual impact to soils during closure will be of low intensity, local extent and medium duration. It will therefore be of medium positive significance.

✓ *On the air*

Once operations have ceased and the site has been restored, there should be limited ongoing sources of air pollution and these will be limited to dust and particulate matter. There will be no ongoing sources of gaseous emissions unless the site is repurposed for other industrial uses. In order to mitigate the deterioration of ambient air quality during the dismantling of the installations and the restoration of the sites, the following measures will be implemented:

- Watering of roads and sites during demolition;
- Careful stockpiling of materials for disposal and/or recycling;
- Implementing speed limit guidelines to reduce dusting;
- Use of equipment that meets the required emission standards and regular maintenance;
- Implementation of closure plan to include rapid vegetation or covering of areas prone to dust entrainment (such as materials transfer points, TSF etc).

The positive residual impact to air quality during closure will be of low intensity, local extent and medium duration. It will therefore be of medium positive significance.

✓ *On the water*

At closure, dewatering pumping will cease and the groundwater level in the affected deep aquifers will gradually rebound. These are hydraulically separate from the shallow aquifer which is used by the local population, and there is no surface expression of these deep aquifers. Therefore, impacts of aquifer rebound will be very limited. Cessation of dewatering will mean that additional water (for communities and agriculture) might no longer be available, unless alternative pumping arrangements are made (for example, installing and equipping a deep well for ongoing use). The measures that will be carried out to mitigate the impacts of the works on water resources are:

- Maintain equipment in good working order to avoid oil and hydrocarbon leaks;
- Completion of the redevelopment works in accordance with the standards to avoid the risk of water contamination
- Establish post closure monitoring of water levels, yields and qualities at key locations.

The residual impact to groundwater during and after closure is expected to be of low intensity, local extent and long duration. It will therefore be of medium significance.

✓ *On wildlife*

During closure activities, the measures that will be implemented to mitigate the impacts on wildlife are listed below. Once closure is complete, it is anticipated that, in the absence of increased hunting pressures from local communities, populations of fauna may increase in the area as there will be an increase in the area of seminatural habitat (revegetation). On the other hand, reduced water availability (on cessation of pumping) might counteract this.

- Raising awareness of workers, including drivers, on the importance of wildlife protection;
- Strict ban on poaching.

The residual impact to wildlife during and after closure is expected to be of low intensity, local extent and long duration. It will therefore be of medium significance.

✓ *On flora*

During the closure phase, the Closure Plan will be implemented which will involved the clearance of the site, reinstatement of soils and seeding or planting with local, self sustaining species which will help to stabilize soils and slopes and provide additional habitat for local fauna. Measures that will continue to be implemented are

- Raising awareness among the wider workforce and local communities about environmental protection and the conservation of certain plant species considered "rare", protected, vulnerable or threatened;
- Continue to implement an invasive species management plan and remove and destroy plants that threaten local habitats;

The residual positive impact to flora during closure will be of low intensity, specific extent and long duration. It will therefore be of minor positive significance.

6.3.2. On the human environment

✓ *On the landscape*

At closure, the visual quality of the landscape will be affected by the implementation of the closure plan, which will aim to integrate elements of the mine infrastructure which remain into the surrounding landscape and its features. The measures that will be implemented during this phase are:

- Rehabilitation of disturbed sites;
- If appropriate, planting tree or bush screens around some features;
- Adequate management of the solid waste that will be generated in order to avoid its erosion, including battering slopes to echo landscape features.

The residual impact to landscape during closure will be of low intensity, specific extent and long duration. It will therefore be of minor significance.

✓ *On safety and health*

During closure activities, the risks of exposure to dangerous conditions and hazardous materials will be elevated due to non routine activities taking place. To mitigate the impacts on the safety and health of workers and the surrounding population, the following measures will be implemented:

- Providing workers with adequate PPE and making it mandatory to wear it;

- Raising awareness of the main risks on the site;
- Staffing of medical clinic;
- Implementation of safety instructions;
- Daily organisation of the safety minute before the start of the work;
- Proper management of the waste that will be generated;
- Watering of the site to reduce dust;
- Dosimetric monitoring of workers.

Once closure is complete, the residual impacts to health and safety are expected to be of low intensity, local extent and long duration. It will therefore be of medium significance.

✓ *On employment and income and the economy*

To mitigate the loss of jobs and income associated with the closure, the measure that will be implemented is a study on the retraining of workers in other occupations. This may be expected to identify a range of transferrable skills that workers have that could increase their chances of employment in other industries, or in setting up their own businesses. A programme of demobilization, identifying and delivering training requirements, is likely to be implemented. The Closure Plan, which will be reviewed and updated regularly during operations (at least every 5 years and 3 years before planned closure) will include consideration of the social aspects of closure, both in terms of direct workers, indirect livelihoods and associated communities (those with a high proportion of workers or suppliers of goods and services) to ensure that the impacts of closure are mitigated as far as possible.

The residual impact to employment, income and the economy during and after closure is expected to be of medium intensity, regional extent and medium duration. It will therefore be of medium significance.

✓ *On noise and vibration*

In order to mitigate the change in the noise and vibration environment during the dismantling of the installations, the measures that will be implemented is the use of machinery in good working order and monitoring of the noise environment. On completion of closure, there will be no ongoing sources of noise or vibration, so in the absence of new industrial development close by, the baseline conditions will be achieved once more.

The residual impacts to noise after closure is expected to be of low intensity, specific extent and long duration. It will therefore be of minor significance.

✓ *On pastoral activities*

During the closure phase, the impacts of the project on pastoral activities will continue to be limited to the exclusion of grazing animals from any remaining fenced areas around key installations. The mitigation measures put in place during operations to mitigate the effects of exclusion should continue into closure, as far as possible. This might mean maintaining irrigation and access to water, to maintain the amount of fodder crops that can be grown to support the grazing herds. The Livestock Food Bank (LFB) should be designed to be self supporting so that it can continue into closure to benefit local communities.

The residual impact to grazing during closure will be of low intensity, local extent and medium duration. It will therefore be of medium significance.

✓ *On traditions and customs*

In order to avoid the degradation of traditions and customs, the measures that will be implemented is the sensitisation of workers to respect the practices and customs of local communities. Cultural aspects will be considered in the Closure Plan, which will be developed in conjunction with the local communities. Once closure has been implemented, there will be no ongoing impacts to traditions and customs.

The residual impact to traditions and customs after closure is expected to be of low intensity, specific extent and long duration. It will therefore be of minor significance.

✓ *On cultural and archaeological heritage*

The impact on cultural and archaeological heritage during this phase is the collection of objects by workers or community members in case of chance finds. To avoid this impact, the measure that will be implemented is to raise awareness of the importance of heritage and to apply the provisions of the procedures in the event of chance finds.

On closure, there will be no ongoing impacts.

6.3.3. Summary of impacts and measures

Table 52 below summarizes pre and post mitigation impact ratings. Note the Impact Assessment Grid (Table 49) above does not allow for low ratings for anything other than short duration, low intensity, one off impacts. Therefore, elimination of an impact through mitigation measures (or on closure) will still rank as medium. This means that even with mitigation measures, applied, the impact rating does not often change.

Table 52 Summary of Impacts through Project Phases

Valued environmental and social component	Construction		Operation		Closure	
	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated
Physical elements						
Soil	Medium	Medium	Medium	Medium	Minor	Medium +
Air	Medium	Medium	Medium	Medium	Medium	Medium +
Water	Medium	Medium	Medium	Medium	Medium	Medium
Wildlife	Medium	Medium	Medium	Medium	Medium +	Medium+
Flora	Medium	Minor	Medium	Medium	Major +	Major +
Human elements						
Landscape	Minor	Minor	Medium	Medium	Medium +	Medium +
Health & Safety	Medium	Medium	Medium	Medium	Medium	Medium
Economy	Major +	Major +	Major +	Major +	Major	Medium
Noise & vibration	Medium	Minor	Medium	Medium	Medium +	Medium +
Pastoral	Medium	Medium	Medium	Medium	Minor +	Minor +
Traditions	Minor	Minor	Medium	Medium	Minor	Minor
Archaeology	Minor	Minor	Medium	Minor	Minor	None

Table 53 below provides a summary of the impacts and mitigation and/or enhancement measures for the Adrar Emoles 3 exploration license.

Table 53 Summary of impacts and mitigation and/or enhancement measures

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
Preparation and construction	Soil	Disturbance of its soil structure, change of topography and exposure to erosion	Respecting the rights of way of the works
			Restoration of all disturbed sites at the end of the works
			Raising awareness of drivers on the strict respect of traffic lanes
		Pollution/contamination from solid and liquid waste and from leaking oil and hydrocarbons from machinery	Implementation of an emergency plan for oil spills and leaks
			Establishment of a management system for the waste that will be generated during the works
			Installation of watertight platforms to ensure the storage and distribution of hydrocarbons and the maintenance of equipment
	Air	Changes in ambient air quality due to pollutant emissions	Suspension of work in case of strong winds
			Dust suppression by spraying the site whenever necessary
			Covering of trucks transporting construction materials
			Maintenance of fixed and mobile equipment in good working order
			Limiting the speed of machinery
	Water (surface and groundwater)	Water consumption and declining potential	Raising awareness of water efficiency among workers
		Modification of the natural drainage system	Respecting the topography of the land during the works and restoring disturbed sites to avoid the risk of altering the drainage system
		Risks of contamination/pollution from the solid and liquid waste that will be generated and from oil and hydrocarbon leaks from machinery	Establishment of an effective management system for the solid and liquid waste that will be generated
			Implementation of an emergency plan (PU) for oil and hydrocarbon spills and leaks
			Installation of watertight platforms to ensure the storage and distribution of hydrocarbons
			Establishment of a watertight platform for the storage of used oils before their evacuation from the work site
	Wildlife	Destruction of habitats and disturbance of wildlife tranquillity	Raising awareness of the importance of wildlife among workers
			Respect for wildlife habitats during construction
			Restoration of sites disturbed during the works

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
		Risk of poaching (harvesting).	Prohibition of all forms of poaching
	Flora	Destruction of vegetation and disruption of photosynthesis	Inventory of trees that will be cut on the sites during the works
			Payment of the slaughter tax
			Strict adherence to the work area in order to limit the destruction of vegetation
			Raising awareness among workers on the need to conserve plant species considered 'rare', protected, vulnerable or threatened
			Planting and compensatory seeding
	Landscape	Changes in the visual quality of the landscape	Restoration of any disturbed sites after the works
			Setting up a good organisation of the site
			Establishment of a solid and liquid waste management system
	Safety and health	Risk of accidents and physical injury	Providing workers with appropriate Personal Protective Equipment (PPE)
			Provision of collective protective equipment (CPE) to sites
			Establishment of an infirmary at the life base
			Setting up first-aid boxes on the construction site
			Organisation of a safety minute at each workstation before the start of the work
			Putting up signs and safety instructions and posters at the work sites
			Establishment of an Occupational Health and Safety Committee and its training to make it operational
		Risks of respiratory diseases	Raising awareness of the risks associated with respiratory diseases
			Regular watering where necessary to reduce dust generation
		Risks of sexually transmitted diseases	Awareness of STI/HIV/AIDS risks among workers extended to local communities
		Risks of exposure to thermal environments	Staffing of workers with appropriate seasonal clothing
		Explosion and fire hazards	Setting up an Internal Operation Plan (IOP)
		Risks of noise-related diseases	Equipping workers with anti-noise kits

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
		Risks of low back pain	Use of mechanical handling aids (hand truck, trolley, etc.) wherever necessary to reduce ergonomic risks
			Creation of good working conditions in the offices, including adapted chairs
		Risks of biological contamination	Provision of sufficient and appropriate toilets for employees and their awareness of hygiene and sanitation
		Risk of COVID-19 contamination	Establishment of a COVID-19 protocol and awareness-raising among workers and local communities about this disease
		Risk of tension/conflict between local people and workers	Setting up a consultation framework for the project
	Employment, income and the economy	Job creation, income improvement	Prioritisation of local labour in recruitment
			Prioritisation of local companies in subcontracting
		Improving local and national tax revenues and developing the local, regional and national economy	Regular payment of the extraction tax on loans to the communes concerned and of the surface fee to the State
	Sound and vibration	Changes in the sound environment and vibrations	Maintaining equipment in good working order
			Prohibition of work at night and during rest hours
	Pastoral activities	• Limiting access to fodder resources • Destruction and reduction of forage potential • Fodder contamination from waste and leaking oils and hydrocarbons	Carrying out the CES/DRS actions accompanied by the seeding of herbaceous plants. This will allow to compensate the possible losses linked to the destruction of the vegetation
			Support to pastoralists through the provision of Livestock Feed Banks
			Construction of hydraulic structures
	Uses and customs	Potential risks of degradation of local traditions and customs	Raising awareness of the company's workers and subcontractors about respecting the traditional practices, customs and traditions of local populations.
	Cultural and archaeological heritage	Risks of total or partial destruction or damage	Training and awareness-raising of the company's workers and employees on the respect and preservation of the identified heritage
			Immediately inform the administration and/or the competent authorities of any archaeological finds

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
		Collection of objects (especially in the case of chance finds) in disregard of the legal provisions in force in this Area	Strict prohibition on the collection of archaeological objects on the project sites during the works
Operation	Soil	Changes in soil structure and exposure to wind and water erosion	Development of a site redevelopment plan
			Rehabilitation of sites, particularly of mined loans
		o Pollution/contamination from solid and liquid waste that will be generated, oil and hydrocarbon leaks from machinery, inadequate storage of inputs o Risks of radiological contamination	Establishment of a solid and liquid waste management system through the SMP to be developed for this purpose
			Implementation of spill management procedures
			Establish preventive maintenance programmes to regularly maintain all machinery and equipment that use or contain hazardous materials (including fuel, oil, etc.) in good condition
			Regular inspection and maintenance of ponds
			Monitoring of soil physicochemical parameters
	Air	Changes in ambient air quality	Implementation of speed limit guidelines to reduce dust (coarse and fine)
			Development of dust mapping and a Dust Management Plan (including all abatement options and protective measures)
			Watering of runways and other dusty areas
			Restriction of machinery traffic to appropriate areas
			Use of equipment that meets emission standards
			Periodic maintenance of machinery
			Air quality monitoring
	Water (surface and groundwater)	Risk of lowering of groundwater levels	Raising awareness on water efficiency to reduce water waste
		Water pollution/contamination	Set up a wastewater treatment system and monitor it through bacteriological analyses
			Monitoring the stability of structures such as ponds to detect possible failures and avoid water contamination

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
			Installation of HDPE at the bottom of the effluent storage ponds and securing them to avoid the risks of soil and water pollution and animal incursion respectively
			Monitoring of water quality in and around the project area
	Wildlife	Destruction of fauna and its habitats (soil and vegetation) and disturbance of its tranquility	Raising awareness of the importance of wildlife among workers
			Carrying out CES/DRS actions with seeding to improve wildlife habitat
		Risk of poaching	Strict ban on poaching
		Risks of falling into ponds and mortality	Setting up a passive and active monitoring system for ponds
		Risk of wildlife poisoning from the waste that will be generated	Development and implementation of a waste and hazardous materials management plan
	Flora	Destruction of vegetation	Survey of trees to be felled and payment of the felling fee
			Raising awareness among the wider workforce and local communities about environmental protection and the conservation of certain plant species considered "rare", protected, vulnerable or threatened
			Respecting the rights of way of the works, particularly in the context of the construction of new ponds
			Implementation of land restoration actions
		Disruption of photosynthesis	Regular watering of sites to reduce dust generation
	Landscape	Changes in the visual quality of the landscape	Rehabilitation of disturbed sites
			Adequate management of solid waste that will be generated in order to avoid its dispersion in the environment of the area
	Safety and health	Risk of accidents and injuries	Staffing of workers with PPE and EPC sites
			Establishment of an Internal Operation Plan (IOP) at the site
			Establishment of a chemical management procedure
		Risks of illness (respiratory, STI/HIV/AIDS, biological contamination, radiological contamination, poisoning, low back pain, etc.) and drowning	Awareness raising of workers on the risks associated with the project including the various diseases
			Regular watering to limit dust generation
			Covering of the conveyor belt to reduce dust

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
			Air-conditioning of machine cabs in order to keep them closed during work and thus avoid exposure of drivers to dust
			Health monitoring of workers through annual medical check-ups
			Dosimetric monitoring of workers exposed to radioactive environments
	Employment, income and the economy	Job creation, income improvement	Prioritisation of local labour in recruitment, particularly for unskilled positions
			Prioritisation of local companies and businesses in the context of subcontracting
		Improvement of tax revenues through the payment of various taxes and fees and the development of small-scale trade in favour of the local economy	Regular payment of taxes and fees
	Sound and vibration	Change in noise and vibration	Development of noise mapping
			Monitoring of the sound environment
			Installation of mufflers on machinery exhausts
			Maintenance of equipment in accordance with manufacturers' recommendations
	Pastoral activities	Destruction and reduction of forage potential	Implementation of environmental restoration actions
			Construction of pastoral works for local communities
			Endowment of the Livestock Feed Bank (LFB).
		Risks of contamination/intoxication of animals	Proper management of the waste that will be generated
		Risk of falling into effluent ponds and animal mortality	Setting up a passive and active monitoring system
		Risks of traffic accidents involving machinery and vehicles that may impact animals	Raising drivers' awareness of compliance with the provisions of the highway code
	Uses and customs	Risks of degradation of the traditions and customs of local populations	Raising awareness of workers, including those of subcontractors, about respecting the customs and practices of local communities
	Cultural and archaeological heritage	Risk of damage or destruction of heritage and collection of objects in case of accidental discovery	Awareness raising on the respect of cultural and archaeological heritage in the project area

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
			Establish an incidental findings procedure and train staff on how to recognise, deal with and respond to incidental findings
Closing	Soil	Changes in soil structure	Site restoration
			Limitation of work to rights of way
		Risks of soil contamination from the solid and liquid waste that will be generated	Appropriate management of the waste that will be generated and maintenance of machinery in good condition to avoid oil and hydrocarbon leaks
		Risks of radiological contamination	Soil quality monitoring
	Air	Alteration of ambient air quality	Watering of roads and sites during construction
			Implementing speed limit guidelines to reduce dusting
			Use of equipment that meets the required emission standards and regular maintenance
	Water (surface and groundwater)	Risk of water contamination	Maintain equipment in good working order to avoid oil and hydrocarbon leaks
			Redevelopment work carried out in accordance with standards to avoid the risk of water contamination
	Wildlife	Risk of disturbance to wildlife and its habitat	Raising awareness of workers, including drivers, on the importance of wildlife protection
			Strict ban on poaching
	Safety and health	o Risk of accidents and injuries o Risks of respiratory diseases o Risks of radiological contamination o Risk of biological contamination	Providing workers with adequate PPE and making it mandatory to wear it
			Raising workers' awareness of the main risks on the site
			Staffing of medicine chest sites
			Implementation of safety instructions
			Daily organisation of minute security before the start of the work
			Proper management of the waste that will be generated
			Watering of the site to reduce dust generation
			Dosimetric monitoring of workers
	Employment, income and the economy	Loss of jobs and income	Study on the retraining of workers in other occupations

PROJECT PHASES	COMPONENTS IMPACTS	IMPACTS	IMPACT MITIGATION AND/OR ENHANCEMENT MEASURES
	Sound and vibration	Changes in the sound environment and vibrations	Use of machinery in good working order and monitoring of the noise environment
	Uses and customs	Risks of not respecting the traditions and customs of local communities	Raising workers' awareness of the need to respect the practices and customs of local communities.
	Cultural and archaeological heritage	Risk of collection of objects in case of accidental discovery	Raising awareness of the importance of heritage and the application of the provisions of the procedures in case of accidental discoveries.

6.3.4. Cumulative Impacts

This section details the cumulative impacts identified for the Dasa Project. It considers "*cumulative impacts of the project in combination with impacts from other relevant past, present and reasonably foreseeable developments as well as unplanned but predictable activities enabled by the project that may occur later or at a different location."*

Many environmental and social management challenges arise as a result of cumulative impacts from several activities, either project related, other projects, or by third parties. Individually, these impacts are typically insignificant however, cumulatively they can have regional or even global repercussions[5].

Cumulative impacts can be both positive and negative and can vary in intensity as well as spatial and temporal extent. The section identifies projects and activities potentially leading to cumulative impacts, and then assesses the magnitude of the impact on identified receptors.

The Cumulative Impact Assessment (CIA) has drawn on the baseline data and impact assessment undertaken for all environmental and social disciplines as well as data gathered during site visits and consultations undertaken. Other projects that are active, planned or proposed have been considered and their operations assessed to determine the potential shared environmental and social receptors with the Dasa Project. Environmental and Social Receptors used in this CIA, includes the following:

- Physical features, habitats, wildlife populations;
- Ecosystem services;
- Natural processes;
- Social conditions; and
- Cultural aspects.

The study areas and project affected areas identified in this ESIA for different environmental and social topics were used to define the limits for cumulative impacts. Existing baseline conditions, as described in this document, were used to inform the CIA.

An assessment has been undertaken to evaluate whether the Project would interact with other planned developments that would lead to cumulative impacts. For this CIA, the assessment considers the residual impacts arising from the Project, according to section 6.2 – 6.4, which could contribute to cumulative effects.

Other active Projects in the region have been identified and shared environmental and social receptors reviewed, see Table below.

[5] IFC Good Practice Handbook on Cumulative Impact Assessment: http://www.ifc.org/wps/wcm/connect/3aebf50041c11f8383ba8700caa2aa08/IFC_GoodPracticeHandbook_CumulativeImpactAssessment.pdf?MOD=AJPERES

Table 54 Summary of Neighboring Projects

Project	Description	Environmental and Social Receptors
Cominak Mine	Underground uranium mine located close to the town of Arlit, approximately 110km north of Dasa. The mine is currently owned by Orano, who closed the mine on 31 Mar 2021. The underground mine had operated since 1978 and is now in the closure phase, which focuses on technical issues, employees and affected communities. Closure is expected to occur over 11 years, with a 5 year environmental monitoring phase to follow.	Economically active population and job seekers in Niger, supply chain.
Somair Uranium Mine	Open pit uranium mine, owned by Orano, also near Arlit, around 110km from Dasa. Began operating in 1971 and predicted to continue producing until at least 2035.	Economically active population, local suppliers of goods and services.
Imouaren project	Located about 50 miles south of Arlit and about 100 miles north of Agadez, this deposit, discovered in 1966, contains one of the largest reserves in the world. Following a feasibility study completed at the end of 2007, Orano was awarded an operating permit to mine the deposit in early 2009. However, since 2015, the work to bring the site into production has been suspended and the site has been put "under wraps", pending more favourable market conditions. Annual production capacity of 5,000 tons and lifespan of 35 years.	Economically active population, surrounding environment, supply chain providers
Madouela project	Owned by Goviex, the Project is situated in the Agadez region in the northern part of the Republic of Niger around 10km south-east of Arlit. Feasibility Study released in September 2022, for a mine with a life of 19 years. An open pit will be followed by two separate underground operations.	Economically active population and job seekers in Niger, surrounding environment, supply chain

Project	Description	Environmental and Social Receptors
	Molybdenum may be produced as a by-product.	
Sonichar coal mine and power station	Located around 80km to the south of Dasa, the open pit coal mine is around 2km from the power station. The principal consumers have been the Cominak and Somair mines in Arlit. The mine, in operation since 1980, uses borehole water from 30km away for cooling. Water is also reticulated to Tchirozerine but not surrounding villages. Water from the mine and plant are discharged to the environment without treatment; effluents show very high levels of sulphates, aluminium, iron, manganese, nickel and selenium. It is not known if the power plant has any pollution control measures on stack emissions.	Economically active population, surrounding environment, supply chain

Cumulative Impacts are shown in the Table below with receptors identified and the spatial and temporal extend of the impact shown. These are further described in the following sections.

Table 55 Summary of impacts, Receptors, Spatial & Temporal Extent

Impact	**Receptors and Spatial Extent**	**Temporal Extent**
Environmental pollution (air quality, noise)	Local and regional area, key communities (Arlit, Tchirozerine)	Mid-term (construction and operational phase)
Impacts to water resources	No permanent surface water courses in the area but should all projects come on stream at the same time, there may be regional effects on groundwater flow. These are thought to be influenced by the Aïr Massif to the east of all the projects. All mines are located in the Niger river catchment.	Mid-long term (Construction, operation, closure and post-closure)
Impacts to Biodiversity	While impacts on vegetation is localised, some of the animal species of conservation concern identified as being present in the Dasa areas have huge ranges which could also include the other mines. Further assessment to the nearby protected area, namely the Aïr massif, may be required.	Long term (construction, operation, closure and post-closure)
Greenhouse Gas Emissions and Climate Change	National and Global reaches.	Long term
Socioeconomics and Employment	Local, regional and national levels of receptors. The extent of these impacts could cover Agadez region as well as more widely in Niger.	Long term
Accommodation	Arlit region, particularly for workers moving to the area to find jobs.	Mid-long term (construction, operation)
Tourism Industry	Potential rejuvenation of tourism to the cultural heritage sites (e.g. the Dabbous giraffe) and Aïr mountains	Long term

Impact	Receptors and Spatial Extent	Temporal Extent
Community Health, Safety and Human Rights	Vulnerable groups, key community members and existing residents located in surrounding villages and towns.	Mid-long term (construction, operation)
Road Traffic Network	Main route RN24 from Arlit to Agadez, particularly the northern stretch. Increased risk of RTAs, noise and air pollution.	Mid-term (construction and operation)
Ecosystem services	Increased population pressures on habitats, water resources, soils and grazing. Habitats might become degraded or destroyed in order to graze more animals or grow more crops.	Mid-long term (construction, operation)
Social structures	Increased economic activity might result in induced migration, where job seekers from elsewhere in Niger or neighbouring countries travel to find work and find lodgings in local communities. Alternatively, young people might move away from rural areas to the nearby towns to find work and better living conditions.	Mid-long term (construction, operation)

6.3.5. Management and Mitigation of cumulative impacts

The Dasa Project is relatively remote with limited industry in the region. As such, the cumulative impacts associated with the Project are not expected to significantly hinder either the development of the Project itself or other planned or ongoing Projects in the region.

Supply chain development and local procurement is an aspect supported by Global Atomic, who have committed to working with local businesses and services to strengthen their offering in the region. Again, this would have beneficial impacts to other industries and operations in the area.

Management and mitigation for cumulative impacts will be covered in topic specific management plans and the Environmental and Social Management System (ESMS). Specific requirements regarding cumulative impacts will be considered within the Biodiversity Management Plan (BMP), Water Management Plan and the Conceptual Mine Closure Plan. The BMP is a live document and will be monitored and updated annually. Should additional impacts be identified that require offsets, these will need to be considered within the BMP.

The Conceptual mine closure plan considers the retrenchment of employees; as part of this a capacity building and training programme is considered. This will provide not only benefits to employees themselves but all to other developments and industries in the region.

The Stakeholder Engagement Plan includes for consultation with local, regional and national authourites. As part of this ongoing consultation GAC personnel will need to consider proposed and planned future projects that may arise during the life of the mine. Both the impact of these Projects on the Dasa Project, as well as any potential obstacles the Dasa Project might pose to future operations will need consideration. GAC will work with legal institutions to ensure a mutually beneficial future for both the Dasa Project and the local area.

6.4. Community Engagement & Support

Global Atomic has been engaging with local communities since their arrival in the area in 2007. Initiatives generally consist of informal engagement with village elders and is ongoing.

Formal consultation engagement undertaken as part of the 2020 ESIA took the form of a series of meetings in the communities around the project area, including Tagaza, *Agatara*, Issakanan, *Sikiret/Tadant*, Oufound, *Mizeine*, *Ghalab*, the *Kelezeret Tribe* and Inolamane.

Environmental concerns noted included potential effects of uranium mining, contamination of the food chain, human and animal health risks; occupation and loss of pastoral areas and crop lands, destruction of vegetation and loss of wildlife habitat; impacts to water resources, management of waste from the mining operations and restoration and rehabilitation of the mine.

Social concerns included population displacement, marginalization of local communities, the security of cultural and tourist sites, employment opportunities for young people from the local communities and management of labour risks.

Community development concerns included youth training and jobs for young people (8 villages each), a water well (7 villages), sanitation (6 villages), construction of a health post (4 villages), market gardening (3 villages), business opportunities and a food bank (2 villages each) and support for animal health and protection of the koris (1 village each).

The consultations assisted GAC in selecting initial priority projects that will be monitored on a regular basis as the project moves into the construction and operations phases (See section below)

Additional consultation took place around the 2022 ESIA, focussing on the villages of Issakanan, Inolamane, Tagaza, *Temil Daabous*, *Eghatrak, Galelo*, Oufoud and *Gados*. Village names in *italics* were consulted in either 2020 or 2022, not both. (Village names in normal font were consulted twice). The 2022 engagement also include the Governorate, the Regional Council, the Regional Director of Mines, the Regional Directorate for the Environment and the Fight against Desertification, the Regional Directorate for the Advancement of Women and Child Protection, the Regional Directorate of Hydraulics and Sanitation, the Regional Labour Inspectorate, and the Regional Directorate of Livestock.

At Departmental level, the Town Hall and the Prefecture as well as the villages listed above were consulted. These consultations resulted in a list of concerns regarding the project, many of which are addressed by the impact assessment and associated mitigation measures and Management Plans, and a list of development goals for their areas of jurisdiction. In many cases, these are basic infrastructure needs that are more commonly provided by the state, such as electricity, health care and access to water. All villages consulted in 2022 requested a health centre and local recruitment. Four villages requested water supply or reticulation, and three villages requested a livestock feedbank, mobile phone coverage and **'**classes in final materials'. Two villages asked for a vaccination programme, electricity supply, the avoidance of the use of toxic materials at the mine site, and one village asked for local procurement and one for 'care of students'. These issues are similar to those identified by different villages in 2020 (summarised above).

The comments received have been reviewed and, along with the previous and ongoing consultations, have been used to develop current community support programs which cover the following areas:

- Food security
- Medical support
- Infrastructure
- Local business support/procurement
- Regional and national procurement

The sectors which have received support since 2007 are detailed in Table 56 below. To date, education and training has been limited to employees of the project and annual contributions to the Ministry of Mines for the training of Ministry employees.

Additional future development support will be delivered in partnership with NGOs currently active in country and will provide targeted benefits to women including enhanced irrigation, training and support of existing market gardening initiatives, support for development of goods and services related to workers apparel and PPE and associated education, training, and mentoring programs.

Table 56 also indicates anticipated increased levels of support and new programs during the construction and underground development phases in the period 2022-2024.

As the project ramps up into commercial operations, the Corporate Social Responsibility contributions will be reviewed with reference to the success of projects to date and priorities identified in consultation with communities, including those referenced above and summarised in the Stakeholder Engagement Plan (Appendix 8, Sect 4.4 Summary Of The Results Of The Public Consultations).

Table 56 Summary of CSR / ESG Engagement since 2008

Global Atomic Corp - CSR / ESG	Exploration														Construction		Ops
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Food																	
millet			x					x						x	x	x	x
sugar	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
rice			x					x						x	x	x	x
Medical																	
ambulance												x					
supplies												x		x	x	x	x
food												x		x	x	x	x
covid													x	x			
Infrastructures																	
roads					x									x	x	x	x
water well - local / nomadic herding			x											x		x	x
water well - Camps / community use					x	x					x		x		x	x	x
water well - farming support													x		x	x	x
Environment																	
EIS and baseline studies / inventory		x	x										x	x	x	x	x
project area inventory													x	x	x	x	x
re-vegetation initiatives														x	x	x	x
mitigation programs																x	x
Education / Training																	
education - exploration			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
training - exploration			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Mining – training / apprenticeship															x	x	x
Environment – training														x	x	x	x
Agriculture – training / support																x	x
Local Business Support / Procurement																	
agriculture														x	x	x	x
food services														x	x	x	x
micro business - community			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
camp supply				x	x	x	x	x	x	x	x	x	x	x	x	x	x
Regional / National procurement																	
exploration drilling			x	x	x	x	x	x			x		x	x	x		x
road work					x									x	x	x	x
camp site development					x	x	x	x	x	x	x	x	x	x	x	x	x
Food services			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
water wells install / maintain					x	x	x	x	x	x	x	x	x	x	x	x	x
camp security - regional / federal					x	x	x	x	x	x	x	x	x	x	x	x	x
ppp - solar farm																	x

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) is a management tool that defines the operational arrangements for implementing the proposed measures. It describes the measures required to prevent, minimise, mitigate or compensate for negative environmental and social impacts or to enhance positive impacts.

Thus, this ESMP, developed within the framework of the Adrar Emoles 3 exploration permit, is structured around the:

- impact mitigation and/or enhancement programme;
- environmental monitoring programme;
- environmental inspection programme;
- capacity building programme for stakeholders.

7.1. Impact mitigation and/or enhancement programme

This programme sets out all the measures to be implemented to mitigate and/or enhance, as appropriate, the impacts of the project. It describes the following elements:

- the elements of the environment that may be affected;
- potential impacts of the project;
- impact mitigation and enhancement measures;
- those responsible for implementing the measures;
- implementation indicators;
- the costs of implementing the measures.

The following table 57 constitutes the mitigation and/or enhancement programme for the project. This is the version which has been agreed with the Government in December 2020 and represents the minimum in terms of environmental management practices, monitoring and inspections.

Table 57 Impact mitigation and/or enhancement programme

Activities/Impact Sources	Components of the affected environment	Potential impacts	Mitigation and/or bonus measures	Execution manager	Implementation indicator	Cost in FCFA
• Preparation, stripping, earthmoving and site clean-up work, • The extraction of building materials • Traffic of machinery and trucks; • The use of machinery and machinery, • Degradation of pastoral paths, • Consumption energy	Air	Altered air quality by dust and gas particles	Putting in place speed limits; Watering the tracks and areas of dusty work; Limiting the movement of vehicles and machinery to the tracks and right-of-way works Use of standard-meet equipment; Equipment and vehicle checks Implementation of an Air Quality Management Plan; Stopping all construction equipment when they are not in service.	**Global Atomic Fuels corporation**	Traffic regulations published Work schedule available Maintenance sheet for vehicles and vehicles Level of Dust Fallout Level suspended particles (PM10, PM2.5, TSP...) NO2 and SO2 level in the air Suspended particle level (PM10, PM2.5, TSP...)	*Environmental and Social Clauses*
		Contributing to change Climate	Conduct an awareness campaign among the project's workforce regarding energy management		Level of reduction in electricity consumption	*Environmental and Social Clauses*
• Cutting down trees and shrubs • Use of heavy machinery	Ground	Changing the structure and texture,	Restricting deforestation and stripping activities to necessary right-of-way;		Site Rehabilitation Report or Minutes	*Environmental and Social Clauses*

• Machinery and vehicle traffic • Use of petroleum products, • Production and management of site waste		Soil compaction; Erosion, contamination and/or pollution	Simultaneous rehabilitation of temporary structures and right-of-way areas used; Restricting vehicle traffic; Preventive maintenance of vehicles and machinery; Establishing an appropriate waste management system; Setting up a watertight platform for storing petroleum, chemical and construction waste Implementation of an emergency plan and clean-up equipment		Waterproof areas for washing/maintenance and for petroleum product depots; Operational waste collection and management system; Traffic procedure available for vehicles and construction equipment Visual observation made on the site during visits by competent service officers or rehabilitated area Waste Management Report Waste Tracking Sheet Availability of decontamination kits; Erosion control procedures.	
• Clearing and clearing of land, • Production and management of solid and liquid construction waste), • Accidental releases of oils from machines	Water	Disruption of hydrological regime Risk of contamination and water pollution Lower level of tablecloths	Waterproofing of washing and/or maintenance areas and depots of petroleum products equipped with retention bowls with drainage system; Preventive maintenance of equipment; Collection and orientation by embankments and/or channels of		Waterproof areas for washing/maintenance and for petroleum product depots; Waterproof tank Operational waste collection and management system Results of analysis	*Environmental and Social Clauses*

• Water consumption			sediment-laden runoff to dedicated control infrastructure; Establishing an appropriate system for managing site waste; Removal of solids deposited in natural drainage channels; Preventive maintenance of vehicles and construction equipment; Implementation of emergency accidental spill management procedures Monitoring the level and quality of groundwater; Installing independent wastewater treatment stations in the camps; Appropriate choice for the location of tailings pours taking into account the hydrology of the area		groundwater Maintenance sheet for vehicles and vehicles Operational Accidental Spill Management Emergency Procedure	
Site preparation work Exploitation of loan and quarry sites Traffic of trucks and construction equipment	Vegetation	Loss of vegetation Disruption of photosynthesis by dust deposit on vegetation	Pre-marking of trees to be felled to limit abusive felling; Awareness of vegetation protection among site staff.		Number of feet felled; Number of feet spared; Number of awareness sessions held;	PM

			Paying the cull tax		Payment release	PM
			CES/DRS works Application of dust-control measures		Area recovered and seeded	25 000 000
Clearing, clearing, stripping and earthmoving of land, How construction equipment works, Presence of staff	Fauna	Destruction of refuge and habitat areas, Destruction of individuals, temporary disturbance and, dislodgement.	Prohibition of killing and/or capture of any species of wildlife on construction sites Information and awareness of construction workers and communities about wildlife and habitat protection; Conducting an ecological study on wildlife; Regular monitoring of the impact of the work on wildlife.		Number of individuals killed and/or captured Operational Information and Outreach Program Number of awareness sessions held Ecological wildlife study available Wildlife Follow-up Report	12 000 000
Stocks of embankments and clearings fromclearing, clearing, stripping and earthmoving, Presence of construction equipment and equipment	Landscape	Visual modification of the local landscape	Restricting stripping and deforestation operations to land needed for surface infrastructure; Limiting the thickness and heights of plant land stocks over limited thicknesses; Gradual rehabilitation of disturbed land; Construction of alveoli for the storage of bulky waste;		Regulations on the conduct of work Rate of rehabilitation of disturbed sites Available bulky waste storage alveoli Disturbed Area Inspection Report	*Environmental and Social Clauses*

Waste production and management			Inspection of disturbed areas and reclaimed land			
Use of equipment (compressors, generators, cement mixers, trucks and machinery, dump trucks, bulldozers, diggers, vibrating compactors, etc.	Soundscape	Increased soundscape and vibration	Equipment of installations with silencers and soundproofing devices; Compliance with IFC HSE environmental standards across all facilities; Use of low-noise reversing alarms; Use of equipment that complies with the manufacturer's instructions; Information from local communities about the site's general activities, including working hours; Maintenance of machinery and construction vehicles; Stopping or putting the machines used between two work sessions into minimum operating mode; Stopping all static installations except generators, pumps and electrical installations when they are not in use; Developing mapping of sensitive sources and targets Regular monitoring of noise levels		Mapping sensitive sources and targets available Sound level recorded at the different receivers Number of complaints about Noise	*Environmental and Social Clauses*

Labor, labour, Local purchase of goods and services	Employment and income	Job creation and increased income tax revenues	Priority of coastal populations when recruiting unskilled local labour.		Proportion of space in the workforce Recruitment contract	*Environmental and Social Clauses*
Purchases of goods and materials, Quarrying and borrowing	Economy	Improving the local economy	Developing and implementing a policy to maximize the purchase of goods and services and the recruitment of labour at the local, regional and national level; Consultation with local employment agencies and training centres; Prioritizing contracts to local, regional and national contractors where possible; Establishing programs or training activities for the local workforce, Established an economic impact monitoring committee; Implementation of a stakeholder engagement and internal complaints management program.		Report on local providers developed Number of services and service contracts awarded to premises Consultation frameworks created Number of people trained Number of young people trained and getting jobs in the mine	15 000 000
Construction work and the movement of machinery and vehicles, Work in dusty areas, Presence of foreign labour	Safety and health	Accident risks for labour and coastal populations Respiratory infections,	Developing a workplace health and safety policy; Developing a single risk management document and risk prevention plan Employment health and safety program;		Occupational health and safety policy is available; Unique risk management document and risk prevention plan is available Operational Health and Safety Program	*Environmental and Social Clauses*

		Increased risk of STI/HIV/AIDS and Covid 19 infection in the area Interactions between staff Biological risks	Workers' training on occupational health and safety; Endowment and obligation to carry PPE Installing appropriate road signs and fencing around construction sites with the greatest risk of accidents; Limiting traffic and speed limits on the site		Number of awareness sessions held Type and quantity of IPEs provided Signage installed Operational traffic procedure	
			Setting up an awareness programme on STI/HIV AIDS Covid 19 in communities Road safety awareness		Number of awareness sessions held Number of accidents recorded	8 000 000
			Support for infrastructure and basic social services in communities		Types of support for communities	30 000 000
Free-of-the-way	Pastoral lands	Reducing grazing areas Degradation of pastoral routes	Setting up spaces for pasture production		Areas embalmed for forage production	20 000 000
			Strengthening the capacity of the local local conflict management authority		Nature of assistance	
			Support for improving animal health;		Type and amount of support provided	15 000 000

			Support for the livestock feed supplement.			
			Improvements to existing hydraulic structures		Number of hydraulic structures rehabilitated	25 000 000
Stripping and earthmoving work	Archaeological and cultural heritage	Destruction of cultural heritage, including cemeteries	Developing a Heritage Resource Management Plan to ensure signage; Involvement of traditional authorities in monitoring identified sites; Relocation of sacred sites (cemeteries and sacred forests); Implementation of a discovery procedure during; Information on the administration of any archaeological discovery.		Heritage Resource Management Plan Developed Number of cemeteries relocated How to discover operational archaeological and cultural heritage	10 000 000
Massive arrival of foreign people	Population and community change	Pressure on basic social infrastructure Disruption of communities (IST-HIV/AIDS and Covid 19; alcohol abuse, theft, violence, conflict, inflation)	Conducting awareness campaigns on health and safety in communities; Cooperation with United Nations agencies (UNHCR) for reconciliation and appeasement of local communities.		Number of health and safety awareness campaigns in communities organized Operational framework for consultation with United Nations agencies (UNHCR)	PM

		Improving the local socio-economic framework	Conducting a study on local activities and the implementation of a validated database of local suppliers; Putting in place a local economic participation plan; Promoting the purchase of local goods and services; Support for the development of community infrastructure and services.		Validated database on local suppliers available Number of services and service contracts awarded to premises Operational local economic participation plan Types and amount of support for basic social services	15 000 000
TOTAL						**175 000 000**

Table 58 Mitigation and Impact Improvement Program for the Operating Phase

Activities/Impact Sources	Components of the affected environment	Potential impacts	Mitigation and/or bonus measures	Execution manager	Implementation indicator	Implementation cost
Traffic of machinery and trucks; Use of machinery and machinery, Extraction of ore; Mechanical and chemical processing of ore, Wind erosion of waste rock and tailings stocks, Consumption energy	Air	Altered air quality	Putting in place speed limit guidelines, Watering tracks and dusty work areas Limiting the movement of vehicles and machinery to the right-of-way of the access road and work areas Use of standard-meet equipment Periodic checks of equipment and vehicles and, construction equipment Monitoring air quality Putting in place a waste rock management plan Coverage and/or seeding of completed stocks as soon as possible to stabilize surfaces; Establishing a radiological monitoring program.	Global Atomic Fuels corporation	Traffic regulations published Level of dust fallout Level of suspended particles (PM10, PM2.5, TSP ...) Level of NO2 and SO2 in the air Suspended particle level (PM10, PM2.5, TSP...) in the air Maintenance sheet for vehicles and vehicles Radioelement rates in target environments Waste management pan available Functional radiological monitoring program	*Environmental and Social Clauses*

		Contributing to change Climate	Conduct an awareness campaign among the project's workforce regarding energy management		Level ofreduction in consumption energy	*Environmental and Social Clauses*
Ore extraction and transport, Use of machinery and machinery, Wind and water erosion of waste rock and tailingsstocks, Waste production and management	Ground	Disruption of biological, and physicochemical properties of soils Soil erosion Soil contamination and pollution	Coordinated site rehabilitation; Sanitation of disturbed land; Inspection of disturbed areas and rehabilitated areas; Dust removal Operational Spill Containment and Treatment Procedures Training in Spill Cleaning Technique; Operational traffic procedures; Vehicle maintenance, inspection; Maintenance of storage areas; Setting up a watertight platform for storing petroleum, chemical and construction waste Cleaning and maintenance of transportation routes, conveyor routes, access roads, drains and stormwater storage facilities; Setting up a soil management awareness program		Site rehabilitation rate Procedure of available driving Operational waste management system; Storage of petroleum products on waterproof holding bowls Collection and storage of site waste; Containment and operational spill treatment procedures available; Availability of decontamination kits; Erosion control procedures; Vehicle maintenance sheet Physicochemical soil parameters	*Environmental and Social Clauses*

			Soil analysis.			
Mine fire, ore felling, ore loading and unloading, crushing, screening and grinding of ore, Operating compressors, ventilation system, various workshops and circulation of machinery including heavy machinery	Soundscape and vibrations	Increased soundscape and vibration	Equipment of installations with silencers and soundproofing devices; Compliance with IFC HSE environmental standards across all facilities; Use of low-noise reversing alarms; Use of equipment that complies with the manufacturer's instructions; Information from local communities about the site's general activities, including working hours; Maintenance of machinery and construction vehicles; Stopping or putting machines into minimum operating mode used between two working sessions Stopping all static installations except generators, pumps and electrical installations when they are not in use; Optimal management of shooting procedures Developing a map of sources and targets		Sound level recorded at the different receivers Number of complaints about Noise Existence of noise source mapping	*Environmental and Social Clauses*

• Deposit of waste rock and tailings, • Presence of infrastructure (buildings, processing units, etc.) • Waste production and management	Landscape	Changing the visual quality of the landscape	Mitigation measures for the impacts associated with the tailings park, waste rock storage; Installing plant screens; Gradual rehabilitation of disturbed land; Inspection of disturbed areas; Construction of alveoli for the storage of bulky waste.		Waste and waste park storage system Success rate of peri-central plantations Regulations on the conduct of work Rate of rehabilitation of disturbed sites Presence of alveoli for the storage of large waste; Disturbed Area Inspection Report	*Environmental and Social Clauses*
Pumping water and blasting, Ore extraction (formation of acid mine drainage) Mining denothing Waste and treatment waste deposits Production and management of site waste, Movement of vehicles and heavy machinery	Water	Changing geochemical and hydrogeological parameters Lower water table levels; Water contamination and pollution; Changes in the hydrological regime.	Development of a hydrogeological model for groundwater flow use and monitoring; Saving water use at the mine; Setting up a committee of water users; Developing a waste rock and tailings management plan; Control of waste and tailings areas; Control of pumps, pipes and tailings pond dykes; Developing and implementing a stormwater management plan;		Tablecloth level Number of piezometers installed Operational water use-saving procedure available Committee of Operational Water Users Number of usage-related conflicts recorded Operational waste and tailings management plan	*Environmental and Social Clauses*

			Developing and implementing a waste management plan; Preventive maintenance of equipment. Installing piezometers around tailings ponds and waste rock stocks; Compacting the surfaces of the waste rock for the installation of a sewage treatment plant; Putting in place an emergency response plan for accidental spills; Putting in place a contaminated soil management plan; Tracking the level of the tablecloths. Appropriate site selection for the location of tailings and proper direction of the pour taking into account the hydrology of the area		Level of operation of waste and tailings areas; pumps, pipe and tailings pond dam Operational waste and stormwater management plans Physicochemical water parameters Vehicle Technical Tracking Sheet Liquid waste discharge standards Emergency Spill Response and Operational Contaminated Soil Management Procedures	
New deposits are being put into operation Traffic of trucks and construction equipment	Vegetation	Destruction of vegetation Disruption of photosynthesis by dust deposit on vegetation	Framing the cups Application of measures to control dust fly control;		Number of trees felled and/or avoided	PM
			Payment slaughter tax		Payment release	PM
			CES/DRS work with seeding of treated areas		Areas recovered and seeded	10 000 000

			Raising awareness among labour and communities about vegetation protection and conservation of certain plant species		Number of awareness sessions held	6 000 000
		Restoration of vegetation	Establishing protected natural areas on and off site; Settlement of *Leptadenia pyrotechnica* of Oufoud.		Areas of protected natural areas Area developed within the settlement of Oufoud	8 000 000
		Increased uranium bioaccumulation potential for plants	Ecotoxicologist analyses of vegetation		Rate of uranium bioaccumulation potential for plants	PM
Explosive fire, movements of machinery and trucks Poaching Clearing the right-of-way of new deposits Management of waste and treatment effluent (evaporation ponds)	Fauna	Disruption and relocation of wildlife Crushing and destruction Habitat loss Risk of wildlife poisoning	Creating protected areas or wildlife habitats; Raising awareness among workers and communities about the protection of wildlife and its habitat; Prohibition of hunting of mine employees and subcontractors.		Number of protected areas created Number of awareness sessions held Number of species killed Proportion of premises in the workforce Number of offices selected for recruitment management Number of trained Nigerian technicians	15 000 000

					Nature of contracts Proportion of premises within the workforce Number of offices selected for recruitment management Number of trained Nigerian technicians The nature of the contracts	
Labor Local subcontracting work, Local purchase of goods and services	Employment and income	Job creation Improved income	Prioritizing coastal populations when recruiting unskilled local labour; Recruitment management by local offices; Training of Nigerian technicians Integration of redundancy pay in the employment contract.		Proportion of space in the workforce Number of offices selected for recruitment management Number of trained Nigerian technicians The nature of the contracts	*Environmental and Social Clauses*
Acquisition of production-related dividends Payment of royalties, taxes and taxes Direct and indirect investments, Local purchase of goods and services	Economy	Improving the local economy; regional and national	Paying taxes to central authorities for affected communities; Support for agriculture and livestock Promoting local content.		State of tax liquidation; mining taxes and royalties Reporting financier Number of services and service contracts awarded to premises Number of producers supported	PM

Local purchase of goods and services						
Waste rock and tailings management, Work in ionizing environments Heavy vehicle and vehicle traffic, Handling machines and chemicals Interaction between resident populations and foreign and/or sex workers Interactions between site staff	Health and safety	Radiation exposure diseases either by radon inhalation, radionuclide ingestion, and exposure Risks of respiratory and cardiovascular diseases	Developing a workplace health and safety policy; Developing a single risk management document and risk prevention plan Developing a health and safety plan; Air conditioning system for machinery and cabins; Endowment and use of PPE; Compliance with HSE requirements for contractors and subcontractors; Training and awareness of staff, providers, subcontractors and suppliers about the risks associated with their work, their responsibilities to manage these risks		Occupational health and safety policy available Unique risk management document and risk prevention plan available Operational health and safety plan available Machinery and cabins equipped with air conditioning system on site; Types and nature of PPE Number of training and awareness sessions organized	PM
		Increased incidence of STIs/HIV/AIDS and Covid19 Risks of incidents and accidents	Awareness and education on the dangers of STIs/HIV/AIDS on Covid19; Raising awareness of road safety among affected users and affected communities.		Number of STI/HIV/AIDS awareness and education sessions held Number of IST/HIV AIDS cases and Covid19 recorded dangers associated with the use of puddles held	45 000 000

					Number of recorded traffic accidents	
Expansion of mining and other infrastructure	Archaeological and cultural heritage	Loss and/or disturbance of historical, archaeological and cultural heritage in attendance	Implementation of the Heritage Resource Management Plan Tracking identified sites and known cultural, historical and aesthetic resources; Implementation of the discovery procedure; Relocation of sacred sites (cemeteries and sacred forests).		Operational Heritage Resource Management Plan Operational discovery procedure Type and nature of archaeological and cultural heritage Number of sacred sites relocated	PM
Population influx in the area	Population and community change	Pressure on basic social infrastructure; Disruption of communities (IST-HIV/AIDS and Covid 19, alcohol abuse, theft, violence,	Strengthening the capacity of local suppliers of goods and services; Development of partnership between regional suppliers of financial products and training and local businesses; Support for local business start-up initiatives, promoting local sourcing; Promoting savings, safe investments and banking services; Accompanying women in AGR;		Number of services provided by local suppliers Number of local businesses operating	PM

		conflict, inflation); Potential destabilization on the internal community and local government dynamics.	Support for the development of basic social infrastructure; Cooperation with United Nations agencies (UNHCR) for reconciliation and appeasement of local communities.			
			Safety and health awareness in partnership with local health professionals and community representatives		Number of awareness sessions held Awareness report	30 000 000
TOTAL						**114 000 000**

Table 59 Closure Impact Mitigation and Enhancement Program

Activities/Impact Sources	Components of the affected environment	Potential impacts	Mitigation and/or bonus measures	Execution manager	Implementation indicator	Implementation cost
Dismantling work, heavy machinery and vehicle traffic, rehabilitation of galleries and temporary traffic lanes; Wind erosion of waste rock and tailings deposits	Air	Altered air quality	Watering the lanes of traffic machines and vehicles; Implementation of speed limit guidelines; Use of equipment that meets the required gas emission standards; Implementation of regular checks of equipment, vehicles and machinery; Stopping any equipment not in service; Monitoring and monitoring of waste rock deposits; and tailings to stabilize surfaces.	Promoter BNEE	Traffic regulations published Maintenance sheet for vehicles and vehicles Level of dust fallout Level of suspended particles (PM10, PM2.5, TSP ...) Level of NO2 and SO2 in the air Suspended particle level (PM10, PM2.5, TSP...)	*Environmental and Social Clauses*
Use of machinery and construction vehicles; Wind and water erosion of waste rock and	Ground	Contamination and/or pollution Soils	Delimitation of non-traffic zones to vehicles in land storage areas Inspection and maintenance of equipment, vehicles and construction equipment; Controlling erosion of waste rock and tailings deposits; Prohibition of off-piste driving for vehicles and equipment Ground	Promoter	Equipment and vehicle maintenance sheet Operational erosion control procedure Operational vehicle and vehicle traffic procedure	*Environmental and Social Clauses*

tailings deposits.			management awareness throughout the closure work.			
Work to fill, demolish and dismantle infrastructure; Moving gear	Soundscape and vibrations	Increased noise levels	Equipment with silencers and/or soundproofing devices of machinery and vehicles; Optimizing the movement of vehicles and construction equipment; Maintenance of machinery and vehicles		Silent and soundproofing devices available on vehicles and gear Operational vehicle and construction equipment traffic procedure Maintenance sheet for vehicles and vehicles	*Environmental and Social Clauses*
Use of machinery and machinery; Wind and water erosion of waste rock and tailings deposits; Restoration work on the site	Water	Groundwater and surface water contamination	Monitoring the quality of water resources even after the mine has closed; Putting in place measures to prevent and protect against accidental spills; Maintenance of machinery and construction vehicles; Introducing a hazardous materials management procedure;		Physicochemical water parameters Operational accidental spill prevention and protection procedures Vehicle and engine maintenance sheet Availability of decontamination kits;	PM

			Putting in place an emergency response plan for accidental spills. Putting in place a contaminated soil management plan			
CES/DRS work	Vegetation	Improved local vegetation cover	CES/DRS work Environmental monitoring of rehabilitated sites		Report of inventoriesforestiers Treated area Visual observation made on the site during visits by competent service officers or rehabilitated area	15 000 000
Dismantling infrastructure Restoration of the site	Fauna	New habitat formation Return of wildlife	Continued implementation of wildlife and habitat protection measures; Establishing a sustainable information and awareness program related to the management of created habitats.		Wildlife attendance rates Number of awareness campaigns organized Unfaunic inventory report	10 000 000
Dismantling infrastructure Restoration of the site	Landscape	Restoring the local landscape	Implementation of the final reclamation of the site		Report of the relevant services on the final condition of the site	PM

Stopping mining	Employment and income	Job loss Allocating workers' income	Training workers for retraining Development of facilities and activities promoting social interaction and positive behaviour for the community for the benefit of young people	Promoter	Number of trained workers Types and nature facilities and activities developed	PM
Loss of operating dividends, direct and indirect investments, royalties and taxes	Economy	Allocating the local, regional and/or national economy Reducing spending and livelihoods	Conducted a study of the socio-economic profile of the project shutdown of the zone; Developing and implementing a plan to support the diversification of the local economy and the consolidation of the promising sectors; Strengthening the socio-economic capacity of coastal communities; Participation in the Economic Development Plan for the communities of Tchirozérine and Dannet.		Results of the socio-economic profile report Social Investment Report	15 000 000
Stop supporting low-cost investment and other social services	Population and community change	Risk of declining quality of life and well-being; Change in the livelihoods and livelihoods of the Project	Conducted a societal study of the dependencies of riparian communities that takes into account water supply, health, energy supply; Livestock; market gardening; local economy	Promoter	Results of the societal study report	15 000 000
TOTAL						**55 000 000**

7.2. Environmental inspection and oversight programme

Environmental inspection or performance monitoring consists of ensuring that the project's environmental commitments are respected. It aims to ensure the effective implementation of the various measures proposed to mitigate or reinforce the impacts resulting from the project, in accordance with the legal provisions in force in Niger.

Table 60 below shows the environmental and social monitoring programme for the Adrar Emoles 3 exploration licence.

It is structured around the following points:

- the project phases;
- elements that may be impacted;
- potential impacts;
- mitigation and/or enhancement measures;
- the person responsible for monitoring the implementation of the measures;
- indicators to be filled in during environmental monitoring;
- costs related to monitoring.

Table 60 Environmental inspection and performance monitoring programme

Activities/Impact Sources	Components of the affected environment	Potential impacts	Mitigation and/or bonus measures	Supervisor	Implementation indicator	Frequency of surveillance	Cost of surveillance in FCFA
Preparation and construction phase							
Once a quarter in five (5) years	Air	Altered air quality by dust and gas particles	Putting in place speed limits; Watering the tracks and areas of dusty work; Limiting the movement of vehicles and machinery to the tracks and right-of-way works Use of standard-meet equipment; Equipment and vehicle checks Implementation of an Air Quality Management Plan; Stopping all construction equipment when they are not in service.	**BNEE**	Traffic regulations published Work schedule available Maintenance sheet for vehicles and vehicles Level of Dust Fallout Level suspended particles (PM10, PM2.5, TSP...) NO2 and SO2 level in the air Suspended particle level (PM10, PM2.5, TSP...)		

		Contributing to change Climate	Conduct an awareness campaign among the project's workforce regarding energy management		Level of reduction in electricity consumption		
	Ground	Changing the structure and texture, Soil compaction; Erosion, contamination and/or pollution	Restricting deforestation and stripping activities to necessary right-of-way; Simultaneous rehabilitation of temporary structures and right-of-way areas used; Restricting vehicle traffic; Preventive maintenance of vehicles and machinery; Establishing an appropriate waste management system; Setting up a watertight platform for storing petroleum, chemical and construction waste Implementation of an emergency plan and clean-up equipment		Site Rehabilitation Report or Minutes Waterproof areas for washing/maintenance and for petroleum product depots; Operational waste collection and management system; Traffic procedure available for vehicles and construction equipment Visual observation made on the site during visits by competent service officers or rehabilitated area Waste Management Report Waste Tracking Sheet		

					Availability of decontamination kits; Erosion control procedures.		
	Water	Disruption of hydrological regime Risk of contamination and water pollution Lower level of tablecloths	Waterproofing of washing and/or maintenance areas and depots of petroleum products equipped with retention bowls with drainage system; Preventive maintenance of equipment; Collection and orientation by embankments and/or channels of sediment-laden runoff to dedicated control infrastructure; Establishing an appropriate system for managing site waste; Removal of solids deposited in natural drainage channels; Preventive maintenance of vehicles and construction equipment;		Waterproof areas for washing/maintenance and for petroleum product depots; Waterproof tank Operational waste collection and management system Results of analysis groundwater Maintenance sheet for vehicles and vehicles Operational Accidental Spill Management Emergency Procedure		

			Implementation of emergency accidental spill management procedures Monitoring the level and quality of groundwater; Installing independent wastewater treatment stations in the camps; Appropriate choice for the location of tailings pours taking into account the hydrology of the area				
	Vegetation	Loss of vegetation Disruption of photosynthesis by dust deposit on vegetation	Pre-marking of trees to be felled to limit abusive felling; Awareness of vegetation protection among site staff.		Number of feet felled; Number of feet spared; Number of awareness sessions held;		
			Paying the cull tax		Payment release		
			CES/DRS works Application of dust-control measures		Area recovered and seeded		

	Fauna	Destruction of refuge and habitat areas, Destruction of individuals, temporary disturbance and, dislodgement.	Prohibition of killing and/or capture of any species of wildlife on construction sites Information and awareness of construction workers and communities about wildlife and habitat protection; Conducting an ecological study on wildlife; Regular monitoring of the impact of the work on wildlife.		Number of individuals killed and/or captured Operational Information and Outreach Program Number of awareness sessions held Ecological wildlife study available Wildlife Follow-up Report		
	Landscape	Visual modification of the local landscape	Restricting stripping and deforestation operations to land needed for surface infrastructure; Limiting the thickness and heights of plant land stocks over limited thicknesses; Gradual rehabilitation of disturbed land; Construction of alveoli for the storage of bulky waste; Inspection of disturbed areas and reclaimed land		Regulations on the conduct of work Rate of rehabilitation of disturbed sites Available bulky waste storage alveoli Disturbed Area Inspection Report		

	Sound scape	Increased soundscape and vibration	Equipment of installations with silencers and soundproofing devices; Compliance with IFC HSE environmental standards across all facilities; Use of low-noise reversing alarms; Use of equipment that complies with the manufacturer's instructions; Information from local communities about the site's general activities, including working hours; Maintenance of machinery and construction vehicles; Stopping or putting the machines used between two work sessions into minimum operating mode; Stopping all static installations except generators, pumps and electrical installations when they are not in use;		Mapping sensitive sources and targets available Sound level recorded at the different receivers Number of complaints about Noise		

			Developing mapping of sensitive sources and targets Regular monitoring of noise levels				
Labor, labour, Local purchase of goods and services	Employment and income	Job creation and increased income tax revenues	Priority of coastal populations when recruiting unskilled local labour.		Proportion of space in the workforce Recruitment contract		
Purchases of goods and materials, Quarrying and borrowing	Economy	Improving the local economy	Developing and implementing a policy to maximize the purchase of goods and services and the recruitment of labour at the local, regional and national level; Consultation with local employment agencies and training centres; Prioritizing contracts to local, regional and national contractors where possible; Establishing programs or training activities for the local workforce,		Report on local providers developed Number of services and service contracts awarded to premises Consultation frameworks created Number of people trained Number of young people trained and getting jobs in the mine		

					Established an economic impact monitoring committee; Implementation of a stakeholder engagement and internal complaints management program.				
Construction work and the movement of machinery and vehicles, Work in dusty areas, Presence of foreign labour	Safety and health	Accident risks for labour and coastal populations Respiratory infections, Increased risk of STI/HIV/AIDS and Covid 19 infection in the area Interactions between staff Biological risks	Developing a workplace health and safety policy; Developing a single risk management document and risk prevention plan Employment health and safety program; Workers' training on occupational health and safety; Endowment and obligation to carry PPE Installing appropriate road signs and fencing around construction sites with the greatest risk of accidents; Limiting traffic and speed limits on the site		Occupational health and safety policy is available; Unique risk management document and risk prevention plan is available Operational Health and Safety Program Number of awareness sessions held Type and quantity of IPEs provided Signage installed Operational traffic procedure			

			Setting up an awareness programme on STI/HIV AIDS Covid 19 in communities Road safety awareness		Number of awareness sessions held Number of accidents recorded		
			Support for infrastructure and basic social services in communities		Types of support for communities		
Free-of-the-way	Pastoral lands	Reducing grazing areas Degradation of pastoral routes	Setting up spaces for pasture production		Areas embalmed for forage production		
			Strengthening the capacity of the local local conflict management authority		Nature of assistance		
			Support for improving animal health; Support for the livestock feed supplement.		Type and amount of support provided		
			Improvements to existing hydraulic structures		Number of hydraulic structures rehabilitated		
Stripping and earthmoving work	Archaeological and cultural	Destruction of cultural heritage,	Developing a Heritage Resource Management Plan to ensure signage;		Heritage Resource Management Plan Developed		

	heritage	including cemeteries	Involvement of traditional authorities in monitoring identified sites; Relocation of sacred sites (cemeteries and sacred forests); Implementation of a discovery procedure during; Information on the administration of any archaeological discovery.		Number of cemeteries relocated How to discover operational archaeological and cultural heritage		
Massive arrival of foreign people	Population and community change	Pressure on basic social infrastructure Disruption of communities (IST-HIV/AIDS and Covid 19; alcohol abuse, theft, violence, conflict, inflation)	Conducting awareness campaigns on health and safety in communities; Cooperation with United Nations agencies (UNHCR) for reconciliation and appeasement of local communities.		Number of health and safety awareness campaigns in communities organized Operational framework for consultation with United Nations agencies (UNHCR)		
		Improving the local socio-	Conducting a study on local activities and the implementation of a		Validated database on local suppliers available Number of services and service		

		economic framework	validated database of local suppliers; Putting in place a local economic participation plan; Promoting the purchase of local goods and services; Support for the development of community infrastructure and services.		contracts awarded to premises Operational local economic participation plan Types and amount of support for basic social services		
Exploitation and processing							
Traffic of machinery and trucks; Use of machinery and machinery, Extraction of ore; Mechanical and chemical processing of ore, Wind erosion of	Air	Altered air quality	Putting in place speed limit guidelines, Watering tracks and dusty work areas Limiting the movement of vehicles and machinery to the right-of-way of the access road and work areas Use of standard-meet equipment Periodic checks of equipment and vehicles and, construction equipment Monitoring air quality		Traffic regulations published Level of dust fallout Level of suspended particles (PM10, PM2.5, TSP ...) Level of NO2 and SO2 in the air Suspended particle level (PM10, PM2.5, TSP...) in the air Maintenance sheet for vehicles and vehicles Radioelement rates in target environments		

waste rock and tailings stocks, Consumption energy			Putting in place a waste rock management plan Coverage and/or seeding of completed stocks as soon as possible to stabilize surfaces; Establishing a radiological monitoring program.		Waste management pan available Functional radiological monitoring program		
		Contributing to change Climate	Conduct an awareness campaign among the project's workforce regarding energy management		Level ofreduction in consumption energy		
Ore extraction and transport, Use of machinery and machinery, Wind and water erosion of waste rock and tailingsstocks, Waste production and management	Ground	Disruption of biological, and physicochemical properties of soils Soil erosion Soil contamination and pollution	Coordinated site rehabilitation; Sanitation of disturbed land; Inspection of disturbed areas and rehabilitated areas; Dust removal Operational Spill Containment and Treatment Procedures Training in Spill Cleaning Technique; Operational traffic procedures; Vehicle maintenance, inspection;		Site rehabilitation rate Procedure of available driving Operational waste management system; Storage of petroleum products on waterproof holding bowls Collection and storage of site waste; Containment and operational spill treatment procedures available;		

			Maintenance of storage areas; Setting up a watertight platform for storing petroleum, chemical and construction waste Cleaning and maintenance of transportation routes, conveyor routes, access roads, drains and stormwater storage facilities; Setting up a soil management awareness program Soil analysis.		Availability of decontamination kits; Erosion control procedures; Vehicle maintenance sheet Physicochemical soil parameters		
Mine fire, ore felling, ore loading and unloading, crushing, screening and grinding of ore, Operating compressors, ventilation	Sound scape and vibrations	Increased soundscape and vibration	Equipment of installations with silencers and soundproofing devices; Compliance with IFC HSE environmental standards across all facilities; Use of low-noise reversing alarms; Use of equipment that complies with the manufacturer's instructions;		Sound level recorded at the different receivers Number of complaints about Noise Existence of noise source mapping		

system, various workshops and circulation of machinery including heavy machinery			Information from local communities about the site's general activities, including working hours; Maintenance of machinery and construction vehicles; Stopping or putting machines into minimum operating mode used between two working sessions Stopping all static installations except generators, pumps and electrical installations when they are not in use; Optimal management of shooting procedures Developing a map of sources and targets				
Waste rock and tailings deposit Presence of infrastructure (buildings, processing units, etc.)	Landscape	Changing the visual quality of the landscape	Mitigation measures for the impacts associated with the tailings park, waste rock storage; Installing plant screens;		Waste and waste park storage system Success rate of peri-central plantations Regulations on the conduct of work		

Waste production and management			Gradual rehabilitation of disturbed land; Inspection of disturbed areas; Construction of alveoli for the storage of bulky waste.		Rate of rehabilitation of disturbed sites Presence of alveoli for the storage of large waste; Disturbed Area Inspection Report		
Pumping water and blasting, Ore extraction (formation of acid mine drainage) Mining denothing Waste and treatment waste deposits Production and management of site waste, Movement of vehicles and heavy machinery	Water	Changing geochemical and hydrogeological parameters Lower water table levels; Water contamination and pollution; Changes in the hydrological regime.	Development of a hydrogeological model for groundwater flow use and monitoring; Saving water use at the mine; Setting up a committee of water users; Developing a waste rock and tailings management plan; Control of waste and tailings areas; Control of pumps, pipes and tailings pond dykes; Developing and implementing a stormwater management plan; Developing and implementing a waste management plan;		Tablecloth level Number of piezometers installed Operational water use-saving procedure available Committee of Operational Water Users Number of usage-related conflicts recorded Operational waste and tailings management plan Level of operation of waste and tailings areas; pumps, pipe and tailings pond dam Operational waste and stormwater management plans Physicochemical water parameters		

			Preventive maintenance of equipment. Installing piezometers around tailings ponds and waste rock stocks; Compacting the surfaces of the waste rock for the installation of a sewage treatment plant; Putting in place an emergency response plan for accidental spills; Putting in place a contaminated soil management plan; Tracking the level of the tablecloths. Appropriate site selection for the location of tailings and proper direction of the pour taking into account the hydrology of the area		Vehicle Technical Tracking Sheet Liquid waste discharge standards Emergency Spill Response and Operational Contaminated Soil Management Procedures		
New deposits are being put into operation	Vegetation	Destruction of vegetation Disruption of photosynthesis by dust	Framing the cups Application of dust-control measures		Number of trees felled and/or avoided		

Traffic of trucks and construction equipment		deposit on vegetation					
			Payment slaughter tax		Payment release		
			CES/DRS work with seeding of treated areas		Areas recovered and seeded		
			Raising awareness among labour and communities about vegetation protection and conservation of certain plant species		Number of awareness sessions held		
		Restoration of vegetation	Establishing protected natural areas on and off site; Settlement of *Leptadenia pyrotechnica* of Oufoud.		Areas of protected natural areas Area developed within the settlement of Oufoud		
		Increased uranium bioaccumulation potential for plants	Ecotoxicologist analyses of vegetation		Rate of uranium bioaccumulation potential for plants		
Explosive fire, movements of	Fauna	Disruption and	Creating protected areas or wildlife habitats;		Number of protected areas created		

machinery and trucks Poaching Clearing the right-of-way of new deposits Management of waste and treatment effluent (evaporation ponds)		relocation of wildlife Crushing and destruction Habitat loss Risk of wildlife poisoning	Raising awareness among workers and communities about the protection of wildlife and its habitat; Prohibition of hunting of mine employees and subcontractors.		Number of awareness sessions held Number of species killed		
Labor Local subcontracting work, Local purchase of goods and services	Employment and income	Job creation Improved income	Prioritizing coastal populations when recruiting unskilled local labour; Recruitment management by local offices; Training of Nigerian technicians Integration of redundancy pay in the employment contract.		Proportion of space in the workforce Number of offices selected for recruitment management Number of trained Nigerian technicians The nature of the contracts		

Acquisition of production-related dividends Payment of royalties, taxes and taxes Direct and indirect investments, Local purchase of goods and services Local purchase of goods and services	Economy	Improving the local economy; regional and national	Paying taxes to central authorities for affected communities; Support for agriculture and livestock Promoting local content.		State of tax liquidation; mining taxes and royalties Reporting financier Number of services and service contracts awarded to premises Number of producers supported		
Waste rock and tailings management, Work in ionizing	Health and safety	Radiation exposure diseases either by radon inhalation, radionuclide ingestion, and exposure	Developing a workplace health and safety policy; Developing a single risk management document and risk prevention plan Developing a health and safety plan;		Occupational health and safety policy available Unique risk management document and risk prevention plan available Operational health and safety plan available		

environments Heavy vehicle and vehicle traffic, Handling machines and chemicals Interaction between resident populations and foreign and/or sex workers Interactions between site staff		Risks of respiratory and cardiovascular diseases	Air conditioning system for machinery and cabins; Endowment and use of PPE; Compliance with HSE requirements for contractors and subcontractors; Training and awareness of staff, providers, subcontractors and suppliers about the risks associated with their work, their responsibilities to manage these risks		Machinery and cabins equipped with air conditioning system on site; Types and nature of PPE Number of training and awareness sessions organized		
		Increased incidence of STIs/HIV/AIDS and Covid19	Awareness and education on the dangers of STIs/HIV/AIDS on Covid19; Raising awareness of road safety among affected users and affected communities.		Number of STI/HIV/AIDS awareness and education sessions held Number of IST/HIV AIDS cases and Covid19 recorded dangers associated with the use of puddles held		

		Risks of incidents and accidents			Number of recorded traffic accidents		
Expansion of mining and other infrastructure	Archaeological and cultural heritage	Loss and/or disturbance of historical, archaeological and cultural heritage in attendance	Implementation of the Heritage Resource Management Plan Tracking identified sites and known cultural, historical and aesthetic resources; Implementation of the discovery procedure; Relocation of sacred sites (cemeteries and sacred forests).		Operational Heritage Resource Management Plan Operational discovery procedure Type and nature of archaeological and cultural heritage Number of sacred sites relocated		
Population influx in the area	Population and community change	Pressure on basic social infrastructure; Disruption of communities (IST-HIV/AIDS and Covid 19, alcohol	Strengthening the capacity of local suppliers of goods and services; Development of partnership between regional suppliers of financial products and training and local businesses; Support for local business start-up initiatives, promoting local sourcing;		Number of services provided by local suppliers Number of local businesses operating		

		abuse, theft, violence, conflict, inflation); Potential destabilization on the internal community and local government dynamics.	Promoting savings, safe investments and banking services; Accompanying women in AGR; Support for the development of basic social infrastructure; Cooperation with United Nations agencies (UNHCR) for reconciliation and appeasement of local communities.				
			Safety and health awareness in partnership with local health professionals and community representatives		Number of awareness sessions held Awareness report		
Closing Phase							
Dismantling work, heavy machinery and vehicle traffic, rehabilitation of galleries and temporary	Air	Altered air quality	Watering the lanes of traffic machines and vehicles; Implementation of speed limit guidelines; Use of equipment that meets the required gas emission standards;		Traffic regulations published Maintenance sheet for vehicles and vehicles Level of dust fallout Level of suspended particles (PM10, PM2.5, TSP ...) Level of NO2 and SO2 in the air		

traffic lanes; Wind erosion of waste rock and tailings deposits			Implementation of regular checks of equipment, vehicles and machinery; Stopping any equipment not in service; Monitoring and monitoring of waste rock deposits; and tailings to stabilize surfaces.		Suspended particle level (PM10, PM2.5, TSP...)		
Use of machinery and construction vehicles; Wind and water erosion of waste rock and tailings deposits.	Ground	Contamination and/or pollution soils	Delimitation of non-traffic zones to vehicles in land storage areas Inspection and maintenance of equipment, vehicles and construction equipment; Controlling erosion of waste rock and tailings deposits; Prohibition of off-piste driving for vehicles and equipment Ground management awareness throughout the closure work.		Equipment and vehicle maintenance sheet Operational erosion control procedure Operational vehicle and vehicle traffic procedure		

CES/DRS work	Vegetation	Improved local vegetation cover	CES/DRS work Environmental monitoring of rehabilitated sites		Report of inventoriesforestiers Treated area Visual observation made on the site during visits by competent service officers or rehabilitated area		
Dismantling infrastructure Restoration of the site	Fauna	New habitat formation Return of wildlife	Continued implementation of wildlife and habitat protection measures; Establishing a sustainable information and awareness program related to the management of created habitats.		Wildlife attendance rates Number of awareness campaigns organized Unfaunic inventory report		
Dismantling infrastructure Restoration of the site	Landscape	Restoring the local landscape	Implementation of the final reclamation of the site		Report of the relevant services on the final condition of the site		

Stopping mining	Employment and income	Job loss Allocating workers' income	Training workers for retraining Development of facilities and activities promoting social interaction and positive behaviour for the community for the benefit of young people		Number of trained workers Types and nature facilities and activities developed		
Loss of operating dividends, direct and indirect investments, royalties and taxes	Economy	Allocating the local, regional and/or national economy Reducing spending and livelihoods	Conducted a study of the socio-economic profile of the project shutdown of the zone; Developing and implementing a plan to support the diversification of the local economy and the consolidation of the promising sectors; Strengthening the socio-economic capacity of coastal communities; Participation in the Economic Development Plan for the communities of Tchirozérine and Dannet.		Results of the socio-economic profile report Social Investment Report		
Stop supporting low-cost investment	Population and comm	Risk of declining quality of life	Conducted a societal study of the dependencies of riparian communities that takes into account water supply, health,		Results of the societal study report		

and other social services	unity change	and well-being; Change in the livelihoods and livelihoods of the Project	energy supply; Livestock; market gardening; local economy				

7.3. Environmental monitoring programme

Environmental monitoring makes it possible to verify, in the field, the accuracy of the assessment of certain impacts and the effectiveness of certain mitigation or compensation measures provided for by the ESMP and for which there is still uncertainty. The knowledge acquired through environmental monitoring will make it possible to correct the measures and possibly revise certain environmental protection standards.

The Monitoring Programme describes:

- the elements of the environment to be monitored;
- monitoring parameters;
- actions to be taken;
- monitoring indicators;
- implementation and monitoring responsibilities;
- the frequency of monitoring and
- the costs of the action to be carried out as well as the follow-up of its implementation.

The following table represents the environmental monitoring programme that will be implemented as part of the project.

Table 61 Environmental monitoring programme

Middle		Activities	Settings Followed	Frequency of Followed	Responsibility	
					Implementation	Monitoring the implementation of actions
Biophysical environment	Air	Measurements of dust fallout, suspended particles and gas emissions (CO2, CO, Nox, SO2) in sensitive areas Radiation tracking	Total dust fallout PM10 and PM2, 5 (24-hour measurement) NO2 and SO2 in concentrations over 24 hours; Short- and long-term gamma and radon measurements at the mine site and in nearby communities	Twice a year		BNEE

					Global Atomic corporation	
	Ground	Measuring the physical,chemical and biological quality of soils	Soil pollutant content	Once a year		
	Sound level and vibrations	Initial noise mapping at the beginning of operation; Measurements of noise level and vibration.		Periodic		BNEE
		Basic sound broadcasts of the new Equipment	dB	1 time at the beginning of its use		
		Vibrations generated by explosions (measured as a particle's peak velocity)	m/s	Daily during each shot		
	Surface Waters	Surface water quality analysis during the rainy season. Sampling points are selected from streams (upstream and downstream of activities) that flow from the permit site	pH and conductivity; Cyanide water content as well as organic pollution	Once a year during the rainy season		
	Underground Water	Establishing a network of sampling points and observations to Track potential changes in groundwater quantity and quality	Volume and flow of water pumped from the catchment field and underground operations (pump flows can be used); The rate and volume of water used and recycled at the mine site;			

		Analysis of the physical-chemical quality of exhaure waters; Regular water measurements of existing wells/drilling in riparian villages.	Groundwater levels in the village wells and boreholes in the drawdown cone; Groundwater quality at the mine site and in nearby communities for the following parameters: pH, Eh, MDT, alkalinity, T-, dissolved oxygen, nitrate, chloride, alpha and global beta activity, fluoride, sulphate, phosphate, Na, K, Ca, Mg, Al, Cr, Fe, Mn, B, Cu, Zn, As, Se, Mo, V and U	Periodic		
	Climate	Installing weather stations on site; Tracking weather parameters (rainfall, humidity, temperature, etc.)	Weather conditions at the site (wind, precipitation, temperatures)	Periodic		
	Radiation	Radiological analysis of the food chain (soil, air, water, vegetation, cheese)	Short- and long-term gamma and radon measurements at the mine site and in nearby communities	Quarterly		
	Vegetation	Evolution of vegetation cover by area unit Inventory of the main types of vegetation cover and their biodiversity	Vegetable cover rate Phytosociological and surficial monitoring of pilot plots	Annual		
	Fauna	Recordings of major wildlife sightings	Evolution of wildlife populations and avifauna; Biodiversity monitoring	Annual		
	Waste	Waste management system checks	Volume of different types of waste disposed of in waste dumps or disposed of in hazardous waste dumps;			

			Volume of different types of wasterecycleed or reused	Periodic		
Human environment	Employment and income	Source of employees (for the Customer and its operators) categorized by: ✓ Skill level ✓ If they are local, ✓ region, country, and/or foreigners ✓ ethnic group sex.	Percentage of employees in each category	Continues for the life of the Project		
	Local content	Origin of operators and suppliers (local, regional, country, and/or international)	Percentage	Once a year		
	Safety and Health	Health monitoring of workers and populations in the project area	Prevalence rate of communicable diseases: STIs, tuberculosis and respiratory tract infections; Malaria; Diarrhea	Twice a year for workers		
		Radiological monitoring of workers	Workers' radiological dose level	Periodic		
		Preventable accidents and incidents	Number and type of incidents	Twice a year for workers		
	Archaeology and cultural patrimony	Moving cemeteries/cultural sites impacted to the satisfaction of affected persons and regulators	Number and type of sites displaced	Twice a year for workers		
	Participation in the Local Economy	Creating Databases for Jobs and Business Opportunities Organizing workshops to identify and evaluate local businesses	Database	Once a year		

	population and community change	General social surveillance using secondary sources available with Household questionnaires to assess: ✓ The population ✓ The frequency of misdemeanors ✓ the frequency of social diseases (alcoholism, prostitution, drug addiction) ✓ access to social infrastructure, such as schools, health centres, credit facilities, religious centres, water supply and sanitation.	Access to basic social services	Once a year		

7.4. Stakeholder capacity building programme

7.4.1. Actors implementing the measures and monitoring control

The main actors for the implementation of the measures and environmental monitoring and control of the ESMP of the Adrar Emoles 3 exploration permit are:

- National Environmental Assessment Office (NEAO);
- Global Atomic Corporation;
- Niger's High Atomic Energy Authority (HANEA)
- Directorate General for Sustainable Development (DGSD);
- Directorate General of Water and Forests (DGE/F);
- Direction des Mines et des Carrières (DMC) of the Ministry of Mines;
- Direction de l'Environnement Minier et des Etablissements Classés (DEM/CE) of the Ministry of Mines;
- Occupational Health and Safety Directorate of the Ministry of Employment, Labour and Social Protection;
- Directorate of Public Hygiene and Health Education (DHPES) of the Ministry of Public Health, Population and Social Affairs;
- Regional Directorate for the Environment and the Fight against Desertification (DRE/LCD) of Agadez;
- Regional Mining Directorate of Agadez;
- Regional Directorate of Hydraulics and Sanitation;
- Regional Livestock Directorate;
- Regional Labour Inspection (IRT) of Agadez;
- Communes of Tchirozérine and Dannet;
- Service providers;
- Civil society organisations.

7.4.2. Roles of the actors

The roles of the actors in the implementation and environmental monitoring and control of the project's ESMP are defined in Table 62 below.

Table 62 Roles of actors in implementing and monitoring the ESMP

Actors	Roles in the implementation of the GSP
Global Atomic Fuels Corporation	• **Prepare with the execution structures, a program work** • **Liaison between the various institutions involved in the implementation of mitigation measures** • **Implementation of the measures in the GSP** • **Keep a consistent environmental watch for the success of the Environmental and Social Management Plan (GSP)**
National Environmental Assessment Office	• **Implementation of monitoring activities and follow-up of the project's Environmental and Social Management Plan (GSP)** • **Ensuring that contractual environmental commitments are met**
General Directorate of Mines and Careers	• **Participate in environmental monitoring and monitoring missions** • **Ensure respect and preservation of the environment as part of the project**
• The National Radiation Protection Center; • The Directorate General of Environment and Sustainable Development; • The General Directorate of Waters and Forests The Regional Directorate of Environment and Development Sustainable Agadez; • The Regional Directorate of Mines of Agadez; • The Regional Directorate of Hydraulics and the Sanitation of Agadez; • Agadez Regional Directorate of Public Health; • The Agadez Work Inspectorate; • The Municipalities of Tchirozerin and Dannet; • The customary chiefs of the area • socio-professional groups/organisations • Civil society organizations	**These structures will be involved in monitoring and monitoring the implementation of the project's Environmental and Social Management Plan (PGES)**

7.4.3. Capacity building needs of actors

In order to build the capacity of those involved in the implementation and monitoring of the Environmental and Social Management Plan (ESMP) for the Adrar Emoles 3

exploration permit project, training courses are planned at the end of this study. The topics and related costs are shown in Table 63 & 64 below.

Table 63 Training Themes and Targets of training courses

Training themes	Targets
• **Environmental and social issues of the project** • **Analysis of contract construction documents** • **Mastering the requirements of the Environmental and Social Clauses,**	• Global Atomic Fuels Corporation • Executives of the National Environmental Assessment Office • Executives of the General Directorate of Mines and Careers • Agadez Regional Council • Regional Directorate of Mines • Regional Environment Directorate • Representatives of the Municipalities of Tchirozerin and Dannet
• **Environmental monitoring of mining work,** • **Monitoring the implementation of the mining project PGES,** • **Development and use of tracking sheets,** • **Writing follow-up reports and monitoring**	• Global Atomic Fuels Corporation • Executives of the National Environmental Assessment Office • Executives of the General Directorate of Mines and Careers • National Radiation Protection Centre; • Representative of the Directorate General of Environment and Sustainable Development; • Representative of the General Directorate of Waters and Forests • Representative of the Agadez Regional Council • Representative of the Regional Directorate of Environment and Sustainable Development of Agadez • Representative of the Regional Directorate of Mines of Agadez; • Representative of the Regional Directorate of Hydraulics and Sanitation of Agadez • Representative of the Regional Directorate of Public Health of Agadez • Agadez Labour Inspectorate Representative • Elected from the Municipalities of Tchirozerin and Dannet; • Customary chiefs of the area; • Representative of the Opinion Leaders of the area • Representing socio-professional groups/organisations • Representing civil society organizations.
• raining in follow-up rehabilitation and closure plan	• Global Atomic Fuels Corporation • Executives of the National Environmental Assessment Office • Executives of the General Directorate of Mines and Careers • Representative of the National Radiation Protection Center • Representative of the Directorate General of Environment and Sustainable Development; • Representative of the General Directorate of Waters and Forests • Representative of the Agadez Regional Council • Representative of the Regional Directorate of Mines of Agadez; • Representative of the Regional Directorate of Environment and Sustainable Development of Agadez

	• Representative of the Regional Directorate of Water and Sanitation of Agadez • Representing Civil Society Organizations.
• Training on the dangers of ionizing radiation	• Global Atomic Fuels Corporation • Executives of the National Environmental Assessment Office • Executives of the General Directorate of Mines and Careers • Representative of the Regional Directorate of Mines of Agadez; • Representative of the Regional Directorate of Waters and Forests • Representative of the Agadez Regional Council • Representative of the National Radiation Protection Center

Table 64 Topics and costs of training courses

Topic	Cost in Frans CFA
Implementation of PGES **Analysis of contract construction documents** **Mastering the requirements of environmental and social clauses**	15 000 000
Environmental monitoring of mining work, **Monitoring the implementation of the mining project PGES,** **Development and use of tracking sheets,** **Writing follow-up reports and monitoring**	**25 000 000**
Training followed by closure and redevelopment plan	15 000 000
Training on the dangers of ionizing radiation	12 000 000
Logistics support (2 vehicles): BNEE and the Ministry of Mines	45 000 000
TOTAL	**112 000 000**

7.5. Summary of ESMP costs

The overall cost of the ESMP for the project is estimated at 456,000,000 FCFA as shown in table 65 below.

Table 65 Overall cost of the ESMP

Topic	Cost in CFA Francs
Program to implement mitigation measures and enhance impacts	344 000 000
Preliminary Capacity Building Program	112 000 000
TOTAL	**456 000 000**

7.6. Implementation of the ESMS within GAC

In order to implement the various elements of the ESIA and environmental management and monitoring commitments agreed with the National Environmental Assessment Office and the General Directorate of Mines and Quarries, a series of policies, management plans and some associated procedures have been developed. This is also in order to align with Good International Industry Practice (GIIP) and the requirements of the Equator Principles. These documents for part of the Environmental and Social Management System (ESMS) which will be developed at site.

A management system is a set of policies, tools, procedures, and internal capacity to manage the environmental and social risks of the Project. A management system aids in

assessing and controlling risks. A management system should be fit for purpose and designed to meet performance standards that are relevant to the Project and potential Project lenders or shareholders.

The ESMS is currently in development and will take into account the findings of the ESIA and the resulting requirements for implementation and management of mitigation and monitoring. Key elements are defined in this chapter. Continual improvement of the ESMS will be undertaken throughout construction and the life of mine. The implementation of the ESMS will aim to minimise and mitigate potential environmental and social effects whilst simultaneously promoting health, safety, social and environmental standards of the Niger regulatory agencies and associated international lending institutions.

The effectiveness and appropriateness of the ESMS will be regularly reviewed by GAC's HSE committee and reported on at quarterly meetings.

The planning phase of the ESMS includes:

- Periodic review of applicable laws, regulation, policies and guidelines;
- Identification of any existing environmental and social baseline conditions and anticipated impacts identified within the IA;
- Definition of required mitigation and management to limit significant impacts;
- Definition of ongoing monitoring requirements;
- Definition of internal performance criteria;
- Development of community development initiatives to beneficially contribute to the long-term sustainability of local communities;
- Establishment of health, safety, environment and community targets;
    - Establishment of monitoring programmes including data management systems and reporting;
    - Identification of internal and external resourcing needs, roles, responsibilities, and chains of command required to deliver the provisions of the ESMS;
    - Training programmes; and
    - Implementation schedule and budget.

The ESMS will require continual reviewing and updating as the final configuration of the operation is designed in detail.

7.7. ESG Policies

A number of corporate policies relating to Environmental, Social and Governance have been developed and implemented by Global Atomic. These policies are available on the Global Atomic website. The policies are as follows:

- Code of Business Conduct and Ethics
- Environmental and Social Policy
- Sustainability Policy

- Whistleblower Policy
- Majority Voting Policy

7.7.1. Environmental and Social Management Plan

7.7.1.1 Management Plans

A set of Management Plans covering environmental and social aspects have been developed for the Project, these cover the construction period in detail, and will be updated to cover the operational period in detail, once construction is nearing completion. Environmental and Social Management for closure is covered in high level in both the Conceptual Mine Closure Plan as well as in topic specific management Plans. Nearing the end of operations these plans will be updated to describe detailed closure requirements. The management plans developed for the Project are as follows:

Plan
Environment Social Management System ("ESMS") framework
Health and Safety including radiological protection of workers
Human Resources (including GBV in the workplace, forced labour, child labour etc)
Water Management Plan
Air quality and GHG
Noise and vibration
Hazardous materials (including NORM)
Waste Management
Mine Waste Management (geochemistry, waste rock and tailings)
Chance Find Procedure, archaeology and cultural heritage
Community Health, Safety and Security (including Human Rights, influx, VPHSR and a focus on IPs)
Stakeholder Engagement Plan and Grievance Mechanism
Biodiversity Management Plan
Contractor Environmental Management
Emergency Preparedness & Response Plan
Conceptual Closure Plan

GAC is responsible for ensuring that the implementation of the above management plans and monitoring strategies is effective across the life of the mine. Suitable staff, equipment, reporting mechanisms and financial resources will be necessary to implement the ESMS. The Management Plans will be incorporated into the ESMS. Many of the plans require activities to be carried out in a certain order, or a certain way, in order to achieve the impact elimination/reduction/mitigation.

These will be carefully reviewed and incorporated into the various construction contracts, as the activities will be carried out by third parties not GAC themselves. This will be

achieved through specific contract clauses, and in the case of key contracts, the requirement for contractors to have their own ESMS and/or develop site specific Environmental Management Plans. In the case of less experienced local contractors, GAC will provide support in developing these plans.

All management plans are “live” documents meaning they will be under continuous review to ensure items are implemented within the required time frame, and prior to certain activities occurring on site. All management plans will be reviewed no less than annually, or when any material changes to the Project or project related activities are realised.

7.7.2. Organizational Capacity and Commitment

A Health, Safety and Environment (HSE) Committee has been established at GAC to assist the Board in fulfilling its oversight responsibilities by reviewing and monitoring any matters relating to the management of workplace, community or environmental impacts, the management of stakeholder relationships (including relevant aspects of human resources), and permitting and relevant regulatory risks. It will provide scrutiny of and guidance to executive management on these issues.

The Implementation, management and monitoring of the ESMS will be the responsibility of the Health, Safety and Environmental Manager for the Dasa Project, who reports directly to the General Manager for the Project. The Environmental team on site comprises a Site Manager, HSE Manager and CSR Manager who have the day-to-day responsibility of ensuring that the actions of the ESMS are implemented. The social team is led by a Coordinator for Social Management and Human Resources Manager. The specific duties of the HSE team include:

- Compliance with legal and permitting requirements for the Project, in regard to environmental and social aspects;
- Compliance with international best practice requirements, including US International Development Finance Corporation (DFC) and Economic Development Canada (EDC) policies;
- Ensuring the implementation of the ESMS throughout the life of the Project;
- Development, Review and implementation of construction and operational management plans;
- Review, oversight and implementation of the ESIA;
- Ensuring that employees and contractors receive required training on the ESMS and specific ESMS aspects, as appropriate;
- Reporting to the Vice President ESG and the HSE Committee on E&S performance;
- Monitoring and Reporting on the ESMS activities;
- Operate within and promote GAC’s core values and ESG strategy;
- Be the main point of contact for ESG-related initiatives within the company; working and aligning closely with senior leadership (and participating in relevant ESG committee meetings) to develop and implement new ESG policies and action plans;

- Act as a catalyst for positive change on key ESG themes, including community relations, water issues, tailings management and transparency;
- Drive improvements in ESG and overall sustainability performance;
- Provide material and insights in support of developing external communications for Investor Relations and leadership engagements;
- Manage relationships on ESG issues with relevant external bodies;
- Drive the implementation of GAC's ESG strategy in coordination with senior leadership, relevant departments and third-party providers;
- Develop metrics and related KPIs/targets to monitor and improve ESG performance across the company;
- Collect and analyse ESG data at the asset and corporate levels;
- Develop with the Vice President ESG a strategy for the company's engagements with community, relevant international organisations and civil society;
- In coordination with the Vice President ESG, lead community and civil society engagement;
- Plan and oversee social investment and, working together with other managers, promote local hiring and procurement;
- Develop relationships with internal stakeholders to support the further integration of ESG in GAC's operations and strategic decision-making;
- Support communications and investor relations in developing relevant content, including for publishing on GAC's external communication channels (website, social media, etc.);
- In coordination with the Vice President ESG monitor ESG trends, standards and initiatives on an ongoing basis.

7.7.3. Monitoring and Reporting

7.7.3.1. Overview of Monitoring

Following the baseline monitoring period, environmental and social monitoring will be undertaken throughout all phases of the Project as follows:

- Construction: Routine monitoring including visual inspections and oversight of contractor activities;
- Operations: monitoring for environmental compliance, and occupational and community health and safety. Routine monitoring of operations and the conduct of personnel through visual inspections and oversight, monitoring of key environmental parameters such as air quality, water quality, noise and biodiversity aspects;
- Social Monitoring: Monitoring of grievances and feedback from project affected persons;
- Employment and Procurement Monitoring: Oversight and monitoring of the

implementation of the local procurement and employment strategies;

- Closure and post-closure monitoring: ambient and emissions monitoring during earth works and activities for closure/rehabilitation. Post-closure monitoring of the baseline conditions for contaminants and environmental condition (slope stability, soils, vegetation cover and resilience, water quality).

Monitoring programmes for each environmental discipline are defined in the relative management plans.

7.7.3.2. Reporting

Incident Reporting

An incident is defined as any event that impacts, or potentially impacts, on the environment, community, or health, safety and security of employees or community members, or any activity that results in regulatory non-compliance, in breach of company policies, standards or commitments.

The following events will constitute an incident:

- Community incidents and grievances;
- Accidental spills of chemicals or fuel outside of bunded or dedicated areas;
- Fires within operation areas;
- Injury or near miss hazards;
- Environmental incidents or activities prohibited as per permitting requirements, including:
    - Noise emissions;
    - Air Quality;
    - Biodiversity – unauthorised vegetation clearance, injury or impact to fauna species;
    - Waste management and Waters and groundwaters.

Incident reporting will be managed in accordance with the ESMS and SEP. Incidents will be logged, assessed and reported to the HSE Committee. All incidents will be publicly disclosed, in accordance with the Stakeholder Engagement Plan and Emergency Preparedness and Response Procedure.

Environmental and Social Reporting

Quarterly Environmental Social Governance reports will be produced alongside the stakeholder engagement reports. Quarterly reporting will summarise activities that have been undertaken and any incidents that have occurred. The reports will be provided to the HSE Committee.

Reporting to lenders or shareholders on ESG related aspects will be required. The schedule for this reporting will be determined as part of any deal process.

7.8. Management of Change

GAC will keep the ESMS under constant review. Detailed review will be undertaken no less than annually, when the Project is nearing the proceeding phase, when material changes to the Project design or activities are required, when an incident occurs or when a community grievance is received.

Management of change (MOC) is a systematic approach to organizational changes with the aim of ensuring the continued environmental, social and safety performance of the project throughout the process. These systematic processes ensures that the change is dealt with in a proactive fashion. While this section focuses on MOC related to the ESIA and ESMS, the company MOC process will ensure that Environmental, Social and Governance implications of significant changes are considered alongside technical, financial, safety and workforce aspects, and given appropriate weightings.

Changes in the Project may occur due to future project developments, for example the ESIA is being undertaken prior to detailed design stage. Adaptive changes may also occur during Project commissioning and operations. The Management of Change process will be initiated when a significant change (as defined above) to either project design elements or ways of working, other than those defined in the Feasibility Study, ESIA, national permits and detailed design, is identified. This might be things like a change in project footprint or road routing, or the use of a new chemical in significant quantities in the process plant. The Process for dealing with Project changes and uncertainty should recognise levels of change/ uncertainty as outlined below.

- Minor Significance – Level One, where the change or uncertainty is largely deemed to be immaterial to the ESIA findings and national permit conditions and does not affect the Project's ability to meet social performance requirements outlined in the ESMS. This level of change may require additional but limited environmental or social study or survey actions.
- Moderate Significance – Level two, where the change or uncertainty is thought to be material to the EIA findings, but is within the boundaries of the defined Project base-case covered by this ESIA. This level may require minor changes to the ESMS and additional surveys or environmental and social assessments.
- High Significance – Level three, where a future significant change or uncertainty leads to a departure from the base-case scenario, or a key aspect of it. An addendum to the ESIA, or a new ESIA and formal submission and approval process is required.

This process will ensure the Project is able to adapt to changes whilst meeting the relevant environmental and social performance requirements.

7.9. Emergency Preparedness and Response

An Emergency Preparedness and Response Plan (EPRP) has been developed for the Dasa Project. The plan describes the Emergency Preparedness and Response Process which will be implemented and supported by specific Response Plans during the construction, commissioning and operational phases of the Dasa Project. The EPRP has been developed to describe the standards and specific procedures that will be followed

by ADT and its contractors in the event of an emergency related to the Project.

A risk assessment for the Project was undertaken as part of the engineering studies, this will be reviewed during the detailed design phase, and then annually, or when any material changes to the Project Design or activities are made. The EPRP has been developed based on the existing risk assessment and will be updated with each iteration of the assessment. Currently, the EPRP covers the following types of emergency:

- an incident resulting in fatality;
- an incident resulting in major injuries;
- fire, bushfire and/or explosion;
- weather/climate;
- hazardous chemical/oil spill on water or land;
- rescue from height/depth or confined space;
- vehicle/equipment accident;
- Significant developments with management of the Tailings Storage Facility;
- Air quality monitoring;
- building evacuation;
- earthquake;
- haul road or public road; and
- river/watercourse incident.

The EPRP is triggered when an incident (i.e., accident, fire, spill, personal injury, etc.) occurs that is beyond the control of the personnel currently at the scene. Implementation of this plan is intended to mitigate or protect Project personnel, contractors, assets and the surrounding communities from injury; prevent contamination of surrounding surface and ground waters with hazardous materials; prevent damage to the environment and in particular fauna and flora; provide fire-fighting procedures and describe other emergency response procedures that may be required at the site.

Specific emergency response procedures are detailed in the EPRP. General measures include the following:

- Immediate reporting of the incident to the Emergency Response Control Room;
- Deployment of Emergency Response Team and Emergency Management Team;
- Determination of the emergency response level (Incident, emergency or crisis);
- Detecting incidents and raising the alarm;
- Evacuating personnel to predetermined points of safety and provision of emergency first aid treatment;
- Systematic and safe shut-down of operations during incidents;
- Designation of a central incident control location for major incidents;

- Containment / control of hazardous materials / situations;
- Search and rescue;
- The removal and/or protection of vital equipment, materials and documents;
- All clear and re-entry procedure;
- Contacts with the authorities, the media and, as appropriate, with the local community (e.g. provision of counselling or other support for any casualties and their families);
- Fire prevention; and
- Medical emergencies.

An inspection and audit program will be developed by GAC and contractors to ensure that emergency preparedness and response procedures are being followed. Regular EPRP monitoring and reporting will be undertaken via the monthly EHS Report that will be prepared and submitted to the General Manager. Reporting will include:

- A summary of activities undertaken during the reporting period;
- Any deviations or non-compliances to the EPRP;
- Planned activities during the next reporting period; and
- Any other issues of concern.

GAC will implement a community awareness programme to ensure that nearby communities are prepared for emergencies that may occur, through an Awareness and Preparedness for Emergencies at local Level (APELL) process (UNEP 2001), or similar. Through the Coordinator for Social Management and/or the Environmental and Social Manager, information will be provided to local communities and authorities on GAC Metal's strategy for emergency preparedness and response through the provision of information particularly in the areas of:

- Transport accidents;
- Natural disasters;
- Health and wellbeing; and
- Road safety and traffic awareness.

The APELL process is defined in the Emergency Preparedness and Response Plan and details a ten-step communication tool for external communications. This strategy is in place to manage incidents that have the potential to affect proximate stakeholders, including other industrial activity.

CONCLUSION

The project to mine the deposits of the Adrar Emoles 3 research permit is in line with the strategic development documents drawn up and implemented by the Government. These include the National Policy on the Environment and Sustainable Development, the National Environment Plan for Sustainable Development (PNEDD), the Sustainable Development and Inclusive Growth Strategy (SDDCI Niger 2035), the Economic and Social Development Plan (PDES 2022-2026), the National Mining Policy adopted in 2020 and covering the period 2020-2029, etc.

This project will have particularly important positive impacts, including: the creation of direct and indirect jobs, the improvement of incomes, the improvement of the turnover of companies and subcontractors, the improvement of tax revenues at local, regional and national level through the payment of taxes, fees, etc. It will improve the level of investment and consequently of infrastructure (health, water, schools, roads, etc.) in the area concerned. This is one of the objectives of its implementation.

Despite the above positive impacts, the project will have potential negative impacts on elements of the biophysical and human environment of the area.

Thus, on the elements of the biophysical environment, these impacts are the disruption of the soil structure and its pollution by solid and liquid waste, oil and hydrocarbon leaks from the machines, and radiological contamination, the modification of the quality of the ambient air, the drop in the level of the water table and the potential contamination of water (physicochemical, bacteriological and radiological contamination), the destruction of vegetation, the destruction of fauna habitats and the disruption of its tranquility, etc.

On the human environment, the negative impacts of the project are the modification of the visual quality of the landscape, the risk of accidents and injuries, the increased risk of environmental and transmissible diseases, the risk of exposure to thermal environments, the risk of radiological contamination, the modification of the noise and vibration environment, the disruption of pastoral activities, the disruption of local customs and traditions and the risk of damage to cultural and archaeological heritage.

To avoid, mitigate or manage the above impacts, measures have been proposed. As for the elements of the biophysical environment, the measures include the restoration of disturbed sites after the works, the implementation of a management system for solid and liquid waste that will be generated, the implementation of an emergency plan that will make it possible to avoid and/or deal with accidental spills and hydrocarbon leaks, the implementation of watertight platforms to ensure the storage and distribution of hydrocarbons as well as the maintenance of the machines, the suppression of dust through regular watering whenever necessary maintaining mobile and fixed machinery in good working order, carrying out CES/DRS actions, raising awareness and training workers in rational water management, raising workers' awareness of the importance of fauna and respect for its habitats during the works, monitoring air quality, monitoring water quality, monitoring soil quality, monitoring meteorological parameters, etc.

With regard to the human environment, the measures will concern the sensitisation of workers, extended to the local communities, on the risks linked to the project, the setting

up of an Internal Operations Plan (IOP), the health monitoring of workers through medical visits, the provision of workers with appropriate individual protection equipment and of the site with collective protection equipment, the setting up of an infirmary, the setting up of an Occupational Health and Safety Committee and its training with a view to making it operational, the monitoring of the noise environment, monitoring of the food chain, support to pastoralists by providing them with cattle food banks, construction of hydraulic works, sensitisation of the company's workers and subcontractors on the respect of traditional practices, customs and traditions of the local populations, sensitisation on the respect of the cultural and archaeological heritage in the project area, implementation of a procedure relating to fortuitous discoveries and training of the personnel so that they know how to recognise, deal with and react to these discoveries, etc.

To define the conditions for the operational implementation of the measures proposed in the study, an Environmental and Social Management Plan (ESMP) has been drawn up and is structured around the following programmes: Impact mitigation and/or improvement programmes, Environmental monitoring programme, Environmental follow-up programme and Stakeholder capacity building programme.

APPENDICES

Appendix 1: Bibliographical references

Appendix 2: Biodiversity report - dry season

Appendix 3: Biodiversity report - rainy season

Appendix 4: Biodiversity Management Plan

Appendix 5: Groundwater piezometric study

Appendix 6: Radiological survey

Appendix 7: Cultural & Archaeological Heritage Report, Chance Find Procedures

Appendix 8: Stakeholder Engagement Plan

Appendix 9: Gender-Based Violence Plan

Appendix 10: Workforce Management Procedures

Appendix 11: Health, Safety and Security Plan

Appendix 12: Emergency Management Plan

Appendix 13: Closure Plan

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URANIUM GIS OPERATION PROJECT OF THE *"ADRAR EMOLES 3"*
RESEARCH PERMIT (AGADEZ REGION, NIGER)

UPDATE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Report on biodiversity (Dry Season)

March 2022

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INTRODUCTION

As part of the update of the Environmental and Social Impact Assessment (ESIA) of the Adrar Emoles uranium mining project, an important part of the study was devoted to biodiversity. The objective of this study is to provide clear and scientific information on biodiversity and wildlife habitats through an inventory of plant and animal species in the project area and the determination of the protection status of these species in accordance with the IUCN classification. The methodological approach and the results obtained are described in this report.

1. METHODOLOGY

The mission was essentially carried out in a 4*4 vehicle with two (2) observers, a guide, a driver and a security guard. This mission was carried out in several stages, namely reconnaissance, systematic monitoring, the use of photographic traps and drones, and finally the socio-ecological surveys.

1.1. Recognition

A preliminary reconnaissance and mapping stage was carried out to familiarise and gather baseline data on the local geography and to gather the information necessary to make final decisions for a realistic approach to the systematic monitoring stage and to test the data collection methodology. A combination of the use of Cybertracker (www.cybertracker.org) with independent GPS data was used to record and map all observations.

1.2. Systematic monitoring

Following the reconnaissance stage, a transect plan for monitoring covering the site over a radius of 7 km and 15 km was developed. As one of the main objectives of the mission was to provide clear information on the distribution of natural resources, a grid of 5 north-west-south-east transects spaced at 5 km intervals was developed.

All direct and indirect observations of fauna were entered into Cybertracker as well as the vegetation control points (plots) in order to obtain a fully geo-referenced database.

1.3. Camera traps

Two Reconyx were used during the mission. Given the limited number of instruments (2) and the duration of the study, the devices were placed opportunistically and were baited with sardines to maximise the chances of attracting small carnivores during the night. Photo 1 below shows the operator attaching the camera trap.

Photo 1: View of the operator attaching the camera trap

1.4. Drone

A Mavic pro 2 drone was used to map certain habitat points using PIX4D software. The images will be used to characterise the different types of vegetation. Photo 2 below illustrates the preparation of a flight session.

Photo 2: View of the preparation of a flight session

1.5. Socio-ecological surveys

On the basis of the survey sheets that were developed, interviews were held with local communities in the project area. Eight villages (Tagaza, Gololo, Temilt dabous, Oufoud, Inolamane, Gados, Issakanane) were targeted for this study. The themes concerned are flora, fauna, ecosystem services and the threats to them.

2. RESULTS

2.1. Vegetation

2.1.1. Habitat characterisation

The characterisation of the habitats in terms of field geomorphology, floristic composition, type of formation, average height of the flora as well as geographical coordinates and altitude is given in Table 1 below.

Table 1 Characterisation of habitats along the transects

REPORTS	READING POINTS	GEOMORPHOLOGY	FORISTIC COMPOSITION	TYPE OF TRAINING	AVERAGE HEIGHT OF the flora	LATITUDE	LONGITUDE	ALTITUDES (M)
R1	T1	Valley / sandy-clay soil	*Balanites aegyptica, Acacia raddiana, Panicum turgidum, Acacia ehrenbergiana, Cyperus conglomeratus*	Gallery forest	6 m	17,94736111	7,5845833	449,8628467
R2	T1	Rocky plateau	*Panicum Trigidium , Phragmites australis, Acacia ehrenbergiana*	Panicum steppe	2 m	17,7985	7,7358056	502,2858884
R3	T1	Rocky plateau	*Panicum turgidum, Phragmites australis*	rocky expanse	--	17,79619444	7,7455556	513,8677233
R4	T1	Plain	*Acacia ehrembergiana, Balanites aegyptiaca, hyphaene thebeica, Panicum turgidum, Phragmites australis*	Steppe with *Panicum turgidum*	3 m	17,75669444	7,7692222	504,7241695
R5	T1	Rocky plateau	*Phragmites australis, Panicum turgidum, Acacia ehrembergiana*	Grassy steppe	2 m	17,74330556	7,7985	522,0969217
R6	T1	Sandy soil	*Acacia ehrembergiana, Panicum trigidium*		5 m	17,72716667	7,8192222	-
R7	T2	Rocky Plateau	*Acacia ehrenbergiana, Phragmites australis*	Serum on the mineral soil part	3 m	17,82325	7,7799722	505,3337397
R8	T2	Mineral soil	*Balanites aegyptica, Maerua crassifolia, Panicum turgidum, Acacia ehrenbergiana, Calotropis procera,*		6 m	17,862	7,7880833	485,8274916
R9	T2	Raw mineral soil plain	*Calotropis procera, Acacia ehrenbergiana, Balanites aegyptiaca, Panicum turgidum*	Steppe with *Panicum turgidum* and *Calotropis procera*	6 m	0	0	-
R10	T2	Sandy clay soil	*Bossia senegalensis, Balanites aegyptiaca, Acacia ehrenbergiana, Panicum turgidum*	Forestry gallery	6 m	17,86008333	7,7111111	464,1877476
R11	T2	Rocky plateau	*Balanites aegyptiaca, Acacia ehrenbergiana, Panicum turgidum*	Sparse formation	3 m	17,85252778	7,6754722	473,6360866
R12	T2	Rocky plateau	*Acacia Ehrenbergiana, Panicum turgidum, Cyperus conglomeratus, Aristida funiculata or Aristida hordeacea*	Steppe with *Panicum turgidum*	2 m	17,88113889	7,6848889	501,6763182
R13	T3	Koris	*Acacia ehrenbergiana, Calotropis procera, Maerua crassifolia, Balanites aegyptiaca, Ziziphus mauritiana, Hyphaene thebeica, Panicum turgidum, Corchorus depressus*	Tree steppe with Calotropis and Panicum	6 m	17,75544444	7,7252222	480,9509296
R14	T3	Tray covered with raw mineral floor	*Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum, Phragmites australis*	Steppe with Panicum turgidum	3 m	17,76811111	7,7084722	492,5327644

R15	T3	Tray covered with raw mineral floor	*Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum, Phragmites australis, Balanites aegyptiaca*	steppe with Panicum turgidum	6 m	17,77513889	7,6873333	480,3413593
R16	T3	Sanded tray	*Panicum turgidum, Phragmites australis, Cyperus conglomeratus, corchorus depressus*	Panicum steppe	2 m	17,78677778	7,6817222	494,9710454
R17	T3	Sanded tray	*Panicum turgidum, Phragmites australis, Maerua crassifolia, Acacia ehrenbergiana, ziziphus mauritiana*	Panicum steppe	3,5 m	17,80333333	7,6551111	462,3590369
R18	T3	Sanded tray	*Panicum turgidum, Maerua crassifolia, Phragmites autralis, Cyperus conlomeratus*	Serum on the mineral soil part	3 m	17,85416667	7,6211667	467,2355989
R19	T3	Rocky plateau	*Acacia ehrenbergiana, Phragmites australis, Panicum turgidum*		2 m	17,81461111	7,6083056	457,1776897
R20	T4	Rocky plateau	*Phragmites australis, Panicum turgidum, Acacia ehrrenbergiana, Maerua crassifolia*		2 m	17,79441667	7,6006667	470,2834502
R21	T4	Rocky plateau	*Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum, Phragmites autralis, Cyperus conglomeratus*	Panicum steppe	4 m	17,76497222	7,6324444	465,102103
R22	T4	Valley	*Balanites aegyptiaca, Acacia ehrenbergiana, Panicum turgidum, Maerua crassifolia, Phragmites australis, Eragrostis tremula*	Gallery forest	6 m	17,75966667	7,6529444	469,0643097
R23	T4	Tray	*Panicum turgidum, Phragmites australis, Acacia ehrenbergiana*	Sparse vegetation	2 m	17,74325	7,6649444	479,1222188
R24	T4		*Cyperus conglomeratus, Phragmites australis, Panicum turgidum, Acacia ehrenbergiana, Maerua crassifolia*	Panicum steppe	5 m	17,73730556	7,687	469,6738799
R25	T5	Tray	*Phragmites australis, Cyperus conglomeratus, Panicum turgidum, Acacia ehrrenbergiana, Maerua crassifolia*	Grassy steppe	3 m	17,693	7,6416389	465,4068881
R26	T5	Rocky plateau	*Phragmites australis, Acacia ehrenbergiana, Maerua crassifolia, Panicum turgidum*	Steppe with trees open to the sandy parts of the plateau	3m	17,70947222	7,62275	462,3590369
R27	T5	Tray	*Pragmites australis*	Phragmites Steppe	60 cm	17,76183333	7,5638333	436,4523011
R28	T5	Valley	*Denine, Balanites aegyptica, Acacia ehrenbergiana*	Forestry gallery	6 m	17,75094444	7,5828889	437,6714416
R29	T5	Plain	*Acacia ehrenbergiana stand*		5 m	17,76172222	7,5650278	443,462359

R30	T5	Tray	*Corchorus depressus, Phragmites australis, Acacia ehrenbergiana*	Localized herbaceous vegetation in depressions	4 m	17,25819444	7,5011111	453,8250533
R31	T5	Tray	Phragmites australis, Cyperus conglomeratus	----	--	17,81983333	7,5216944	442,2432185

2.1.2. Floristic composition Vegetation

A total of 29 species were recorded in and around the permit area: 17 herbaceous and 12 woody. The woody species are divided into 7 families including Mimosaceae (4 or 33%), Arecaceae (2 or 17%), Capparaceae (2; 17%), Zygolaceae (1 or 8%), Asclepiadaceae (1; 8%), Rhamaceae (1 or 8%) and Burseraceae (1 or 8%) (see Table 2 below).

Table 2 Woody species recorded in the project area

Woody	Family
Acacia ehrenbergiana	Mimosaceae
Acacia raddiana	Mimosaceae
Accacia nilotica	Mimosaceae
Accacia senegal	Mimosaceae
Balanites aegyptiaca	Zygophyllaceae
Boscia senegalensis	Capparidaceae
Calotropis procera	Asclepiadaceae
Commiphora africana	Burseraceae
Hyphaene thebaica	Arecaceae
Maerua crassifolia	Cappariacae
Phoenix dactylifera	Arecaceae
Ziziphus mauritania	Rhamnaceae

As for the herbaceous species, they are distributed in 10 families, of which Graminae represent the most important (7 species or 41%), Caesalpiniaceae (1 species or 6%), Amaranthaceae (1 species or 6%), Poaceae (1 species or 6%), Capparidaceae (1 species or 6%), Tiliaceae (2 species or 11%), Cyperaceae (2 species or 11%), Fabaceae (1 species or 6%), and Aizoaceae (1 species or 6%) (cf. Table 3).

Table 3 Herbaceous areas inventoried in and around the permit area

Herbaceous	Family
Andropogon gayanus	Gramineae
Aristida Sp	Gramineae
Cassia obtusifolia	Caesalpiniaceae
Celosia trigyna	Amaranthaceae
Cenchrus bilorus	Poaceae
Chrysopogon aucheri	Graminae
Cleome africana	Capparidaceae
Corchorus depressus	Tiliaceae
Corchorus olitorius	Tiliaceae
Cymbopogon sp	Gramineae
Cyperus Alopecuroides	Cyperaceae

Herbaceous	Family
Digitaria Horizontalis	Gramineae
Eragrostis tremula	Gramineae
Indicofera Nummulariifolia	Fabaceae
Limeum Viscosum	Aizoaceae
Panicum turgidum	Gramineae
Schoenoplectus corymbosus	Cyperaceae

Figure 1 below shows the floristic composition map of the permit area.

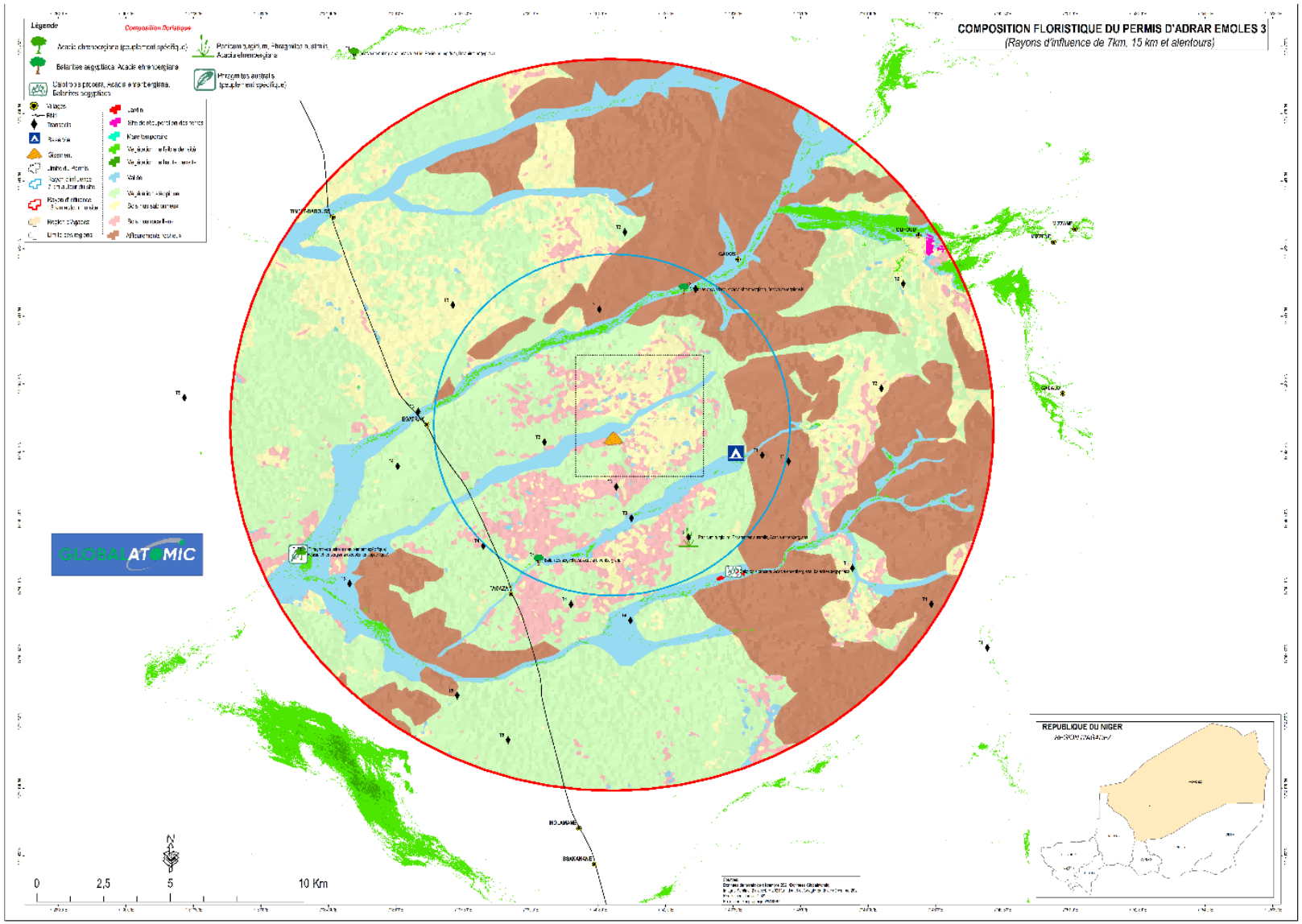

Figure 1 Floristic composition of the permit area

2.1.3. Vegetation cover of the permit area

The average cover of the vegetation cover is between 1 and 75%. The highest cover is found in R1, R3, R8, R9, R14, R20, R23, R29, R31, which varies between 50-75%. The lowest cover is found in R2, R5, R6, R10, R12, R16, R18, R21, R22, R25, R27, R30, with a cover of between 1-5%. Table 4 below gives the overlap per survey.

Table 4 Vegetation cover

TRANSECTS	SECTOR	PLANT COVER
T1	R1	50 - 75 %
T1	R2	1 - 5 %
T1	R3	50 - 75 %
T1	R4	20 - 50 %
T1	R5	1-5%
T2	R6	1 - 5 %
T2	R7	20 - 50 %
T2	R8	50 - 75 %
T2	R9	50 - 75 %
T2	R10	1 - 5 %
T2	R11	20 - 50 %
T2	R12	1 - 5 %
T3	R13	> 75 %
T3	R14	> 75 %
T3	R15	20 - 50 %
T3	R16	1 - 5 %
T3	R17	20 - 50 %
T3	R18	1 - 5 %
T3	R19	1 - 5 %
T3	R20	50 - 75 %
T3	R21	1 - 5 %
T4	R22	1 - 5 %
T4	R23	50 - 75 %
T4	R24	5 - 20 %
T4	R25	1 - 5 %
T4	R26	5 - 20 %
T4	R27	1 - 5 %
T4	R28	5 - 20 %
T5	R29	50 - 75 %
T5	R30	1 - 5 %
T5	R31	50 - 75 %
T5	R32	5 - 20 %
T5	R33	5 - 20 %

TRANSECTS	SECTOR	PLANT COVER
T5	R34	5 - 20 %

2.1.4. Floristic groups

In the course of the study, seven (7) floristic groupings associated with the morphology of the terrain were observed (see Table 5 and Figure 2 below).

Table 5: Plant groups associated with the morphology of the terrain

FLORISTIC GROUPING	CHARACTERISTIC SPECIES	GEOMORPHOLOGY	GEOGRAPHICAL COORDINATES	
G1	*Acacia ehrenbergiana, Acacia tortilis, Panicum turgidum, Balanites aegyptiaca*	Valley	N 17°56'50.5''	E 007°35'04.5''
G2	*Calotropis procera, Acacia ehrenbergiana, balanites aegyptiaca*	Plain	N 17°45'19.6''	E 007°43'30.8''
G3	*Balanites aegyptiaca, Acacia ehrenbergiana*	Plain	N 17°45'34.8''	E 007°39'10.6''
G4	*Balanites aegyptiaca, Acacia ehrenbergiana, Boscia senegalensis*	Valley	N 17°51'36.3''	E 007°42'40.0''
G5	*Phragmites australis* (specific stand)	Plain	N 17°45'42.6''	E 007°33.49.8''
G6	*Acacia ehrenbergiana* (specific stand)	Plain	N 17°45'42.2''	E 007°33'54.1''
G7	*Panicum turgidum, Phragmites australis, Acacia ehrenbergiana*	Sandy plateau / rocky plateau	N 17°46'05.2''	E 007°42'30.5""

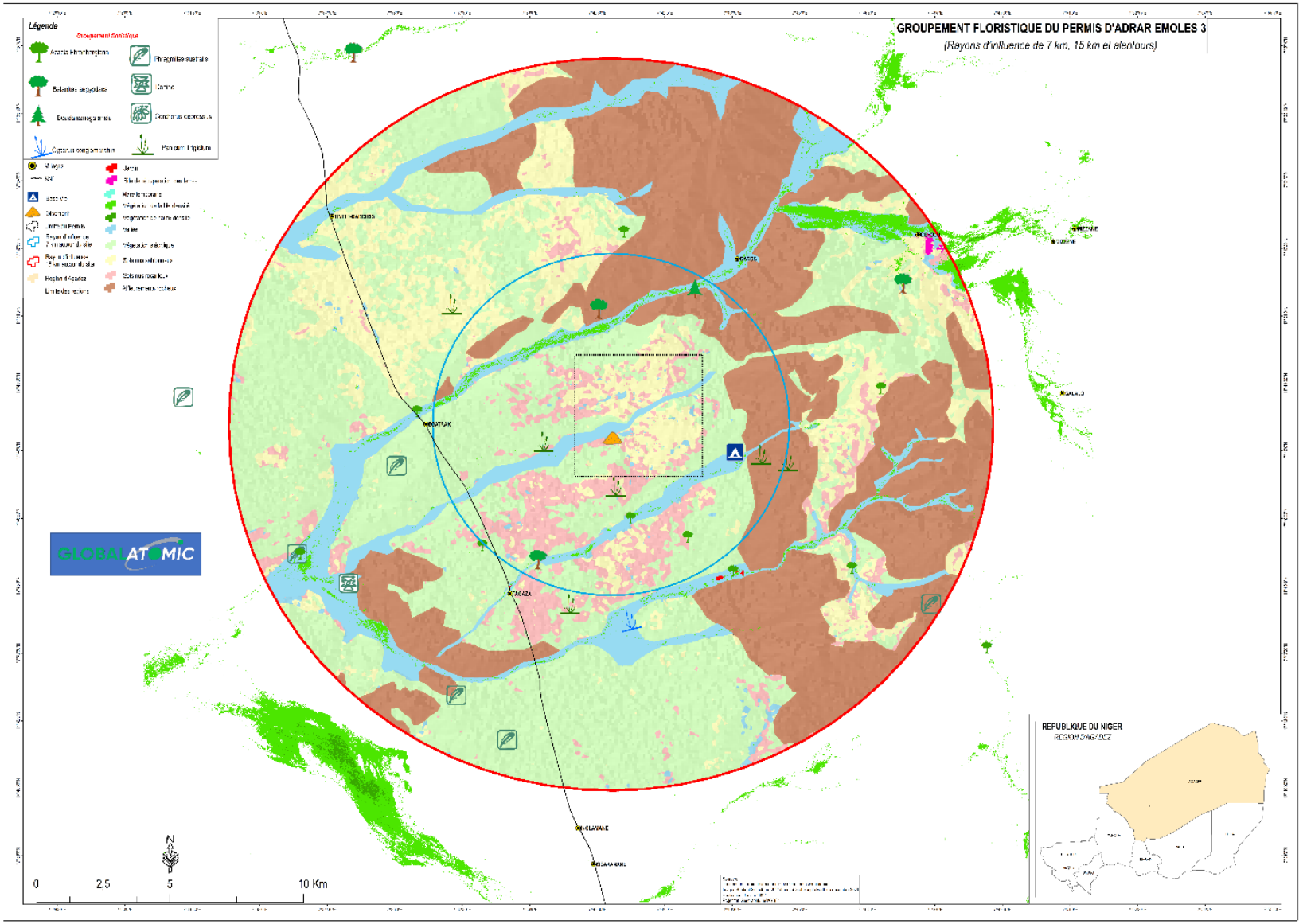

Figure 2 Floristic groups in the permit area

Photos 3, 4 and 5 illustrate some of the associations observed in terms of clustering in the permit area.

Photo 3: Tree steppe with a herbaceous carpet dominated by Phragmites australis

Photo 4: Specific grassy steppe of Panicum turgidum

Photo 5: Stand of Acacia ehrenbergiana

2.1.5. Services provided to local communities

As part of this update of the environmental and social impact assessment of the Adrar Emoles 3 exploration permit, an evaluation of ecosystem services was carried out and

concerned the different uses of vegetation (food, pharmacopoeia, service wood, firewood, grazing, etc.) by local communities. The results are given in the table below.

Table 6 Services provided by flora

SCIENTIFIC NAME	FAMILY	LOCAL NAME	BETAIL FOOD	HUMAN FOOD	PHARMACOPHY	OTHER
LIGNEUX						
Acacia ehrenbergiana	Mimosaceae	Tamat	Yes	Yes	Yes	Firewood, construction
Acacia raddiana	Mimosaceae	Afagak	Yes	No	No	Firewood
Accacia nilotica	Mimosaceae	tiggaert	Yes	No	Yes	Firewood
Accacia senegal	Mimosaceae	Dibshi	Yes	No	Yes	Firewood
Balanites aegyptiaca	Zygophyllaceae	Aborak	Yes	Yes	Yes	Firewood, Handicrafts
Boscia senegalensis	Capparidaceae	Tedent	Yes	Yes	Yes	Firewood
Calotropis procera	Asclepiadaceae	Tirza	Yes	No	Yes	Firewood
Commiphora africana	Burseraceae	Adäras				Firewood
Hyphaene thebaica	Arecaceae	Taggeyt	Yes	Yes	Yes	Firewood
Maerua crassifolia	Cappariacae	Agar	Yes	No	Yes	Firewood
Phoenix dactylifera	Arecaceae	Talizouk	Yes	Yes	Yes	Firewood
Ziziphus mauritania	Rhamnaceae	Abaka	Yes	Yes	Yes	Firewood
HERBACEES						
Andropogon gayanus	Gramineae	Katagoêts				
Aristida Sp	Gramineae	Tazmei				
Cassia obtusifolia	Caesalpiniaceae	Abaezzey	Yes	Yes	Yes	
Celosia trigyna	Amaranthaceae	Tajelanghitayt.				
Cenchrus bilorus	Poaceae	Wajjag	Yes	No	No	
Chrysopogon aucheri	Graminae	Taezmé				
Cleome africana	Capparidaceae	Taedak				
Corchorus depressus	Tiliaceae	Amadghos				
Corchorus olitorius	Tiliaceae	Melahya	Yes	Yes	Yes	
Cymbopogon sp	Gramineae	Tebéremt	Yes	No	Yes	
Cyperus Alopecuroides	Cyperaceae					

SCIENTIFIC NAME	FAMILY	LOCAL NAME	BETAIL FOOD	HUMAN FOOD	PHARMACOPHY	OTHER
Digitaria Horizontalis	Gramineae	Ishibaen	yes	yes		
Eragrostis tremula	Gramineae	Tegit	yes			
Indicofera Nummulariifolia	Fabaceae	Agarof	Yes	Yes	Yes	
Limeum Viscosum	Aizoaceae	Tamasalt				
Panicum turgidum	Gramineae	Afazo	Yes	No	No	Construction secko
Schoenoplectus corymbosus	Cyperaceae	Alögi				

2.2. Wildlife

2.2.1. Results of the observations

During the monitoring mission, direct and indirect observations were recorded. In practice, these observations mainly concerned the most easily observable mammals, birds and reptiles.

The two photographic traps used during five (5) nights, i.e. 10 different positions, allowed us to record some carnivores that were difficult to observe during the day.

In addition, the socio-ecological surveys allowed us to confirm the presence of certain species in the area.

A total of 54 animal species were observed, including 34 birds, 13 mammals and 7 reptiles.

2.2.1.1. Mammals and reptiles

During this mission 6 dorcas gazelles were observed in two direct observations with a flight distance of about 300-500 m, 4 squirrels, 1 jackal and 5 cape hares,

Indirect observations include dorcas gazelles, mouflon, patas, jackal, fennec, pale fox, raccoon, Libyan cat. Photo 4 below shows a fennec photographed by the trap camera.

Of these mammals, only the Dorcas Gazelle and the mouflon are classified as vulnerable on the IUCN red list.

Photo 6 Fennec photographed by the camera

As far as reptiles are concerned, among the species inventoried are the Horned Viper, Snake, Cobra, and the Sand Boa, the Uromastix (see Photo 7 below) and the common lizards.

Photo 7 View of a Uromastyx (direct observation)

The IUCN status of these species (mammals and reptiles) is given in the table below.

Table 7 Status of mammal species and reptiles

N°	TYPE OF OBSERVATION	FRENCH NAME	SCIENTIFIC NAME	LOCAL NAME	IUCN STATUS	CMS	CITES
1	Direct, Questionnaires	Squirrel	*Xerus erytropus*	KolanKolan	Least Concern		
2	Camera trap, questionnaires	Fennec	*Vulpeszerda*	Ezagaz	Least Concern		
3	Direct and indirect, Questionnaires	Dorcas	*Gazella dorcas*	Azankat	Vulnerable	I	III
4	Direct, Questionnaires	Cape Hare	*Lepus capensis*	Tamarwarlt	Least Concern		
5	Indirect, Questionnaires	Mouflons_manchette	*Ammotragus lervia*		Vulnerable	II	II
6	Indirect, Questionnaires	Patas	*Erythrocebus patas*		Least Concern		
7	Indirect, Questionnaires	Ratel	*Mellivora capensis*		Least Concern		III
8	Indirect, Camera trap	Libyan cat	*Felis lybica Felis silvestris*		Least Concern		
9	Indirect, direct, camera trap, questionnaires	Common Jackal	*canis aureus*		Least Concern		III
10	Questionnaires	Gerbil	*Jaculus jaculus*		Least Concern		
11	Questionnaires	Pork spices	*Hystrix cristata*	Takonichit	Least Concern		
12	Camaera trap, Questionnaires	Pale fox	*Vulpes pallida*		Least Concern		
13	Direct, Questionnaires	Herison	*Paraechinus aethiopicus*		Least Concern		
14	Direct, Questionnaires	Uromastyx	*Uromastyx geyri*	Amakachaw	Nearly menaced		
15	Direct, Questionnaires	Lezard	*Agama agama*		Least Concern		
16	Direct, Questionnaires	Desert monitor	*Varanus griseus*		Least Concern		I
17	Indirect, Questionnaires	Cobra	*Najanigri collis*	Safaltas	Least Concern		
18	Indirect, Questionnaires	Horned Viper	*Cerastes ceraste*	Tachile	Least Concern		
19	Direct, Questionnaires	Snake	*Psammophissibilansor Psammophissubtaeniatus*	Koumoetcho	Least Concern		
20	Questionnaires	Sand Boa	*Eryx jaculus*		Least Concern		
21	Questionnaires	Black Sorpion	*Pandinus imperator*	Tazardimet	Least Concern		II
	Disappeared from the project area	Gazelle dama	*Nanger dama*		Critically endangered	I	I
	Disappeared from the project area	Oryx	*Oryx dammah*		Extinct in the wild	I	I
	Disappeared from the project area	Austria					

2.2.1.2. Birds

Several bird species were observed in the project area. Identification was made using the Birds of Western Africa guide, 2nd edition by Nik Borrow and Ron Demey and resulted in 34 species being identified. The raptors observed were the Oricou Vulture, Egyptian Vulture, Great Horned Owl, Short-toed Eagle and Kestrel. The following pictures 8 and 9 illustrate respectively an Orico Vulture and an Egyptian Vulture observed in the project area.

Photo 8 Oricou Vulture

Photo 9 Egyptian woodpecker

Of these birds, only the Oricou Vulture and the Egyptian Vulture are classified as endangered on the IUCN Red List (see Table 7 below), in CITES Appendix II and CMS Appendix II/I for the Egyptian Vulture and CMS Appendix I for the Oricou Vulture.

Table 8 Status of bird species in the project area

FRENCH NAME	SCIENTIFIC NAME	IUCN STATUS
Podobean Agrobate	*Cercotrichos podobe*	Least Concern
Rufous Agrobate	*Cercotrichas galactotes*	Least Concern
Sahara Bunting	*Emberiza striolata*	Least Concern
Red-billed Hornbill	*Tockus nasutus*	Least Concern
Crested Cocksucker	*Galerida cristata*	Least Concern
Capuchins silver beak	*Euodice cantans*	Least Concern
Blue-eared Choucador	*Lamprotornis chalybaeus*	Least Concern
White-winged Eagle	*Circaetus gallicus gallicus*	Least Concern
Brown Raven	*Corvus ruficollis*	Least Concern
Short-tailed Raven	*Corvus rhipidurus*	Least Concern
Pied Raven	*Corvusalbus*	Least Concern
Ruffed Collie	*Urocolius macrourus*	Least Concern
Tawny Cratérope	*Turdoides fulvus*	Least Concern
Kestrel	*Falco tinnunculus*	Least Concern
Brown-bellied Ganga	*Pterocles exustus*	Least Concern
Lichtenstein Ganga	*Pterocles lichtensteinii*	Least Concern
African Hoopoe	*Upupa epops senegalensis*	Least Concern
Great horned owl	*Bubo ascalaphus*	Least Concern
Hoopoe	*Upupa epops*	Least Concern
House Swift	*Apus affinis*	Least Concern
Golden sparrow	*Passer luteus*	Least Concern
White-fronted sparrow	*Eremopterix nigriceps*	Least Concern
Egyptian Percnopter	***Neophron pernopterus***	**At risk**
Little green bee-eater	*Merops orientalis*	Least Concern
Southern Shrike	*Lanius meridionalis*	Least Concern
Rock pigeon	*Columba guinea*	Least Concern
Guinea fowl Common	*Numida meleagris*	Least Concern
Collared dove	*Streptopelia senegalensis*	Least Concern
Masked dove	*Oena capensis*	Least Concern
Mourning Dove	*Streptopelia decipens*	Least Concern
White-headed Wheatear	*Oenanthe leucopyga*	Least Concern
Desert Parrot	*Oenanthe desertii*	Least Concern
Isabella Wheatear	*Oenanthe isabellina*	Least Concern
Oricu Vulture	***Torgos tracheliotos***	**At risk**

2.2.2. Threatened or extinct species

From interviews with local communities, it was found that in the project area, the dama gazelle (*Nanger dama*), the Oryx (*Oryx dammah*) and the Red-necked Austria *(Struthio camelus*) existed.

Today, these species have completely disappeared due to poaching, combined with drought and climate change.

2.2.3. Use of wildlife

As with the flora, the different uses of the fauna by local communities were studied, particularly in terms of food and pharmacopoeia, etc. The results of this are recorded in Table 9 below.

Table 9 Wildlife services

N°	SPECIES	SCIENTIFIC NAME	LOCAL NAME	USES/SERVICES
1	Squirrel	*Xerus erytropus*	KolanKolan	
2	Fennec	*Vulpeszerda*	Ezagaz	
3	Dorcas	*Gazella dorcas*	Azankat	Consumption
4	Cape Hare	*Lepus capensis*	Tamarwarlt	Consumption, ornament of nature
5	Mouflons_manchette	*Ammotragus lervia*		Consumption
6	Patas	*Erythrocebus patas*		
7	Ratel	*Mellivora capensis*		Snake hunter
8	Libyan cat	*Felis lybica Felis silvestris*		
9	Common Jackal	*canis aureus*		Traditional medicine
10	Gerbil	*Jaculus jaculus*		
11	Pork spice	*Hystrix cristata*	Takonichit	
12	Pale fox	*Vulpes pallida*		
13	Herison	*Paraechinus aethiopicus*		
14	Uromastyx	*Uromastyx geyri*	Amakachaw	Traditional medicine
15	Lezard	*Agama agama*		
16	Desert monitor	*Varanus griseus*		Traditional medicine
17	Cobra	*Najanigri collis*	Safaltas	
18	Horned Viper	*Cerastes ceraste*	Tachile	
19	Snake	*Psammophissibilans or Psammophissubtaeniatus*	Koumoetcho	
20	Sand Boa	----------		
21	Black Sorpion	*Pandinus imperator*	Tazardimet	

CONCLUSION

This biodiversity study undertaken as part of the update of the Environmental and Social Impact Assessment of the Adrar Emoles 3 Exploration Permit has provided an overview of the plant and animal species present in the project area.

The methodological approach used combined the use of modern means (Cybertracker, GPS, camera traps, Drone) and socio-ecological surveys (with local communities) in order to have scientifically valid data that will allow an objective assessment of the risks and potential impacts of the project on the environment (particularly on fauna and flora) as well as a proposal of mitigation and/or compensation measures.

Thus, for the vegetation, at the end of this work, a total of 29 species were identified in and around the permit area, including 17 herbaceous and 12 woody species.

As for the fauna, 6 dorcas gazelles, 4 squirrels, 1 jackal and 5 cape hares were observed (direct observations) in terms of mammals and reptiles. Indirect observations included dorcas gazelles, mouflon, patas, jackal, fennec, pale fox, raccoon and Libyan cat. Among the mammals, only the dorcas gazelle and the mouflon are classified as vulnerable on the IUCN red list. Concerning reptiles, among the species inventoried, the Horned Viper, Snake, Spitting Cobra, and the Sand Boa, Uromastix, should be noted.

For birds, 34 species were distinguished during the study. However, the Oricou vulture and the Egyptian vulture are classified as endangered on the IUCN red list.

Finally, the study also took stock of the different ecosystem services in the project area.

PROJECT TO EXPLOIT THE URANIUM DEPOSITS OF THE *"ADRAR EMOLES 3*"
RESEARCH PERMIT (AGADEZ REGION, NIGER)

UPDATE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Report on biodiversity

(Rainy season)

October 2022

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INTRODUCTION

As part of the update of the Environmental and Social Impact Assessment (ESIA) of the Adrar Emoles 3 uranium mining project, a biodiversity study was carried out to characterise biodiversity in the project area. In order to obtain information on biodiversity in the rainy season, a similar study was conducted. A data collection mission visited the site from 10 to 17 October 2022.

The present document, which constitutes the report of the said study, is structured around two (2) components, namely flora and fauna, each consisting of sub-items.

1. OBJECTIVES AND RESULTS OF THE STUDY

The main objective of this study is to update the data on fauna and flora during the rainy season.

Specifically, it is about:

- Carried out habitat points;
- Characterise the fauna and flora at these habitat points;
- Take the GPS coordinates of the various observations, within a radius of 7 km and 15 km from the heart of the deposits;
- Develop thematic maps.

The expected results of the study are:

- Habitat points are carried out;
- The fauna and flora are characterised at these habitat points;
- GPS coordinates for the various observations, within a radius of 7 km and 15 km from the heart of the deposits, are taken;
- Thematic maps are developed.

2. FLORA COMPONENT

2.1. Methodological approach

In order to carry out the flora study, a methodological framework focusing on the following points was adopted: Identification of habitat points, Characterisation of woody and herbaceous vegetation, Processing and analysis of collected data.

2.1.1. Identification of habitat points

The identification of habitat points was done along five (5) transects spaced approximately 5 km apart within a 15 km radius from the core of the deposits. The transects were established during the first mission in September 2021.

The characterisation of the habitats is carried out at the level of the three (3) geomorphological units that are the plateaus, the plains and the valleys that are found within the perimeter of the exploitation permit. This (characterisation) made it possible to distinguish the different types of existing stands.

2.1.2. Characterisation of woody and herbaceous vegetation

Data collection is done in sample plots of 2500 m² (50 m *50 m) corresponding to the minimum area. A plot was defined for each habitat point (survey) and its geographical coordinates were recorded using a GPS.

A total of 37 + 4+ survey points were walked, for which information on woody and herbaceous vegetation was collected. For the first 37 points, a quick observation of the state of the vegetation, the floristic composition and the nature of the soil was carried out. For the four 4+ surveys, an exhaustive census of woody plants was carried out. The dendrometric parameters measured were trunk diameter at base (D20), diameter at breast height (D 1.30 m), total tree height (H) and tree health. The number of offshoots is counted. All trees with a diameter of D20 less than 5 cm are considered as regeneration.

2.1.3. Data processing and analysis

This stage consisted of the processing and analysis of the data collected, according to the objectives of the study, in particular with the Excel spreadsheet and the Geographic Information System (GIS) software. This led to the elaboration of thematic maps and related graphics.

2.2. Results of the study

The results of this study are of two (2) types. These are information on the description of the 37 habitat points through direct observation and the results of the dendrometric measurements carried out through 4 surveys (R38 to 41) in the two (2) valleys in the exploitation area.

Thus, the description of the 37 habitat points (Tables 1 to 5) identified the following areas: grassy steppes, shrub and tree areas, modified areas/habitats, heavily vegetated areas, namely valleys and plains.

2.2.1. Characterisation of habitats

The following tables (1-5) give the characteristic features of the habitats in the different surveys (R1-R37) during the rainy season. They show the types of vegetation formations associated with the geomorphology, as well as their condition, their herbaceous cover, and the heights of the different plant species.

Table 1 Habitat characteristics (surveys R1-R6)

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude(m)	Latitude in dd	Longitude in dd
R1	Rocky plateaus	Steppe with *Panicum turgidum*	Rocky outcrops (sandstone)	No trees	Semi green	- *Panicum turgidum ;* - *Stipagrostis vulnerans*	Near zero	1 - 5 %	< 1 m	547,762207	17,7925	7,75086
R2	Sanded trays	Steppe with *Aristida funiculata; Panicum turgidum; Boerhavia repens*	Sandy, coarse-textured soil	> 25 m	Semi Green	- *Acacia raddiana;* - *Maerua crassifolia;* - *Balanites aegyptiaca;* - *Calotropis procera;* - *Ziziphus mauritania,* - *Hyphaene thebaica,* - *Aristida funiculata;* - *Panicum turgidum;* - *Boerhavia repens;* - *Cenchrus biflorus;* - *Citrullus colocynthis;* - *Corchorus tridens*	Strong	50 - 75 %	5 m	528,538086	17,7579	7,76992
R3	Plain	Grass steppe with *Panicum turgidum, Aristida finiculata* and *Cassia mimosoides*	Gravelly and rocky soil	> 50 m	Semi green	- *Acacia raddiana;* - *Maerua crassifolia,* - *Aristida funiculata;* - *Panicum turgidum,* - *Cassia mimosoide*	Low	1 - 5 %	2 m	549,522949	17,7433	7,79864
R4	Rocky plateau	Shrub Steppe	Sandy-clay soil	5 m	Semi green	- *Acacia ehrenbergiana ;* - *Acacia raddiana;* - *Balanites aegyptiaca;* - *Maerua crassifolia,* - *Aristida funiculata;* - *Citrullus colocynthis;* - *Panicum turgidum*	Strong	20 - 50 %	3 m	536,939453	17,7269	7,81873
R5	Rocky plateaus	Localized vegetation remnant	Gravelly and rocky soil	No trees	Semi green	- *Aristida funiculata*	None	1 - 5 %	< 0,5 m	534,660156	17,7679	7,78304
R6	Curaceous Plateaux	Localized vegetation remnant	Rock outcrops	> 50 m	Semi green	- *Acacia ehrenbergiana;* - *Balanites aegyptiaca;* - *Maerua crassifolia,* - *Aristida funiculata;* - *Panicum turgidum,* - *cassia mimosoide*	Near zero	1 - 5 %	1 m	524,502197	17,819	7,72182

Table 2 Habitat characteristics (surveys R7-R13)

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude (m)	Latitude in dd	Longitude in dd
R7	Sandy valley	Steppe with *Panicum turgidum* and *Cenchrus prieuri*	Sandy, coarse-textured soil	5 m	Green	- *Calotropis procera* - *Acacia ehrenbergiana* - *Acacia raddiana* - *Balanites aegyptiaca* - *Maerua crassifolia* - *Aristida funiculata* - *Panicum turgidum* - *Boerhavia repens* - *Cassia italica* - *Cenchrus prieuri*	Average	> 75 %	4 m	514,0907593	17,85031189	7,74287316
R8	Valley	Steppe with *Aristida finiculata* and *Zizuphus mauritiana*	Sandy, coarse-textured soil	5 m	Green	- *Calotropis procera* - *Acacia ehrenbergiana* - *Acacia raddiana* - *Balanites aegyptiaca* - *Maerua crassifolia* - *Ziziphus mauritania* - *Aristida funiculata* - *Panicum turgidum*	Average	50 - 75 %	4 m	515,7553711	17,86379071	7,78792371
R9	Rocky plateaus	Localized vegetation remnant	Rock outcrops	No tree	Green	- *Aristida funiculata*		1 - 5 %	< 0,5 m	501,4935303	17,86023111	7,72550087
R10	Valley	Steppe with *Panicum turgidum*	Sandy-clay soil	5 m	Green	- *Boscia senegalensis* - *Acacia ehrenbergiana* - *Acacia raddiana* - *Balanites aegyptiaca* - *Maerua crassifolia* - *Aristida funiculata*	Strong	> 75 %	6 m	493,4946289	17,86332757	7,72116058
R11	Valley	Steppe with *Panicum turgidum*	Sandy-clay soil	5 m	Semi green	- *Acacia ehrenbergiana* - *Balanites aegyptiaca* - *Acacia raddiana* - *Maerua crassifolia* - *Aristida funiculate* - *Panicum turgidum*	Strong	> 75 %	4 m	518,1557007	17,79203802	7,71638322

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude (m)	Latitude in dd	Longitude in dd
R12	Valley	Steppe with *Panicum turgidum*	Sandy, coarse-textured soil	5 m	Green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Calotropis procera* - *Maerua crassifolia* - *Aristida funiculata* - *Panicum turgidum*	Average	50 - 75 %	5 m	504,9383545	17,75507261	7,72451225
R13	Sanded trays	Shrub steppe with *Panicum turgidum* and *Cassia mimosoides*	Sandy, coarse-textured soil	100 m	Semi green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Aristida funiculate* - *Panicum turgidum* - *Cassia mimosoide* - *Euphorbia aegyptiaca*	Average	50 - 75 %	3 m	515,1231079	17,76676802	7,70929949

Table 3 Habitat characteristics (surveys R14-R20)

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude in m	Latitude in dd	Longitude in dd
R14	Valley	Steppe with *Panicum turgidum*	Sandy-clay soil	5 m	Semi green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Balanites aegyptiaca* - *Maerua crassifolia* - *Aristida funiculate* - *Panicum turgidum*	Average	20 - 50 %	6 m	501,4438477	17,77576614	7,68711393
R15	Plain	Grass steppe with *Aristida funiculata*	Rocky outcrops (sandstone)	> 100 m	Semi green	- *Acacia ehrenbergiana* - *Aristida funiculate* - *Panicum turgidum*	Low	5 - 20 %	1 m	485,5023193	17,79350473	7,66764992
R16	Rocky plateaus	Shrub steppe with *Panicum turgidum* and *Aristida finiculata*	Rock outcrops	100 m	Green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Maerua crassifolia* - *Aristida funiculate* - *Panicum turgidum*	Low	20 - 50 %	2 m	483,7755127	17,80441284	7,64651936
R17	Rocky plateaus	Grass steppe with *Aristida funiculata* and *Panicum turgidum*	Rock outcrops	> 100 m	Green	- *Acacia ehrenbergiana* - *Maerua crassifolia* - *Aristida funiculate* - *Panicum turgidum*	Very low	5 - 10 %	1 m	481,420166	17,81609554	7,63420664
R18	Valley	Gallery forest	Sandy-clay soil	5 m	Green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Balanites aegyptiaca* - *Boscia senegalensis* - *Maerua crassifolia* - *Aristida funiculata*	Strong	50 - 75 %	7 m	466,6442261	17,81317526	7,60863537
R19	Sanded trays	Shrub steppe with *Panicum turgidum*	Sandy, coarse-textured soil	100 m	Semi green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Maerua crassifolia* - *Aristida funiculate* - *Panicum turgidum*	Strong	50 - 75 %	3 m	489,029541	17,85543272	7,62339344
R20	Sanded trays	Grass steppe with *Panicum turgidum*	Sandy, coarse-textured soil	No trees	Green	- *Panicum turgidum* - *Aristida funiculata*	Low	20 - 50 %	1 m	498,4844971	17,86979106	7,64599219

Table 4 Habitat characteristics (surveys R21-R28)

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude in m	Latitude in dd	Longitude in dd
R21	Rocky plateaus	Localized vegetation remnant	Gravelly and rocky soil	No trees	Semi green	- *Aristida funiculata*	None	1 - 5 %	< 0,5 m	498,2946777	17,85156639	7,67579715
R22	Valley	Gallery forest	Sandy-clay soil	5 m	Green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Balanites aegyptiaca* - *Boscia senegalensis* - *Aristida funiculata* - *Panicum turgidum*	Strong	> 75 %	8 m	483,144165	17,84909887	7,68351807
R23	Valley	Steppe with *Acacia ehrenbergiana* and *Maerua crassifolia*	Sandy-clay soil	25 m	Semi green	- *Acacia ehrenbergiana* - *Maerua crassifolia*	Low	50 - 75 %	4 m	492,5551147	17,76489679	7,63646372
R24	Valley	Forest gallery	Sandy-clay soil	5 m	Green	- *Balanites aegyptiaca* - *Acacia ehrenbergiana* - *Acacia raddiana* - *Maerua crassifolia,* - *Aristida funiculata* - *Panicum turgidum*	Strong	> 75 %	6 m	495,4853516	17,76002581	7,65670356
R25	Rocky plateaus	Grass steppe with *Aristida funiculata*	Rock outcrops	> 100 m	Semi green	- *Acacia ehrenbergiana,* - *Aristida funiculata;* - *Panicum turgidum*	Average	> 75 %	1m	500,7680054	17,74075667	7,67444381
R26	Plain	Steppe with *Aristida finiculata* and *Euphorbia aegyptiaca*	Sandy, coarse-textured soil	25 m	Green	- *Acacia raddiana* - *Acacia ehrenbergiana* - *Balanites aegyptiaca* - *Maerua crassifolia* - *Aristida funiculata* - *Panicum turgidum* - *Euphorbia aegyptiaca*	Low	20 - 50 %	6 m	499,6590576	17,73682727	7,68796142
R27	Rocky plateaus	Localized vegetation remnant	Gravelly and rocky soil	> 100 m	Semi green	- *Acacia ehrenbergiana* - *Aristida finiculata*	Near zero	5 - 10 %	3 m	508,371582	17,73358253	7,69872166
R28	Valley	Forest gallery	Sandy soil, fine texture	5 m	Green	- *Acacia raddiana* - *Acacia nilotica* - *Calotropis procera*	Strong	> 75 %	7 m	510,2754517	17,75568966	7,73940816

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude in m	Latitude in dd	Longitude in dd
						- *Ziziphus mauritania* - *Hyphaene thebaica* - *Aristida funiculata* - *Panicum turgidum*						

Table 5 Habitat characteristics (surveys R28-R37)

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude in m	Latitude in dd	Longitude in dd
R28	Valley	Gallic forest	Sandy soil, fine texture	5 m	Green	- *Acacia raddiana* - *Acacia nilotica* - *Calotropis procera* - *Ziziphus mauritania,* - *Hyphaene thebaica,* - *Aristida funiculate* - *Panicum turgidum*	Strong	> 75 %	7 m	510,2754517	17,75568966	7,73940816
R29	Plain	Grass steppe with *Caccia mimosoides*	Soil sand, coarse texture	100 m	Semi green	- *Acacia ehrenbergiana* - *Balanites aegyptiaca* - *Aristida funiculate* - *Panicum turgidum* - *Cassia mimosoide*	Average	> 75 %	4m	488,0388184	17,69874053	7,64478627
R30	Rocky plateaus	Bare surface	Gravelly and rocky soil	No trees		- *CLEAR*	None	0%	0 m	489,1968994	17,70939085	7,62280596
R31	Plain	Steppe with *Calotropis procera* and *Aristida finiculata*	Sandy soil, fine texture	10 m	Semi green	- *Calotropis procera* - *Acacia raddiana* - *Balanites aegyptiaca* - *Aristida funiculata*	Low	20 - 50 %	5m	475,0681763	17,72295929	7,60472443
R32	Valley	Forest gallery	Sandy-clay soil	5 m	Semi green	- *Acacia ehrenbergiana* - *Acacia raddiana* - *Balanites aegyptiaca* - *Calotropis procera*	Strong	> 75 %	7m	465,9248047	17,73525037	7,59631777
R33	Plain	Shrub steppe with *Panicum turgidum*	Sandy-clay soil	25 m	Semi green	- *Acacia ehrenbergiana* - *Aristida funiculate* - *Panicum turgidum*	Strong	> 75 %	2m	458,6110229	17,75641785	7,57415771
R34	Valley	Forest gallery	Sandy-clay soil	5 m	Green	- *Grewia tenax* - *Acacia ehrenbergiana* - *Balanites aegyptiaca* - *Aristida funiculate* - *cassia tora,*	Average	> 75 %	5m	461,7724609	17,76182233	7,56390668
R35	Rocky plateaus	Grass steppe with *Aristida funiculata*	Gravelly and rocky soil	>100 m	Semi green	- *Acacia ehrenbergiana* - *Aristida funiculata*	Near zero	20 - 50 %	< 0,5 m	467,4057617	17,79694401	7,55050554
R36	Rocky plateaus	Grass steppe with *Aristide finiculata* and *Panicum turgidum*	Gravelly and rocky soil	100 m	Semi green	- *Acacia ehrenbergiana* - *Maerua crassifolia* - *Aristida funiculate* - *Panicum turgidum*	Average	50 - 75 %	1m	472,7519531	17,79493325	7,60200187

Survey	Geomorphology	Types of training	Soil	Distance between trees	State of the vegetation	Floristic composition	Regeneration	Grass cover (%)	Height of the stratum (m)	Altitude in m	Latitude in dd	Longitude in dd
R37	Plain	Grass steppe with *Aristida funiculata*	Sandy soil, coarse texture	50 m	Semi green	- *Acacia raddiana* - *Acacia ehrenbergiana* - *Balanites aegyptiaca* - *Maerua crassifolia* - *Aristida funiculate* - *Panicum turgidum*	Low	> 75 %	4m	500,6781006	17,80576661	7,68572974

2.2.2. Floristic composition

A total of 38 species (25 herbaceous and 13 woody) were recorded in and around the area compared to 29 species in December 2021. This difference is due to the rainy season which allowed the identification of some herbaceous species. The woody species are divided into 8 families including Mimosaceae (4 or 30%), Arecaceae (2 or 15%), Capparaceae (2; 15%), Zygolaceae (1 or 7%), Asclepiadaceae (1; 7%), Rhamaceae (1 or 7%) and Burseraceae (1 or 7%), Tiliaceae (1 or 7%) (see Table 6 below).

Compared to the December 2021 mission, there is little change in woody species. In addition, the phenology of the trees is completely green and regeneration is observed at certain survey points.

Table 6 Woody species identified in the project area

SCIENTIFIC NAME	FAMILY	LOCAL NAME	Status in Niger
Acacia ehrenbergiana	Mimosaceae	Tamat	Claase B
Acacia raddiana	Mimosaceae	Afagak	Claase B
Accacia nilotica	Mimosaceae	tiggaert	Class A
Accacia senegal	Mimosaceae	dibshi	Class A
Balanites aegyptiaca	Zygophyllaceae	Aborak	Class A
Boscia senegalensis	Capparidaceae	Tedent	Class B
Calotropis procera	Asclepiadaceae	Tirza	Class B
Commiphora africana	Burseraceae	Adäras	Class B
Grevia tenax	Tiliaceae	terkoet	Class B
Hyphaene thebaica	Arecaceae	Taggeyt	Class A
Maerua crassifolia	Cappariacae	Agar	Class B
Phoenix dactylifera	Arecaceae	Talizouk	Class B
Ziziphus mauritania	Rhamnaceae	Abaka	Class B

In Niger forest species are classified according to two protection regimes "Class A" and "Class B" (Articles 59 of Decree n°2018 191/PRN/ME/DD of 16 March 2018).

- "Class A": concerns all species of ecological and socio-economic value recognised as threatened or endangered on a national scale and whose protection and reintroduction is necessary (Article 60 of Decree n°2018-191/PRN/ME/DD of 16 March 2018)
- "Class B": Concerns all species of ecological and socio-economic value that are not listed in Class A and that are threatened with overexploitation in a given region, to such an extent that their regeneration is compromised or poorly carried out (Article 61 Decree n°2018 191/PRN/ME/DD of 16 March 2018)

As for the herbaceous plants, they are distributed in thirteen (13) families of which the Graminae represent the most important (7 species or 28%), Caesalpiniaceae (3 species or 12%), Amaranthaceae (1 species or 6%), Poaceae (1 species or 6%), Capparidaceae (2 species or 8%), Tiliaceae (2 species or 8%), Cyperaceae (2 species or 8%), Fabaceae (1 species or 4%), and Aizoaceae (1 species or 4%), Cucurbitaceae (1 species or 4%), Nyctaginaceae (1 species or 4%), Euphorbiaceae (1 species or 4%), Nyctaginaceae Table 7 below).

Eight (8) new species were recorded in addition to those identified during the last inventory, an increase of 32%.

Table 7 Herbaceous species inventoried in and around the permit area

SCIENTIFIC NAME	FAMILY	LOCAL NAME
Andropogon gayanus	Gramineae	Katagoêts
Aristida Sp	Gramineae	Tazmei
Cassia obtusifolia	Caesalpiniaceae	Abaezzey
Celosia trigyna	Amaranthaceae	Tajelanghitayt.
Cenchrus bilorus	Poaceae	Wajjag
Chrysopogon aucheri	Graminae	Taezmé
Cleome africana	Capparidaceae	Taedak
Corchorus depressus	Tiliaceae	Amadghos
Corchorus olitorius	Tiliaceae	Melahya
Cymbopogon sp	Gramineae	Tebéremt
Cyperus Alopecuroides	Cyperaceae	
Digitaria Horizontalis	Gramineae	Ishibaen
Eragrostis tremula	Gramineae	Tegit
Indicofera Nummulariifolia	Fabaceae	Agarof
Limeum Viscosum	Aizoaceae	Tamasalt
Panicum turgidum	Gramineae	Afazo
Schoenoplectus corymbosus	Cyperaceae	Alögi
Cassia mimosoides	Caesalpiniaceae	Tiggarna' madal
Cleome viscosa	Capparidaceae	adagall nagasaye
Indigofera cordifolia	Fabaceae	
Citrillus colocynthis	Cucurbitaceae	tagallat
Boerhavia repens	Nyctaginaceae	Tamasalt
Euphorbia aegyptiaca	Euphorbiaceae	Taelakh
Cryptolepis sanguinolenta	Periplocaceae	Oemaman
Cassia italica	Caesalpiniaceae	agargar

2.2.3. Floristic groups

The analysis of the above tables (1 to 5 on habitat characterisation) reveals seven (7) types of plant association or grouping indicated in Table 8 below. These are distributed in the three (3) geomorphological units which are *the Plateaux, Plains and Valleys.*

Table 8 Floristic groups in relation to geomorphology

Floristic grouping	Characteristic species	Geomorphological units	Contact details	
G1	- *Acacia ehrenbergiana,* - *Acacia radiana,* - *Panicum turgidum,* - *Balanites aegyptiaca*	Valley	N 17°56'50.5''	E 007°35'04.5''
G2	- *Calotropis procera,* - *Acacia ehrenbergiana,* - *Balanites aegyptiaca*	Plain	N 17°45'19.6''	E 007°43'30.8''
G3	- *Balanites aegyptiaca,* - *Acacia ehrenbergiana*	Plain	N 17°45'34.8''	E 007°39'10.6''
G4	- *Balanites aegyptiaca,*	Valley	N 17°51'36.3''	E 007°42'40.0''

Floristic grouping	Characteristic species	Geomorphological units	Contact details	
	- *Acacia ehrenbergiana,* - *Boscia senegalensis*			
G5	- *Aristida finiculata (specific stand)*	Plain	N 17°45'42.6''	E 007°33.49.8''
G6	- *Acacia ehrenbergiana (specific stand)*	Plain	N 17°45'42.2''	E 007°33'54.1''
G7	- *Panicum turgidum,* - *Aristida finiculata,* - *Acacia ehrenbergiana*	Sandy plateau/rocky plateau	N 17°46'05.2''	E 007°42'30.5""

2.2.4. Characterisation of the surveys R38 to R41

For the survey points R38, R39, R40 and R41, an exhaustive census of the woody plants was made. The dendrometric parameters measured were trunk diameter at the base (D20), diameter at breast height (D 1.30 m), total height (H) and tree health.

Figure 1 below shows the floristic composition of the woody plants in these surveys (R38 to 41).

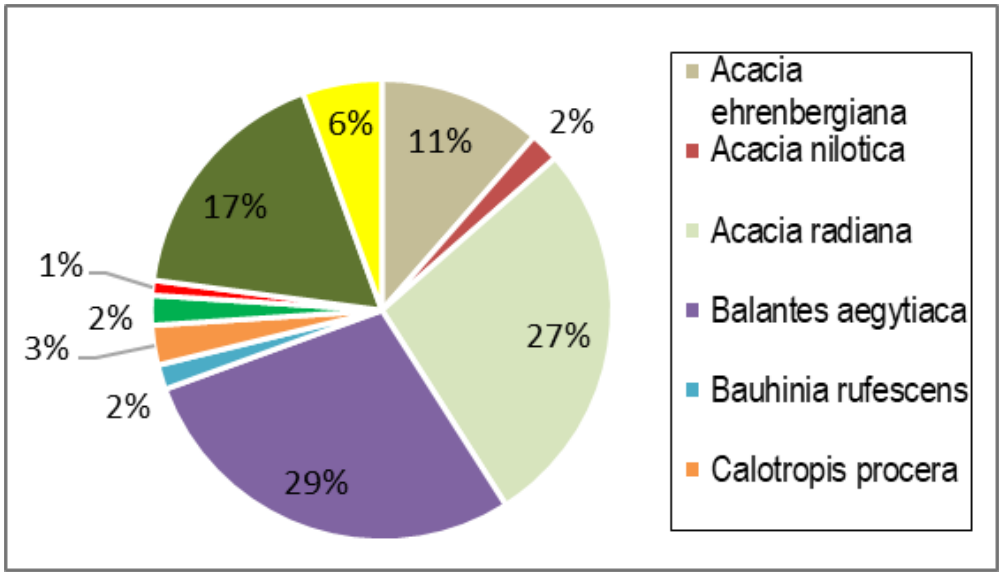


Figure 1 Floristic composition (R38-R41)

Analysis of Figure 1 above shows a strong dominance of Balanites aegyptiaca and *Acacia radiana* with respectively 29% and 27% of the overall floristic composition. They are followed by *Maerua crassifolia* (17%) and *Acacia ehrenbergiana* (11%). Species such as Acacia nilotica (2%), *Hyphaene thebaica* (2%), *Bauhinia rufescens* (2%) and Lianes (1%) are endemic to the Elagozane valley where they exist in a few old individuals. This means that these species do not renew themselves, or at least very slowly, and therefore could disappear over time.

The situation regarding the health status of the woody plants at points R38 to R41 is shown in Figure 2 below.

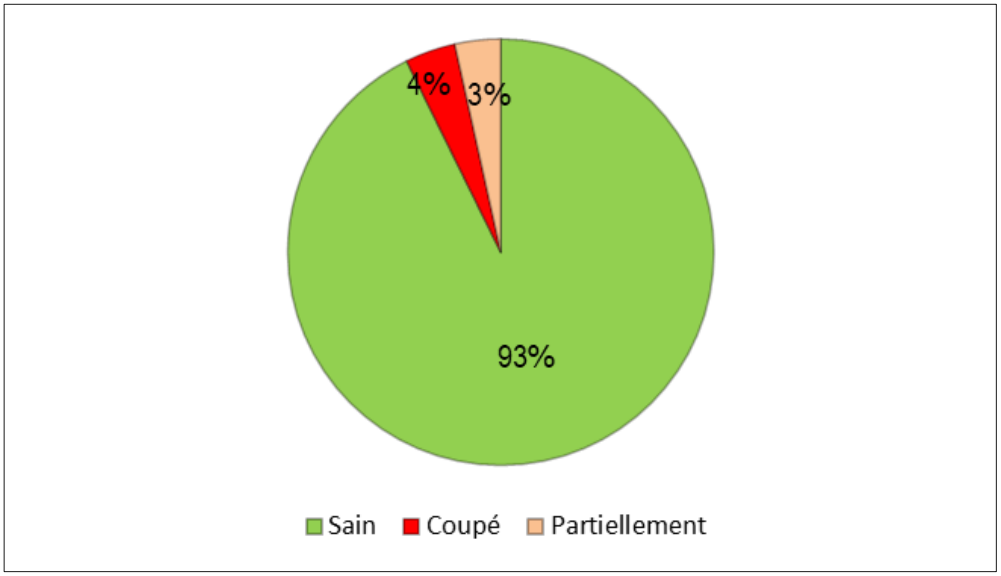


Figure 2 Health status of woody plants (R38-R41)

Overall, the woody formation is doing well. Thus, 93% of the trees are healthy. However, clear-cutting was observed on about 4% of the formation and 3% of the trees are dry, although they are still alive. Clear cutting is a sign of anthropisation of the forest formations. In these areas, the main source of energy is wood. The Balanites aegyptiaca, because of the quality of its wood, is the most affected by logging.

The diameter and height structures of the woody plants are shown in figures 3 and 4 respectively.

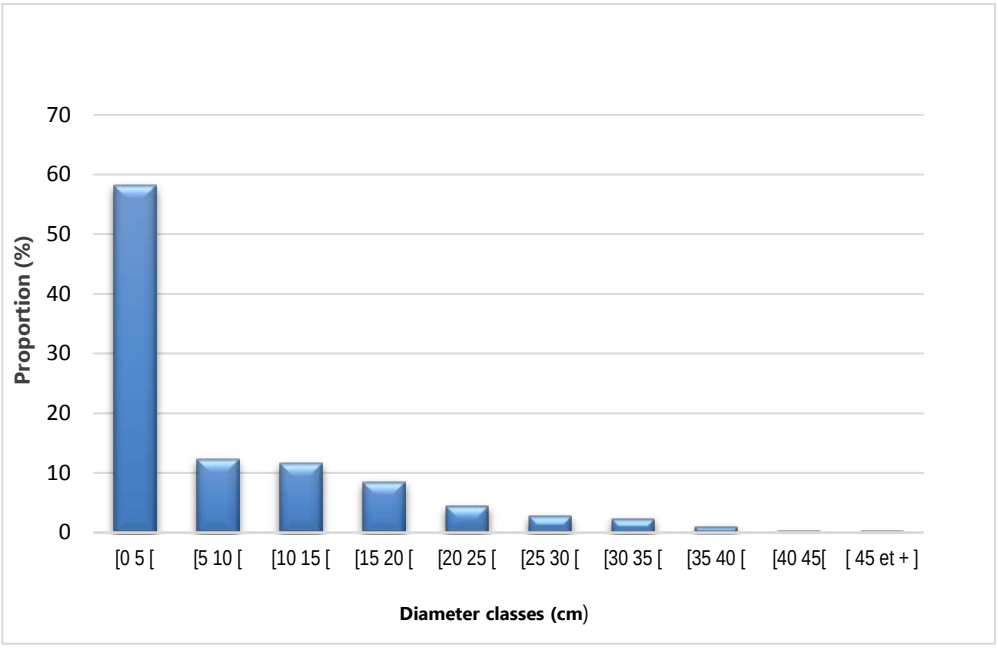


Figure 3 Diameter structure (D1,30) of woody plants (R38-R41)

The ***L-shaped*** diagram in Figure 3 above illustrates a woody formation with a high predominance of young, small-diameter individuals, which is characteristic of a rejuvenating population, thus reflecting strong natural regeneration in the study area.

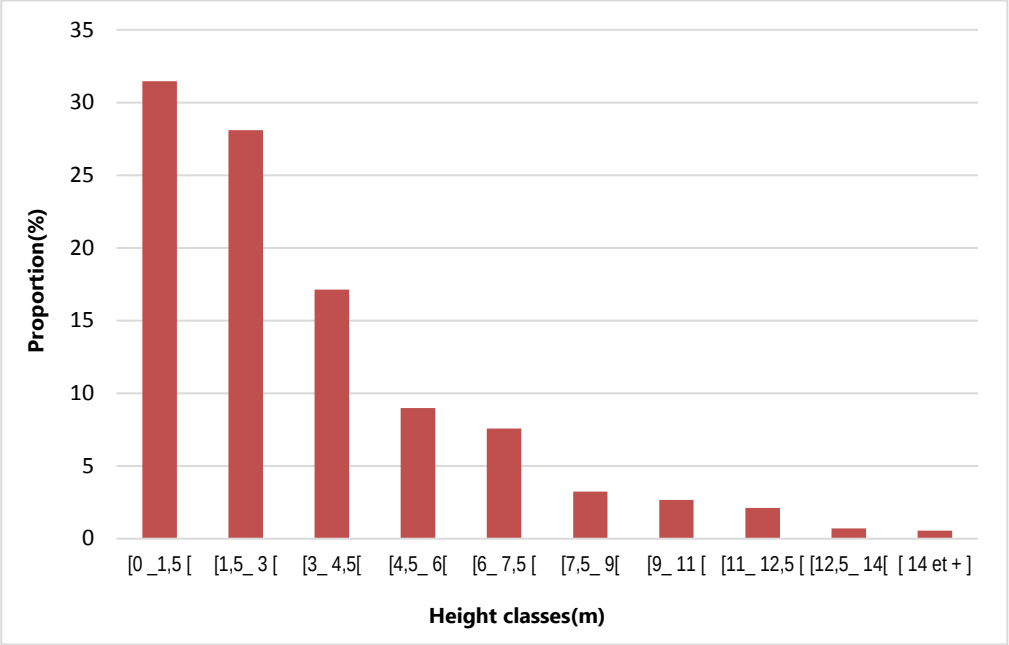


Figure 4 Height structure of woody plants (R38-R41)

The ***L-shaped*** diagram in Figure 4 above illustrates a woody formation with a high predominance of young, low individuals, characteristic of a rejuvenating population. This translates into strong natural regeneration.

3. WILDLIFE COMPONENT

3.1. Methodology

The mission was essentially carried out in a 4*4 vehicle with two (2) observers, a driver and a guide. It was carried out in several stages, namely systematic monitoring, the use of photographic traps , data collection using a Cybertracker (www.cybertracker.org) with independent GPS data.

3.1.1. Systematic monitoring

Following the reconnaissance stage, a planning of transects for monitoring covering the site over a radius of 7 km and 15 km was made. As one of the main objectives of the mission was to provide clear information on the distribution of natural resources, a grid of five (5) northwest/southeast transects spaced at 5 km intervals was defined.

All direct and indirect observations of fauna were entered into a Cybertracker as well as the vegetation control points (plots) to obtain a fully geo-referenced database.

3.1.2. Camera traps

Four (4) Browning cameras were used during the mission. They were placed opportunistically at burrows, waterholes and some large valleys and were baited with sardines to maximise the chances of attracting small carnivores during the night. Photo 1 below shows one of the camera traps attached as part of the mission.

Photo 1 Camera trap set up next to a burrow

3.2. Results of the observations

During the monitoring mission, direct and indirect observations were recorded. In practice, these observations mainly concerned the most easily observable mammals, birds and reptiles.

The four (4) photographic traps used during three (3) nights, i.e. twelve (12) different positions, allowed us to record some carnivores that were difficult to observe during the day.

A total of 49 animal species were observed, including 34 birds, 10 mammals and 4 reptiles.

3.2.1. Mammals and reptiles

The species observed directly and indirectly during this mission are Dorcas Gazelle, Jackal, Cape Hare, Mouflon, Ratel, Fennec, Pale Fox, Raccoon, Libyan Cat. Of these mammals, only the dorcas gazelle and the mouflon are classified as vulnerable on the IUCN red list. Photo 2 below shows a ratel photographed by the trap camera.

Photo 2 Ratel photographed by the camera

As far as reptiles are concerned, the Horned Viper (see photo 3), Snake, Uromastix and common lizards are among the species inventoried.

Photo 3 Horned viper (Cerastes ceraste)

The IUCN status of these species (mammals and reptiles) is given in Table 9 below.

Table 9 Status of mammal and reptile species

Type of observation	French name	Scientific name	IUCN status	CMS	CITES
Indirect,	Dorcas	*Gazella dorcas*	Vulnerable	I	III
Direct	Cape Hare	*Lepus capensis*	Least Concern		
Indirect	Mouflons_manchette	*Ammotragus lervia*	Vulnerable	II	II
Indirect, camera trap	Ratel	*Mellivora capensis*	Least Concern		III
Indirect	Libyan cat	*Felis lybica Felis silvestris*	Least Concern		
Indirect, direct, camera trap	Common Jackal	*Canis aureus*	Least Concern		III
Indirect	Pork spice	*Hystrix cristata*	Least Concern		
Indirect	Pale fox	*Vulpes pallida*	Least Concern		
Direct	Herison	*Paraechinus aethiopicus*	Least Concern		
Direct	Uromastyx	*Uromastyx geyri*	Nearly menaced		
Direct	Lezard	*Agama agama*	Least Concern		
Direct,	Desert monitor	*Varanus griseus*	Least Concern		I
indirect	Horned viper	*Cerastes ceraste*	Least Concern		
Direct	Snake	*Psammophis sibilans or Psammophis subtaeniatus*	Least Concern		
Direct	Frog	*Rana dalmatina*	Least Concern		

3.2.2. Birds

Several bird species were observed in the project area. Identification was made using the Birds of Western Africa guide, 2ème edition by Nik Borrow and Ron Demey and resulted in 34 species being identified. The raptors observed were the Egyptian vulture and the kestrel.

Of these birds, only the Egyptian vulture is classified as endangered on the IUCN Red List (see Table 10 below), CITES Appendix II and CMS Appendix II/I.

Table 10 Status of bird species in the project area

French name	Scientific name	IUCN status	CITES	CMS
Podobean Agrobate	*Cercotrichos podobe*	Least Concern		
Rufous Agrobate	*Cercotrichas galactotes*	Least Concern		

Sahara Bunting	*Emberiza striolata*	Least Concern		
Red-billed Hornbill	*Tockus nasutus*	Least Concern		
Crested Cocksucker	*Galerida cristata*	Least Concern		
Capuchins silver beak	*Euodice cantans*	Least Concern		
Blue-eared Choucador	*Lamprotornis chalybaeus*	Least Concern		
Brown Raven	*Corvus ruficollis*	Least Concern		
Short-tailed Raven	*Corvus rhipidurus*	Least Concern		
Pied Raven	*Corvusalbus*	Least Concern		
Ruffed Collie	*Urocolius macrourus*	Least Concern		
Tawny Cratérope	*Turdoides fulvus*	Least Concern		
Kestrel	*Falco tinnunculus*	Least Concern		
Brown-bellied Ganga	*Pterocles exustus*	Least Concern		
Lichtenstein Ganga	*Pterocles lichtensteinii*	Least Concern		
White-throated Bee-eater	*Merops albicollis*	Least Concern		
African Hoopoe	*Upupa epops senegalensis*	Least Concern		
Great horned owl	*Bubo ascalaphus*	Least Concern		
Hoopoe	*Upupa epops*	Least Concern		
House Swift	*Apus affinis*	Least Concern		
Golden sparrow	*Passer luteus*	Least Concern		
White-fronted sparrow	*Eremopterix nigriceps*	Least Concern		
Egyptian Percnopter	*Neophron pernopterus*	**At risk**	III	I/II
Little green bee-eater	*Merops orientalis*	Least Concern		
Southern Shrike	*Lanius meridionalis*	Least Concern		
Rock pigeon	*Columba guinea*	Least Concern		
Guinea fowl Common	*Numida meleagris*	Least Concern		
Collared dove	*Streptopelia senegalensis*	Least Concern		
Masked dove	*Oena capensis*	Least Concern		
Mourning Dove	*Streptopelia decipens*	Least Concern		
White-headed Wheatear	*Oenanthe leucopyga*	Least Concern		
Desert Parrot	*Oenanthe desertii*	Least Concern		
Isabella Wheatear	*Oenanthe isabellina*	Least Concern		

CONCLUSION

Conducted during the rainy season, this study made it possible to characterise the plant formations and fauna in the area of the "Adrar Emoles 3" uranium mining project.

Thus, as far as flora is concerned, a total of 38 species (25 herbaceous and 13 woody) have been recorded in and around the area, compared with 29 species in December 2021.

The herbaceous cover is not very diverse and is dominated by a perennial poaceae (*Panicum turgidum*). The woody formation is moderately diversified and dominated by Acacia. They contain very localised endemic species such as *Boscia senegalensis, Greria tenax, Acacia nilotica*. The height and diameter structures indicate good regeneration.

With regard to the fauna, the study enabled the observation of a total of 49 animal species, including 34 birds, 10 mammals and 4 reptiles.

Among mammals and reptiles, the species listed as vulnerable by the IUCN are *Gazella dorcas* and *Ammotragus lervia*. The *Uromastyx geyri is* considered a *near-threatened* species according to the same status. The others are species of Least Concern.

For birds, only the Egyptian vulture is classified as endangered on the IUCN Red List, CITES Appendix II and CMS Appendix II/I.

APPENDICES

- Appendix 1: Map of Floristic Groups
- Appendix 2: Herbaceous map
- Appendix 3: Map of wildlife observation points

URANIUM DEPOSIT EXPLOITATION PROJECT OF THE *RESEARCH PERMIT "ADRAR EMOLES 3*" (AGADEZ REGION, NIGER)

BIODIVERSITY MANAGEMENT PLAN

March 2022

TABLE OF CONTENTS

INTRODUCTION

As part of the update of the Environmental and Social Impact Assessment (ESIA) of the Uranium Deposit Exploitation Project of the Adrar Emoles research permit, an important component was devoted to biodiversity.

Thus, the related study made it possible to provide clear and scientific information on biodiversity and wildlife habitats through an inventory of plant and animal species in the project area and the determination of the protection status of these species in accordance with the IUCN classification.

After this assessment, it was necessary, given the potential negative impacts that the project will have on biodiversity, to develop this Management Plan in order to highlight the activities that are the source of Impacts on biodiversity, the potential negative impacts, the measures to mitigate or compensate for them as well as the institutions responsible for implementing them. in implementation and monitoring control.

This report , which constitutes the said plan , is structured around the following points:

- Brief presentation of the Project;
- Roles of biodiversity;
- Project activities sources of impacts on biodiversity;
- Impacts of the project on biodiversity and measures;
- Implementation plan of the measures;
- Institutional actors for the implementation of the measures;
- Conclusion.

1. BRIEF PRESENTATION OF THE PROJECT

The Company Global Atomic Corporation, a Canadian company, which has been conducting mining research in Niger since 2007, is considering the exploitation of the uranium deposit that it discovered in the "Adrar Emoles 3" research permit.

The area of the operating permit, object of this project covers an area of 25.01 km² and is located in the Rural Commune of Tchirozérine (Department of Tchirozérine, Region of Agadez.

The geographic coordinates (Latitude/Longitude, ADINDAN – Clarke 1880) of the tops of the permit perimeter are given in Table 1 below. Figure 1 illustrates this on a topographical background.

Table 1 : Coordinates of the peaks of the perimeter of operation

Point	Longitude	Latitude
A	7° 39' 59, 8''	17° 50' 08''
B	7° 42' 50''	17° 50' 08''
C	7° 42' 50''	17° 47' 26''
D	7° 39' 59, 8''	17° 47' 26''

1.1. Project Objectives

The general objective of the project is the exploitation of the uranium deposit discovered in the "Adrar Emoles 3" research permit.

The specific objectives are:

- Build and install permanent surface infrastructures (life base, buildings including administrative and technical blocks, sanitary facilities, water and electricity networks, basins, various workshops and garages, shops and warehouses of various products and equipment, etc.);
- Build the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) as well as all the installations associated with it (garage, workshops, crushing device, various cables, signals, instructions, etc.);
- Build the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouses, various networks, contact for the production of sulfuric acid, hydraulic works, worms, different input storage areas, etc.);
- Process the ore to obtain uranate, feed it and transport it to potential outlets;
- Create temporary and permanent jobs and contribute to the improvement of people's living conditions;
- Contribute significantly to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors;
- Redevelop all the sites operated when the project closes.

1.2. Expected results

The main expected results of the project implementation are:

- permanent surface infrastructures (life base, buildings including administrative and technical blocks, sanitary facilities, water and electricity networks, basins, various workshops and garages, shops and warehouses of various products and equipment, waste rock and residue deposit areas, etc.) are built and/or installed;
- the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) as well as all the installations associated with it (garage, workshops, crushing device, various cables, signaling, instructions, etc.) are built and/or installed;
- the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouse, various networks, contact

for the production of sulfuric acid, hydraulic works, pours, pours, different input storage areas, etc.) are built;

- the ore extracted is processed, the uranate obtained swollen and transported to potential outlets;
- temporary and permanent jobs are created and the living conditions of the people of the area are improved;
- a significant contribution to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors is made;
- all the sites operated are redeveloped when the project closes.

1.3. Description of the deposit

All known uranium deposits in Niger are located in sandstones and conglomerates in the Tim Mersoi Basin. They are all classified as belonging to sedimentary tabular types.

Uranium deposits hosted in sandstone are marked by epigenetic concentrations of uranium in river/lake or deltaic sandstones deposited in fluvial continental environments frequently in transition zones from higher to lower flow regimes, such as along paleo ridges or domes. Roll-front deposits contain impermeable shale or mudstones that cover or underlyze or often separate mineralized sandstone and ensure that fluids move along sandstone bodies.

In sandstone-type deposits, uranium is usually precipitated by oxidizing fluids of reducing agents such as plant matter, amorphous humate, sulphides, iron minerals and hydrocarbons. The oxidation and reduction facies display typical colors and can assist in the selection of exploration targets. Fluid migrations and uranium deposition leave a color change from red hematite (oxidized) to gray-green (reduced). The main uranium minerals in most sandstone-type deposits are uraninite, pitchblende, coffinite

Generally speaking, it can be noted from north to south to east of Niger that uranium mineralization seems to occur in increasingly younger strata. This is most likely a combination of a change in the source areas and the addition of uranium over time as well as the fact that in the south the younger layers are exposed to the surface, which requires deeper and deeper drilling in the southern areas (e.g. for the Carboniferous - aged targets).

The best grade and tonnage of uranium from the Adrar Emoles 3 deposit is found in the sandstones of the Chirezrine 2 formation, the same formation that also contains the large Orano Imouraren deposit, located about 40 km northwest of Adrar Emoles 3.

Unlike carboniferous mineralization in the Arlit region, uranium from the Chirezrine 2 formation appears primarily as hexavalent uranium minerals in an oxidized environment. Uranophane is the most abundant mineral. It may form small aggregates or appear as a continuous coating parallel to stratification. Uranophane is commonly associated with chrysocolla and in small amounts also associated with boltwoodite. Metahuyamunite was also found. Coffinite exists in residual reduced areas, as well as chalcocite and native copper. Pitchblende has been observed in small quantities. This mineralization comes in two main forms: interstitial in sandstones, and massive mineralization associated with sulphides in microcracks with galena and blende.

1.4. Mineral Resource and Reserve Estimate

The mineral resources of the deposit have been estimated according to the proposed method of exploitation which is ***underground mining***. They are summarized in Table 2 below.

Table 2 : Mineral Resource and Reserve Estimates

Cut	Category	Tonnes	eU3O8	Metal content
eU3O8 pm		Mt	Ppm	Mlb
100	Proved	81,6	718	129,1
	Probable	96,1	606	128,4
300	Proved	34,4	1146	109,6
	Probable	37,6	1260	104,6
1000	Proved	9,6	3885	82,1
	Probable	10,2	3308	74,2
2000	Proved	4,6	6624	66,8
	Probable	4,5	5713	56,8
2500	Proved	3,6	7849	61,9
	Probable	3,4	6838	51,4
5000	Proved	1,6	13186	46,8
	Probable	1,6	10805	37,2
10000	Proved	0,6	24401	31,1
	Probable	0,8	14598	25,3
15000	Proved	0,3	34236	24,3
	Probable	0,1	21493	4,0

1.5. Key production data

The main production data of the "Adrar Emoles 3" research permit deposit exploitation project are shown in Table 3 below.

Table 3 : Production Profile

Mine life	Years	12
Total ore production	Million tonnes	4,13
Total plant treatment	Million tonnes	4,03
Total sterile production	Million tonnes	0,99
Cut-off content	Ppm	5396
Global recovery shredder	%	92
Resource consumption	Drinking water	For the record
	Industrial water	55 ^{m3}/h
	Electrical energy	10 MW
	Fuels	2000 l/d
	Treatment reagents	93 t/d
Jobs	Direct	307
	Indirect	500.

The total number of direct and indirect jobs during the operation of the mine will be 307 and 500 respectively. However, it should be noted that during the construction phase of the mine, the project will generate more than 450 direct and indirect jobs.

1.6. Project activities

The main activities that will be implemented as part of the adrar Emoles 3 research permit deposit project are given in Table 4 below.

Table 4 : Project Activities

Project Phases	Activities
Development (Preparation and construction)	- Construction/development of access roads/tracks - Site preparation (stripping or removal of overburden) for the construction of temporary equipment - Installation of temporary infrastructure and equipment that will contribute to the construction of the project (life base to accommodate the staff of the construction companies, material base, etc.) - Exploitation of loans and quarries (sand, gravel, laterite, etc.) - Preparation of facility rights-of-way - Construction/installation of surface structures and equipment (employees' life base, administrative and technical blocks, factory and support services including workshops/garages for maintenance and reconditioning of machinery, boilermaking, pneumatics, etc., input warehouses, contact workshop for the production of sulphuric acid, basins, dikes, boreholes, tailings park, waste treatment facilities, electrical power generation system, etc.) - Construction of the underground mine (ramps, galleries, ventilation holes) and its underground support services (garage, workshops, crushing device, various networks, road signs and lockers, etc.).
Exploitation	- Extraction of ore from the underground mine (drilling, logging by explosive fire, transport of ore to the primary crusher, dayway conveying through a conveyor belt) - Storage of inputs (chemicals including sulphur, hydrocarbons, etc.) - Operation of workshops (maintenance of machinery and equipment, reconditioning of machinery, manufacture of spare parts, etc.) - Ore storage, crushing and conveying to the plant - Plant-level ore processing (crushing, grinding and classification, attack, liquid/solid separation, clarification, precipitation, purification, uranate drying/calcination and runaway) - Storage of ore processing tailings - Loading and shipping uranate - Periodic maintenance work on the plant
Closure	- Dismantling of installations - Site Cleanup - Redevelopment/rehabilitation of sites

1.7. Main infrastructures of the project

The main infrastructures that will be built as part of the project:

- the living base: staff homes, health, social, cultural, educational, electrical, drinking water supply, roads, etc.
- the mining area: access roads to the mine, the all-coming, ore piles, explosives warehouse, mechanical workshops, storage stores, truck loading facilities and other related infrastructure such as internal roads, buildings (administration, changing rooms, etc.) and services.

- the ore processing plant, the contact workshop for the production of sulfuric acid and the solvent extraction process for uranium.
- transportation runways, service corridors, overhead power lines and water pipes.
- Tailings storage facilities and waste rock worms - Residues from the treatment plant will be stored dry in a waste storage facility with a clay coating. Waste rock from the mine will be discharged into waste rock worms.

1.8. Project equipment and materials

The main equipment and materials necessary for the implementation of the project include:

- Bulldozers, Backhoes, Graders, Drills, Trucks, Loaders, Tanker Trucks;
- Crushers, Grinders, Sprayers;
- Injection and extraction pumps;
- Materials and equipment for maintenance and repair;
- Machines for turning parts;
- Welding machines;
- Laboratory materials and equipment;
- Extraction materials and equipment;
- Filtration and washing materials and equipment;
- Purification, drying and smoking materials and equipment;
- Explosives;
- Various spare parts;
- Various consumables;
- Etc.

1.9. Water supply and electricity

The supply of industrial and drinking water will be based on the capture of aquifers identified for this purpose. This is mainly the tablecloth of the geological formation of Teloua and incidentally that of Tchirozérine 2. However, dewatering water from the mine will also be injected into the industrial water pumping circuit.

The hydrogeological programmes carried out on the permit have also highlighted the possibility of exploiting other aquifers such as the Guézouman and the Tarat.

Pumping tests carried out by Global Atomic Corporation on boreholes capturing the Teloua aquifer have yielded flows varying between 15 and 25 ^{m3}/h.

The supply of electricity during the construction phase will be provided by diesel generators, including for water supply systems. Diesel for generators will be stored in a protected area equipped with accidental spill cleaning kits and associated oil/water separators.

In the operation phase, the needs will be met by the SONICHAR network. For this purpose, power lines and the substation will be built.

2. DEFINITION AND ROLES OF BIODIVERSITY

The Convention on Biological Diversity defines biodiversity as follows: "*Variability of living organisms of all origins including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within and between species as well as ecosystem diversity. »*

Biodiversity includes all living organisms and their genetic diversity, a large and complex set of ecosystems and habitats, and the processes that underpin and result from this diversity, such as photosynthesis, food cycles or pollination.

Figure 1 below illustrates the different roles/services (ecosystem services) provided by biodiversity.

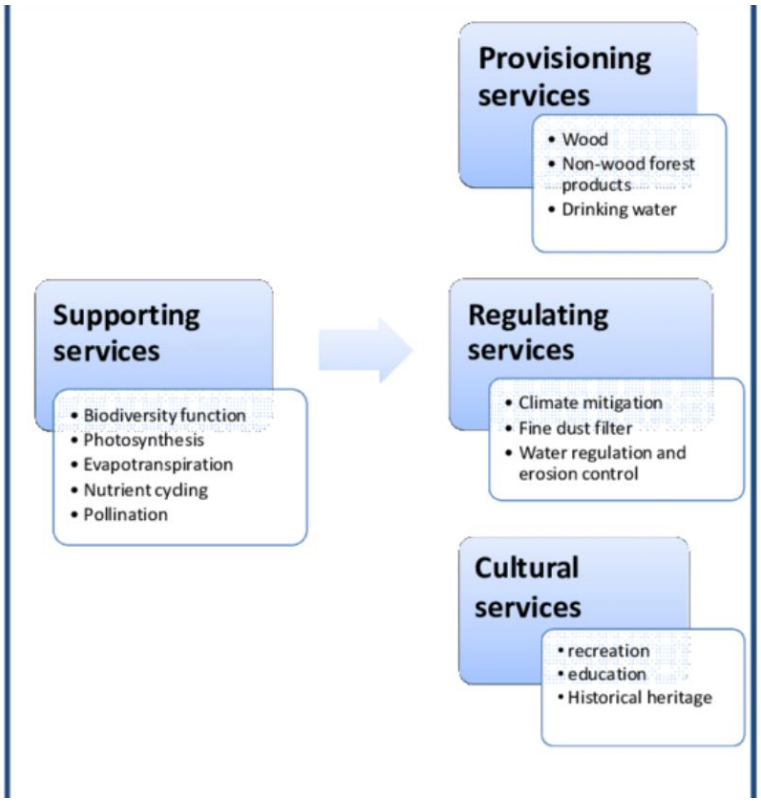


Figure 1 : Biodiversity Services (Ecosystem Services)

As part of the update of the environmental and social impact study of the Adrar Emoles 3 research permit deposit exploitation project, the assessment of ecosystem services was made and concerned the different uses of vegetation and wildlife by local communities. Thus, the following uses have been identified: human food, pharmacopoeia, firewood, timber and service wood, livestock feed, etc.

3. PROJECT ACTIVITIES SOURCES OF IMPACTS ON BIODIVERSITY

The activities that will be implemented under the Adrar Emoles 3 Exploration Permit Deposit Exploitation Project will have potential negative impacts on biodiversity at the

area level. Table 6 below shows the status of its activities according to the different phases of the project.

Table 5 : Matrix of Interrelationships

PROJECT PHASES	ACTIVITIES THAT ARE SOURCES OF IMPACTS
Development (Preparation and construction)	Construction/development of access roads/tracks
	Site preparation of temporary equipment
	Installation of temporary infrastructure and equipment
	Exploitation of loans and quarries (sand, gravel, laterite, etc.)
	Movement of construction machinery and supply of construction materials and materials to the site
	Preparation of rights-of-way for permanent project facilities
	Construction/installation of surface structures and equipment
	Recruitment of the workforce and functioning of the life base
Exploitation	Recruitment of the workforce and operation of the project life bases and subcontractors
	Truck movements for input supply
	Ore processing at the plant level
	Storage of ore processing tailings
	Effluent storage at the basin level
	Construction of new basins
	Exploitation of loans for the needs of the site in laterites and gravel
	Movement of project equipment and subcontractors
Closure	Site redevelopment/rehabilitation
	Gear movements
	Presence of the hand in the context of the work

4. POTENTIAL NEGATIVE IMPACTS OF THE PROJECT ON BIODIVERSITY AND MEASURES

4.1. Impacts of the project on biodiversity

The Adrar Emoles 3 research permit deposit exploitation project will have potential negative impacts on fauna and flora during the different phases of its implementation, namely the Development phase (Preparation and construction), the exploitation phase and the closure phase.

These impacts are summarized in Table 7 below.

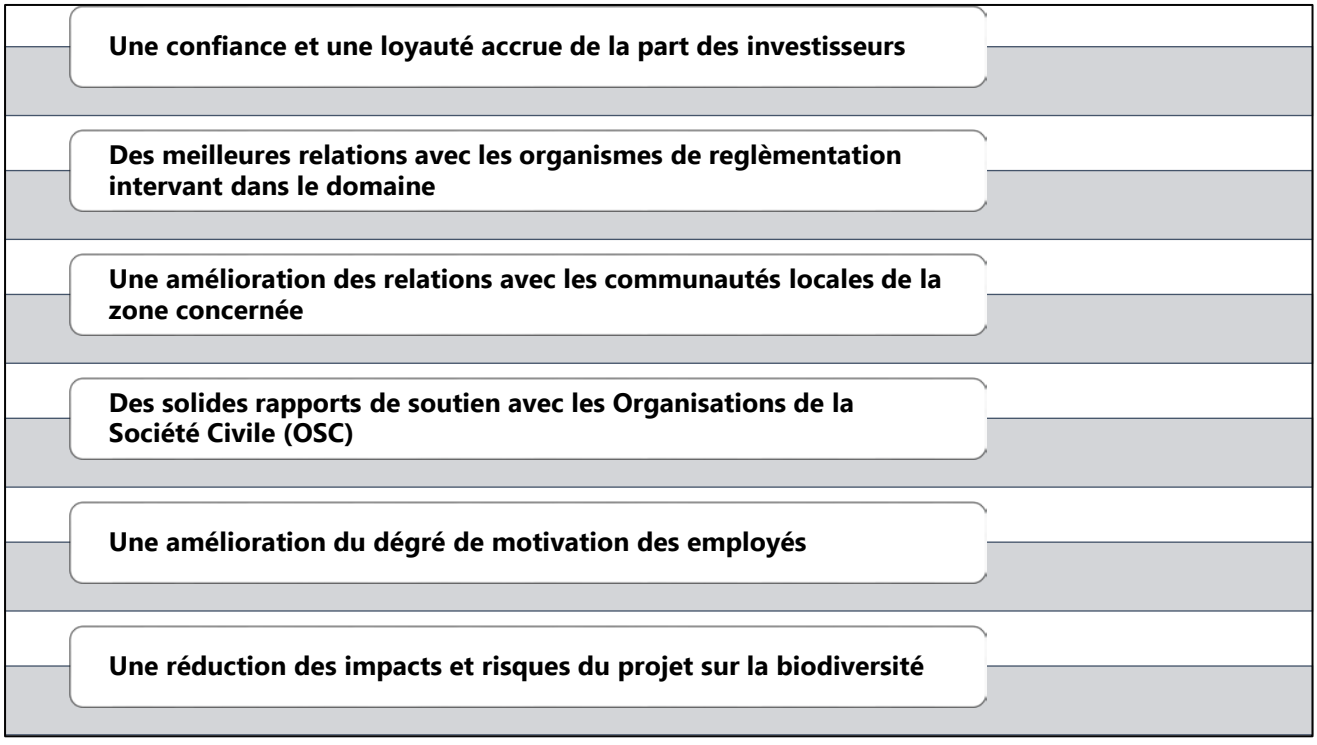
Table 6 : Impacts of the project on biodiversity

PROJECT PHASES	IMPACT COMPONENTS	IMPACTS
Development (Preparation and construction)	Fauna	- Habitat destruction - Disturbance of the tranquility of the fauna
		- Risks of poaching (sampling).
		- Destruction of wildlife following the movement of gear

	Flora	- Destruction of vegetation - Disruption of photosynthesis following pollutant emissions
Exploitation	Fauna	- Destruction of fauna and its habitats (soil and vegetation)
		- Disturbance of the tranquility of the fauna
		- Poaching Risques
		- Risks of falls in the basins and mortality
		- Risk of poisoning of wildlife by the waste that will be generated
	Flora	- Vegetation destruction
		- Disruption of photosynthesis by pollutant emissions
		- Contamination of plants by polluting emissions
Closure	Fauna	- Risk of disturbance of wildlife and wildlife habitat

4.2. Mitigation and compensation measures for impacts

The inclusion of biodiversity in project activities will bring the following benefits to Global Atomic fuels Corporation.



Thus, the measures set out in table 8 below have been proposed.

Table 7 : Mitigation and/or Impact Compensation Measures

PROJECT PHASES	IMPACT COMPONENTS	IMPACTS	MITIGATION AND/OR ENHANCEMENT OF IMPACTS
		- Impacts to protected species, i.e. Lappet-faced vulture, Egyptian vulture, Tawny Eagle	Pre-construction surveys to contribute to final mitigation plans for species Minimise construction footprint and temporary construction areas Minimise construction during seasonal months (i.e. bird breeding seasons) Review design of new powerlines and supporting structures to minimise risk or electrocution or other injury to birds. Monitor and restrict use of poisons or chemicals which are likely to harm birds, especially scavenging birds such as vultures
Development (Preparation and construction)	Fauna	- Destruction of habitats Disturbance of the tranquility of wildlife	Educating workers about the importance of wildlife
			Respect for wildlife habitats during the work
			Remediation of sites disturbed during the work
		- Risks of poaching (sampling).	Prohibition of all forms of poaching
		- Destruction of wildlife following the movement of gear	Driver Awareness
	Flora	- Destruction of vegetation - Disruption of photosynthesis following pollutant emissions	Inventory of trees that will be cut on sites during the work
			Payment of the slaughter tax
			Strict compliance with the rights of way of the works in order to limit the destruction of vegetation
			Sensitization of workers on the need to conserve plant species considered "rare", protected, vulnerable or threatened
			Realization of plantations and sowing of compensation
			Baseline surveys have not confirmed any alien invasive species in the study area. Future surveys will continue to monitor for the presence of alien invasive species.
			Identify eradication and control measures for alien invasive species. A biosecurity plan/ Invasive Species Management Plan will be developed and adhered to by the project to prevent future accidental spread of alien invasive species.
Exploitation	Fauna	- Destruction of fauna and its habitats (soil and vegetation)	Educating workers about the importance of wildlife
			Implementation of CES/DRS actions accompanied by sowing in order to improve the habitat of wildlife
		- Disturbance of the tranquility of the fauna	Regular maintenance of equipment and machinery in accordance with manufacturers'

			recommendations to prevent increases in noise emissions
		- Poaching Risques	Strict ban on poaching
		- Risks of falls in the basins and mortality	Establishment of a passive and active monitoring system for basins
		- Risk of poisoning of wildlife by the waste that will be generated	Development and implementation of a waste and hazardous materials management plan
	Flora	- Vegetation destruction	Identification of trees to be cut and payment of the felling tax
			Sensitization of the workforce extended to local communities on the protection of the environment and the conservation of certain plant species considered "rare", protected, vulnerable or threatened
			Respect for the rights-of-way of the work, particularly in the context of the construction of new basins
			Implementation of land restoration actions
		- Disruption of photosynthesis by pollutant emissions - Contamination of plants by polluting emissions	Regular watering of sites to reduce dust flight
			Regular maintenance of equipment to reduce polluting air emissions
			Regular maintenance of equipment to reduce polluting air emissions
Closure	Fauna	- Risk of disturbance of wildlife and wildlife habitat	Educating workers including drivers about the importance of wildlife protection
			Strict ban on poaching

5. IMPLEMENTATION PLAN FOR THE MEASURES

The following Plan represented in Table 9 will cover the different phases of implementation of the project and will allow biodiversity to be taken into account during the implementation of the activities.

Table 8: Action Implementation Plan

PROJECT PHASES	IMPACT COMPONENTS	IMPACTS	MITIGATION MEASURES AND/OR COMPENSATION FOR IMPACTS	IMPLEMENTING ACTORS	IMPLEMENTATION INDICATORS	COST OF IMPLEMENTATION
Development (Preparation and construction)	Fauna	Habitat destruction Disturbance of wildlife tranquility	Educating workers about the importance of wildlife	GAC	- Number of sessions conducted themes developed - Number of persons concerned	500000
			Respect for wildlife habitats during the work		- Measures taken to mitigate the destruction of wildlife habitats	Clauses approx.
			Remediation of sites disturbed during the work		- Condition of the sites after work	PM
		Risks of poaching (sampling).	Prohibition of all forms of poaching		- Guidelines and measures at the site level to prohibit poaching	Clauses approx.
		Destruction of wildlife following the movement of gear	Driver Awareness		- Number of sessions conducted - Themes developed - Number of persons concerned	500000
	Flora	Destruction of vegetation Disturbance of photosynthesis following polluting emissions	Inventory of trees that will be cut on sites during the work		- Number and types of species identified that may be affected by the work	Clauses approx.
			Payment of the slaughter tax		- Amount of slaughter tax paid	PM
			Strict compliance with the rights of way of the works in order to limit the destruction of vegetation		- Measures taken to ensure compliance with rights-of-way during the work - Scope of the right-of-way of the work	Clauses approx.
			Sensitization of workers on the need to conserve plant species considered "rare", protected, vulnerable or threatened		- Number of sessions conducted - Themes developed - Number of persons concerned	500000
			Realization of plantations and sowing of compensation		- Number and types of seedlings planted	PM
Exploitation	Fauna	Destruction of fauna and its habitats (soil and vegetation)	Educating workers about the importance of wildlife		- Number of sessions conducted - Themes developed - Number of persons concerned	600000
			Implementation of CES/DRS actions accompanied by sowing in order to improve the habitat of wildlife		- Number of ha realized	10000000

		Disturbance of the tranquility of the fauna	Regular maintenance of equipment and machinery in accordance with manufacturers' recommendations to prevent increases in noise emissions		- Frequency of maintenance of the machines	PM
		Poaching Risques	Strict ban on poaching		- Measures taken to ban poaching	Clauses approx.
		Risks of falls in the basins and mortality	Establishment of a passive and active monitoring system for basins		- System set up to ensure the monitoring of basins	PM
		Risk of poisoning of wildlife by the waste that will be generated	Development and implementation of a waste and hazardous materials management plan		- Waste and Hazardous Materials Management Plan developed and implemented	PM
	Flora	Vegetation destruction	Identification of trees to be cut and payment of the felling tax		- Number and types of tree species identified - Amount of slaughter tax paid	PM
			Sensitization of the workforce extended to local communities on the protection of the environment and the conservation of certain plant species considered "rare", protected, vulnerable or threatened		- Number of sessions conducted - Themes developed - Number of persons concerned	2000000
			Respect for the rights-of-way of the work, particularly in the context of the construction of new basins		- Measures taken to respect the rights-of-way of the work	Clauses approx.
			Implementation of land restoration actions		- Number of ha realized	PM
		- Disruption of photosynthesis by pollutant emissions - Contamination of plants by polluting emissions	Regular watering of sites to reduce dust flight		- Frequency of watering	Clauses approx.
			- Regular maintenance of equipment to reduce polluting air emissions		- Frequency of maintenance of the machines	PM
Closure	Fauna	Risk of disturbance of wildlife and wildlife habitat	Educating workers including drivers about the importance of wildlife protection		- Number of sessions conducted - Themes developed - Number of persons concerned	500000
			Strict ban on poaching		- Measures taken to ban poaching	Clauses approx.
TOTAL						**14 600 000**

6. INSTITUTIONAL ACTORS

The different actors who will be involved in the implementation and monitoring of the mitigation and/or compensation measures for the impacts of the project on biodiversity are given in Table 10 below.

Table 10: Institutional actors9

ACTORS	ROLES IN THE IMPLEMENTATION OF THE GGP
- National Environmental Assessment Office (NCEA)	- Environmental monitoring and control of the implementation of biodiversity measures
- Global Atomic Corporation	- Implementation of the measures in accordance with the provisions of the environmental and social specifications
- Service Provider	- Implementation of environmental and social measures to mitigate the impacts of the project on biodiversity in accordance with the terms of the contract with the Société Globale Atomic Fuels Corporation
- Directorate General for Sustainable Development (DGDD)	- It will be involved in the monitoring of environmental control of the implementation of measures with a view to placing particular emphasis on the management of waste that will be generated in such a way as to avoid the potential impacts it may have on biodiversity, particularly wildlife.
- Directorate-General for Water and Forests (DGE/F) - Regional Directorate for the Environment and the Fight against Desertification (DRE/LCD) of Agadez	- They will ensure the preservation of biodiversity within the framework of the activities - Contribute to assessing the implementation of biodiversity measures - Make any proposal to ensure that biodiversity is taken into account in the context of project activities
- Regional Directorate of Mines of Agadez - Communes of Tchirozérine and Dannet - Civil society organizations	- They will provide support in monitoring the implementation of biodiversity measures

CONCLUSION

The Adrar Emoles 3 Research Permit Deposit Exploitation Project is certainly a great opportunity for Niger in general and the region concerned in particular. Its implementation will generate significant positive impacts in terms of job creation, reduction of unemployment, improvement of incomes and tax revenues and consequently of the level of investment in development infrastructure, etc.

On the other hand, this project will generate potential negative impacts, particularly on biological diversity (fauna and flora). Thus, after the assessment of its potential at the level of the area concerned, this Biodiversity Management Plan (BMP) has been developed. It has therefore made it possible to propose the necessary measures that will make it possible to internalize the potential negative impacts that will be generated by the activities to be implemented.

The overall cost for its implementation of this GBP is estimated at *fourteen million six hundred thousand (14,600,000) FCFA.*

PIEZOMETRIC STUDY OF GROUNDWATER IN THE DASA PROJECT AREA

ADRAR EMOLES PERMIT 3

INTERIM REPORT

October 2022

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REMINDER OF THE STUDY'S OBJECTIVES

In accordance with the technical offer of the contract, the Study initiated and to be carried out over a period of ten (10) months, within the perimeter of the DASA mining project has a double objective, namely:

- surface water monitoring;
- groundwater monitoring;
- water quality monitoring.

1. Surface water monitoring

This monitoring consists first of all of making an inventory of the various watercourses (or koris) that may affect the mining operations area in normal times or in periods of flooding and of monitoring their flows while evaluating their depths and sizes. It also consists of assessing the spread of these koris over the area of mining operations or in case of flooding.

Once these operations have been completed, flow measurements of the various watercourses will be carried out using the float or tracer method. The following equipment is required for these measurements:

- a graduated rod to measure depths taking into account many parameters;
- a tape measure for length and width measurements;
- a float or tracer to measure the flow velocity;
- a stopwatch.

Once all these parameters have been determined, the flow rate of each of the rivers will be calculated and consequently the quantities of water they can drain during the high and low water period. These measurements should be made several times on several streams in order to obtain an average.

2. Groundwater monitoring

This monitoring consists of plotting the piezometric surface of the aquifers before the mine opens and drawing up a hydrogeological baseline of the mining area. This monitoring should be carried out on several structures during the rainy and dry seasons.

This monitoring should allow:

- to confirm or deny whether or not the water table is being recharged;
- to confirm or deny whether the aquifers communicate with each other.

Measurements must be taken weekly at each structure and always at the same time and place. To this end, the measuring points of the various structures must be marked, the above-ground level must be measured, and the piezometric level must be determined.

Measurements from two periods will be superimposed to assess the influence of the rainy seasons on possible groundwater recharge.

In order to have a representative baseline, a large number of boreholes are required, hence the need to use all the water boreholes in the project area as well as some of the mining boreholes that are still accessible.

3. Water quality monitoring

As there are no permanent water bodies (ponds) in the mining project area, water quality monitoring can only be done through groundwater sampling. Several factors can influence water sampling, but the most important is the state of the water at the time of sampling.

For the purposes of the Study, in addition to the results obtained through the various hydrological and hydrogeological programmes, new piezometers, an inventory of existing wells and structures and a piezometric campaign on the identified water boreholes will be carried out.

The depth of groundwater fluctuates with seasonal variations in precipitation and can also be affected locally by withdrawals from the aquifer (a reservoir rock consisting of any porous or fissured geological formation containing groundwater and sufficiently permeable for water to circulate freely). Within the aquifer, a kind of equilibrium state is created that ensures that the range of seasonal fluctuations in water levels remains relatively constant from year to year. Under normal conditions, the volume of water entering the aquifer (mainly precipitation) is equal to the volume leaving it, so the reserve in place remains constant (the reserve is the volume of water in the aquifer). However, a significant increase in abstraction due to an increase in the number of wells, intensive pumping or a significant rainfall deficit (e.g. prolonged drought), can create a change in the state of equilibrium which will then result in a change in the reserve in place. Such a change will be reflected in the water levels in the form of a shift in the range of their seasonal fluctuations. It is in this context that the various aquifers in the study area are regularly monitored for water levels during certain periods of the year, in particular by means of a piezometric system. At the same time, water samples are taken to monitor water quality.

1. PRESENTATION OF THE STUDY AREA AND THE MINING PROJECT

1.1. Presentation of the study area

The geographical location of the Study Area in the Republic of Niger is shown in Figure 1 below. It is located in the north-central region of Niger, approximately 120km northwest of the town of Agadez (the region's capital) and 108km southeast of the town of Arlit. It can be reached by taking the RN 25 (Agadez-Arlit).

It is precisely located in the south-western part of the "Adrar Emoles 3" exploration permit, which has a total area of 121.2 km^2. Administratively speaking, the area is attached to the department of Tchirozérine.

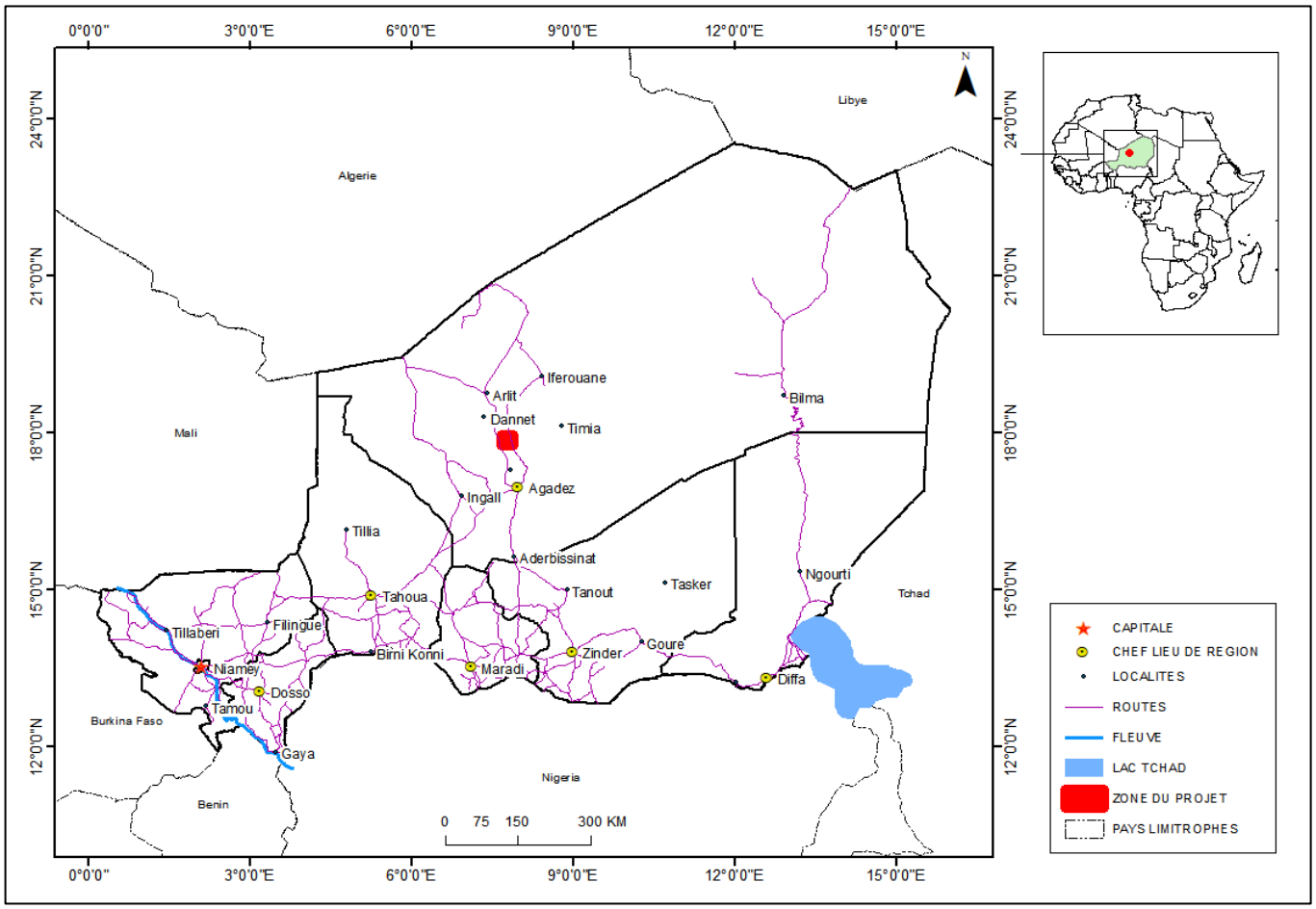

Figure 1 Geographical location of the study area

1.1.1. Vegetation

Woody vegetation is mainly concentrated in the kori bed. The main species encountered are:

- Acacia radiana;

- Balanites aegyptiaca ;
- Hyphaena thebaica ;
- Calotropis procera.

The herbaceous vegetation is cenchrus biflorus, afazaou, aloun mouz, adag etc.

1.1.2. The climate

The sub-desert tropical climate is very arid with:

- A very low level of rainfall, intense evaporation which exacerbates climatic drying (ETP 2,500 to 2,600 mm/year), very high insolation (3192.9 hours/year on average from 1967 to 1992).
- A brutal thermal gradient characterised by large thermal amplitudes (maxima 42°C and minima - 2°C) and a regularity of the dominant North/North-East winds (observations of wind higher than 25 km/h in Bilma for 160 days/year).

1.1.3. Rainfall

The climate of the project area is desert, with an average annual rainfall of 144 mm according to the ten (10) years' record (maximum available) obtained from the Meteorological Department for the Tchirozérine station (**Table 3, below**). It can be seen that seven (07) years out of ten (10) have recorded rainfall in excess of 100 mm and three (03) years out of ten (10) have recorded rainfall of less than 100 mm. The rainy season lasts about two three months, from July to September.

Table 1 Annual rainfall (mm) from 2011 to 2020

Year	Year to date
2011	89,2
2012	173,2
2013	48,8
2014	105,2
2015	271,6
2016	222,1
2017	158,5

2018	114,4
2019	174,6
2020	89

Source: National Meteorological Directorate

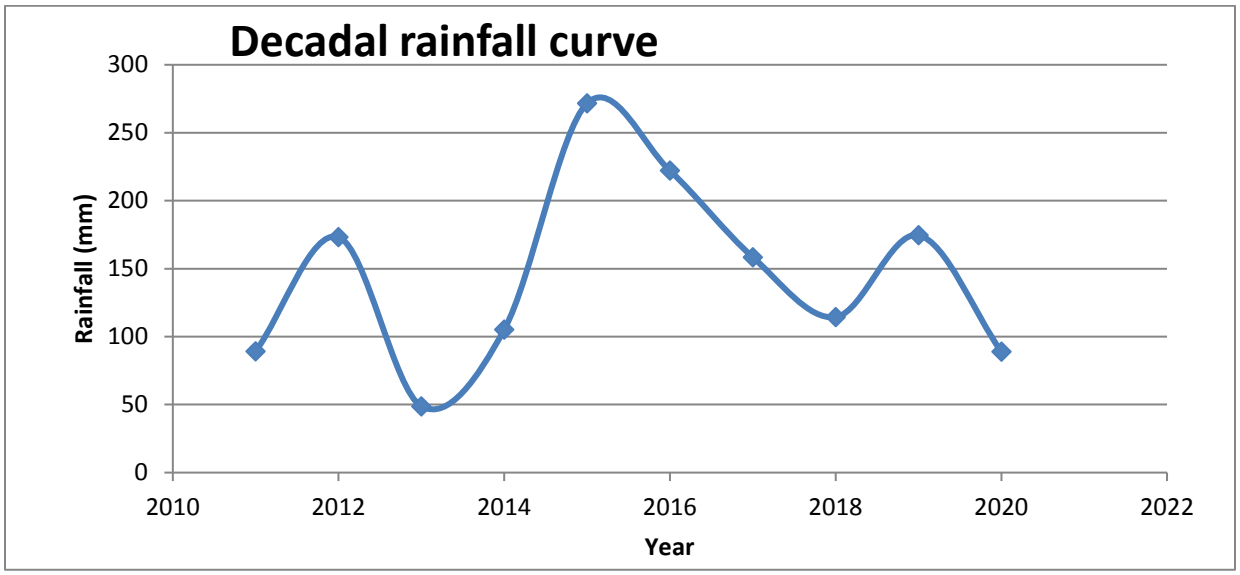

Figure 2 Ten-year rainfall curve

The average rainfall recorded in recent years in the area hardly exceeds 144 mm/year. However, it should be noted that they are unevenly distributed in time and space, especially with the phenomenon of climate change.

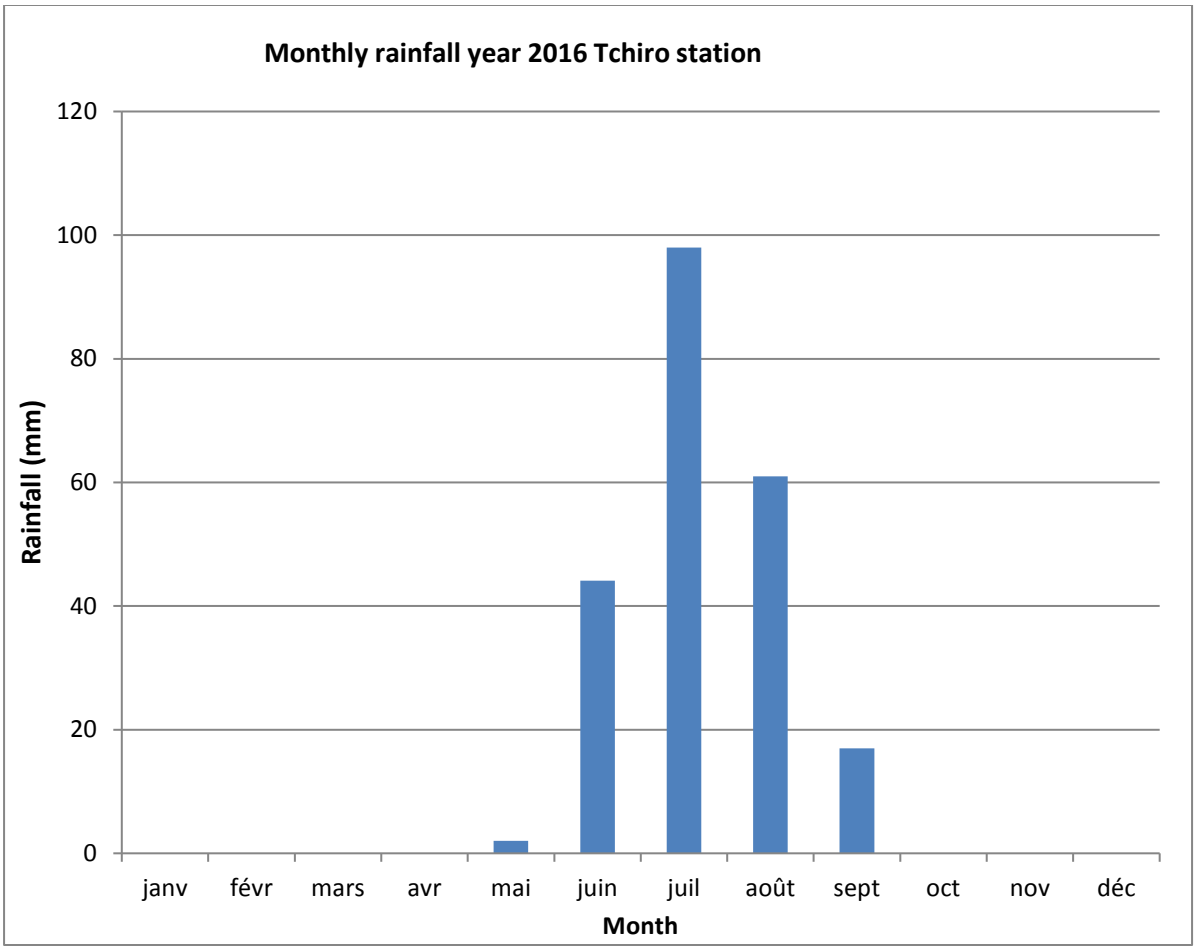

Figure 3 **Monthly rainfall for the year 2016**

Rainfall in the area hardly lasts 3 months with the maximum recorded between July and August with a maximum recorded in 2016.

1.1.4. The temperatures

The temperature variations in the area are summarised as follows:

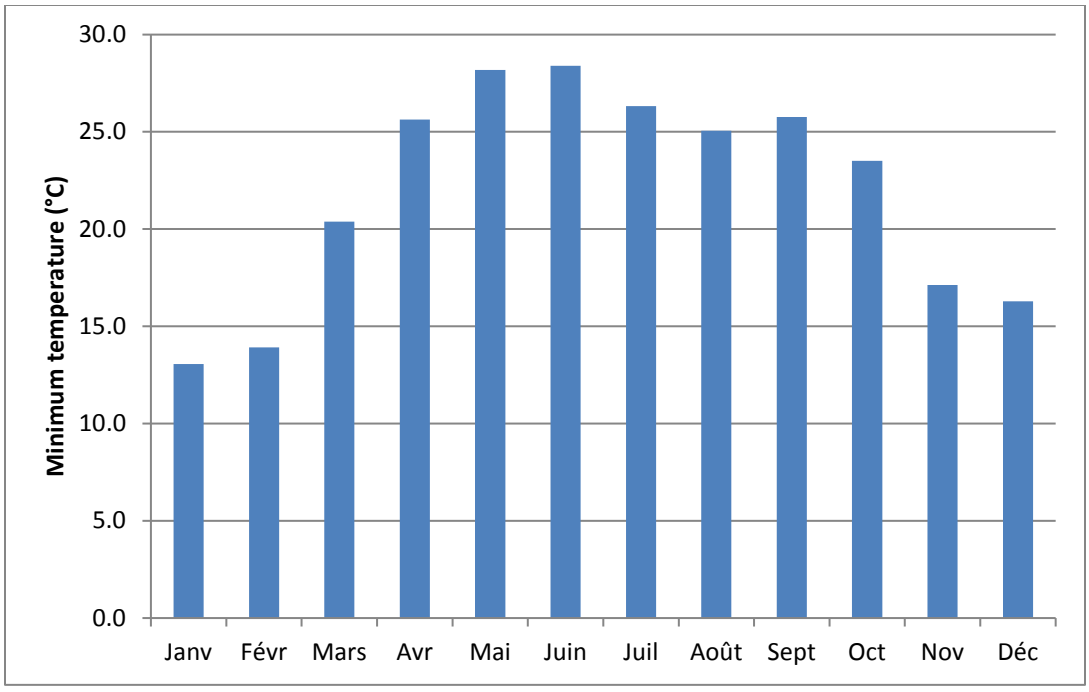

Figure 4 Low temperatures

They are usually recorded between October and March.

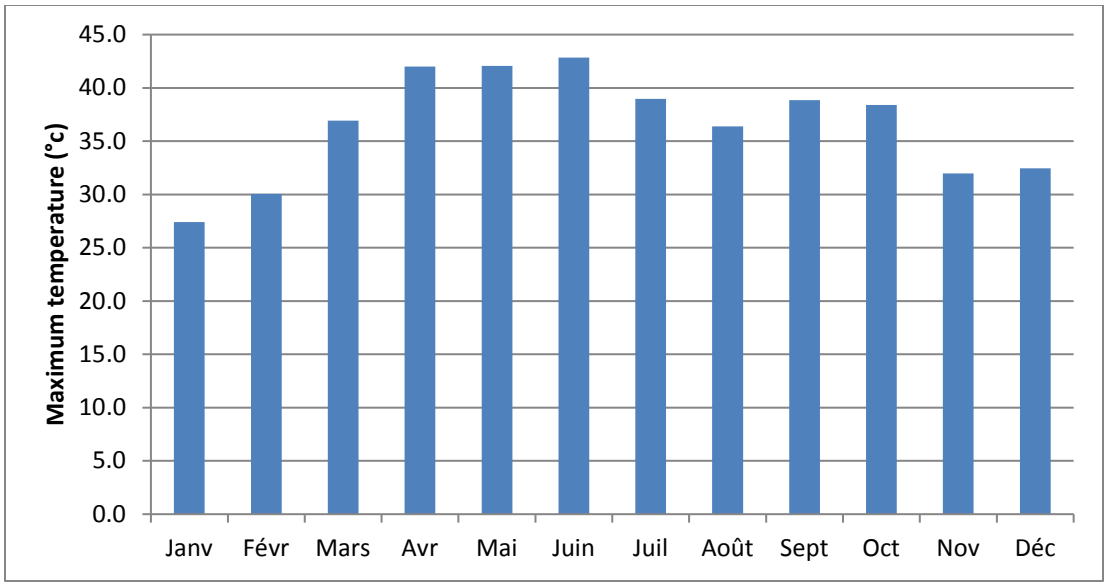

Figure 5 High temperatures

1.1.5. The winds

The study area is windy all year round. The preferential direction of these winds varies with the seasons. Measurements of wind strength and wind direction (wind rose) as a function of season are given in the figures below.

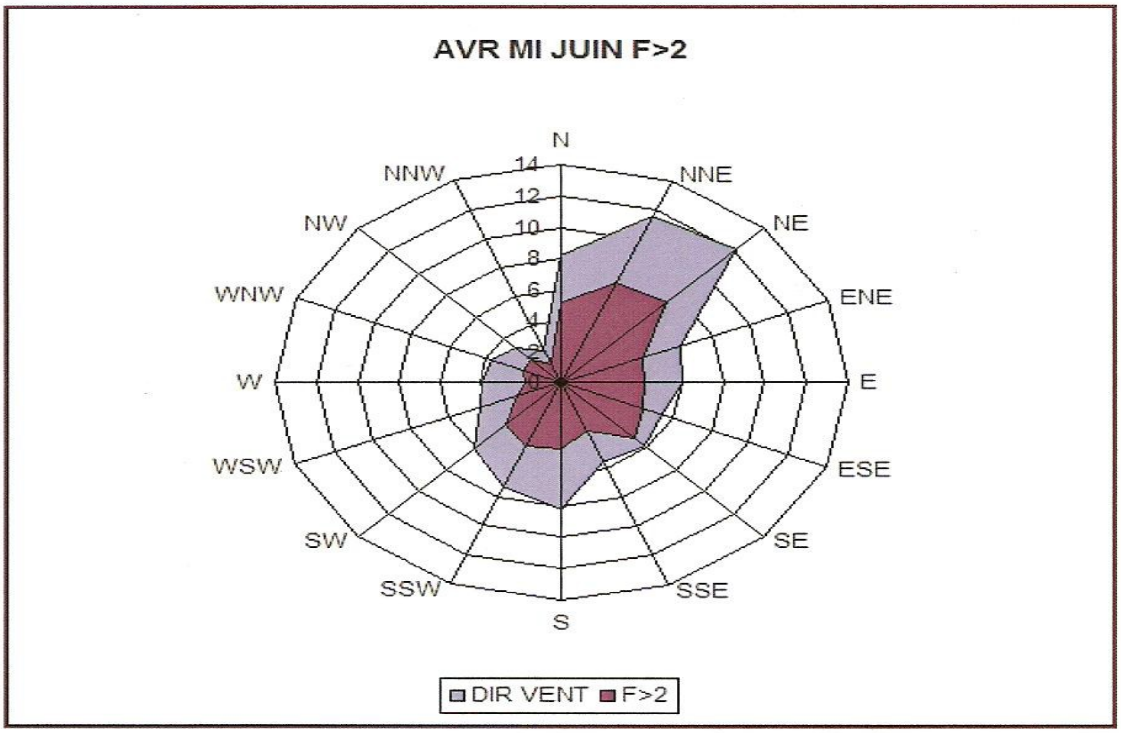

Figure 6 Wind rose in the dry season (April-June)

This figure shows winds above zero on the BEAUFORT scale (in blue) and those above 2 (9km/h) in purple. This wind rose also shows that the study area is located in an area with little wind. It can be seen that the dominant winds, which represent 12% of the winds, are from the north-east, followed by those from the north-north-east. These are the Harmattan winds.

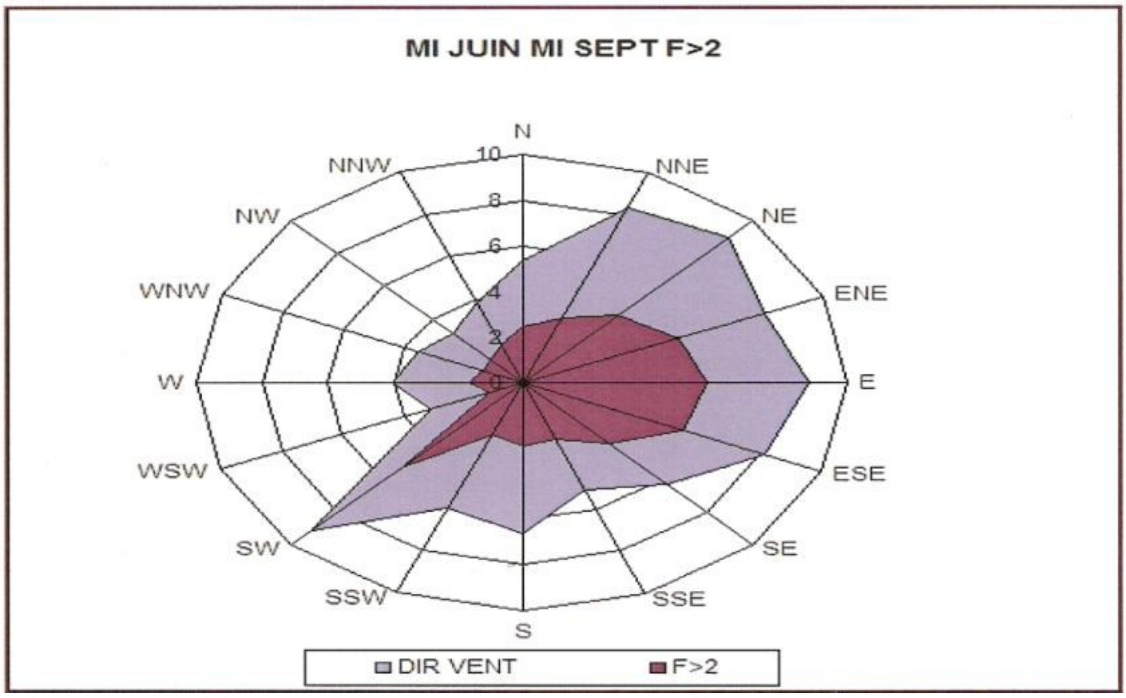

Figure 7 Wind rose in rainy season (June-September), *1Source: EIA, Immouraren 2008-AREV*

This second figure shows that the dominant winds during the rainy period are from the southwest and represent 9% of the winds. It can also be seen that 50% of the winds are above 9km/h with a maximum of 35km/h.

1.1.6. The hydrological cycle

The hydrological cycle (or water cycle) is a model representing the flows between the major reservoirs of liquid, solid or gaseous water on Earth: the oceans, the atmosphere, lakes, rivers, groundwater and glaciers. It corresponds to a continuous movement of water in the globe, the quantity in displacement being constant, it is in fact the distribution of this quantity during these displacements which is irregular.

The water cycle can be analysed schematically according to the following three elements:

- Precipitation.
- Surface runoff and subsurface runoff.
- Physical evaporation and evapotranspiration, which encompasses the processes of evaporation and transpiration by vegetation.

The 'engine' of this cycle is solar energy, which, by promoting the evaporation of water, drives all other exchanges.

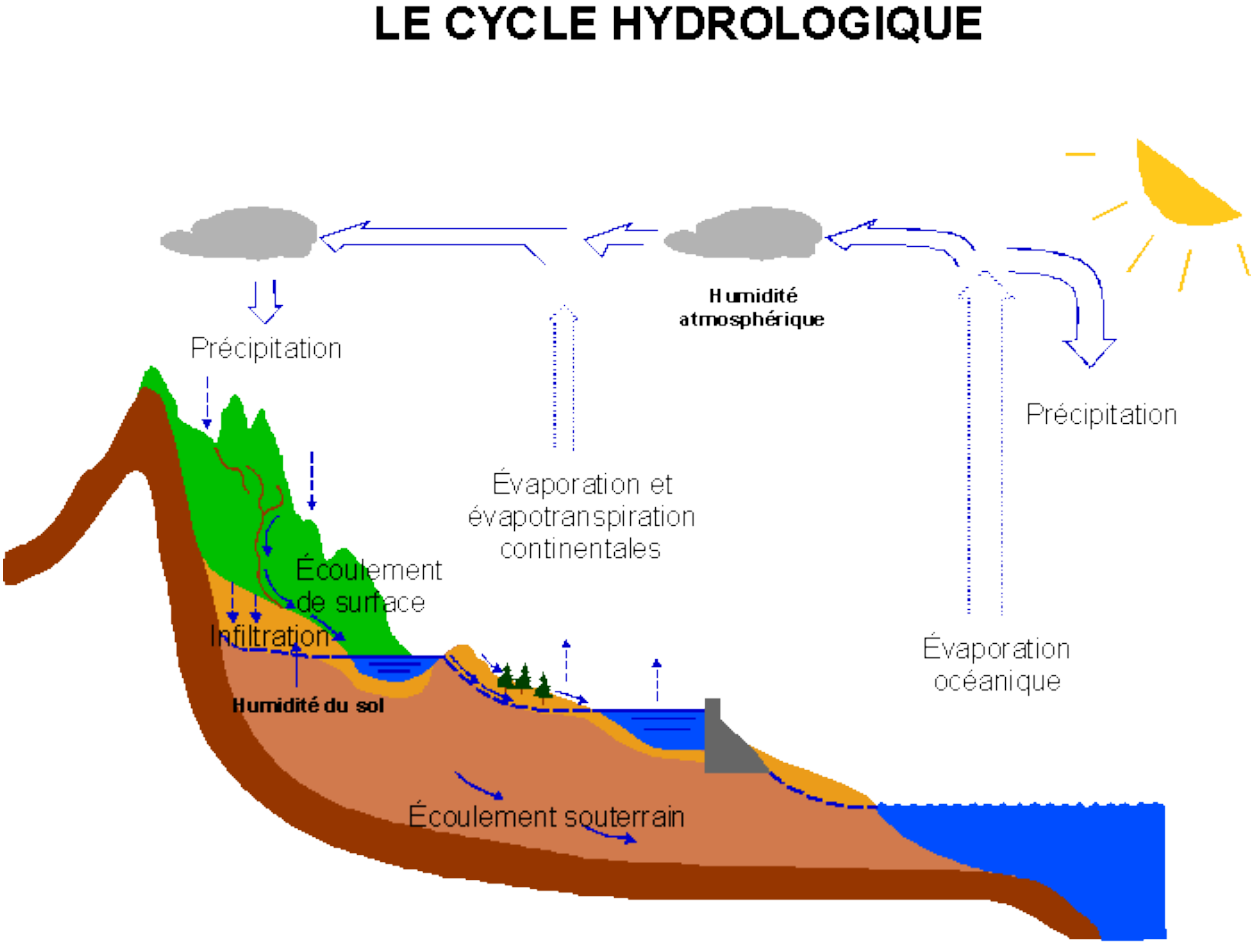

Figure 8 Illustration of the existing binders the different climatic parameters of the region

1.1.7. Local water framework

Surface water, although temporary, is an important reserve for at least four months of the year.

- Surface water

The waters of the region are generally made up of temporary streams known as koris and semi-permanent streams. The koris are seasonally flowing rivers that drain the western slopes of the Air and flow into the three major collectors of the region which are: Anou Zangarène, Anou Makarene and Irhazer Wan Agadez.

These three main rivers merge about 200 km west of the Air to form the Azawk, which is a powerful ancient river that flows into the Dallol Bosso.

The Téloua kori, which flows through the town of Agadez and is assumed to recharge the water table of the same name, the exploitation of which ensures the water supply of the town of Agadez.

- **Semi-permanent watercourses**

These watercourses are located in the Irhazer valleys and in the fracture zones of the Air Massif, the main ones being the Tchintaborak and Aderbissanat pools. In addition, there are the springs of Azelik, Toubak, Geleli and the thermal spring of Tafadek.

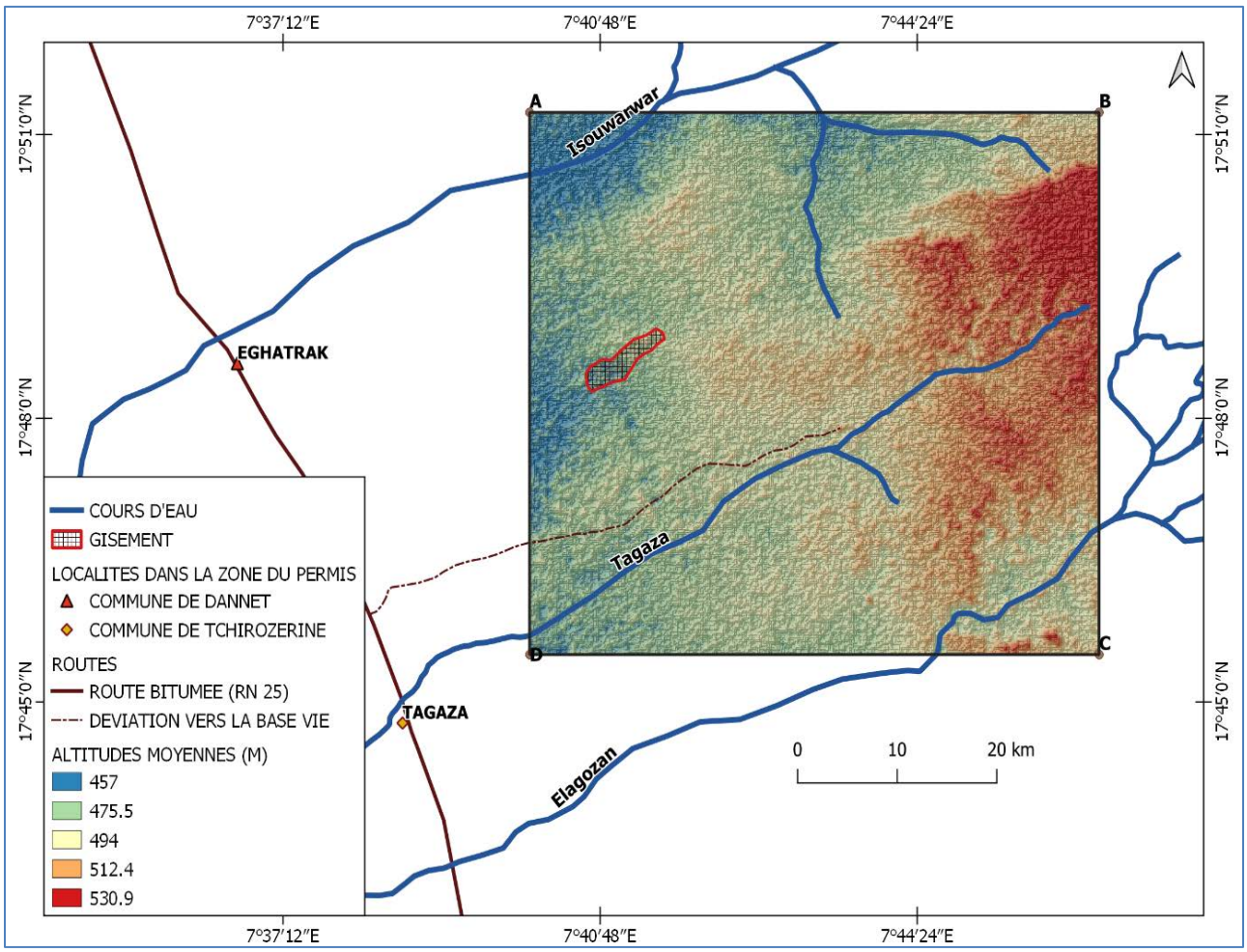

Figure 9 Map of the water system in the permit area

1.1.8. Local hydrogeological framework

The hydrogeology of the study area is characterised by a multi-layered aquifer system which includes the Guezouman, Tarat and Izégwandan aquifers in the eastern part of the In-Azaoua-Arlit fault. In the western part, these aquifers are surmounted by a permeable horizon which shelters the Tchirozérine and Téloua aquifers.

- **The Guezouman slick**

It is formed of white sandstone to fine to medium sandstone. The sandstone-clay alternation at the top of the Guezouman corresponds to a very low permeability level. The transmissivities are also low, between 1.8 x 10-4 and 1.5 x10-6 m²/s. This water table flows from an old supply zone in the south to an evaporation zone in the north at the edge of the water table, where it is free.

- **The Tarat tablecloth**

This nappe is made up of coarse sandstone, fine sandstone and micro conglomeratic sandstone mudstones, which are well individualised at all levels of the spreading, especially in the thickening zones where feldspars are more abundant. The transmissivities of this nappe are between 3.8x10-6 to 1x10-2m2/s and flow in a SSE - NNW direction.

- **The Izegwandan slick**

It is represented by arkosic, heterogranular sandstones mixed with lenses of very red argillite. With a low flow, its permeabilities are between 1.2 x 10-6 and 7.5 x 10-7 m/s. It has a SSE-NNW flow direction and low transmissivities (1.10-4 and 8.10-5m²/s).

- **The Chirozerin aquifer**

The sandstones of this nappe are coarse, poorly cemented, vacuolated, permeable and locally conglomeratic. Silicified wood can be found. The sandstones of Tchirozérine II are separated by an impermeable layer called Abinky located at the base of Tchirozérine II. The specific flow rates can vary considerably from 0.5 to 2 m3/h/m and up to 12 m3/h/m at SONICHAR (Rharous). Transmissivities are of the order of 2.10-3 m²/s and tend to increase towards the south (SONICHAR: T≈1.10-2 m/s).

- **The Teloua aquifer**

This water table is composed of arkosic sandstones with pebbles, fine, medium and coarse sandstones, analcimus sandstones and feldspathic clayey sandstones. It constitutes a multi-layered reservoir whose water can be captured within permeable sandstone lenses, the location and extent of which are not well known. This water table is practically not recharged, apart from a few infiltrations of water from the koris in the west of the Aïr (Téloua, Tchirozérine, Solomi, etc.) in favourable years. It is one of the best aquifers in the sector with a flow rate varying from 10 to 20m3 /h in the free parts and from 30 to 100m3/h in the captive parts, especially to the west of the flexure-fault. The static level of this water table varies from 30 to 80 m depending on whether it is free or confined. The transmissivities are different and are low in the parts where the water table is free. The power of this water table varies from 80 to 100 metres and flows from East to West. It is one of the most exploited aquifers in the region and is the main resource for supplying drinking water to the city of Agadez.

- **Alluvial aquifers**

These aquifers are present in the Aïr valley (kory) and provide a significant part of the region's water supply, especially in rural areas. These aquifers take the form of a succession of alluvial reservoirs separated by sills resting on the crystalline base. Their maximum thickness reaches 30 metres (Téloua basin in Agadez). These aquifers are sandy-gravelly, with silty or clayey lenses. The water is generally found at a depth of between 10 and 20 metres.

1.2. Presentation of the mining project

The "DASA" uranium deposit (25 km²) is located in the "Adrar Emoles 3" exploration permit held by the Canadian company Global Atomic Fuels Corporation. It was discovered after intensive exploration work carried out between 2010 and 2018. The deposit will be developed as an underground mine.

Hydrological and hydrogeological studies conducted by the company have provided a better understanding of the aquifers. The estimated water resources would be more than sufficient to cover the needs of the mine and ore processing facilities.

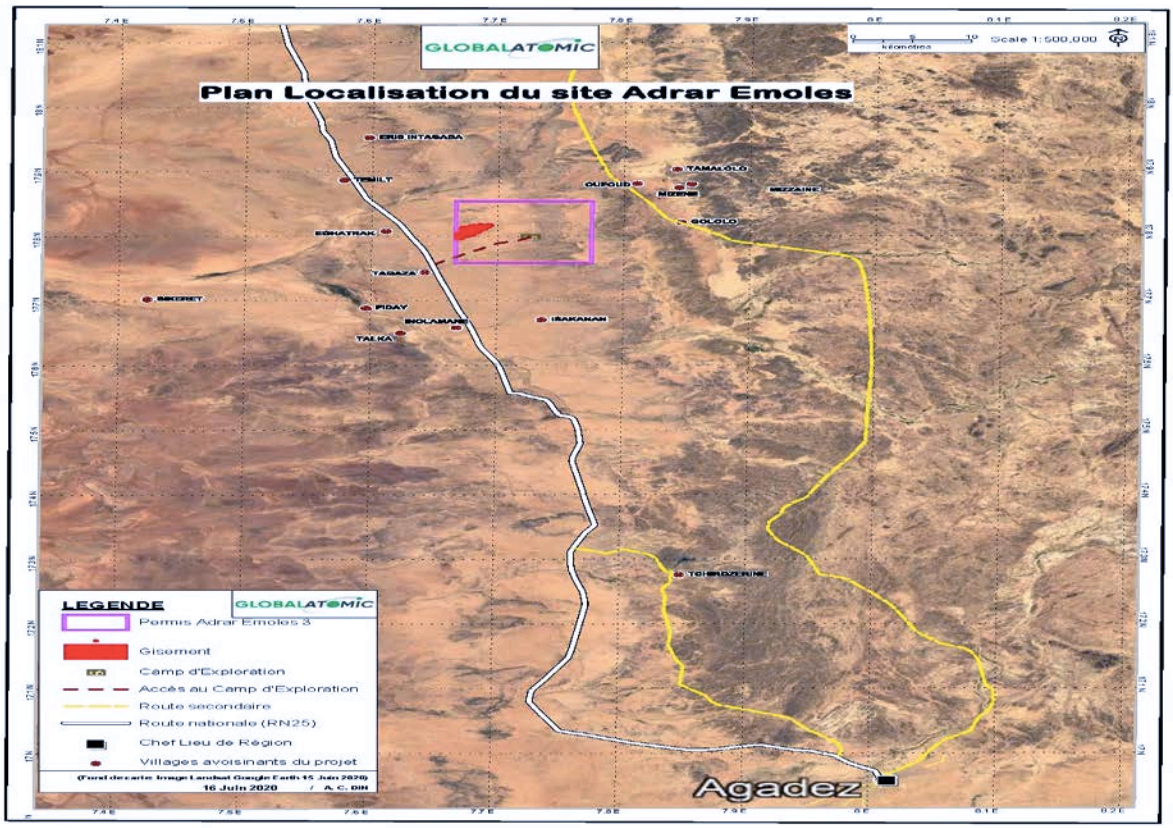

Figure 10 Geographical location of the project area

2. HYDRODYNAMIC CHARACTERISTICS OF THE AQUIFERS IN THE STUDY AREA

In order to better understand the flow regimes of the aquifers, piezometric data from the steady state period (non-pumping conditions) were used to determine the general trend of the piezometry on the one hand, and to study the potential lateral and vertical exchanges between the four aquifers on the other. The monitoring of water levels makes it possible to understand the effect of anthropogenic or natural modifications on the reserve in place, and therefore on the availability of the resource. Piezometric monitoring carried out between 2013, 2018, 2021 and 2022 has shown that fluctuations in water levels remain negligible (maximum 1.51m), which shows that there is not a great deal of abstraction in the sector and that rainwater does not affect the water table levels too much. These aquifers are considered to be fossilised but we believe that they are being recharged, albeit in small volumes. The data presented in the table below has been used to model these aquifers in order to determine their direction of flow as shown in Figure 12 below.

Table 2 Summary of piezometric measurements made on boreholes and some mining holes in 2018

HDI	X	Y	Pr (m)	Natural ground level (m)	Static level (m)	Piezometric level
DADH234	360900	1970250	37	487,95	33,8	454,15
DADH236	361000	1970250	39	486,90	35,6	451,30
DADH	360450	1969900			52,8	
DADH266	360550	1969950	82	483,50	64,85	418,65
DADH265	360550	1969900	70	480,90	62,2	418,70
DADH	360713	1970094			44,9	
DADH352B	360650	1969900			48,8	
DADH353	360550	1969800	40,32		44,7	
DADH197	360350	1969900	47,00	481,69	43,7	437,99
DADH190	360350	1969950	37,00	482,61	35,4	447,21
DADH176	360350	1970000	16,00	485,35	34,5	450,85
DADH149	360250	1970250	18,00	484,34	16,85	467,49
DADH193	360193	1970000	24,00	484,92	23	461,92
DADH333	360250	1970008	32,00	485,19	27,5	457,69
DADH216	360100	1970150	11,00	480,61	10,6	470,01
DADH184	360350	1970300	19,00	483,75	20,1	463,65
DADH162	360550	1970300	27,00	487,67	23,75	463,92
DADH298	360850	1970400	25,00	486,39	24,35	462,04
DADH297	360900	1970450	24,00	485,92	23,7	462,22
DADH295	361000	1970450	22,00	486,27	21,35	464,92
DADH294	361050	1970450	22,00	486,17	19,8	466,37
DADH292	361150	1970450	22,00	486,34	18,7	467,64
DADH279	361250	1970400	90,00	480,02	67,1	412,92

DADH105	360200	1970500	12	479,33	13,6	465,73
DADH220	359425	1969900	83,00	474,14	55,8	418,34
DADH222	359425	1969750	88,00	475,19	57,05	418,14
DADH362	359350	1969750	82,00		15,4	
DADH315	359587	1969768	92,00	477,00	59,05	417,95
DADH313	359785	1969750	58,00	479,34	58,36	420,98
ASDH030	359500	1968689	41	460,79	40,7	420,09
ASDH157	359250	1968550	60	460,79	39,63	421,16
ASDH089	359300	1968900	80	459,70	40,47	419,23
ASDH157	359300	1969050	24,00		40,6	
ASDH137	359300	1969100	115	460,14	41,12	419,02
ASDH300	359250	1969200	182	460,00	35,66	424,34
ASDH138B	359209	1969203	236	459,75	36,03	423,72
ASDH301	359150	1969200	156	458,82	37,59	421,23
ASDH287	359400	1969150	151	459,33	41,58	417,75
ASDH088	359400	1968900	77	460,61	41,27	419,34
ASDH179	359450	1968900	75	460,61	40,88	419,73
ASDH259	359446	1969102	128	460,70	41,36	419,34
ASDH285	359500	1969150	126	459,88	41,02	418,86
ASDH284	359550	1969150	121	460,22	42,67	417,55
ASDH308	360000	1969500	453	464,80	25,72	439,08
ASDH252	360350	1969400	350	466,70	44,5	422,20
ASDH277	360545	1969450	76	468,35	47,69	420,66
ASDH121	360500	1969450	60	466,70	45,76	420,94
ASDH348	359100	1969200	157,00	458,51	42,6	415,91
ASDH347	359100	1969150	170,00	458,46	42,05	416,41
ASDH481	359050	1969100	138	458,629	41,92	416,71
ASDH492	359050	1969150	143	458,842	42,45	416,39
ASDH493	359050	1969200	132	459,394	30,11	429,28
ASDH494	359000	1969200	137	459,511	44,38	415,13
ASDH491	359000	1969150	143	459,298	44,3	415,00
ASDH482	359000	1969100	140	458,908	37,92	420,99
ASDH371	359000	1969050	133	458,802	42,12	416,68
ASDH394	358950	1969050	124	458,549	42	416,55
ASDH393	358950	1969000	120	457,616	41,55	416,07
ASDH395	358900	1969050	109	457,862	34,5	423,36
ASDH490	358950	1969150	104	459,346	35,52	423,83
ASDH489	358900	1969150	95	458,967	43,2	415,77
ASDH381	359000	1968550	79	457,906	39,08	418,83
ASDH363	359050	1968700	83	457,886	39,45	418,44
ASDH362	359050	1968650	82	457,967	39,55	418,42

ASDH365	359050	1968800	93	458,425	39,88	418,55
ASDH366	359050	1968850	92	458,53	40,35	418,18
ASDH368	359050	1968950	115	458,328	40,78	417,55
ASDH370	359050	1969050	132	458,63	42,15	416,48
ASDH373	359000	1968950	105	458,085	40,68	417,41
ASDH374	359000	1968900	102	458,495	40,55	417,95
ASDH414	358850	1968850	113	455,345	39,45	415,90
ASDH264	360424	1969430	155	473,12	38,14	434,98
ASDH558	359863	1969302	690	469,75	35,38	434,37
ASDH559	360435	1969612	684,29	473,68	38,12	435,56
ASDH553	359444	1969395	737,6	470,36	37,89	432,47
ASDH575	360271	1969561	693,25	472,47	36,34	436,13
ASDH573	359837	1969350	750	469	37,76	431,24
DADH388	360550	1969740	700	482	40,11	441,89
ASDH580	360660	1969623	350	482	39,12	442,88

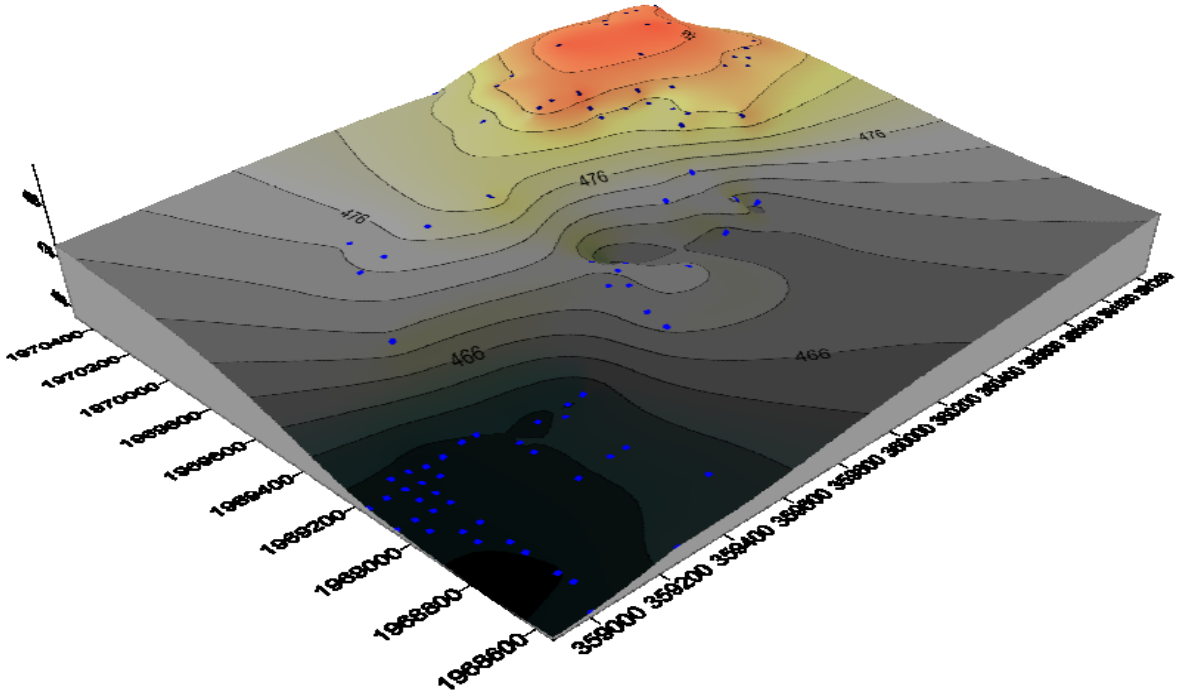

Figure 11 Piezometric map of the study area in 3D made in 2018

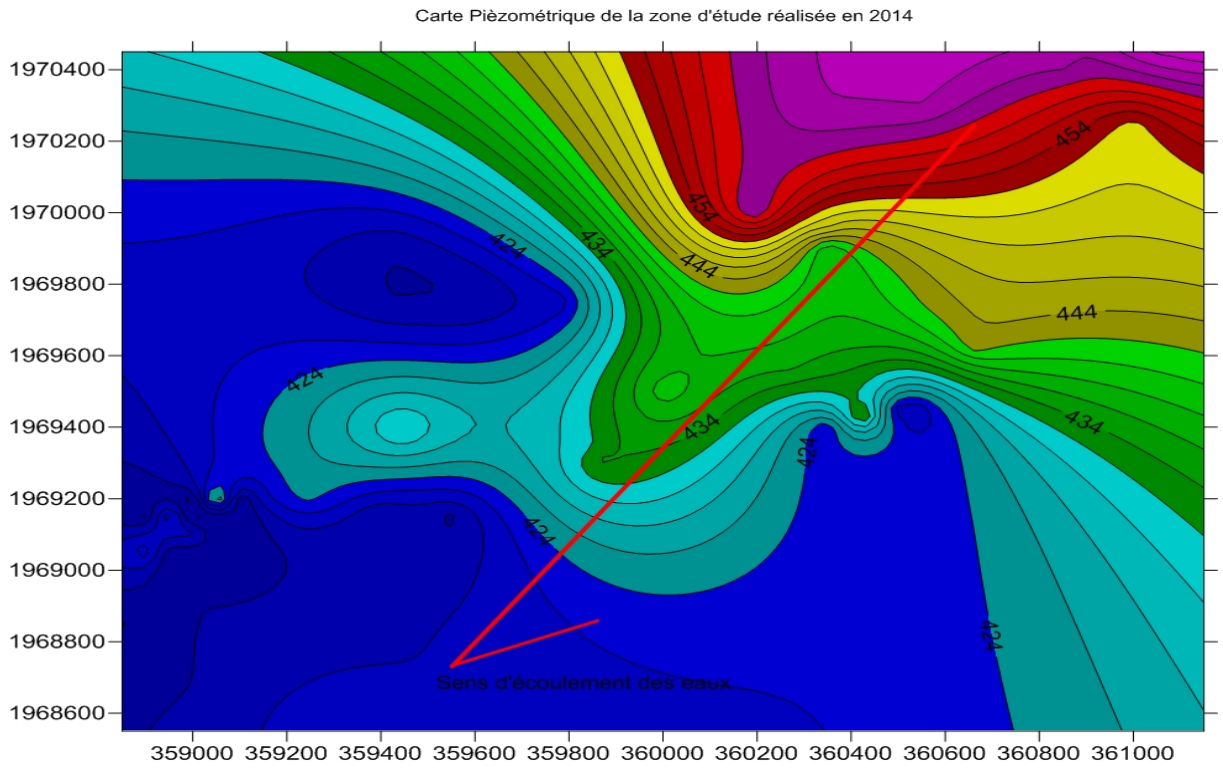

***Figure 12* Piezometric map of the study area**

These piezometric data allowed the direction of groundwater flow in the study area to be determined, which is from NE to SW. In addition to the direction of flow, the data recorded in 2021 and early 2022 showed that the piezometric levels of the various aquifers do not fluctuate sufficiently, which confirms the fossil nature of these aquifers and the absence of major water-consuming activities in the area. The hydrodynamic parameters of the aquifers calculated recently are summarised in the table below:

Table 3 Hydrodynamic characteristics of aquifers in the study area

Hydrodynamic characteristics of aquifers in the study area							
Reference	Aquifer types	Captured water	Depth (m)	Ns (m)	Q (m3/h)	TransmissivityT (m2/s)	Permeability K(m/s)
1	Chirezerin 2	Chirezerin 2	95	30 à 60	0,5	1.05.10-6	2.10-7
2	Teloua	Tchil and Teloua 1,2 and 3	180	40 à 55	15 à 25	2.10-4	5.10-6

3	Izégwandan	Izégwandan	231	30 à 45	2 à 3	3.10-5	1.4.10-6
4	Tarat	Tarat	330	25 à 40	>30	1.02.10-4	3.10-6
5	Guézouman	Guézouman	500				

3. RELATIONSHIP BETWEEN SURFACE WATER AND GROUNDWATER

The study area as a whole is not very hilly, which can facilitate exchanges between surface water and groundwater. All the alluvial groundwater along the koris is fed by the koris as shown in Figure 13 below.

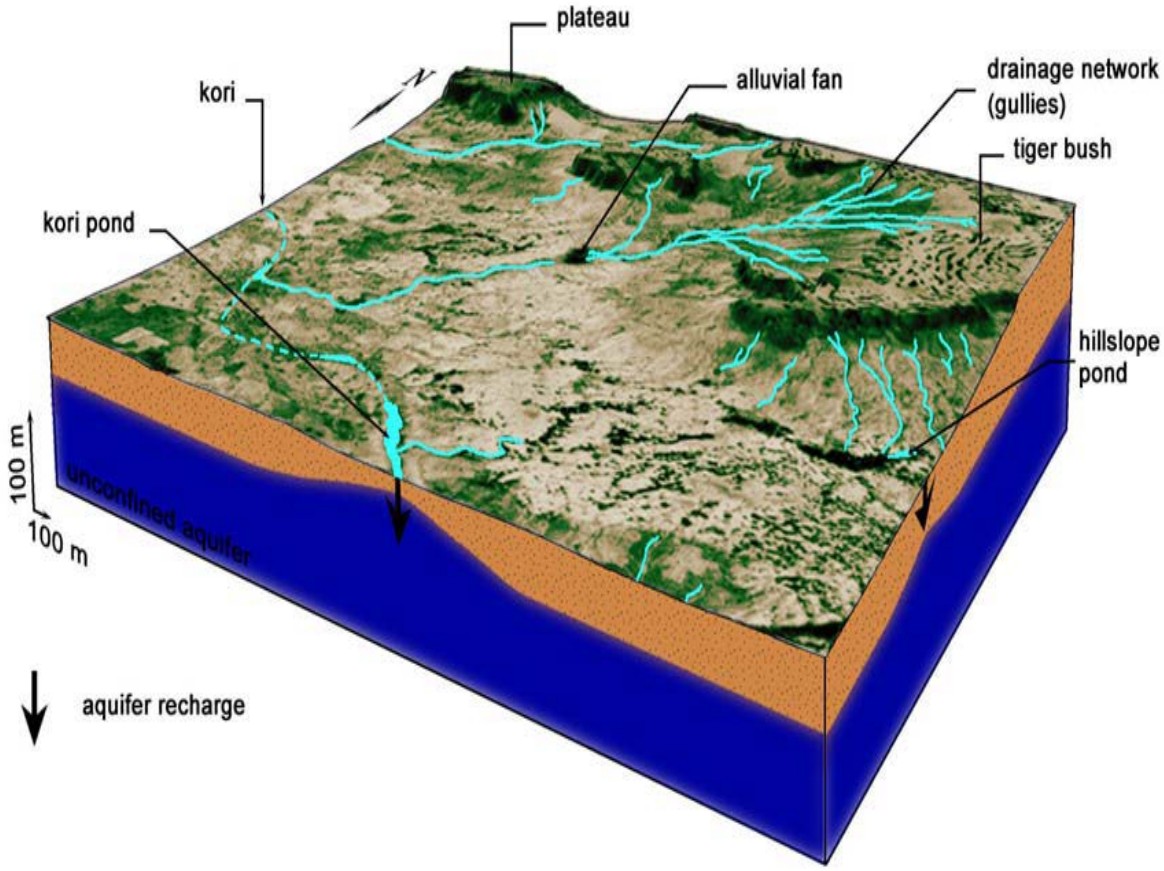

Figure 13 Hydrographic map showing the relationship between surface water and groundwater

In fact, the marked endoreism of the study area, especially in and around the uranium deposit, favours the maintenance of water resources in situ; increased recharge in the shallows, concentration of flows towards koris with well-marked beds and pools, support of certain water bodies by the overflow of the water table. Exchanges are irreversible because the alluvial aquifers receive water from the koris but, whatever the time of year, they never feed the koris. It should also be noted that these exchanges generally take place during the rainy season with the flow of the koris. On the other hand, the deep aquifers are considered as fossil aquifers and do not exchange with surface water in some places.

NB: It should be noted that exchanges between the different aquifers take place at the level of the Graben through faults or inclined exploration boreholes, as in the case of borehole HYDRO4. This borehole taps the Irhazer formation but, to our great surprise, it has the lowest dynamic level (29 m) observed during monitoring.

4. TYPES OF WATER USE

The types of water use in the study area fall into several categories. Water, a limited resource but essential to human life and activities, such as agriculture, industry and domestic activities (drinking water supply), as well as to the functioning of terrestrial ecosystems, owes its geopolitical dimension to the unequal distribution of resources according to region and to the transnational character of many rivers.

4.1. Use of surface water

Surface water is almost non-existent in the project area; there are no permanent or temporary springs apart from the koris, which have seasonal flows. They are used in the study area for drinking and watering livestock for a few days to a few months.

4.2. Groundwater use

The study area has significant groundwater resources that are not widely exploited. They are used in the following cases:

- **Small-scale irrigation**

Previously practised seasonally after the rainy season, we are now witnessing the development of market gardening exclusively from the groundwater of the alluvial aquifers, which are very accessible with few resources. The depths hardly exceed 10 to 20 m.

Nowadays, many projects are beginning to take an interest in these activities and are helping the local population with the construction of modern water points, such as the Global Atomic Corporation, which drilled a 180 m borehole in Elagozan for small-scale irrigation and drinking water supply. The International Organisation for Migration (IOM) has built a Mini AEP in Tagaza in the same framework, as well as Areva in Agatara.

- **Drinking water supply**

All the administrative villages in the study area are equipped with drinking water supply systems or modern water wells (modern or traditional wells). All these water points are supplied from groundwater.

- **Mining**

The two major mining companies in the area use groundwater for their operations.

5. PIEZOMETRIC MONITORING OF AQUIFERS

The main objective of piezometric monitoring is to observe fluctuations in the water table over time. It allows the identification of high and low water periods and thus the determination of the water table's beat.

The measurement campaign took place from September 2021 to August 2022 covering all seasons of the year. The piezometric network of the study area is made up of seven (07) boreholes transformed into piezometers for the occasion. These piezometers are distributed over the mine site and were set up with the main objective of monitoring the natural evolution of the water table. The parameter measured is the depth of water in the water table, which corresponds to the level naturally reached by the water in the piezometer.

The following table shows all the piezometric monitoring points carried out.

Table 4 Piezometric monitoring points

Work	X	Y	Location in relation to the mine site	Monitoring period	Formation/ aquifer
HYDRO 4	359976	1969222	On the website	September 2021 - August 2022	Tchirezerine 1
HYDRO 2	359987	1969340	On the website	September 2021 - August 2022	Irhazer
Piezometer	360008	1969087	On the website	September 2021 - August 2022	Teloua
ASDH-126 B	360045	1969257	On the website	September 2021 - August 2022	Teloua
ASDH-264	360425	1969430	On the website	September 2021 - August 2022	Teloua
GIHF4	365753	1973165	3km	September 2021 - August 2022	Tarat
GIHF2	365329	1972996	2.5km	September 2021 - August 2022	Izegwandan

5.1. Material and human resources

The implementation of the Study required the mobilisation of human and material resources as listed in the financial offer.

5.2. Measurement methodology

The measurements of the different piezometric levels must be carried out under conditions of stabilisation of the water table for the whole mapped area during the shortest possible period. The piezometric surface we measure is the upper limit of the water table. It is a hydrodynamic limit that is constantly fluctuating. This limit (piezometric surface) can rise or fall freely in the permeable hydrogeological formation. As it is very expensive to install them in the vicinity of the boreholes we want to study, we have carried out our measurements directly in the various works (boreholes) selected**.**

To take the measurement, the probe tip is inserted into the structure and once it reaches the surface of the water, the probe emits a sound and its indicator light comes on. The depth of the water level in the structure can then be read. Then the height of the coping (the elevation around the structure to protect it: in our study area it is usually a breeze block wall, a PVC pipe or a steel drill head) is measured to determine the actual water level in relation to the topographic surface. Then the water level in the structure is calculated. Finally, the name of the place or the number of the measuring well where the structure is located, the height of the coping and the piezometric level are recorded in a grid.

Weekly monitoring of the 7 points was carried out to control the variation of the groundwater level in the study area.

Monitoring of a river was also carried out by measuring a few hills along the river.

6. SUMMARY OF RESULTS

6.1. Monitoring of water levels

Monitoring water level fluctuations firstly allows us to assess whether there is a decrease in water reserves. Past data are used to assess whether the observed water levels correspond to a usual or abnormal variation. Under natural flow conditions, water level fluctuations are negligible. However, when levels are influenced by intermittent pumping, such as seasonal pumping (e.g. in agriculture), these variations can be significant. In addition, variations in rainfall can also cause water levels to vary. Monitoring of water levels therefore makes it possible to understand the effect of anthropogenic or natural modifications on the reserve in place, and therefore on the availability of the resource. In addition, this monitoring will make it possible to define various future projects: definition of alert coasts in the event of drought, development of a hydrogeological model.

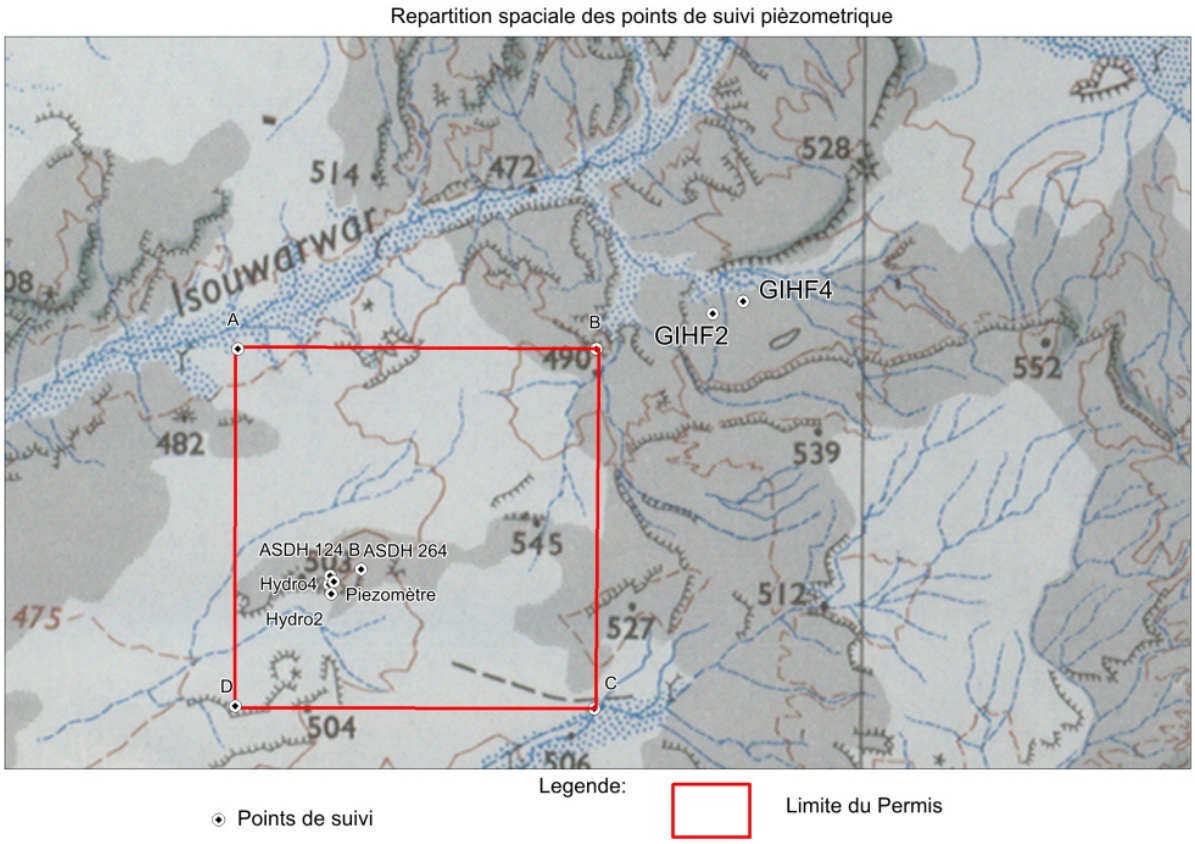

Figure 14 Map of spatial distribution of monitoring points

6.2. Monitoring of water levels in the Chirozerin 2 aquifer

This water table is not very productive in our sector, with a flow rate varying from 1 to 4 m3/h (Hydro4), but it is of capital importance for us because part of the mineralization is found in this formation. Knowledge of the fluctuation of this water table is essential for the project. A reconnaissance borehole was drilled on this water table in 2020. It was

transformed into a piezometer and monitored for a few months (12 months). The diagram below shows the fluctuation of this aquifer.

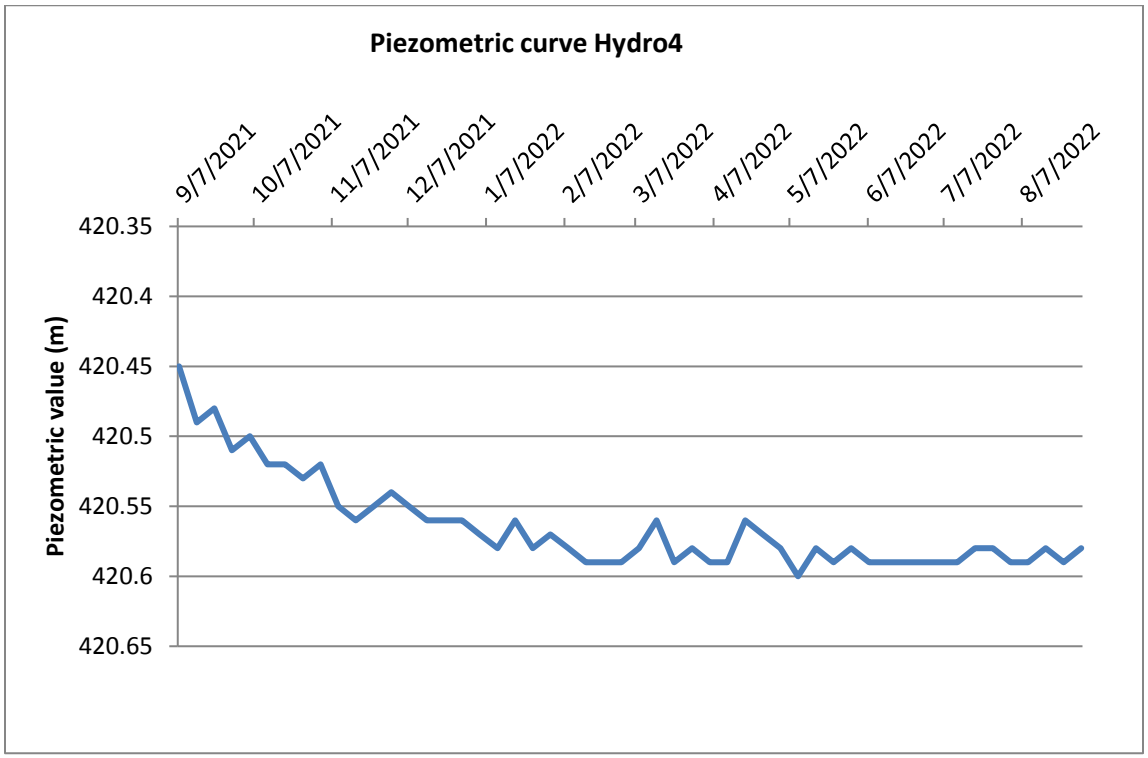

Figure 15 Water level monitoring curve in the Chirozerin 2 aquifer

The water table rises successively from September to April, then falls slightly between April and May, and then rises again because this is the period of high water in rivers and aquifers. However, there is little fluctuation (**0.15** m) throughout the year, so this water table is not recharged very much and we can therefore conclude that its natural level is not disturbed.

6.3. The Izegwandane water table

This aquifer is not very productive in the study area with a flow rate of $3m^3$ /h and a drawdown of more than 160 m. It is not of great interest from a hydrogeological point of view in this sector due to the very important clay alternations in this aquifer. The curve below gives us an overview of the groundwater level during the period of the measurements.

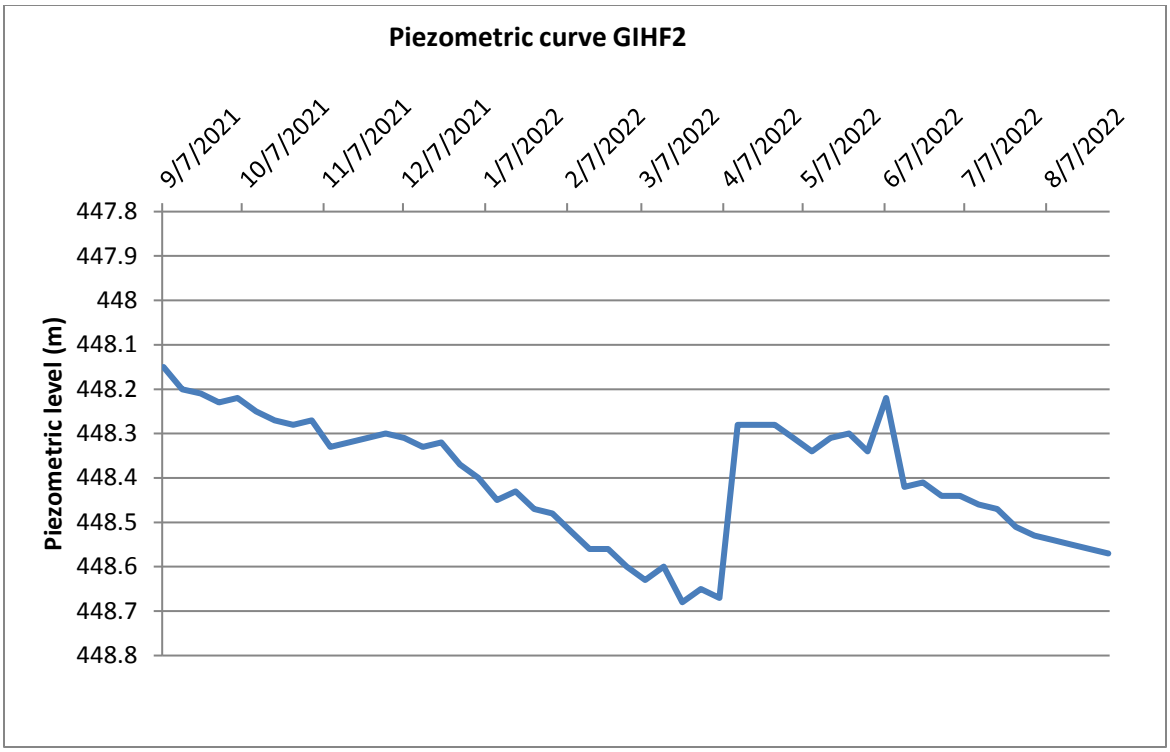

Figure 16 Water level monitoring curve in the Izégwandane aquifer

From September to the end of March, the water table rises before starting to fall from April until July. This water table follows the normal evolution of aquifers. During the period of high water the level rises and then falls again during the period of low water, from April to June. After the month of June the curve resumes its upward trend following the evolution of rainfall. However, it should be noted that the variation in piezometric levels (0.46 m in one year only) is significant.

6.4. The Teloua aquifer

The Teloua aquifer is the best exploited and best known aquifer in the area. It supplies the entire town of Agadez and almost all the villages along the Agadez-Arilt road. It is a very productive water table with a flow rate varying from 10 to 50 m3/h and from 20 to 100 m3/h depending on whether one is to the east or west of the Arlit fault flexure. In the study area, three boreholes tap this water table, two of which are in operation and one of which is considered to be a piezometer for monitoring variations in the level of this water table.

The flow rates of these boreholes vary from 10 to 30 m^3 /h, which confirms the thesis found in the literature that the flow rates vary according to the position in relation to the fault flexure. The piezometric measurements carried out at the level of this water table give us enough information as shown in the figures below:

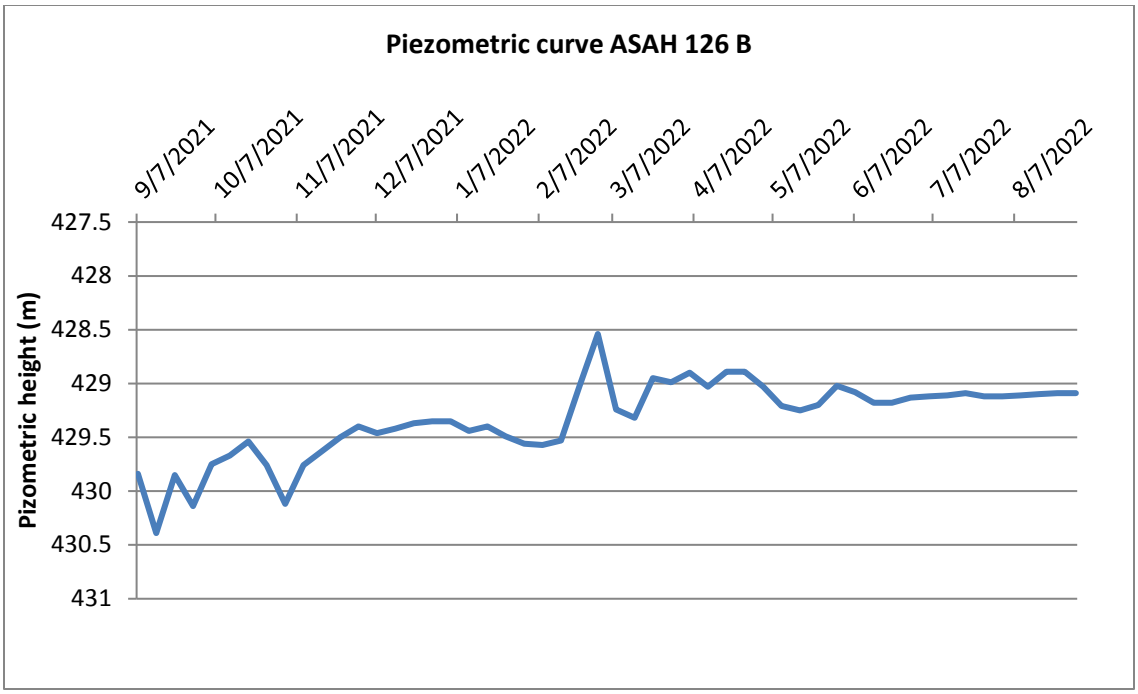

Figure 17 Monitoring curve of water levels in the Teloua aquifer.

If we analyse the following curve, we can see that the level only goes down throughout the recording period, which corresponds to the high water period. In principle, the level should rise during this period, but given the pumping for the drilling work, this is not the case. However, from April onwards, the water level rises slightly until the end of the study. We believe that the piezometric level of this borehole is disturbed by the pumping for the exploration works. A piezometric amplitude of 1.51 m was measured on this structure and the fluctuation is enormous.

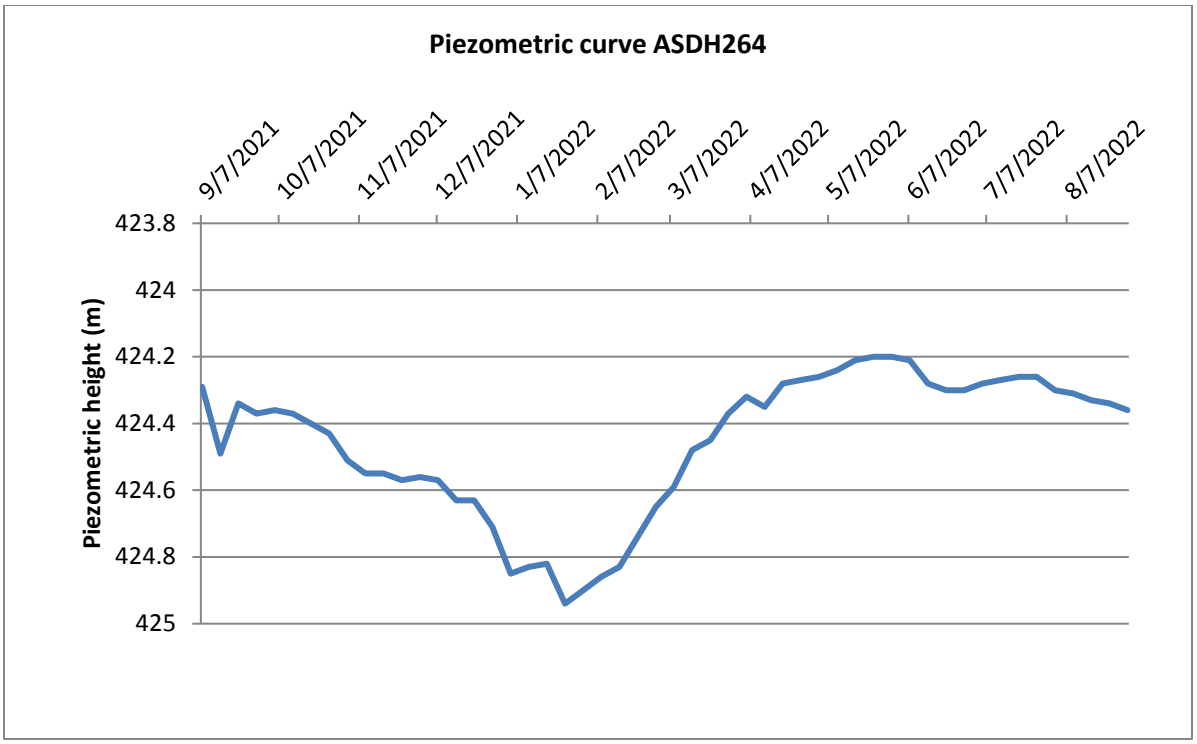

Figure 18 Monitoring curve of water levels in the Teloua aquifer.

We can see here that the water level rises from September to February, which corresponds to the high water period. The variation observed during this period is **0.73 m which is** enormous for one year of monitoring. On the other hand, from March onwards, the water level decreased, which is quite normal as it is a low water period until June. Then the water table starts to rise after the first rains recorded in the area and this until the end of the study. It can be concluded that the water table of the Teloua in the area is recharged during the rainy season.

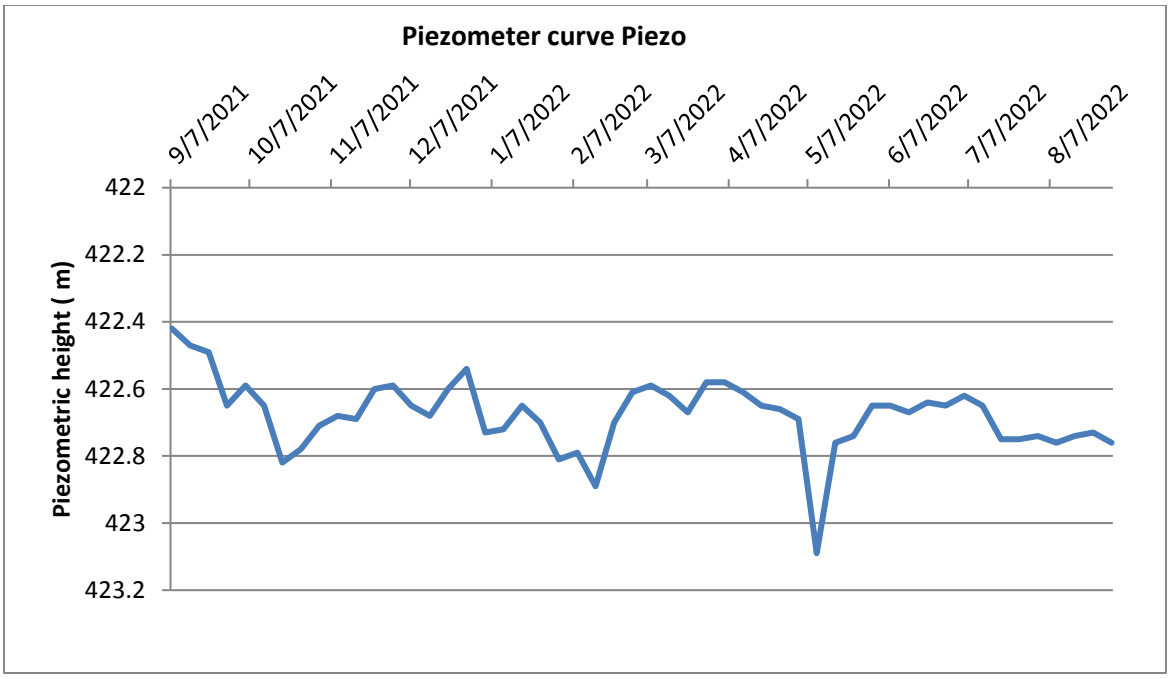

Figure 19 Monitoring curve of water levels in the Teloua aquifer on a piezometer

We can see here that the water level rises from September to February, which corresponds to the high water period. The variation observed during this period is **0.62 m which is** enormous for one year of monitoring.

The conclusion is the same as for Figure 18.

By combining the three piezometric curves of the boreholes tapping the Teloua aquifer, we obtain the figure below.

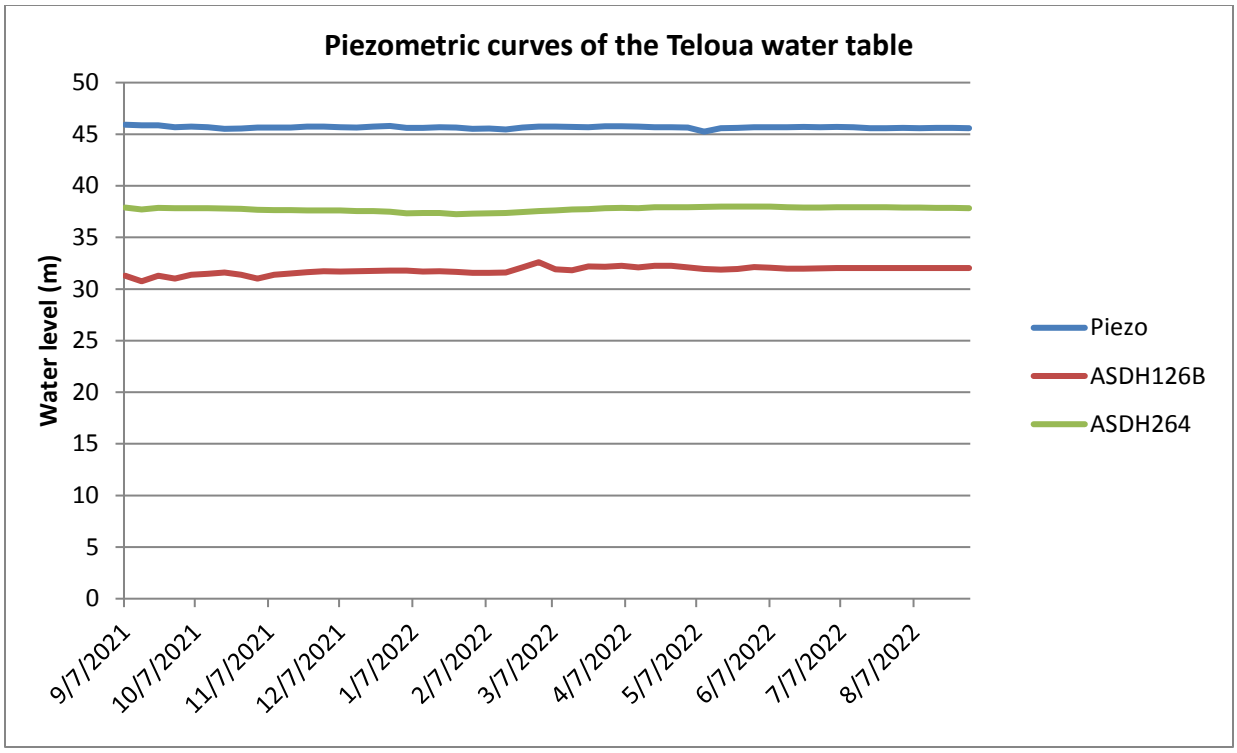

Figure 20 Piezometric curves of the Teloua water table

The first constant that can be drawn from this graph is that the Teloua water table has a piezometric level that varies from 31 to 46 m in the Graben area, whatever the time of year.

6.5. The Tarat aquifer

The Tarat aquifer is of great importance in the region because of its water resources. Its exploitation ensures the supply of water to urban areas and industrial units.

This water table is very productive with a flow rate varying from 20 to 50 m^3 /h and from 40 to 100 m^3 /h depending on the sector. In the study area, a borehole tapping this water table has been drilled and the pumping tests carried out gave a flow rate of 27 m^3 /h. The curve below shows the variation of the water table during the recording period.

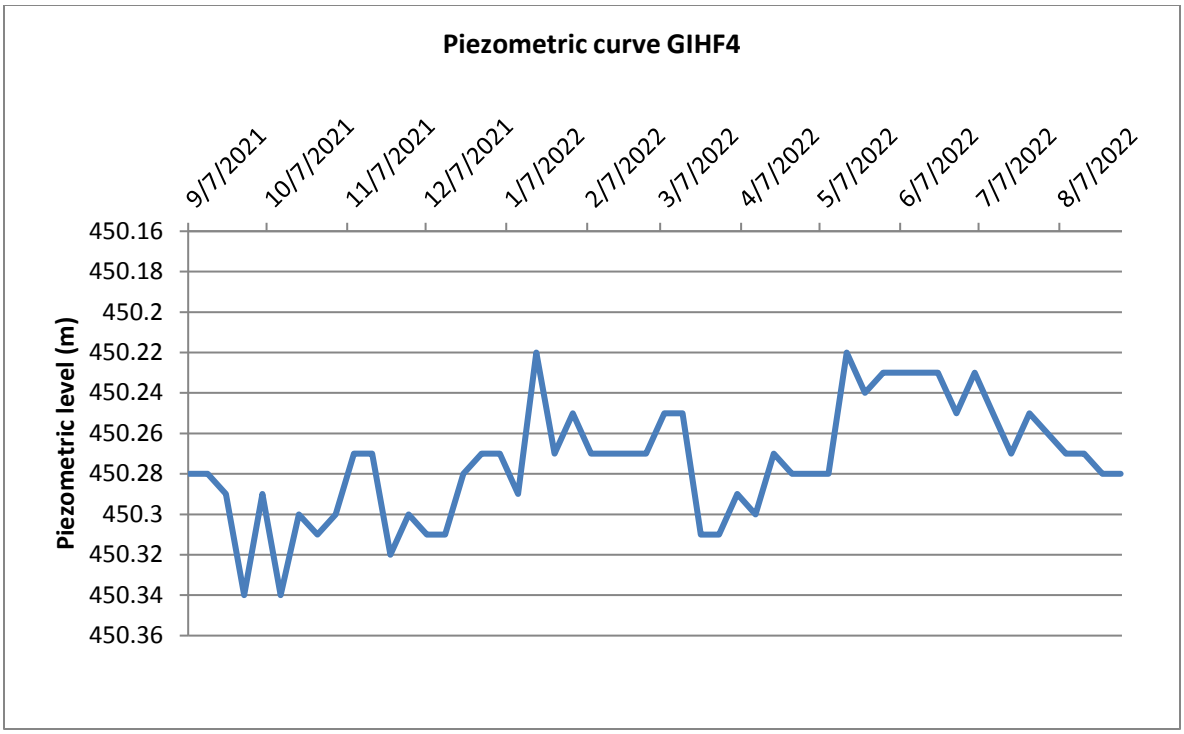

Figure 21 Water level monitoring curve in the Tarat aquifer

The observation of this curve shows us that the water level shows a particular pattern, which is proof of a certain disturbance of the water in this well.

6.6. The formation of the Irhazer

This formation only exists in the study area at the Graben. It consists solely of clay and is therefore of no importance from a hydrogeological point of view. However, it may be of interest in the context of water management in the mine. For this purpose, a borehole (HYDRO 2: 265 m deep) was drilled in this formation to follow the water flowing from the argillites. The dynamic level in this borehole is the lowest of all (29 m) during the monitoring period as shown in the figure below.

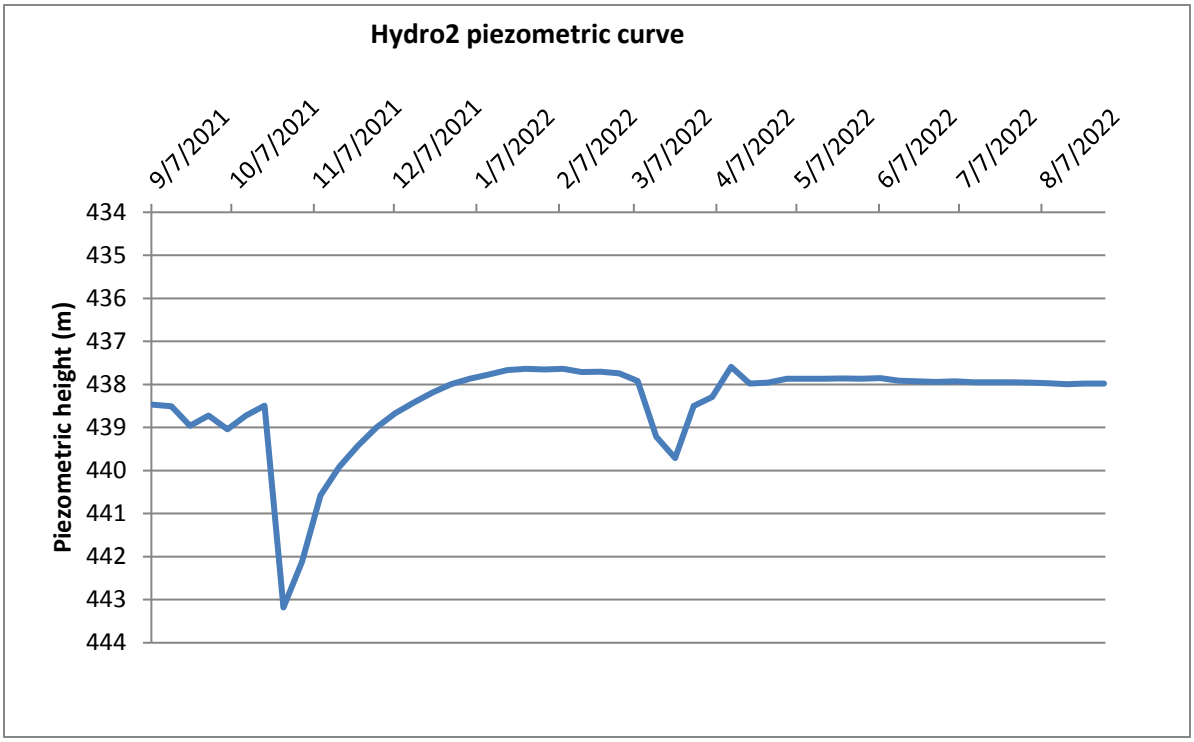

Figure 22 **Water level monitoring curve in the Irhazer formation**

We note that the water level fell by 4.96 m during October before starting to rise again in January. We believe that the presence of water in this structure is due in part to the various faults that exist in the Graben and the communication between the water table through these faults and the unsealed mine holes. It should be noted that the presence of water in this formation through both events can be an obstacle that must be taken into account during mining. All this was confirmed by a water level monitoring that we carried out in the Graben of some of the mining holes, the results of which are presented below.

6.7. Piezometric monitoring work prior to the Study

In 2018 four mining holes were cleaned up to monitor water levels. These holes cross several aquifers and the results of the monitoring are given in the following tables.

- ***The ASDH 553 survey***

This borehole is located in the Graben.

Table 5

Date	ID - HOLE	Pr (m)	Z (m)	Ns (m)	Hs (m)	Cp (M)
25/06/2018	ASDH553	737,6	470,36	12,68	0,3	457,38
26/06/2018	ASDH553	737,6	470,36	12,68	0,3	457,38
27/06/2018	ASDH553	737,6	470,36	12,67	0,3	457,39

28/06/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
29/06/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
30/06/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
01/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
02/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
03/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
04/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
05/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
06/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
07/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
08/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
09/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
10/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
11/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
12/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
13/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
14/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
15/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
16/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
17/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
18/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
19/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
20/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
21/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
22/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
23/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39
24/07/2018	ASDH553	737,6	470,36	12,67	0,3	457,39

- ***The ASDH 558 survey***

This borehole is located in the Graben.

Table 6

Date	ID - HOLE	Pr (m)	Z (m)	Ns (m)	Hs (m)	Cp (M)
25/06/2018	ASDH558	690	469,75	34,43	0,7	434,62
26/06/2018	ASDH558	690	469,75	34,43	0,7	434,62
27/06/2018	ASDH558	690	469,75	34,42	0,7	434,63
28/06/2018	ASDH558	690	469,75	34,43	0,7	434,62
29/06/2018	ASDH558	690	469,75	34,43	0,7	434,62
30/06/2018	ASDH558	690	469,75	34,43	0,7	434,62

01/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
02/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
03/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
04/07/2018	ASDH558	690	469,75	34,43	0,7	434,62
05/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
06/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
07/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
08/07/2018	ASDH558	690	469,75	34,43	0,7	434,62
09/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
10/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
11/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
12/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
13/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
14/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
15/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
16/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
17/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
18/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
19/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
20/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
21/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
22/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
23/07/2018	ASDH558	690	469,75	34,42	0,7	434,63
24/07/2018	ASDH558	690	469,75	34,42	0,7	434,63

- ***The ASDH559 survey***

This borehole is also located in the Graben.

Table 7

Date	ID - HOLE	Pr (m)	Z (m)	Ns (m)	Hs (m)	Cp (M)
25/06/2018	ASDH559	684,29	473,68	23,29	0,5	449,89
26/06/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
27/06/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
28/06/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
29/06/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
30/06/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
01/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
02/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
03/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
04/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90

05/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
06/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
07/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
08/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
09/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
10/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
11/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
12/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
13/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
14/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
15/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
16/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
17/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
18/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
19/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
20/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
21/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
22/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
23/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90
24/07/2018	ASDH559	684,29	473,68	23,28	0,5	449,90

The graph below gives us an overview of the evolution of the water levels during the two months of monitoring.

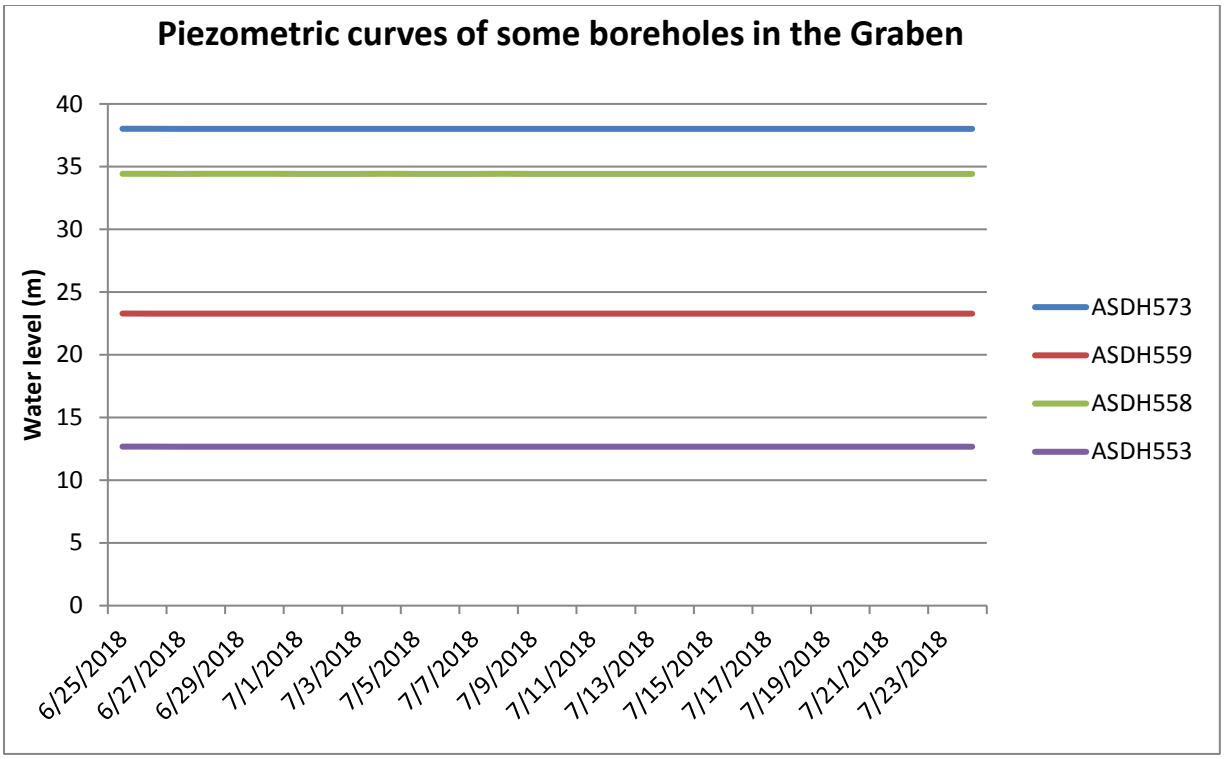

Figure 23 Piezometer curves for selected boreholes in the Graben

We can see that the four curves are almost horizontal, so no variation in water level has been observed during this period, whereas normally we should see a rise in water levels as we are in a high water or rainy season. However, these measurements show that water can rise to within 20 m of the surface in this area.

7. INTERPRETATION OF RESULTS

7.1. Calculation of the hydraulic gradient

By comparison between the experimental device of the Darcy laboratory (Castany, 1998) and the field, the hydraulic gradient is the difference in piezometric level between two points on the surface, per unit of length, measured along a flow line (direction of groundwater flow). The hydraulic gradient, I, can be compared to the slope of the piezometric surface (Castany, 1998).

In practice, the hydraulic gradient is calculated in the field, using piezometric levels measured in two observation structures, aligned on a streamline,

The hydraulic gradient can also be assessed from observation wells. In this case, the depth of water in the different wells is measured, the difference in water level, AH, between two neighbouring wells is calculated and the result is divided by the distance between them.

In application to our study area for the HYDRO 4 boreholes and the piezometers which are on the same streamline and 100 m apart; on 12 August and 11 November for example, the hydraulic gradient is:

12 August 2005	**11 November 2005**
i = (1109.19 m - 1095.12 m) / 300 m	i = 1109.61 m - 1095.05 m) / 300 m
= 0, 047	= 0, 048

These two values of the gradient for the extreme periods show us that even over time the groundwater regime in the basin is constant. This suggests a uniform groundwater recharge and identical groundwater circulation in the Tem Mersoi basin.

7.2. Hydrochemistry of groundwater

The availability of the water resource takes into account its quantity as well as its quality. Its quality is determined by its chemical composition. Water in its journey through nature undergoes several processes that affect its chemical composition and therefore its quality (Tremblay et al 2014). Water that is unfit for human consumption can cause diseases commonly known as waterborne diseases. This is why, in addition to quantitative monitoring, piezometers are monitored from the point of view of quality, even if the monitoring is not regular over time. In addition to the analysis of the dynamics of the evolution of the piezometric levels, a brief overview of the hydrochemistry of the water was made. To do this, the chemical parameters of the water in the piezometers at the time of our visit were analysed; then Piper and Scöeller diagrams were drawn up to highlight the mineralisation and the different hydrochemical facies of the water in the piezometers. The aim is to highlight the quality of the water. Our work, which also aims

to determine the physico-chemical parameters of the groundwater in the study area, the sampling methods and materials used are presented as follows:

7.3. Data

Two types of data were used. These were field data (carried out in April 2018) and data collected from the DGRE (Directorate General for Water Resources). As the time spent on fieldwork did not allow for water sampling from boreholes, we limited ourselves to sampling and analysis of piezometer water. For this purpose, the analysis concerned physico-chemical parameters (pH, temperature, turbidity, conductivity, total alkalimetric titre) and major ions such as calciums, magnesium, sodium, chloride, carbonates, sulphates and nitrates.

7.4. Materials and methods in groundwater hydrochemistry

Plastic bottles of 1.5 litres were used to collect the water and a cooler was used to store and pack the samples for analysis.

7.5. Choice of sampling points

Sampling is the procedure of taking a representative quantity of water from a river, lake or well.

The choice of sampling points should meet several criteria. These points must be representative of the water table or river bed, based on the following parameters:

- characterisation of the watercourse;
- the search for a possible source of groundwater contamination (domestic waste and chemical deposits);
- the use of the water point by the surrounding population for various activities (agriculture, washing clothes, cooking, drinking, etc.).

The water was collected from 10 boreholes, 6 of which were in the exploration permit and 4 in the surrounding area, using a 1.7 Kw solar-powered submersible pump mobilised for the purpose and packaged in plastic bottles. Sampling was carried out in the borehole piezometers that were accessible. In situ and laboratory measurements were made using the electrochemical method for physical parameters with the WTW pH 3210 SET 1&3 and the 355IR turbidimeter. 47 For major ions, the spectrophotometric method was applied with DR 3900 (for nitrates, sulphates), by photometry for sodium and potassium with the AFP 100 flame spectrophotometer. Calcium, magnesium, and chlorides were determined by complexometric titration with NF T90-016; NF T90-003, NF T90-017.

7.6. Methods of sample collection

According to Moll (2005), there are several types of samples: the point sample; the periodic sample; the composite sample (weighted or unweighted) and the integrated sample.

A thorough study of a river or well in a watershed requires multiple samples, according to a predetermined grid (Tardat - Henry, 1992).

Samples were taken in March 2022 from ten (10) different water points. The samples were taken in plastic bottles previously washed with soap and distilled water and rinsed with the water to be analysed. They were kept in a cooler and sent for analysis to the laboratory of the Agadez regional water authority. As spot samples do not provide absolute information on the variability of water (Tardat - Henry, 1992), our samples were composed and weighted in 12 hours to obtain a single sample. The constant volume samples taken at 6, 12 and 18 hours (i.e. at 6-hour intervals) are mixed.

Once the weighted composite samples had been taken, they were subjected in situ to temperature measurement using a precision thermometer, conductivity measurement using a conductivity meter and pH measurement using a pH meter. The temperatures obtained are close to the atmospheric temperature, with an average of 35°C. The other parameters such as colour, calcium and total hardness, salinity, major cations and anions and silica were measured in the laboratory.

7.7. Laboratory analysis of samples

To assess the physico-chemical quality of the water in the study area, chemical analyses were carried out on 10 water samples from the boreholes. The elements analysed at the laboratory of the Regional Directorate of Hydraulics and Sanitation of Agadez are the following: HCO3, SO4, Cl, NO3, Na, K, Ca, Mg, pH and Electrical Conductivity. The results of these physico-chemical analyses allowed the potability of these waters to be assessed in accordance with the acceptable standards of the World Health Organisation (WHO). The information obtained from the analyses of these parameters is described below and the critical values are reported on a case-by-case basis. ***Electrical Conductivity (EC) -*** there is a relationship between the dissolved salt content of water and the resistance it offers to the passage of electric current.

Electrical conductivity is measured in micro Siemens per centimetre (µS/cm). Conductivity measured at 25°C is a good measure of the material in solution, but is not proportional to the mass of the elements dissolved in the water. For example, pure demineralised water has a very low conductivity, whereas seawater has a conductivity of around 30,000µS/cm. Drinking water quality is defined as follows:

- from 50 to 400µS/cm: excellent quality;
- of 400 0 750 µS/cm: good quality;
- 750 to 1500 µS/cm: poor quality but usable;
- Above 1500µS/cm: excessive mineralisation.

The electrical conductivity measurements carried out 'in situ' on 10 groundwater points provided a preliminary characterisation of the chemical quality of the groundwater, the

level of which varies from 20 to 46 metres. The measurements can be broken down as follows: - water points with EC below 500 = 82.14%; - water points with EC above 500 = 17.86%.

7.8. Presentation of results

The table below gives the different values of the physico-chemical parameters measured on the boreholes of the study area.

Table 8 Physico-chemical parameters analysed

Parameters analysed in April 2022												
Sample Work	**pH**	**T (°C)**	**Conductivity (µs/cm)**	**Ca++**	**K**	**HCO3-**	**Cl**	**$SO4^{2-}$**	**NO3-**	**NO2**	**Fe**	**F-**
Drilling Camp Global Atomic	9,1	29,6	470	136	0,3	215	0	1	25,52	0	0	0,35
Drilling Camp Foraco	8,95	37,5	444	0	0,5	205	0	1	19,45	0,0033	0	0,2
Drilling and tanking	8,3	36	370	4	0,3	65	0	10	17,69	0	0	0,29
HYDRO 4 borehole	8,66	38,92	528	148	0	190	0	74	17,69	0	0	1,17
HYDRO 5 borehole	8,44	41,9	446	0	0,5	170	0	150	14,74	0,0033	0,01	1,52
Borehole Piezometer	8,69	40,22	622	2	1,3	140	0,05	150	13,42	0	0,02	1,51
Borehole No. 7	7,64	36,9	374	22	3	210	0	1	19,1	0,0033	0	0,15
Drilling GIHF2	8,64	37,82	650	123	0,9	420	0,07	130	11,4	0	0	11,9
Agatara borehole	8,17	38,2	352	4	0,2	190	0	13	10,78	0	0	0,39
Tagaza borehole	8,5	38,3	253	12	1,2	165	0	0	25,08	0	0	0,18
WHO Standard	**6,5-9,5**		**200 à 1100**	**100 mg/l**	**12 mg/l**	**400 mg/l**	**250 mg/l**	**400 mg/l**	**50 mg/l**	**0.3 mg/l**	**0.3 mg/l**	**1.5 mg/l**

- The conductivity

The electrical conductivity measurements carried out on ten samples spread over the study area also made it possible to assess the mineralization of the water. The measured values vary from 252 to 650 µS/cm and 84% of the water samples have values below 200 µS/cm. The chemical analysis results show that about 100% of the water samples have

EC (groundwater) values below 750 uS/cm. This means that the quality of the water analysed is good, as shown in the curve below:

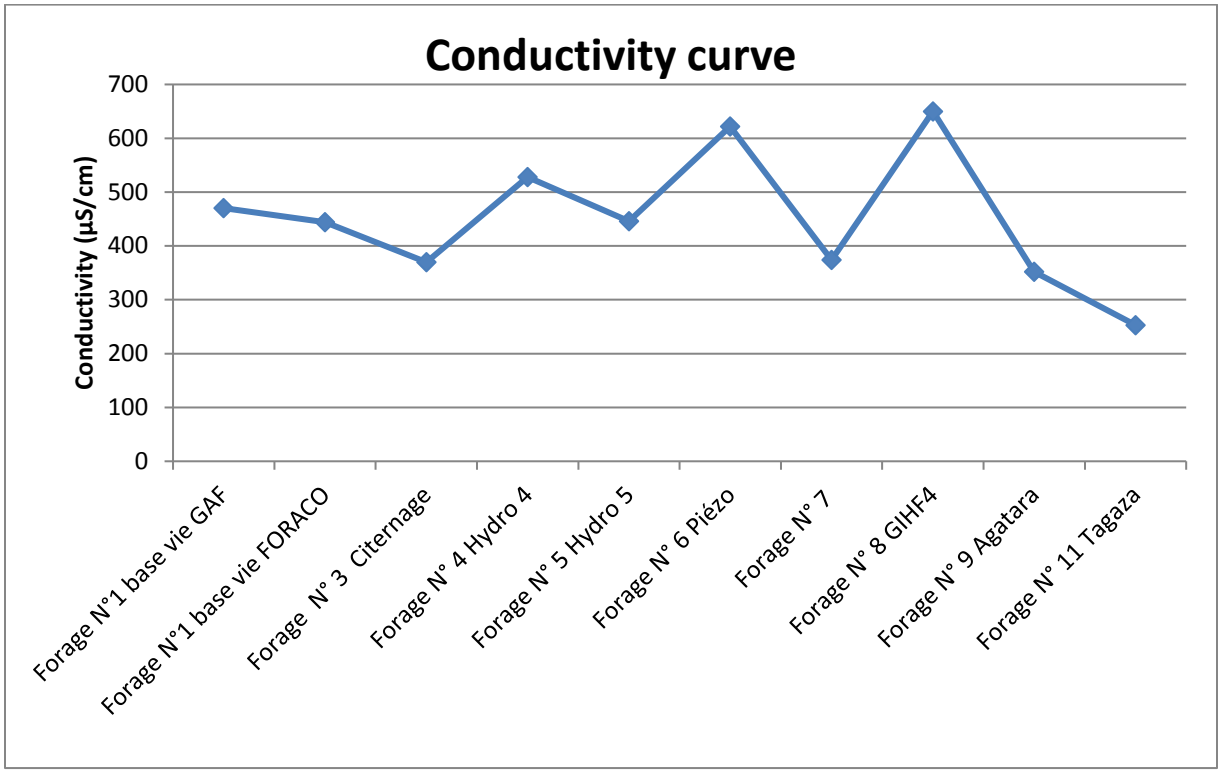

Figure 24 Conductivity curve

- The pH

The determination of the pH consists of a measurement of the concentration of H+ ions in water. Its value conditions a large number of physico-chemical equilibria. In groundwater, the pH depends on the geological nature of the reservoir, with more acidic pH values and less in the basement areas or in sandstone. The pH value is at the origin of most of the problems attributable to water in the pipes, in particular too high an acidity favours the corrosion of metal pipes. The pH value also affects the taste. Values between 7.5 and 9.2 can be considered an acceptable range. Most of the water in the study area is basic, except for the water from borehole 7, which is located outside the permit area and has a value of 7.64, as shown in the curve below.

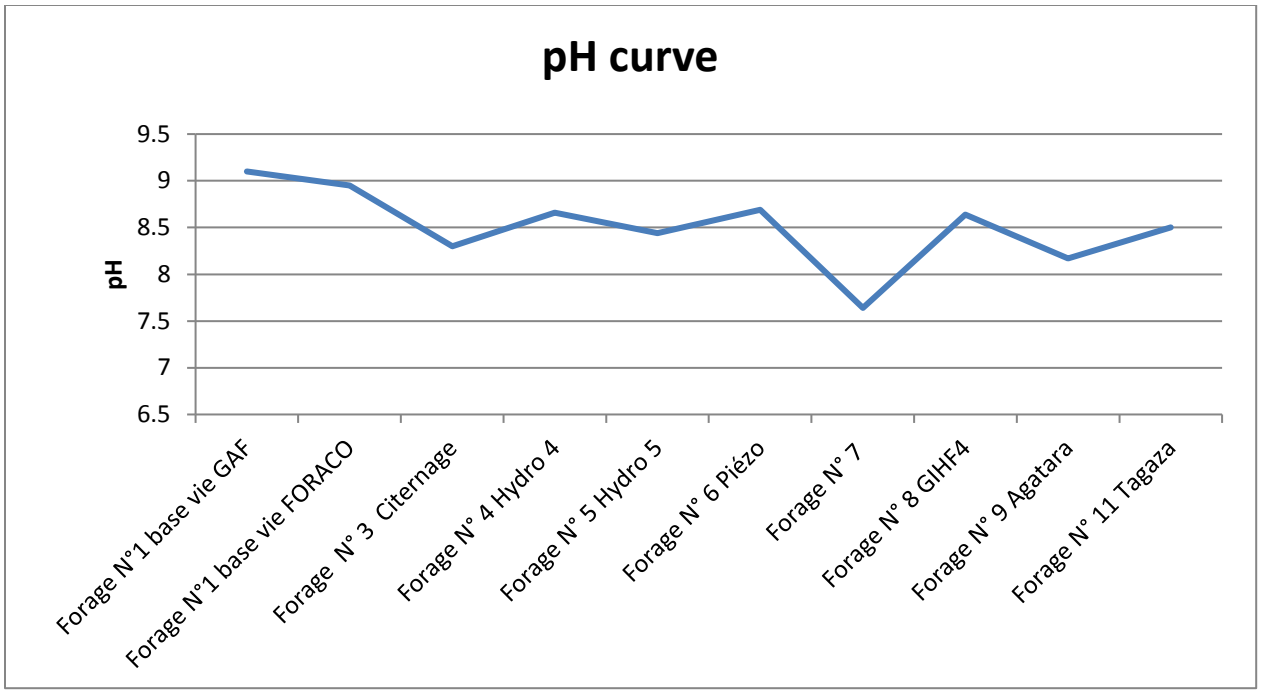

***Figure 25* pH curve**

- Calcium

The calcium content is directly related to the nature of the geological formations crossed. The content can vary from 1 to 150mg/l. It is mainly found in the form of bicarbonates. For the WHO, the permissible levels vary from 75 to 200 mg/l. The human body needs 0.7 to 2 g of calcium per day. In the 10 water samples analysed, the calcium values vary from 1 to 148 mg/l as shown in the curve below:

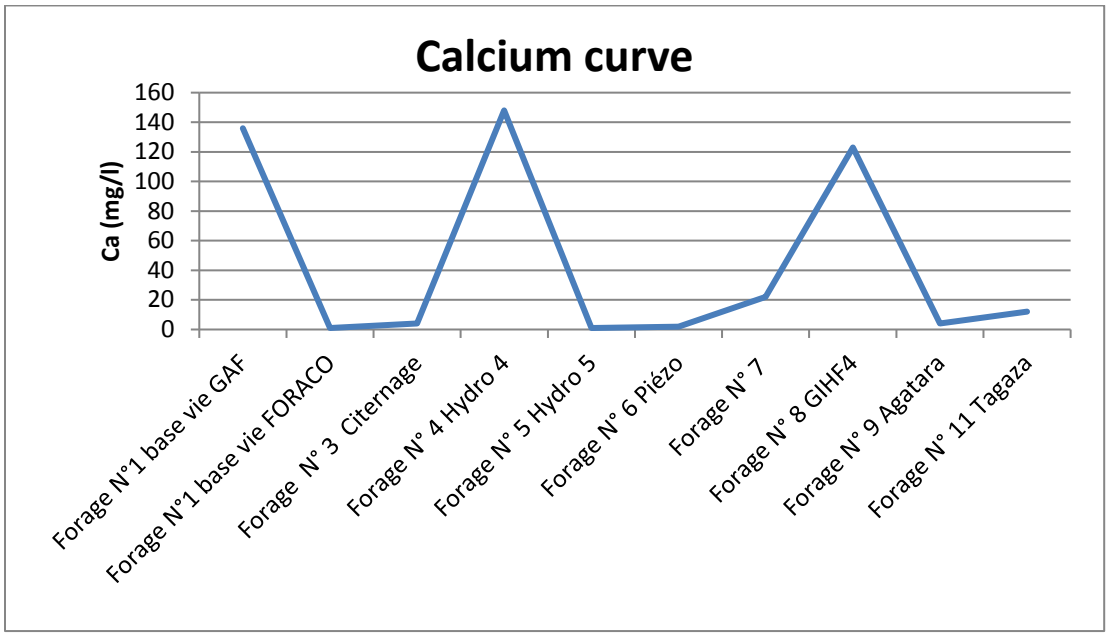

Figure 26 Calcium curve

- Magnesium

Magnesium has the same origin as calcium. It contributes to the hardness of water without being the essential element. The various regulations give acceptable limits of between 50 and 150 mg/l. Magnesium is of great biological importance in the constitution of bones. At high concentrations it gives water a bitter taste and leaves traces in food cooking vessels that are more visible and unpleasant than those of calcium. Magnesium values could not be obtained due to lack of reagent.

- Sodium

It is one of the major constituents of the earth's crust, and the solubility of sodium salts is very high. It is present in all waters. A high level has no major disadvantage, apart from a laxative effect in very high concentrations. However, these waters are not suitable for people with vascular or kidney problems. Good quality water can contain up to 200 mg/l of sodium, but the desirable level should not exceed 10 mg/l. The values could not be obtained due to lack of reagent.

- Potassium

Potassium is a normal element in water, but its concentration is much lower than that of sodium. Although as abundant as sodium and highly soluble, potassium salts remain adsorbed in the soil. Despite a purgative action above 1000mg/l, this cation is considered to have no physiological effect on humans. The taste perception threshold is around 340mg/l.

- Bicarbonates

The concentration of bicarbonates and carbonates in water is essentially a function of equilibrium conditions involving CO2 content, temperature and water mineralisation. In a natural environment, alkalinity expressed as HCO3 varies from 25 to 250mg/l and can reach 350mg/l. There are no precise standards for alkalinity; however, if the water is aggressive, it can attack the pipes. In the study area, the 10 water samples analysed have values between 65 and 420 mg/l.

- Sulphates

Natural compounds in water, they are related to the major cations: calcium, potassium, and sodium. They come mainly from the formations through which the water has passed. The sulphate content of water does not exceed one gram per litre. International standards set the maximum permissible level at 400mg/l. Higher levels have no effect, but can cause diarrhoeal problems in children. The sulphate values of the 10 water samples analysed range from 0 to 150 mg/l and are well below the WHO standards.

- Chlorides

Chlorides exist in all waters in highly variable concentrations, the origin of which may be percolation through saline soils or industrial waste. The taste threshold of chlorides varies

greatly from one individual to another, and according to the composition of the water. Extreme values of 100 to 700 mg/l are quoted, but the average detectable level is 400 mg/l. International standards set the maximum permissible level at 600 mg/l. Slightly higher values are not harmful, but water with a high chloride content is laxative. In the study area, the 10 water samples analysed show very low or even zero values with a maximum value of 0.07mg/l

- Nitrates

The nitrates found naturally in water come from rain (for a small part) and from the leaching of surface soil. As soon as the content exceeds 50mg/l, human activity is undoubtedly involved. Nitrates can harm infants, but they are not dangerous for children or adults. International standards set the maximum level at 50mg/l. Of the 10 nitrate measurements taken, none exceeded the WHO standard.

- Nitrites

The presence of nitrites in water in its natural state is extremely rare, and if they are present it is always necessary to carry out a bacteriological control. In fact, their presence is often due to the bacterial oxidation of ammonia. Up to 0.1mg/l can be tolerated. In the study area, the 10 water samples analysed have very low nitrite values between 0 and 0.003 mg/l.

- Iron

Iron comes from the leaching of geological formations. It is an essential element of the human diet. Potability limits are based on aesthetic effects, on the taste threshold, on household effects (linen and containers) and on the inconvenience it causes to the network if it is found in too large a quantity. The limits imposed for human consumption are 0.3 mg/l. The total iron values of the 10 water samples analysed are between 0 and 0.02 mg/l.

Table 9 Physico-chemical parameters analysed

Analysis results second campaign September 2022												
Sample name	**pH**	**T (°C)**	**Conductivity (µS/cm)**	**Sulphate (SO2-4)**	**Bicarbonate (HCO3-)**	**Total chloride**	**Fluorides (F-)**	**Nitarates (NO3-)**	**Nitrites (NO2-)**	**Potassuim (K+)**	**Total iron**	**Calcuim (Ca 2+)**
WHO standards	**6,5-9,5**	**-**	**200 à 1100**	**400 mg/l**	**400 mg/l**	**250 mg/l**	**1.5 mg/l**	**50 mg/l**	**0.3 mg/l**	**12 mg/l**	**0.3 mg/l**	**100 mg/l**
Elogazan	9,2	26	435	8	165	0,12	0,24	14,52	0,0066	0,4	0,01	128
Agatara	8,8	26,1	394	10	170	0,12	0,08	9,86	0,0033	0,6	0,00	6
Tagaza	8,5	25,7	415	1	15	0,10	0,04	14,04	0,0033	3,3	0,01	20
GAF Life Base	9	25,8	511	0,00	205	0,09	0,08	15,93	0,0033	0,4	0	133
FORACO	8,9	27	491	0,00	200	0,09	0,06	14,21	0,00	0,1	0	0,00
HYDRO 5	9,5	26,6	771	128	0,00	0,01	1,90	9,02	0,00	0,40	0,01	2
GIHF2	9,4	25,8	1283	132	270	0,17	7,9	6,03	0,017	1,3	0,06	142
HYDRO 4	9,2	25,4	685	94	165	0,09	0,6	9,28	0,017	1,4	0,03	2
Citing	8,8	24,6	425	2	165	0,15	0,13	12,14	0,0033	0,5	0	2

We can see that it is always in the same structures that we find fluoride levels exceeding the normal (GIHF2, HYDRO 5) as in the April 2022 analysis, so these structures must be monitored regularly for this element.

7.9. Interpretation of results

The method used was based firstly on a comparative analysis of the physical parameters of the water in the piezometers at their date of completion, some in 2013 and others in 2020. Piper and Schöeller diagrams were then drawn up to highlight the mineralization of the water and the various related facies in order to better understand the quality of the water. The DIAGRAMS software was used to produce the diagrams. The ionic balance was calculated beforehand to check the reliability of the analyses. The reliability limit of the analyses considered was based on the work of Ouandaogo, (2008) who used BI = 10% in the case where the water had a high ionic load. In this case, an electrical conductivity of 672 µs/cm was observed in one piezometer (GIHF2). This shows a high mineralization of the water at this location. Hence the consideration of the 10% reliability limit. Thus the ion balance is calculated with the following relationship: BI (%) = (Σ $cations$ - Σ $anions$)

(Σ $cations$ + Σ $anion$)

où $les\ concentrations\ sont\ exprimées\ en\ meq/l$

7.9.1. Comparative analysis of the situation in April 2022 and 2022 of the physico-chemical parameters

- Physical parameters

Only the physical parameters were compared. The curves obtained from the analysis results of the ten works give an overview of this comparative study. The analysis results are in Annexes 2, 3 and 4 of the report.

- Conductivity

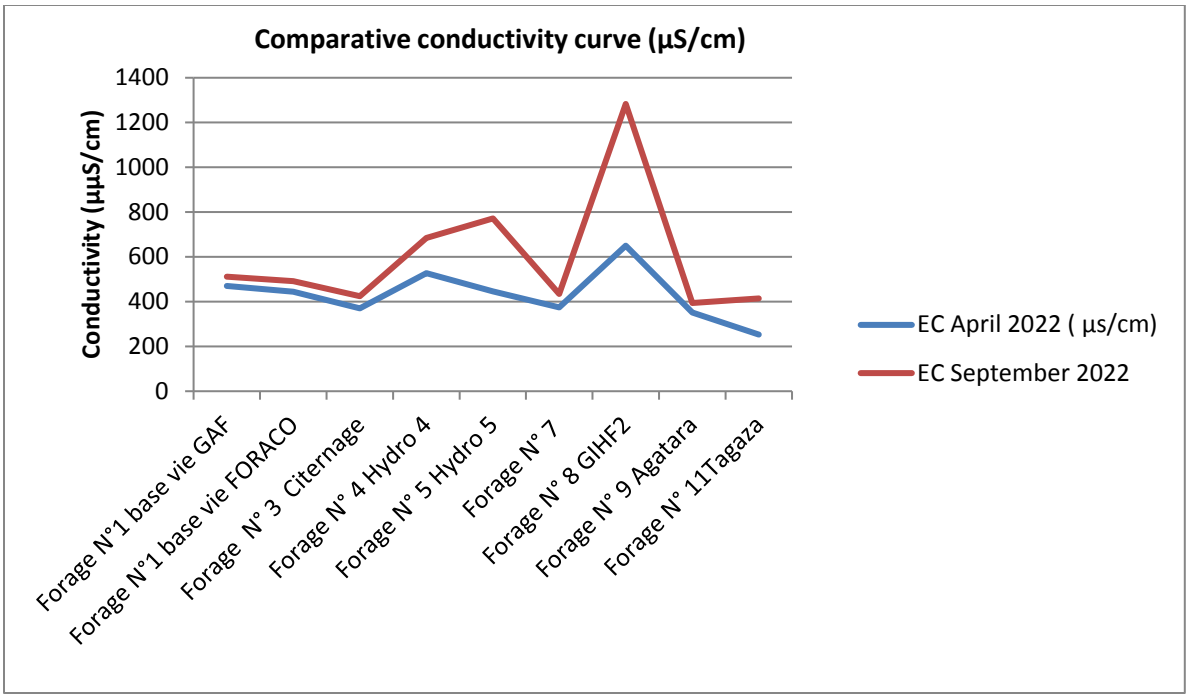

Figure 27 In situ conductivity curves

The curves above show the situations for the months of April and September 2022. It can be seen that the conductivities are higher in September than in April, which is quite normal as this month corresponds to a period of rising waters and therefore of mineral substance transport.

- The temperature

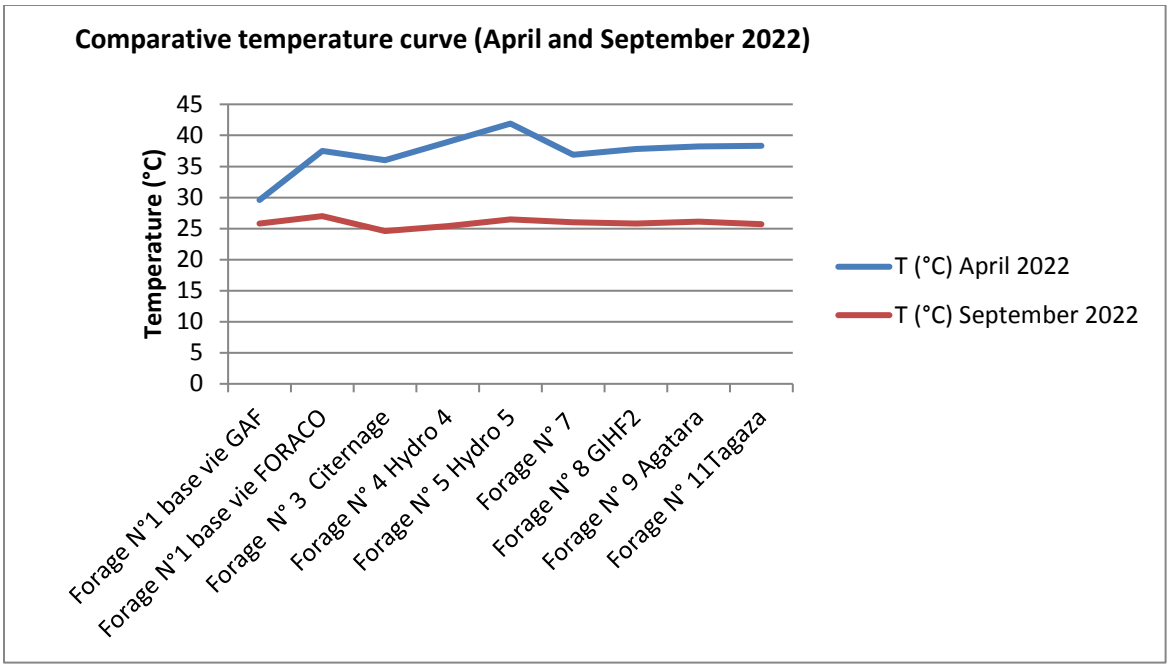

Figure 28 In situ temperature curves

These curves show that temperatures are higher in April than in September, which confirms the thesis that the temperatures of the subterranean evolve in most cases in function of the ambient temperature.

- The pH

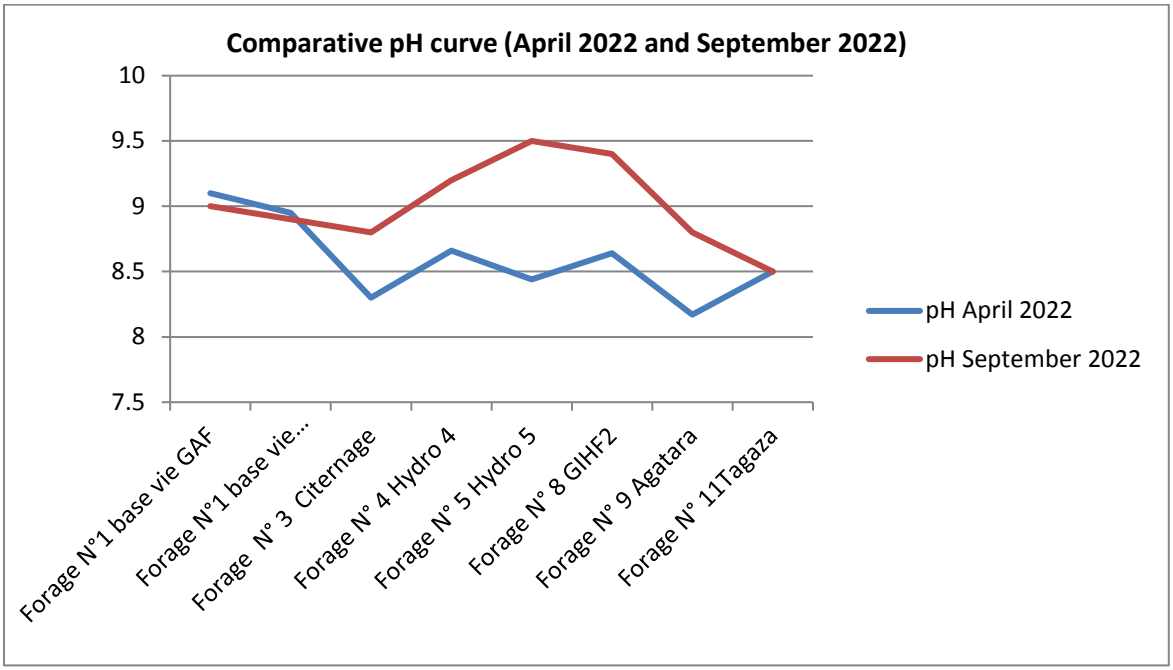

Figure 29 In situ pH curve

In the same way as conductivity, pH changes with the period of rising water.

- Major ions

Major ions include negatively charged anions and positively charged cations. It is the major ions that contribute to the mineralisation of water (Kagamaté, 2006).

Cations: consisting of positively charged ions are represented by Na, Mg, K and Fe ions. Among the most abundant cations are the Ca ions. The waters of all the piezometers have their Ca higher than the other cations. The second most abundant element is Mg which is often exceeded by Na. The least abundant element is K. This gives the order of abundance: Ca2+>Mg2+>Na+>K+ or Ca2+> Na+> Mg2+>K+.

Anions: consisting of negatively charged ions are represented by ions such as

HCO3- , NO3- , Cl- , SO4-2 . The HCO3- are largely dominant and allow the order to be established: HCO3- >NO3- >Cl- >SO-2 4 or HCO3- > Cl- > NO3- >SO-2 4.

- Hydrochemical Facies

Piper and Schöeller diagrams were developed to characterise the hydrochemical facies of the piezometer water. The DIAGRAMMES software was used.

- Piper diagram

The Piper diagram consists of two triangles and a diamond. Each triangle represents a cationic or anionic facies. The rhombus summarises the overall facies of the water analysed. At the end of our analysis, two facies families emerge. These are the family of calcic and magnesian bicarbonates and the family of calcic bicarbonates, as shown in the figure below:

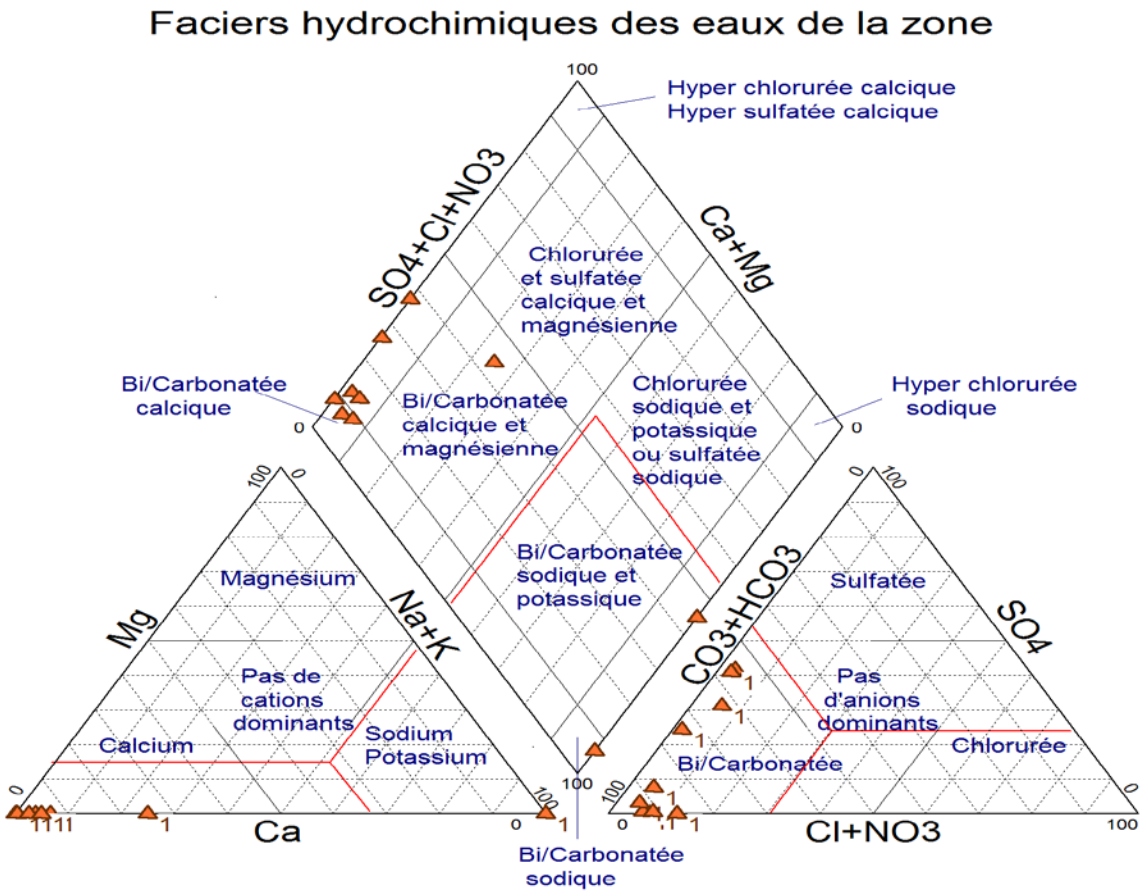

Figure 30 Hydro-chemical facies of the waters in the area

The waters of the study area are calcic bicarbonate and sodium bicarbonate.

8. MONITORING OF SURFACE WATER FLOWS

A range of equipment was used to ensure the smooth running of the study, including (in addition to the logistics) 1 ETREX child GPS for taking coordinates, 1 stopwatch, 1 tape measure, 1 graduated ruler, 1 float, 1 station stake and 1 record sheet.

8.1. Methods

There are several methods of measuring stream flow, the choice of which will depend on the objectives sought, the accuracy and the equipment available. In this study, the float method was used because it allows both low and high flows to be measured with moderate accuracy. The equipment required to apply the method is: a float, a station stake, a tape measure, a record sheet, a stopwatch and a ruler.

- Principle of the method

First, place a stake as the first station, take the coordinates of each station, measure the width of the stream, measure a length of 10 m, place a second stake (second station), measure the depths of the stream along each station, the average is the depth, stand in the middle of the stream and set the stopwatch to start and throw the float at the same time from station 1 to station 2 to stop the stopwatch and float, the time recorded is the time from station 1 to station 2. The operation can be repeated many times depending on the number of stations defined and the objectives to be reached, in this case about ten stations have been made.

- Measured parameters

The parameters measured are: length (L), width (l), time (chrono), depth.

- The length (L) or distance (d) is equal to the average of the measured lengths;
- The width (l) is equal to the average of the measured widths;
- The time (t) is equal to the average time ;
- The depth or height is equal to the average of the measured heights.
- The average speed: Vmean (m/s) = dmean (m) / Tmean (s)
- The average cross-section: Smoyen (m^2) : lmoyen (m) x Hmoyen (m)
- **The flow rate: Q (m^3 /s) = Vmean (m/s) x Smmean (m^3)**

8.2. Results obtained

Results of the measurements made

The tables below summarise the measurements made on the kori located to the south-east of the base and the kori of Aborak located 4 km north-east of the Exploration Camp.

Table 10 Measurements taken on 15/06/2022 on the Aborak kori

15/06/2022	Stopwatch (seconds)	Launch time	Time of visit	Length (m)	Water height (m)	Width (m)	Contact details		
							X	Y	Z
1st station	16	18h 30'	18h 31'	10	0,3	9,08	364325	1972530	529
2nd Station	17	18h 33'	18h 34'	10	0,3	10	364328	1972554	523
3rd station	12	18h 42'	18h 43'	10	0,4	9,5	364333	1972504	523
4th station	20	18h 50'	18h 51	10	0,3	11,4	364330	1972518	520
5th station	15	18h 57'	16h 58'	10	0,3	8,2	364332	1972537	496
6th station	22	19h 04'	19h 05'	10	0,2	11	364320	1972531	500
7th station	15	19h 10'	19h 11'	10	0,2	14,3	364314	1972543	479

The Aborak kori has a flow rate of : **Qmean= 1.787 m3/S; Qmean = 6433.2 m3/h.**

Table 11 Measurements taken on 14/09/2021 on the kori south-east of the Exploration Camp

14/09/021	Stopwatch (seconds)	Launch time	Time of visit	Length (m)	Water height (m)	Width (m)	Contact details		
							X	Y	Z
1st Station	27	15h 28'	15h 28'	10	0,3	27,8	365764	1968610	499
2nd station	21	15h 50'	15h 51'	10	0,4	14,1	365786	1968614	492
3rd station	18	16h 03'	16h 03'	10	0,03	15,3	365792	1968617	493
4th station	23	16h 10'	16h 11	10	0,25	17	365804	1968621	504
5th station	24	16h 24'	16h 25'	10	0,25	14	365612	1968624	491

This kori located at a flow rate of : **Qaverage= 1.898 m3/S; Qaverage = 6832.8 m3/h.**

9. CONCLUSION

The implementation of this study on the groundwater in the DASA mining project area allows the following conclusions to be drawn.

9.1. Evolution of the piezometers since their installation

The variations observed vary from one piezometer to another. Some piezometers show a decreasing trend while others show an increase in water levels over time, probably due to climatic conditions.

9.2. Hydrodynamic parameters

The analysis of the hydrodynamic parameters of the aquifers has shown the uneven distribution of transmissivity in the different geological formations. It is generally low. Nearly half of the boreholes in the study area have a transmissivity **of** less than **10^{-5} m2/s**, while all the boreholes tapping the Teloua and Tarat aquifers have a transmissivity of more than **10^{-4} m2/s** (in the sandstone).

9.3. Flow measurements

According to the Study, good flow rates from boreholes do not depend on great depths or great thicknesses but on the aquifer formation.

Finally, the sketch on the water quality of the piezometers indicates that physical parameters such as turbidity has increased while hardness has decreased (situation in 2020 compared to 2022). Electrical conductivity has decreased in some piezometers and increased in others. The reasons for this evolution could not be highlighted due to insufficient data. As these chemical parameters can change following a change in the environment, a comparative analysis of the chemical analysis results for 2020 and 2022 was only carried out. In addition, two hydrofacies were identified: calcium bicarbonates and sodium bicarbonates. Despite the results obtained, the lack of data was a major limitation. Not all piezometers have good continuity in the piezometric data records and have many gaps. The insufficient number of piezometers was also a limitation for this work. One of the initial objectives, which was to draw up a piezometric map, was therefore not achieved. The water level data in the boreholes, which could have complemented the piezometer data, was also insufficient. The lack of data on chemistry was also a major limitation.

10. RECOMMENDATION

- The densification of the piezometric network or the number of piezometers in the study area is insufficient. As the main purpose of a piezometer network is to monitor and improve knowledge of groundwater, the piezometer network must be densified by the installation of new piezometers.

- Improve the monitoring of piezometers in order to increase the quality and reliability of data. Some of the piezometers we have used have failed and are partly clogged (case of GIHF4). It will also be important to equip the piezometers with recorders in order to automate monitoring and increase their number for better monitoring.

- Increase protection of piezometers: some piezometers are subject to vandalism (GHIF1 and GIHF4). It would be advisable to build fences with a grid to increase the security of the piezometers.

- Carry out an in-depth study on the impact of climate change on groundwater. Indeed, this study highlighted the increase in piezometric levels in all the piezometers with amplitudes ranging from 0.15m to 1.51 or even more (5.59 m HYDRO 2, a borehole that is not supposed to contain water because it captures the Irhazer formation). It would be important to investigate further in order to find the real causes and to check whether the return of favourable climatic conditions is not the main factor, and especially the play of faults in the Graben area or the inter-connections between the aquifers in the Graben. It should also be noted that the presence of unformed exploration boreholes may play an important role in the upwelling of water in the Graben.

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APPENDICES

Appendix 1: Piezometric monitoring data

Appendix 2: Water analysis results 2022

Appendix 3: Field photos

Appendix 1: Data from the 2021 - 2022 piezometric monitoring

Table 5 Data from piezometric monitoring of borehole HYDRO 2

Date	ID - HOLE	Pr (m)	Z (m)	ND (m)	Hs (m)	Cp (M)
07/09/2021	Hydro2	265	468	28,72	0,81	438,47
14/09/2021	Hydro2	265	468	28,68	0,81	438,51
21/09/2021	Hydro2	265	468	28,23	0,81	438,96
28/09/2021	Hydro2	265	468	28,47	0,81	438,72
05/10/2021	Hydro2	265	468	28,15	0,81	439,04
12/10/2021	Hydro2	265	468	28,47	0,81	438,72
19/10/2021	Hydro2	265	468	28,7	0,81	438,49
26/10/2021	Hydro2	265	468	24,01	0,81	443,18
02/11/2021	Hydro2	265	468	25,07	0,81	442,12
09/11/2021	Hydro2	265	468	26,62	0,81	440,57
16/11/2021	Hydro2	265	468	27,27	0,81	439,92
23/11/2021	Hydro2	265	468	27,77	0,81	439,42
30/11/2021	Hydro2	265	468	28,19	0,81	439
07/12/2021	Hydro2	265	468	28,52	0,81	438,67
14/12/2021	Hydro2	265	468	28,77	0,81	438,42
21/12/2021	Hydro2	265	468	29	0,81	438,19
28/12/2021	Hydro2	265	468	29,2	0,81	437,99
04/01/2022	Hydro2	265	468	29,32	0,81	437,87
11/01/2022	Hydro2	265	468	29,42	0,81	437,77
18/01/2022	Hydro2	265	468	29,52	0,81	437,67
25/01/2022	Hydro2	265	468	29,55	0,81	437,64
01/02/2022	Hydro2	265	468	29,54	0,81	437,65
08/02/2022	Hydro2	265	468	29,55	0,81	437,64

15/02/2022	Hydro2	265	468	29,48	0,81	437,71
22/02/2022	Hydro2	265	468	29,49	0,81	437,7
01/03/2022	Hydro2	265	468	29,45	0,81	437,74
08/03/2022	Hydro2	265	468	29,27	0,81	437,92
15/03/2022	Hydro2	265	468	27,98	0,81	439,21
22/03/2022	Hydro2	265	468	27,48	0,81	439,71
29/03/2022	Hydro2	265	468	28,69	0,81	438,5
05/04/2022	Hydro2	265	468	28,9	0,81	438,29
12/04/2022	Hydro2	265	468	29,6	0,81	437,59
19/04/2022	Hydro2	265	468	29,21	0,81	437,98
26/04/2022	Hydro2	265	468	29,23	0,81	437,96
03/05/2022	Hydro2	265	468	29,32	0,81	437,87
10/05/2022	Hydro2	265	468	29,32	0,81	437,87
17/05/2022	Hydro2	265	468	29,32	0,81	437,87
24/05/2022	Hydro2	265	468	29,33	0,81	437,86
31/05/2022	Hydro2	265	468	29,32	0,81	437,87
07/06/2022	Hydro2	265	468	29,34	0,81	437,85
14/06/2022	Hydro2	265	468	29,28	0,81	437,91
21/06/2022	Hydro2	265	468	29,26	0,81	437,93
28/06/2022	Hydro2	265	468	29,25	0,81	437,94
05/07/2022	Hydro2	265	468	29,26	0,81	437,93
12/07/2022	Hydro2	265	468	29,24	0,81	437,95
19/07/2022	Hydro2	265	468	29,24	0,81	437,95
26/07/2022	Hydro2	265	468	29,24	0,81	437,95
02/08/2022	Hydro2	265	468	29,23	0,81	437,96

09/08/2022	Hydro2	265	468	29,22	0,81	437,97
16/08/2022	Hydro2	265	468	29,2	0,81	437,99
23/08/2022	Hydro2	265	468	29,21	0,81	437,98
30/08/2022	Hydro2	265	468	29,21	0,81	437,98

Table 6 Data from piezometric monitoring of the Hydro 4 borehole

Date	ID - HOLE	Pr (m)	Z (m)	ND (m)	Hs (m)	Cp (M)
07/09/2021	Hydro4	81	466	44,81	0,74	420,45
14/09/2021	Hydro4	81	466	44,77	0,74	420,49
21/09/2021	Hydro4	81	466	44,78	0,74	420,48
28/09/2021	Hydro4	81	466	44,75	0,74	420,51
05/10/2021	Hydro4	81	466	44,76	0,74	420,5
12/10/2021	Hydro4	81	466	44,74	0,74	420,52
19/10/2021	Hydro4	81	466	44,74	0,74	420,52
26/10/2021	Hydro4	81	466	44,73	0,74	420,53
02/11/2021	Hydro4	81	466	44,74	0,74	420,52
09/11/2021	Hydro4	81	466	44,71	0,74	420,55
16/11/2021	Hydro4	81	466	44,7	0,74	420,56
23/11/2021	Hydro4	81	466	44,71	0,74	420,55
30/11/2021	Hydro4	81	466	44,72	0,74	420,54
07/12/2021	Hydro4	81	466	44,71	0,74	420,55
14/12/2021	Hydro4	81	466	44,7	0,74	420,56
21/12/2021	Hydro4	81	466	44,7	0,74	420,56
28/12/2021	Hydro4	81	466	44,7	0,74	420,56
04/01/2022	Hydro4	81	466	44,69	0,74	420,57
11/01/2022	Hydro4	81	466	44,68	0,74	420,58
18/01/2022	Hydro4	81	466	44,7	0,74	420,56
25/01/2022	Hydro4	81	466	44,68	0,74	420,58
01/02/2022	Hydro4	81	466	44,69	0,74	420,57
08/02/2022	Hydro4	81	466	44,68	0,74	420,58
15/02/2022	Hydro4	81	466	44,67	0,74	420,59
22/02/2022	Hydro4	81	466	44,67	0,74	420,59
01/03/2022	Hydro4	81	466	44,67	0,74	420,59
08/03/2022	Hydro4	81	466	44,68	0,74	420,58
15/03/2022	Hydro4	81	466	44,7	0,74	420,56
22/03/2022	Hydro4	81	466	44,67	0,74	420,59
29/03/2022	Hydro4	81	466	44,68	0,74	420,58

05/04/2022	Hydro4	81	466	44,67	0,74	420,59
12/04/2022	Hydro4	81	466	44,67	0,74	420,59
19/04/2022	Hydro4	81	466	44,7	0,74	420,56
26/04/2022	Hydro4	81	466	44,69	0,74	420,57
03/05/2022	Hydro4	81	466	44,68	0,74	420,58
10/05/2022	Hydro4	81	466	44,66	0,74	420,6
17/05/2022	Hydro4	81	466	44,68	0,74	420,58
24/05/2022	Hydro4	81	466	44,67	0,74	420,59
31/05/2022	Hydro4	81	466	44,68	0,74	420,58
07/06/2022	Hydro4	81	466	44,67	0,74	420,59
14/06/2022	Hydro4	81	466	44,67	0,74	420,59
21/06/2022	Hydro4	81	466	44,67	0,74	420,59
28/06/2022	Hydro4	81	466	44,67	0,74	420,59
05/07/2022	Hydro4	81	466	44,67	0,74	420,59
12/07/2022	Hydro4	81	466	44,67	0,74	420,59
19/07/2022	Hydro4	81	466	44,68	0,74	420,58
26/07/2022	Hydro4	81	466	44,68	0,74	420,58
02/08/2022	Hydro4	81	466	44,67	0,74	420,59
09/08/2022	Hydro4	81	466	44,67	0,74	420,59
16/08/2022	Hydro4	81	466	44,68	0,74	420,58
23/08/2022	Hydro4	81	466	44,67	0,74	420,59
30/08/2022	Hydro4	81	466	44,68	0,74	420,58

Table 7 Piezometric monitoring data from the Piezo borehole

Date	ID - HOLE	Pr (m)	Z (m)	ND (m)	Hs (m)	Pièzo
07/09/2021	Piezo	205	469	45,92	0,66	422,42
14/09/2021	Piezo	205	469	45,87	0,66	422,47
21/09/2021	Piezo	205	469	45,85	0,66	422,49
28/09/2021	Piezo	205	469	45,69	0,66	422,65
05/10/2021	Piezo	205	469	45,75	0,66	422,59
12/10/2021	Piezo	205	469	45,69	0,66	422,65
19/10/2021	Piezo	205	469	45,52	0,66	422,82
26/10/2021	Piezo	205	469	45,56	0,66	422,78
02/11/2021	Piezo	205	469	45,63	0,66	422,71

09/11/2021	Piezo	205	469	45,66	0,66	422,68
16/11/2021	Piezo	205	469	45,65	0,66	422,69
23/11/2021	Piezo	205	469	45,74	0,66	422,6
30/11/2021	Piezo	205	469	45,75	0,66	422,59
07/12/2021	Piezo	205	469	45,69	0,66	422,65
14/12/2021	Piezo	205	469	45,66	0,66	422,68
21/12/2021	Piezo	205	469	45,74	0,66	422,6
28/12/2021	Piezo	205	469	45,8	0,66	422,54
04/01/2022	Piezo	205	469	45,61	0,66	422,73
11/01/2022	Piezo	205	469	45,62	0,66	422,72
18/01/2022	Piezo	205	469	45,69	0,66	422,65
25/01/2022	Piezo	205	469	45,64	0,66	422,7
01/02/2022	Piezo	205	469	45,53	0,66	422,81
08/02/2022	Piezo	205	469	45,55	0,66	422,79
15/02/2022	Piezo	205	469	45,45	0,66	422,89
22/02/2022	Piezo	205	469	45,64	0,66	422,7
01/03/2022	Piezo	205	469	45,73	0,66	422,61
08/03/2022	Piezo	205	469	45,75	0,66	422,59
15/03/2022	Piezo	205	469	45,72	0,66	422,62
22/03/2022	Piezo	205	469	45,67	0,66	422,67
29/03/2022	Piezo	205	469	45,76	0,66	422,58
05/04/2022	Piezo	205	469	45,76	0,66	422,58
12/04/2022	Piezo	205	469	45,73	0,66	422,61
19/04/2022	Piezo	205	469	45,69	0,66	422,65
26/04/2022	Piezo	205	469	45,68	0,66	422,66

03/05/2022	Piezo	205	469	45,65	0,66	422,69
10/05/2022	Piezo	205	469	45,25	0,66	423,09
17/05/2022	Piezo	205	469	45,58	0,66	422,76
24/05/2022	Piezo	205	469	45,6	0,66	422,74
31/05/2022	Piezo	205	469	45,69	0,66	422,65
07/06/2022	Piezo	205	469	45,69	0,66	422,65
14/06/2022	Piezo	205	469	45,67	0,66	422,67
21/06/2022	Piezo	205	469	45,7	0,66	422,64
28/06/2022	Piezo	205	469	45,69	0,66	422,65
05/07/2022	Piezo	205	469	45,72	0,66	422,62
12/07/2022	Piezo	205	469	45,69	0,66	422,65
19/07/2022	Piezo	205	469	45,59	0,66	422,75
26/07/2022	Piezo	205	469	45,59	0,66	422,75
02/08/2022	Piezo	205	469	45,6	0,66	422,74
09/08/2022	Piezo	205	469	45,58	0,66	422,76
16/08/2022	Piezo	205	469	45,6	0,66	422,74
23/08/2022	Piezo	205	469	45,61	0,66	422,73
30/08/2022	Piezo	205	469	45,58	0,66	422,76

Table 8 Piezometric monitoring data for borehole ASDH126B

Date	ID - HOLE	Pr (m)	Z (m)	ND (m)	Hs (m)	Cp (m)
07/09/2021	ASDH126B	164	462	31,3	0,86	429,84
14/09/2021	ASDH126B	164	462	30,75	0,86	430,39
21/09/2021	ASDH126B	164	462	31,29	0,86	429,85
28/09/2021	ASDH126B	164	462	31	0,86	430,14

05/10/2021	ASDH126B	164	462	31,39	0,86	429,75
12/10/2021	ASDH126B	164	462	31,47	0,86	429,67
19/10/2021	ASDH126B	164	462	31,6	0,86	429,54
26/10/2021	ASDH126B	164	462	31,38	0,86	429,76
02/11/2021	ASDH126B	164	462	31,02	0,86	430,12
09/11/2021	ASDH126B	164	462	31,38	0,86	429,76
16/11/2021	ASDH126B	164	462	31,51	0,86	429,63
23/11/2021	ASDH126B	164	462	31,64	0,86	429,5
30/11/2021	ASDH126B	164	462	31,74	0,86	429,4
07/12/2021	ASDH126B	164	462	31,68	0,86	429,46
14/12/2021	ASDH126B	164	462	31,72	0,86	429,42
21/12/2021	ASDH126B	164	462	31,77	0,86	429,37
28/12/2021	ASDH126B	164	462	31,79	0,86	429,35
04/01/2022	ASDH126B	164	462	31,79	0,86	429,35
11/01/2022	ASDH126B	164	462	31,7	0,86	429,44
18/01/2022	ASDH126B	164	462	31,74	0,86	429,4
25/01/2022	ASDH126B	164	462	31,65	0,86	429,49
01/02/2022	ASDH126B	164	462	31,58	0,86	429,56
08/02/2022	ASDH126B	164	462	31,57	0,86	429,57
15/02/2022	ASDH126B	164	462	31,61	0,86	429,53
22/02/2022	ASDH126B	164	462	32,11	0,86	429,03
01/03/2022	ASDH126B	164	462	32,6	0,86	428,54
08/03/2022	ASDH126B	164	462	31,9	0,86	429,24

15/03/2022	ASDH126B	164	462	31,82	0,86	429,32
22/03/2022	ASDH126B	164	462	32,19	0,86	428,95
29/03/2022	ASDH126B	164	462	32,15	0,86	428,99
05/04/2022	ASDH126B	164	462	32,24	0,86	428,9
12/04/2022	ASDH126B	164	462	32,11	0,86	429,03
19/04/2022	ASDH126B	164	462	32,25	0,86	428,89
26/04/2022	ASDH126B	164	462	32,25	0,86	428,89
03/05/2022	ASDH126B	164	462	32,11	0,86	429,03
10/05/2022	ASDH126B	164	462	31,93	0,86	429,21
17/05/2022	ASDH126B	164	462	31,89	0,86	429,25
24/05/2022	ASDH126B	164	462	31,94	0,86	429,2
31/05/2022	ASDH126B	164	462	32,12	0,86	429,02
07/06/2022	ASDH126B	164	462	32,06	0,86	429,08
14/06/2022	ASDH126B	164	462	31,96	0,86	429,18
21/06/2022	ASDH126B	164	462	31,96	0,86	429,18
28/06/2022	ASDH126B	164	462	32,01	0,86	429,13
05/07/2022	ASDH126B	164	462	32,02	0,86	429,12
12/07/2022	ASDH126B	164	462	32,03	0,86	429,11
19/07/2022	ASDH126B	164	462	32,05	0,86	429,09
26/07/2022	ASDH126B	164	462	32,02	0,86	429,12
02/08/2022	ASDH126B	164	462	32,02	0,86	429,12
09/08/2022	ASDH126B	164	462	32,03	0,86	429,11
16/08/2022	ASDH126B	164	462	32,04	0,86	429,1

23/08/2022	ASDH126B	164	462	32,05	0,86	429,09
30/08/2022	ASDH126B	164	462	32,05	0,86	429,09

Table 9 Data from piezometric monitoring of borehole ASDH264

Date	ID - HOLE	Pr (m)	Z (m)	ND (m)	Hs (m)	Cp (M)
07/09/2021	ASDH264	182	463	37,9	0,81	424,29
14/09/2021	ASDH264	182	463	37,7	0,81	424,49
21/09/2021	ASDH264	182	463	37,85	0,81	424,34
28/09/2021	ASDH264	182	463	37,82	0,81	424,37
05/10/2021	ASDH264	182	463	37,83	0,81	424,36
12/10/2021	ASDH264	182	463	37,82	0,81	424,37
19/10/2021	ASDH264	182	463	37,79	0,81	424,4
26/10/2021	ASDH264	182	463	37,76	0,81	424,43
02/11/2021	ASDH264	182	463	37,68	0,81	424,51
09/11/2021	ASDH264	182	463	37,64	0,81	424,55
16/11/2021	ASDH264	182	463	37,64	0,81	424,55
23/11/2021	ASDH264	182	463	37,62	0,81	424,57
30/11/2021	ASDH264	182	463	37,63	0,81	424,56
07/12/2021	ASDH264	182	463	37,62	0,81	424,57
14/12/2021	ASDH264	182	463	37,56	0,81	424,63
21/12/2021	ASDH264	182	463	37,56	0,81	424,63
28/12/2021	ASDH264	182	463	37,48	0,81	424,71
04/01/2022	ASDH264	182	463	37,34	0,81	424,85
11/01/2022	ASDH264	182	463	37,36	0,81	424,83

18/01/2022	ASDH264	182	463	37,37	0,81	424,82
25/01/2022	ASDH264	182	463	37,25	0,81	424,94
01/02/2022	ASDH264	182	463	37,29	0,81	424,9
08/02/2022	ASDH264	182	463	37,33	0,81	424,86
15/02/2022	ASDH264	182	463	37,36	0,81	424,83
22/02/2022	ASDH264	182	463	37,45	0,81	424,74
01/03/2022	ASDH264	182	463	37,54	0,81	424,65
08/03/2022	ASDH264	182	463	37,6	0,81	424,59
15/03/2022	ASDH264	182	463	37,71	0,81	424,48
22/03/2022	ASDH264	182	463	37,74	0,81	424,45
29/03/2022	ASDH264	182	463	37,82	0,81	424,37
05/04/2022	ASDH264	182	463	37,87	0,81	424,32
12/04/2022	ASDH264	182	463	37,84	0,81	424,35
19/04/2022	ASDH264	182	463	37,91	0,81	424,28
26/04/2022	ASDH264	182	463	37,92	0,81	424,27
03/05/2022	ASDH264	182	463	37,93	0,81	424,26
10/05/2022	ASDH264	182	463	37,95	0,81	424,24
17/05/2022	ASDH264	182	463	37,98	0,81	424,21
24/05/2022	ASDH264	182	463	37,99	0,81	424,2
31/05/2022	ASDH264	182	463	37,99	0,81	424,2
07/06/2022	ASDH264	182	463	37,98	0,81	424,21
14/06/2022	ASDH264	182	463	37,91	0,81	424,28
21/06/2022	ASDH264	182	463	37,89	0,81	424,3

28/06/2022	ASDH264	182	463	37,89	0,81	424,3
05/07/2022	ASDH264	182	463	37,91	0,81	424,28
12/07/2022	ASDH264	182	463	37,92	0,81	424,27
19/07/2022	ASDH264	182	463	37,93	0,81	424,26
26/07/2022	ASDH264	182	463	37,93	0,81	424,26
02/08/2022	ASDH264	182	463	37,89	0,81	424,3
09/08/2022	ASDH264	182	463	37,88	0,81	424,31
16/08/2022	ASDH264	182	463	37,86	0,81	424,33
23/08/2022	ASDH264	182	463	37,85	0,81	424,34
30/08/2022	ASDH264	182	463	37,83	0,81	424,36

Table 10 Data from piezometric monitoring of borehole GIHF2

Date	ID - HOLE	Pr (m)	Z (m)	ND (m)	Hs (m)	Cp (m)
07/09/2021	GIHF2	231	480	31,3	0,55	448,15
14/09/2021	GIHF2	231	480	31,25	0,55	448,2
21/09/2021	GIHF2	231	480	31,24	0,55	448,21
28/09/2021	GIHF2	231	480	31,22	0,55	448,23
05/10/2021	GIHF2	231	480	31,23	0,55	448,22
12/10/2021	GIHF2	231	480	31,2	0,55	448,25
19/10/2021	GIHF2	231	480	31,18	0,55	448,27
26/10/2021	GIHF2	231	480	31,17	0,55	448,28
02/11/2021	GIHF2	231	480	31,18	0,55	448,27
09/11/2021	GIHF2	231	480	31,12	0,55	448,33
16/11/2021	GIHF2	231	480	31,13	0,55	448,32

23/11/2021	GIHF2	231	480	31,14	0,55	448,31
30/11/2021	GIHF2	231	480	31,15	0,55	448,3
07/12/2021	GIHF2	231	480	31,14	0,55	448,31
14/12/2021	GIHF2	231	480	31,12	0,55	448,33
21/12/2021	GIHF2	231	480	31,13	0,55	448,32
28/12/2021	GIHF2	231	480	31,08	0,55	448,37
04/01/2022	GIHF2	231	480	31,05	0,55	448,4
11/01/2022	GIHF2	231	480	31	0,55	448,45
18/01/2022	GIHF2	231	480	31,02	0,55	448,43
25/01/2022	GIHF2	231	480	30,98	0,55	448,47
01/02/2022	GIHF2	231	480	30,97	0,55	448,48
08/02/2022	GIHF2	231	480	30,93	0,55	448,52
15/02/2022	GIHF2	231	480	30,89	0,55	448,56
22/02/2022	GIHF2	231	480	30,89	0,55	448,56
01/03/2022	GIHF2	231	480	30,85	0,55	448,6
08/03/2022	GIHF2	231	480	30,82	0,55	448,63
15/03/2022	GIHF2	231	480	30,85	0,55	448,6
22/03/2022	GIHF2	231	480	30,77	0,55	448,68
29/03/2022	GIHF2	231	480	30,8	0,55	448,65
05/04/2022	GIHF2	231	480	30,78	0,55	448,67
12/04/2022	GIHF2	231	480	31,17	0,55	448,28
19/04/2022	GIHF2	231	480	31,17	0,55	448,28
26/04/2022	GIHF2	231	480	31,17	0,55	448,28

03/05/2022	GIHF2	231	480	31,14	0,55	448,31
10/05/2022	GIHF2	231	480	31,11	0,55	448,34
17/05/2022	GIHF2	231	480	31,14	0,55	448,31
24/05/2022	GIHF2	231	480	31,15	0,55	448,3
31/05/2022	GIHF2	231	480	31,11	0,55	448,34
07/06/2022	GIHF2	231	480	31,23	0,55	448,22
14/06/2022	GIHF2	231	480	31,03	0,55	448,42
21/06/2022	GIHF2	231	480	31,04	0,55	448,41
28/06/2022	GIHF2	231	480	31,01	0,55	448,44
05/07/2022	GIHF2	231	480	31,01	0,55	448,44
12/07/2022	GIHF2	231	480	30,99	0,55	448,46
19/07/2022	GIHF2	231	480	30,98	0,55	448,47
26/07/2022	GIHF2	231	480	30,94	0,55	448,51
02/08/2022	GIHF2	231	480	30,92	0,55	448,53
09/08/2022	GIHF2	231	480	30,91	0,55	448,54
16/08/2022	GIHF2	231	480	30,9	0,55	448,55
23/08/2022	GIHF2	231	480	30,89	0,55	448,56
30/08/2022	GIHF2	231	480	30,88	0,55	448,57

Table 11 Data from piezometric monitoring of borehole GIHF4

Date	ID - HOLE	Pr (m)	Z (m)	ND (m)	Hs (m)	Cp (M)
07/09/2021	GIHF4	331	478	27,18	0,54	450,28
14/09/2021	GIHF4	331	478	27,18	0,54	450,28
21/09/2021	GIHF4	331	478	27,17	0,54	450,29
28/09/2021	GIHF4	331	478	27,12	0,54	450,34

05/10/2021	GIHF4	331	478	27,17	0,54	450,29
12/10/2021	GIHF4	331	478	27,12	0,54	450,34
19/10/2021	GIHF4	331	478	27,16	0,54	450,3
26/10/2021	GIHF4	331	478	27,15	0,54	450,31
02/11/2021	GIHF4	331	478	27,16	0,54	450,3
09/11/2021	GIHF4	331	478	27,19	0,54	450,27
16/11/2021	GIHF4	331	478	27,19	0,54	450,27
23/11/2021	GIHF4	331	478	27,14	0,54	450,32
30/11/2021	GIHF4	331	478	27,16	0,54	450,3
07/12/2021	GIHF4	331	478	27,15	0,54	450,31
14/12/2021	GIHF4	331	478	27,15	0,54	450,31
21/12/2021	GIHF4	331	478	27,18	0,54	450,28
28/12/2021	GIHF4	331	478	27,19	0,54	450,27
04/01/2022	GIHF4	331	478	27,19	0,54	450,27
11/01/2022	GIHF4	331	478	27,17	0,54	450,29
18/01/2022	GIHF4	331	478	27,24	0,54	450,22
25/01/2022	GIHF4	331	478	27,19	0,54	450,27
01/02/2022	GIHF4	331	478	27,21	0,54	450,25
08/02/2022	GIHF4	331	478	27,19	0,54	450,27
15/02/2022	GIHF4	331	478	27,19	0,54	450,27
22/02/2022	GIHF4	331	478	27,19	0,54	450,27
01/03/2022	GIHF4	331	478	27,19	0,54	450,27
08/03/2022	GIHF4	331	478	27,21	0,54	450,25

15/03/2022	GIHF4	331	478	27,21	0,54	450,25
22/03/2022	GIHF4	331	478	27,15	0,54	450,31
29/03/2022	GIHF4	331	478	27,15	0,54	450,31
05/04/2022	GIHF4	331	478	27,17	0,54	450,29
12/04/2022	GIHF4	331	478	27,16	0,54	450,3
19/04/2022	GIHF4	331	478	27,19	0,54	450,27
26/04/2022	GIHF4	331	478	27,18	0,54	450,28
03/05/2022	GIHF4	331	478	27,18	0,54	450,28
10/05/2022	GIHF4	331	478	27,18	0,54	450,28
17/05/2022	GIHF4	331	478	27,24	0,54	450,22
24/05/2022	GIHF4	331	478	27,22	0,54	450,24
31/05/2022	GIHF4	331	478	27,23	0,54	450,23
07/06/2022	GIHF4	331	478	27,23	0,54	450,23
14/06/2022	GIHF4	331	478	27,23	0,54	450,23
21/06/2022	GIHF4	331	478	27,23	0,54	450,23
28/06/2022	GIHF4	331	478	27,21	0,54	450,25
05/07/2022	GIHF4	331	478	27,23	0,54	450,23
12/07/2022	GIHF4	331	478	27,21	0,54	450,25
19/07/2022	GIHF4	331	478	27,19	0,54	450,27
26/07/2022	GIHF4	331	478	27,21	0,54	450,25
02/08/2022	GIHF4	331	478	27,2	0,54	450,26
09/08/2022	GIHF4	331	478	27,19	0,54	450,27
16/08/2022	GIHF4	331	478	27,19	0,54	450,27

23/08/2022	GIHF4	331	478	27,18	0,54	450,28
30/08/2022	GIHF4	331	478	27,18	0,54	450,28

Appendix 2: Water analysis results 2022

Table 12 Physico-chemical analysis sheet for the Elogazan borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : Flogazam	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 02/09/2022 au 03/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	9.2	-	6.5-9.5	Nitrates (NO_3^-)	14.52	mg/l	50mg/l
Température	26	°C	-	Nitrites (NO_2^-)	0.0066	mg/l	0.3mg/l
Conductivité	435	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.25	NTU	5 NTU	Potassium (K^+)	0.4	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	0.01	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.02	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.06	mg/l	100mg/l
Sulfate (SO_4^{2-})	8	mg/l	400 mg/l	Calcium (Ca^{++})	128	mg/l	100mg/l
Carbonate (CO_3^{--})	20	mg/l	-	Aluminium (Al^{3+})	0.01	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	165	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	7.8	mg/l	10mg/l
Chlorures (Cl^-) libre	0.01	mg/l	0.5mg/l	Alcalinité totale	135.25	mg/l	< 500mg/l
Chlore total	0.12	mg/l	250mg/l	TDS	242	mg/l	1000 mg/l
Fluorures (F^-)	0.24	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, de teneur en **calcium** supérieure aux normes O.M.S en vigueur : Elle est **acceptable** pour la consommation humaine.

Agadez le : 03/09/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 13 Physico-chemical analysis sheet for the Agatara borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : Agatara	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse** : Du 02/09/2022 au 03/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.8	-	6.5-9.5	Nitrates (NO_3^-)	9.86	mg/l	50mg/l
Température	26.1	°C	-	Nitrites (NO_2^-)	0.0033	mg/l	0.3mg/l
Conductivité	394	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.19	NTU	5 NTU	Potassium (K^+)	0.6	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	0.00	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.00	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.06	mg/l	100mg/l
Sulfate (SO_4^{2-})	10	mg/l	400 mg/l	Calcium (Ca^{++})	6	mg/l	100mg/l
Carbonate (CO_3^{--})	20	mg/l	-	Aluminium (Al^{3+})	0.04	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	170	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	10.7	mg/l	10mg/l
Chlorures (Cl^-) libre	0.01	mg/l	0.5mg/l	Alcalinité totale	139.34	mg/l	< 500mg/l
Chlore total	0.12	mg/l	250mg/l	TDS	215	mg/l	1000 mg/l
Fluorures (F^-)	0.08	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, de teneur en **phosphates légèrement** supérieure aux normes O.M.S en vigueur : Elle est **acceptable** pour la consommation humaine.

Agadez le : 03/09/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 14 Physico-chemical analysis sheet for Tagaza borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : Tagaza	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 02/09/2022 au 03/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.5	-	6.5-9.5	Nitrates (NO_3^-)	14.04	mg/l	50mg/l
Température	25.7	°C	-	Nitrites (NO_2^-)	0.0033	mg/l	0.3mg/l
Conductivité	415	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.2	NTU	5 NTU	Potassium (K^+)	3.3	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	0.01	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.04	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.04	mg/l	100mg/l
Sulfate (SO_4^{2-})	1	mg/l	400 mg/l	Calcium (Ca^{++})	20	mg/l	100mg/l
Carbonate (CO_3^{--})	200	mg/l	-	Aluminium (Al^{3+})	0.00	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	15	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	13.2	mg/l	10mg/l
Chlorures (Cl^-) libre	0.01	mg/l	0.5mg/l	Alcalinité totale	12.3	mg/l	< 500mg/l
Chlore total	0.10	mg/l	250mg/l	TDS	230	mg/l	1000 mg/l
Fluorures (F^-)	0.04	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, de teneur en **phosphates** supérieure aux normes O.M.S en vigueur : Elle est **acceptable** pour la consommation humaine.

Agadez le : 03/09/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 15 Physico-chemical analysis sheet for the Exploration Camp borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : Base vie GAF	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 02/09/2022 au 03/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	9	-	6.5-9.5	Nitrates (NO_3^-)	15.93	mg/l	50mg/l
Température	25.8	°C	-	Nitrites (NO_2^-)	0.0033	mg/l	0.3mg/l
Conductivité	511	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.34	NTU	5 NTU	Potassium (K^+)	0.4	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.06	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.06	mg/l	100mg/l
Sulfate (SO_4^{2-})	0.00	mg/l	400 mg/l	Calcium (Ca^{++})	133	mg/l	100mg/l
Carbonate (CO_3^{--})	40	mg/l	-	Aluminium (Al^{3+})	0.00	mg/l	2.9mg/l
Bicarbonate (HCO_3^-	205	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	10.4	mg/l	10mg/l
Chlorures (Cl^-) libre	0.01	mg/l	0.5mg/l	Alcalinité totale	168.03	mg/l	< 500mg/l
Chlore total	0.09	mg/l	250mg/l	TDS	289	mg/l	1000 mg/l
Fluorures (F^-)	0.08	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, de teneur en **calcium** supérieure aux normes O.M.S en vigueur : Elle est **acceptable** pour la consommation humaine.

Agadez le : 03/09/2022

Responsable du laboratoire

Mamane Elh. Abdou

Table 16 Physico-chemical analysis sheet for the FORACO borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : FORACO	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 03/09/2022 au 04/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.9	-	6.5-9.5	Nitrates (NO_3^-)	14.21	mg/l	50mg/l
Température	27	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	491	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	2.52	NTU	5 NTU	Potassium (K^+)	0.1	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.00	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.00	mg/l	100mg/l
Sulfate (SO_4^{2-})	0.00	mg/l	400 mg/l	Calcium (Ca^{++})	0.00	mg/l	100mg/l
Carbonate (CO_3^{--})	20	mg/l	-	Aluminium (Al^{3+})	0.01	mg/l	2.9mg/l
Bicarbonate (HCO_3^-	200	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	7.6	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	163.93	mg/l	< 500mg/l
Chlore total	0.09	mg/l	250mg/l	TDS	260	mg/l	1000 mg/l
Fluorures (F^-)	0.06	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau d'alimentation de **qualités** (physico-chimique et bactériologique) **conformes** aux exigences **des normes O. M. S. en vigueur.**

Agadez le : 04/09/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 17 Physico-chemical analysis sheet for borehole HYDRO 5

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : HYDRO 5	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 03/09/2022 au 04/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	9.5	-	6.5-9.5	Nitrates (NO_3^-)	9.02	mg/l	50mg/l
Température	26.6	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	771	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	23.3	NTU	5 NTU	Potassium (K^+)	0.4	mg/l	12mg/l
Couleur	Peu claire	-	-	Fer total	0.01	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.03	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.06	mg/l	100mg/l
Sulfate (SO_4^{2-})	128	mg/l	400 mg/l	Calcium (Ca^{++})	2	mg/l	100mg/l
Carbonate (CO_3^{--})	160	mg/l	-	Aluminium (Al^{3+})	Néant	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	0.00	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	Néant	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	0.00	mg/l	< 500mg/l
Chlore total	0.01	mg/l	250mg/l	TDS	411	mg/l	1000 mg/l
Fluorures (F^-)	1.9	mg/l	1.5mg/l	Ion hydroxyde (OH^-)	35	mg/l	-

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, **légèrement trouble** (5 NTU < valeur de turbidité≤ 30 NTU) et de teneur en **fluor** supérieure aux normes O.M.S en vigueur : Cette eau est **interdite** pour la **consommation humaine**.

Agadez le : 04/09/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 18 Physico-chemical analysis sheet for borehole GIHF2

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : GIHF2	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 03/09/2022 au 04/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	9.4	-	6.5-9.5	Nitrates (NO_3^-)	6.03	mg/l	50mg/l
Température	25.8	°C	-	Nitrites (NO_2^-)	0.017	mg/l	0.3mg/l
Conductivité	1283	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	6.68	NTU	5 NTU	Potassium (K^+)	1.3	mg/l	12mg/l
Couleur	Peu claire	-	-	Fer total	0.06	mg/l	0.3mg/l
Gout	Du natron	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.16	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.18	mg/l	100mg/l
Sulfate (SO_4^{2-})	132	mg/l	400 mg/l	Calcium (Ca^{++})	142	mg/l	100mg/l
Carbonate (CO_3^{--})	200	mg/l	-	Aluminium (Al^{3+})	0.00	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	270	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	7.2	mg/l	10mg/l
Chlorures (Cl^-) libre	0.11	mg/l	0.5mg/l	Alcalinité totale	221.31	mg/l	< 500mg/l
Chlore total	0.17	mg/l	250mg/l	TDS	680	mg/l	1000 mg/l
Fluorures (F^-)	7.9	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, **légèrement trouble** (5 NTU < valeur de turbidité≤ 30 NTU), de [conductivité et de teneurs (en **calcium** et en **fluor**)] supérieures aux normes O.M.S en vigueur : Cette eau est **strictement interdite** pour la **consommation humaine**.

Agadez le : 04/09/2022

Responsable du laboratoire
Mamane Elh Abdou

Table 19 Physico-chemical analysis sheet for borehole HYDRO 4

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : HYDRO 4	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 03/09/2022 au 04/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	9.2	-	6.5-9.5	Nitrates (NO_3^-)	9.28	mg/l	50mg/l
Température	25.4	°C	-	Nitrites (NO_2^-)	0.017	mg/l	0.3mg/l
Conductivité	685	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	5.52	NTU	5 NTU	Potassium (K^+)	1.4	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	0.03	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.08	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.10	mg/l	100mg/l
Sulfate (SO_4^{2-})	94	mg/l	400 mg/l	Calcium (Ca^{++})	2	mg/l	100mg/l
Carbonate (CO_3^{--})	50	mg/l	-	Aluminium (Al^{3+})	0.02	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	165	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	10.1	mg/l	10mg/l
Chlorures (Cl^-) libre	0.05	mg/l	0.5mg/l	Alcalinité totale	135.25	mg/l	< 500mg/l
Chlore total	0.09	mg/l	250mg/l	TDS	367	mg/l	1000 mg/l
Fluorures (F^-)	0.6	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, **légèrement trouble** (5 NTU < valeur de turbidité≤ 30 NTU): Elle est **acceptable** pour la consommation humaine.

Agadez le : 04/09/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 20 Physico-chemical analysis sheet for the Citernage borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Roufai ABDOU **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 02/09/2022
Localité : Citernage	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage	**Date d'analyse :** Du 03/09/2022 au 04/09/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : ..... m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.8	-	6.5-9.5	Nitrates (NO_3^-)	12.14	mg/l	50mg/l
Température	24.6	°C	-	Nitrites (NO_2^-)	0.0033	mg/l	0.3mg/l
Conductivité	425	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.28	NTU	5 NTU	Potassium (K^+)	0.5	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.02	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.02	mg/l	100mg/l
Sulfate (SO_4^{2-})	2	mg/l	400 mg/l	Calcium (Ca^{++})	2	mg/l	100mg/l
Carbonate (CO_3^{--})	30	mg/l	-	Aluminium (Al^{3+})	Néant	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	165	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	8.8	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	135.25	mg/l	< 500mg/l
Chlore total	0.15	mg/l	250mg/l	TDS	228	mg/l	1000 mg/l
Fluorures (F^-)	0.13	mg/l	1.5mg/l	Manganèse (Mn^{++})	-	mg/l	0.4mg/l

(-) Non mesurés

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau d'alimentation de **qualités** (physico-chimique et bactériologique) **conformes** aux exigences **des normes O. M. S. en vigueur.**

Agadez le : 04/09/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 21 Physico-chemical analysis sheet for the Camp FORACO borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 08/04/2022 à 10H : 30
Localité : Dajy	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°2 Base vie FORACO	**Date d'analyse :** Du 17/04/2022 au 18/04/2022
N° IRH:..... **X :** 365450 **Y :** 1968322	**Laboratoire :** DRHA/Az
Profondeur totale : 175 m **NS :** 53.56 m **HE :** 121.44 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.95	-	6.5-9.5	Nitrates (NO_3^-)	19.45	mg/l	50mg/l
Température	37.5	°C	-	Nitrites (NO_2^-)	0.0033	mg/l	0.3mg/l
Conductivité	444	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	2.28	NTU	5 NTU	Potassium (K^+)	0.5	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.06	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.06	mg/l	100mg/l
Sulfate (SO_4^{2-})	1	mg/l	400 mg/l	Calcium (Ca^{++})	0.00	mg/l	100mg/l
Carbonate (CO_3^{--})	40	mg/l	-	Aluminium (Al^{3+})	0.01	mg/l	2.9mg/l
Bicarbonate (HCO_3^-	205	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	6.1	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	168.03	mg/l	< 500mg/l
Chlore total	0.10	mg/l	250mg/l	TDS	272	mg/l	1000 mg/l
Fluorures (F^-)	0.2	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **qualités** (physico-chimique et bactériologique) **conformes** aux exigences **des normes O. M. S. en vigueur.**

Agadez le : 18/04/2022

Responsable du laboratoire
Mamane Elh Abdou

Table 22 Physico-chemical analysis sheet for borehole GIHF2

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 06/04/2022 à 10H : 14
Localité : Dajy	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°8 GIHF2	**Date d'analyse :** Du 17/04/2022 au 18/04/2022
N° IRH:..... **X :** 365329 **Y :** 1972996	**Laboratoire :** DRHA/Az
Profondeur totale : 231 m **NS :** 30.89 m **HE :** 200.11 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.64	-	6.5-9.5	Nitrates (NO_3^-)	11.4	mg/l	50mg/l
Température	37.82	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	650	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	4.31	NTU	5 NTU	Potassium (K^+)	0.9	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.06	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.10	mg/l	100mg/l
Sulfate (SO_4^{2-})	130	mg/l	400 mg/l	Calcium (Ca^{++})	123	mg/l	100mg/l
Carbonate (CO_3^{--})	40	mg/l	-	Aluminium (Al^{3+})	0.00	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	420	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	7.5	mg/l	10mg/l
Chlorures (Cl^-) libre	0.07	mg/l	0.5mg/l	Alcalinité totale	344.26	mg/l	< 500mg/l
Chlore total	0.17	mg/l	250mg/l	TDS	678	mg/l	1000 mg/l
Fluorures (F^-)	11.9	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, de teneurs (en **fluor**, en **bicarbonates** et en **calcium**) supérieures aux normes O.M.S en vigueur **:** Elle est **strictement interdite** pour la consommation humaine.

Agadez le : 18/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 23 Physico-chemical analysis sheet for the Exploration Camp borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 06/04/2022 à 7H : 05
Localité : Dajy	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°1 Base vie GAF	**Date d'analyse :** Du 17/04/2022 au 18/04/2022
N° IRH:..... **X :** 364950 **Y :** 1968322	**Laboratoire :** DRHA/Az
Profondeur totale : 154 m **NS :** 53.56 m **HE :** 100.44 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	9.1	-	6.5-9.5	Nitrates (NO_3^-)	25.52	mg/l	50mg/l
Température	29.6	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	470	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.53	NTU	5 NTU	Potassium (K^+)	0.3	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.00	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.00	mg/l	100mg/l
Sulfate (SO_4^{2-})	1	mg/l	400 mg/l	Calcium (Ca^{++})	136	mg/l	100mg/l
Carbonate (CO_3^{--})	40	mg/l	-	Aluminium (Al^{3+})	0.01	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	215	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	4.9	mg/l	10mg/l
Chlorures (Cl^-) libre	Néant	mg/l	0.5mg/l	Alcalinité totale	176.23	mg/l	< 500mg/l
Chlore total	0.00	mg/l	250mg/l	TDS	276	mg/l	1000 mg/l
Fluorures (F^-)	0.35	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, de teneur en **calcium** supérieure aux normes O.M.S en vigueur : Elle est **acceptable** pour la consommation humaine.

Agadez le : 18/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 24 Physico-chemical analysis sheet for Tagaza borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 12/04/2022 à 10H : 25
Localité : Tagaza	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°7	**Date d'analyse :** Du 17/04/2022 au 18/04/2022
N° IRH:..... **X :** ..... **Y :**	**Laboratoire :** DRHA/Az
Profondeur totale : 331 m **NS :** ..... m **HE :** ..... m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	7.64	-	6.5-9.5	Nitrates (NO_3^-)	19.10	mg/l	50mg/l
Température	36.9	°C	-	Nitrites (NO_2^-)	0.0033	mg/l	0.3mg/l
Conductivité	374	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.19	NTU	5 NTU	Potassium (K^+)	3	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.02	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.04	mg/l	100mg/l
Sulfate (SO_4^{2-})	1	mg/l	400 mg/l	Calcium (Ca^{++})	22	mg/l	100mg/l
Carbonate (CO_3^{--})	0.00	mg/l	-	Aluminium (Al^{3+})	0.01	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	210	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	8.5	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	172.13	mg/l	< 500mg/l
Chlore total	0.05	mg/l	250mg/l	TDS	225	mg/l	1000 mg/l
Fluorures (F^-)	0.15	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité)ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **qualités** (physico-chimique et bactériologique) **conformes** aux exigences **des normes O. M. S. en vigueur.**

Agadez le : 18/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 25 Physico-chemical analysis sheet for Tagaza borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 05/04/2022 à 15H : 57
Localité : Tagaza	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°11	**Date d'analyse :** Du 16/04/2022 au 17/04/2022
N° IRH:..... **X :** 356044 **Y :** 1962722	**Laboratoire :** DRHA/Az
Profondeur totale : 110 m **NS :** 44.23 m **HE :** 65.77 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.5	-	6.5-9.5	Nitrates (NO_3^-)	25.08	mg/l	50mg/l
Température	38.3	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	253	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.22	NTU	5 NTU	Potassium (K^+)	1.2	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.00	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.02	mg/l	100mg/l
Sulfate (SO_4^{2-})	0.00	mg/l	400 mg/l	Calcium (Ca^{++})	12	mg/l	100mg/l
Carbonate (CO_3^{--})	0.00	mg/l	-	Aluminium (Al^{3+})	0.01	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	165	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	3.6	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	135.25	mg/l	< 500mg/l
Chlore total	0.02	mg/l	250mg/l	TDS	161	mg/l	1000 mg/l
Fluorures (F^-)	0.18	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **qualités** (physico-chimique et bactériologique) **conformes** aux exigences **des normes O. M. S. en vigueur.**

Agadez le : 17/04/2022

Responsable du laboratoire
Mamane Elh Abdou

Table 26 Physico-chemical analysis sheet for borehole HYDRO 4

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 05/04/2022 à 12H : 40
Localité : Dajy	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°4 HYDRO 4	**Date d'analyse :** Du 16/04/2022 au 17/04/2022
N° IRH:..... **X :** 359976 **Y :** 1969220	**Laboratoire :** DRHA/Az
Profondeur totale : 175 m **NS :** 45.24 m **HE :** 129.76 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.66	-	6.5-9.5	Nitrates (NO_3^-)	17.69	mg/l	50mg/l
Température	38.92	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	528	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	208	NTU	5 NTU	Potassium (K^+)	Néant	mg/l	12mg/l
Couleur	**Trouble**	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.00	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.00	mg/l	100mg/l
Sulfate (SO_4^{2-})	74	mg/l	400 mg/l	Calcium (Ca^{++})	148	mg/l	100mg/l
Carbonate (CO_3^{--})	0.00	mg/l	-	Aluminium (Al^{3+})	0.16	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	190	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	Néant	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	155.74	mg/l	< 500mg/l
Chlore total	0.00	mg/l	250mg/l	TDS	368	mg/l	1000 mg/l
Fluorures (F^-)	1.17	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau de **bonne qualité bactériologique** mais, **trouble** (valeur de turbidité > 100 NTU) et de teneur en **calcium** supérieure aux normes O.M.S en vigueur : Ainsi, il **faut développer** puis **ramener l'échantillon d'eau** au **laboratoire** pour **vérification**.

Agadez le : 17/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 27 Physico-chemical analysis sheet for the Piezo well

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 29/03/2022 à 10H : 30
Localité : Dajy	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°6 Piézo	**Date d'analyse :** Du 15/04/2022 au 16/04/2022
N° IRH:..... **X :** 360008 **Y :** 1969087	**Laboratoire :** DRHA/Az
Profondeur totale : 182 m **NS :** 45.64 m **HE :** 136.36 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.69	-	6.5-9.5	Nitrates (NO_3^-)	13.42	mg/l	50mg/l
Température	40.22	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	622	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	5.12	NTU	5 NTU	Potassium (K^+)	1.3	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	0.02	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.08	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.10	mg/l	100mg/l
Sulfate (SO_4^{2-})	150	mg/l	400 mg/l	Calcium (Ca^{++})	2	mg/l	100mg/l
Carbonate (CO_3^{--})	60	mg/l	-	Aluminium (Al^{3+})	0.02	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	140	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	6.2	mg/l	10mg/l
Chlorures (Cl^-) libre	0.05	mg/l	0.5mg/l	Alcalinité totale	114.75	mg/l	< 500mg/l
Chlore total	0.07	mg/l	250mg/l	TDS	353	mg/l	1000 mg/l
Fluorures (F^-)	1.51	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau **acceptable** pour la consommation humaine. Si possible le suivi de la teneur en **fluor** est nécessaire.

Agadez le : 16/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 28 Physico-chemical analysis sheet for the Citernage borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 29/03/2022 à 12H : 50
Localité : Dajy	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°3 Citernage	**Date d'analyse :** Du 16/04/2022 au 17/04/2022
N° IRH:..... **X :** 359420 **Y :** 1968508	**Laboratoire :** DRHA/Az
Profondeur totale : 175 m **NS :** 45.24 m **HE :** 129.76 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.30	-	6.5-9.5	Nitrates (NO_3^-)	17.69	mg/l	50mg/l
Température	36	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	370	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.32	NTU	5 NTU	Potassium (K^+)	0.3	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.00	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.00	mg/l	100mg/l
Sulfate (SO_4^{2-})	10	mg/l	400 mg/l	Calcium (Ca^{++})	4	mg/l	100mg/l
Carbonate (CO_3^{--})	150	mg/l	-	Aluminium (Al^{3+})	0.00	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	65	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	4	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	53.28	mg/l	< 500mg/l
Chlore total	0.01	mg/l	250mg/l	TDS	225	mg/l	1000 mg/l
Fluorures (F^-)	0.29	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: : Eau de **qualités** (physico-chimique et bactériologique) **conformes** aux exigences **des normes O. M. S. en vigueur.**

Agadez le : 17/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 29 Physico-chemical analysis sheet for the Agatara borehole

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 05/04/2022 à 15H : 20
Localité : Agatara	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°9	**Date d'analyse :** Du 16/04/2022 au 17/04/2022
N° IRH:..... **X :** 352588 **Y :** 1969202	**Laboratoire :** DRHA/Az
Profondeur totale : 200 m **NS :** 46.12 m **HE :** 153.88 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.17	-	6.5-9.5	Nitrates (NO_3^-)	10.78	mg/l	50mg/l
Température	38.2	°C	-	Nitrites (NO_2^-)	0.00	mg/l	0.3mg/l
Conductivité	352	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	0.27	NTU	5 NTU	Potassium (K^+)	0.2	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	Néant	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.00	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.00	mg/l	100mg/l
Sulfate (SO_4^{2-})	13	mg/l	400 mg/l	Calcium (Ca^{++})	4	mg/l	100mg/l
Carbonate (CO_3^{--})	0.00	mg/l	-	Aluminium (Al^{3+})	0.01	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	190	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	4	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	155.74	mg/l	< 500mg/l
Chlore total	0.04	mg/l	250mg/l	TDS	214	mg/l	1000 mg/l
Fluorures (F^-)	0.39	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: : Eau de **qualités** (physico-chimique et bactériologique) **conformes** aux exigences **des normes O. M. S. en vigueur.**

Agadez le : 17/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Table 30 Physico-chemical analysis sheet for borehole HYDRO 5

REPUBLIQUE DU NIGER
REGION D'AGADEZ
DIRECTION DE L'HYDRAULIQUE ET DE L'ASSAINISSEMENT
LABORATOIRE DE CONTROLE DE LA QUALITE DES EAUX
BP : 23/AGADEZ TEL :(227)20440052

LOCALISATION :

Région : Agadez	**Prélevé par :** Rabiou GONDAH ABDOURAZAK **A la demande de** : GLOBAL ATOMIC
Département : Tchirozérine	**Motif de la demande d'analyse :** Contrôle sanitaire de l'eau
Commune Rurale : Tchirozérine	**Date de prélèvement** : 05/04/2022 à 11H : 10
Localité : Dajy	**Analysé par :** Mamane Elh. Abdou 96727879 / 90343074
Origine de l'eau : Forage N°5 HYDRO 5	**Date d'analyse :** Du 16/04/2022 au 17/04/2022
N° IRH:..... **X :** 360177 **Y :** 1969128	**Laboratoire :** DRHA/Az
Profondeur totale : 183 m **NS :** 47.20 m **HE :** 135.8 m	**Qualification de l'opérateur :** Ingénieur chimiste

FICHE D'ANALYSE PHYSICO-CHIMIQUE DE L'EAU :

RESULTATS :

PARAMETRES	RESULTATS	UNITES	NORMES OMS	PARAMETRES	RESULTATS	UNITES	NORMES OMS
pH	8.44	-	6.5-9.5	Nitrates (NO_3^-)	14.74	mg/l	50mg/l
Température	41.9	°C	-	Nitrites (NO_2^-)	0.0033	mg/l	0.3mg/l
Conductivité	446	µS/cm	≥ 200 et ≤1100 µS/cm	Sodium (Na^+)	-	mg/l	200mg/l
Turbidité	1.96	NTU	5 NTU	Potassium (K^+)	0.5	mg/l	12mg/l
Couleur	Claire	-	-	Fer total	0.01	mg/l	0.3mg/l
Gout	ND	-	Non Désagréable (ND)	Cuivre libre (Cu^{2+})	0.06	mg/l	2mg/l
Odeur	ND	-	Non Désagréable (ND)	Cuivre total (Cu^{++})	0.08	mg/l	100mg/l
Sulfate (SO_4^{2-})	150	mg/l	400 mg/l	Calcium (Ca^{++})	0.00	mg/l	100mg/l
Carbonate (CO_3^{--})	40	mg/l	-	Aluminium (Al^{3+})	0.02	mg/l	2.9mg/l
Bicarbonate (HCO_3^-)	170	mg/l	400mg/l	Ammoniac (NH_3)	Néant	mg/l	-
Ammonium (NH_4^+)	Néant	mg/l	0.5mg/l	Phosphates (PO_4^{3-})	4.9	mg/l	10mg/l
Chlorures (Cl^-) libre	0.00	mg/l	0.5mg/l	Alcalinité totale	139.34	mg/l	< 500mg/l
Chlore total	0.07	mg/l	250mg/l	TDS	398	mg/l	1000 mg/l
Fluorures (F^-)	1.52	mg/l	1.5mg/l	Manganèse (Mn^{++})	Néant	mg/l	0.4mg/l

(-) Non mesurés **NB : Les paramètres in situ (pH, Température et conductivité) ont été mesurés par Rabiou Gondah A.**

FICHE D'ANALYSE BACTERIOLOGIQUE DE L'EAU :

RESULTATS :

PARAMETRES MICROBIOLOGIQUES	NOMBRE DE COLONIES
Coliformes fécaux/100ml d'échantillon filtrés	0
Coliformes totaux/100ml d'échantillon filtrés	0

Observation pour l'ensemble des paramètres mesurés: Eau **acceptable** pour la consommation humaine. Si possible le suivi de la teneur en **fluor** est nécessaire.

Agadez le : 17/04/2022

Responsable du laboratoire

Mamane Elh Abdou

Appendix 3: Field photos

Photo 1 View of the kori taken on: 2/08/2022 at 18:13

Photo 2 View of the kori taken: 2/08/2020 at 18:13

Photo 3 View of the kori taken: 26/06/2020 at 17:13

Photo 4 View of the kori taken: 26/06/2020 at 17:13

FINAL REPORT

EVALUATION OF THE NATURAL BACKGROUND LEVEL OF THE DASA MINING PROJECT AREA

ADRAR EMOLES 3" PERMIT

Mr. KANDO Hamadou

Radiation Protection Expert, Consultant

November 2022

SUMMARY

LIST OF ACRONYMS AND DEFINITIONS

ALGADE: **AL** (Alpha (α)), **GA** (gamma (ɣ)) **DE** (delta (Δ)) is the name of a French laboratory that performs various types of radiological analyses including water, air and food samples. It is located in Bessines-Sur-Gartempe, Avenue du BRUGEAUD 87250.

Becquerel (Bq): unit of disintegration, 1 Bq = 1 disintegration per second

Dose: measurement of radiation received or absorbed by a target

Committed effective dose: sum of tissue-weighted equivalent doses calculated over a period of 50 years for adults and 70 years for children.

Equivalent dose (H): physical quantity used in dosimetry to assess the impact of ionising radiation on humans.

Potential alpha energy (of radon and thoron progeny): total alpha energy ultimately emitted during the decay of radon and thoron progeny through the entire progeny chain up to and including ^{210} Pb in the case of ^{222} Rn progeny and up to and including ^{208} Pb stable in the case of
^{220}Rn.

Exposure: any action of voluntarily or involuntarily subjecting or being subjected to external or internal irradiation.

It also refers to the physical quantity equal to the product of the activity concentration or energy concentration of a radionuclide and time.

Equilibrium factor: ratio F between the equivalent equilibrium concentration of radon and its effective concentration; the equivalent equilibrium concentration is the activity concentration of radon in equilibrium with its short-lived progeny having the same potential alpha energy concentration as the non-equilibrium mixture under consideration (Safety Series No. 115, IAEA).

Incorporation: The process of introducing radionuclides into the body by inhalation or ingestion or through the skin.

J (**Joule**): unit of energy, required to lift a 100 g mass a vertical distance of one metre.

Radon progeny: short-lived decay products of radon.

Radionuclide: A radioactive nuclide or radioelement.

Ionising radiation : Radiation capable of producing ion pairs in biological material.

Radon (Rn): isotopes of the chemical element with atomic number 86.

Sievert (Sv): unit of equivalent dose. In the case of X-rays, 1 Sv = 1 J/kg

INTRODUCTION

The extraction and processing of uranium ore involves several risks for workers, the population living around the mining sites and the environment. The risk that most concerns the populations and the authorities in charge of protecting health and the environment is the one linked to radioactivity, specifically the risk of exposure to the radioactive elements present in the ore and its consequences. However, it is well known that this natural radioactivity exists in all regions of the world and has existed since the creation of the earth. Indeed, natural radionuclides are found in the soil, air and water. Therefore, to better assess the radiological impacts of mining a uranium deposit, international radiation protection standards and national radiation protection regulations require mining companies to determine the initial natural background level or natural background level of the area of operation. Global Atomic Corporation has commissioned this study to assess this level for the licence area

For the "Adrar Emoles3 " and for all routes of human exposure to natural ionising radiation

I. BACKGROUND AND RATIONALE

The mining company Global Atomic Corporation (GAC) is planning to start work on the uranium deposit of the DASA mining project, located within the perimeter of the "Adrar Emoles 3" research permit. Such activities will have, among other nuisances, radiological impacts on the environment, the subsequent evaluation of which will require prior knowledge of the initial radiological level (reference radiological level) of the project area. To this end, Global Atomic Corporation (GAC) has carried out an Environmental and Societal Impact Assessment (ESIA) in accordance with the provisions of the regulations. Within this framework, measurements of external exposure dose rates and radiological analyses of soil and water samples taken in the field were carried out.

For the assessment and monitoring of the radiological impacts of activities or practices on the environment and populations, the dose limits set in international standards and national regulations are based on one year's exposure; therefore, the results of the ESIA measurements need to be complemented by results from continuous environmental dosimetry monitoring over a longer period. In order to meet this requirement, GAC decided to implement an environmental dosimetry monitoring programme for the DASA mine project area over a twelve month period.

Knowledge of this reference level is of paramount importance since it would not only allow a periodic and reasonable estimate of the radiological impacts resulting from the mining and processing of uranium ore, but also and above all to have guide values for the restoration of the site at the end of the mining operation. It would also facilitate communication with partners (public services, non-governmental organisations, civil society, trade unions, etc.) during information and awareness-raising activities and through the periodic reports required by the regulations in force. This is why international standards and national regulations on radiation protection require mining companies to determine the initial natural radiological level of the areas before starting uranium mining operations.

In conclusion, it is to meet this requirement of Niger's regulations for the protection of people and the environment against the dangers of ionising radiation that the Global Atomic Corporation has commissioned this Study.

II. OBJECTIVES OF THE STUDY

The overall objective of this Study is to determine the initial radiological level (baseline) of the DASA project area, prior to the work that will be undertaken by the company to extract and process uranium ore. For this purpose, all pathways of exposure of the population to natural ionising radiation in the area of interest are taken into account.

The specific objectives are as follows:

- ✓ Implement an appropriate strategy for annual (rolling 12-month) dosimetric monitoring of the project area environment, including continuous assessment of external exposure to gamma and energetic beta radiation as well as internal exposure through inhalation of atmospheric air containing radioactive radon gas and other naturally occurring solid radionuclides suspended in dust
- ✓ Implement the defined strategy to obtain measurement results for each route of human exposure to natural ionising radiation in the mine site environment: external exposure dose to ambient gamma and beta radiation, water volume concentration of natural radioelements, air volume concentrations of Potential Alpha Energy (PAE) of radioactive radon gas (Rn220 and Rn222) and alpha activity of long-lived uranium238 and thorium232 chain progeny present in airborne dust.

Calculations will then be made to determine the total annual reference dose (external + internal exposure) to which a member of the population living in the area concerned would naturally be exposed.

III. EXPECTED RESULTS

The main expected outcome of the study is the determination of the initial or reference radiological level of the ADRAR EMOLES mining perimeter area, taking into account the external and internal exposure pathways of the population to natural ionising radiation.
This requires integrated radiation measurements or sampling for radiological analysis in cooperation with recognised laboratories in order to obtain :

- the annual external gamma and energetic beta exposure values of the area of interest, using passive detectors, over four successive monitoring periods of three months each,

- the average air volume concentrations of radon Potential Alpha Energy (PAE) (Rn220, Rn222) and alpha activity of long-lived uranium238 and thorium232 chain emitters in airborne dust, by month and over a rolling twelve-month period.

A report should then be written to present the results of the external gamma and beta radiation exposure assessment, the results of the internal inhalation exposure assessment for radon and long-lived alpha emitters in dust, the cumulative doses due to these exposures, and the results of previous radiological analyses of the soil and groundwater consumed by the local population.

IV. REMINDER OF THE LEGAL FRAMEWORK

In Niger, an environmental impact assessment is mandatory prior to the implementation of any project likely to modify the physical parameters of the area of interest, as stipulated in Article 35 of the Constitution of the Seventh Republic: "the State shall ensure the evaluation and control of the impacts of any development project and programme on the environment. It is important to specify here that the evaluation and control of environmental impacts require the prior knowledge or characterisation of the initial state of the environment, commonly called the "reference level", i.e. the state of the environment as it is before the start of the planned activities that are likely to modify it.

It should be noted that the obligation of mining operators is also clearly defined in the 2006 Mining Code, Model Mining Convention, Article 27 relating to the protection of the environment and the rehabilitation of exploited sites, which specifies that: "the exploitation of any new deposit is subject to the prior completion of an environmental impact assessment in accordance with the environmental legislation in force...". Also, Law N°2018-26 of 14 May 2018 determining the fundamental principles of Environmental Assessment in Niger stipulates in its Chapter II dealing with strategic environmental assessment, the following provisions: "Article11: Any public policy, strategy, plan and development programme, or any other initiative upstream of projects, likely to have significant environmental and social effects, both positive and negative, is subject to a Strategic Environmental Assessment (SEA).

Article 13: The implementation activities of policies, strategies, plans, programmes or any other initiative that has been subject to a strategic environmental assessment may be subject to the prior completion of a detailed (in-depth) or simplified (specific environmental and social impact assessment) environmental and social impact assessment.

With regard specifically to the radiological environmental impact study, in particular the determination of the radiological environmental reference level, Order N°0003/MME/DM of 8 January 2001 on protection against the dangers of ionising radiation in the mining sector stipulates in Article 43, paragraph 4: "the employer must implement control means that allow the characterisation of the natural level of exposure existing outside the influence of the works and installations.

Prior to the opening of an operation, the characteristics of the natural exposure observable on the site and in its immediate environment will be provided by the impact assessment."

The State institutions responsible, each in its own right, for ensuring compliance with the provisions of the legislative and regulatory texts relating to the protection of the population and the environment against the dangers of ionising radiation in the mining sector, including uranium mining, are

- the Nuclear Regulation and Safety Authority (ARSN), created by law N°2016-45 of 06 December 2016 and placed under the supervision of the Prime Minister;
- the Ministry in charge of Mines, through the Direction des Mines;
- and the Ministry in charge of the Environment, through the National Environmental Assessment Office (BNEE).

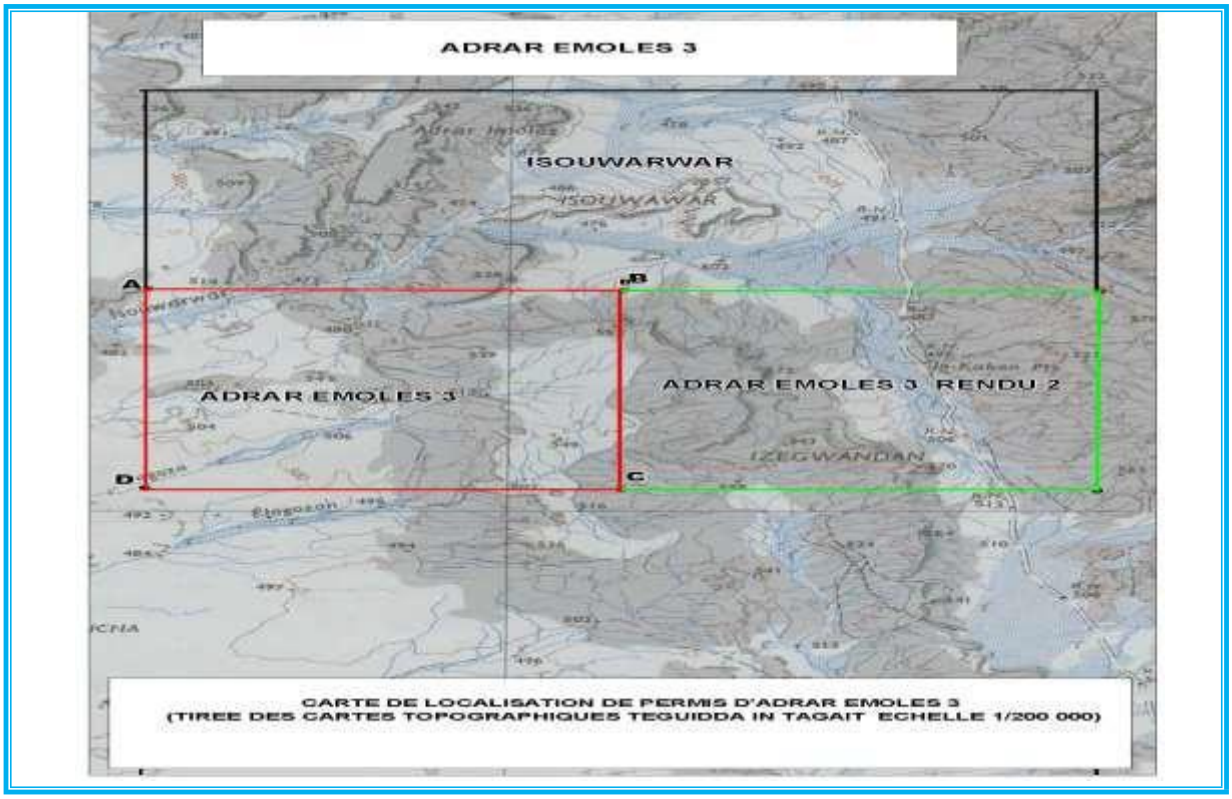
Regulatory controls are carried out at various levels, including inspections and the evaluation of periodic regulatory reports.

V. PRESENTATION OF THE STUDY AREA

The study is carried out on the site of the DASA mining permit (see map below, see provisional report of the Environmental and Social Impact Assessment carried out by the ART & GENIE Group, which includes uranium deposits that are currently being mined by the Global Atomic Corporation).

The "Adrar Emoles3" permit is delimited by points A, B, C and D whose geographical coordinates are :

Point	Longitude	Latitude
A	7° 40' 00"	17° 51' 14"
B	7° 46' 28"	17° 51' 14"
C	7° 46' 28"	17° 45' 30"
D	7° 40' 00"	17° 45' 30'



This permit area is located in the Department of Tchirozérine, precisely to the west of the villages of Tagaza and Agatara, which are more than one hundred kilometres from Agadez, on the Tahoua Arlit or RTA road.

VI. METHODOLOGY OF THE STUDY

In order to conduct the assessment study of the natural background level of the DASA mining project area and its surroundings, considerations were made as to the most appropriate methodology. As a result of these considerations, it was decided to proceed as follows:

- identify villages and points needed for the establishment of environmental monitoring stations;
- collaborate with recognised laboratories for the performance of dosimetric measurements and radiological analyses of atmospheric air sampling filters;
- set up a technical mechanism to :
    - the continuous use of passive detectors (thermoluminescent dosimeters) to assess the external exposure doses due to natural gamma and beta ionising radiation, per quarter, for four successive quarters, i.e. twelve sliding months;
    - continuous sampling and radiological analysis of atmospheric air to determine the average volume concentrations of radon (Rn220, Rn222) Potential Alpha Energy (PAE) and alpha activity of long-lived uranium238 and thorium232 chain emitters in airborne dust, per month and over a rolling twelve-month period

The raw results provided by the laboratories are then recorded and processed to determine, by monitoring station, the annual doses due to external exposure to ambient ionising radiation and internal exposure through inhalation of radioactive radon gas and solid radionuclides contained in atmospheric airborne dust. These results, which represent the initial radiological level of the area before any human intervention that might alter it, should not normally be discussed. However, they can be compared with other known natural background radiological levels in the world and used for public awareness purposes.

VII. LOCATION OF STATIONS OF MONITORING RADIOLOGY OF THE ENVIRONMENT

Using the geographical map and the positions of the nearest villages, locations were identified for the establishment of environmental monitoring stations. These are : Global Base Camp, Mining Site, Tagaza Village, Agatara Village and New Camp or Mining City site.

These stations have been equipped with the required equipment to continuously assess :

- ✓ external exposure due to gamma and energetic beta ionising radiation;
- ✓ internal exposure due to the inhalation of radionuclides contained in the air, such as radon-220 and radon-222 gas and their short-lived alpha emitting solid progeny, uranium-238 and its long-lived alpha emitting solid progeny, contained in dust.

VII.1 Acquisition of materials required for the construction and equipping of radiological environmental monitoring stations

Given the practical requirements of this study, including continuous sampling and measurement over long periods of time, necessary to minimise errors, the following appropriate equipment was acquired:

- ✓ Material needed for the fencing: angle irons, hooks, rolls of wire mesh, rolls of galvanised wire, cement packages, supports for air sampling equipment, battery and solar panel supports, locks, padlocks with keys;

- ✓ Power supply equipment: inverter and voltage stabiliser to power one AC sampler, four (4) 12 V batteries, four (4) solar panels and four (4) inverters to power four (4) solar panels

  (4) DC samplers, electric wires, eight (8) crocodile clips for the electrical connection of the samplers with the batteries.

A service contract was signed with ALGADE (France) for :

- delivery of sampling devices and air sampling filters,
- monthly radiological analyses of the filters for the assessment of EAP of radon and the alpha activity by volume of the long-lived emitters of the uranium238 and thorium232 chains contained in the dusts.

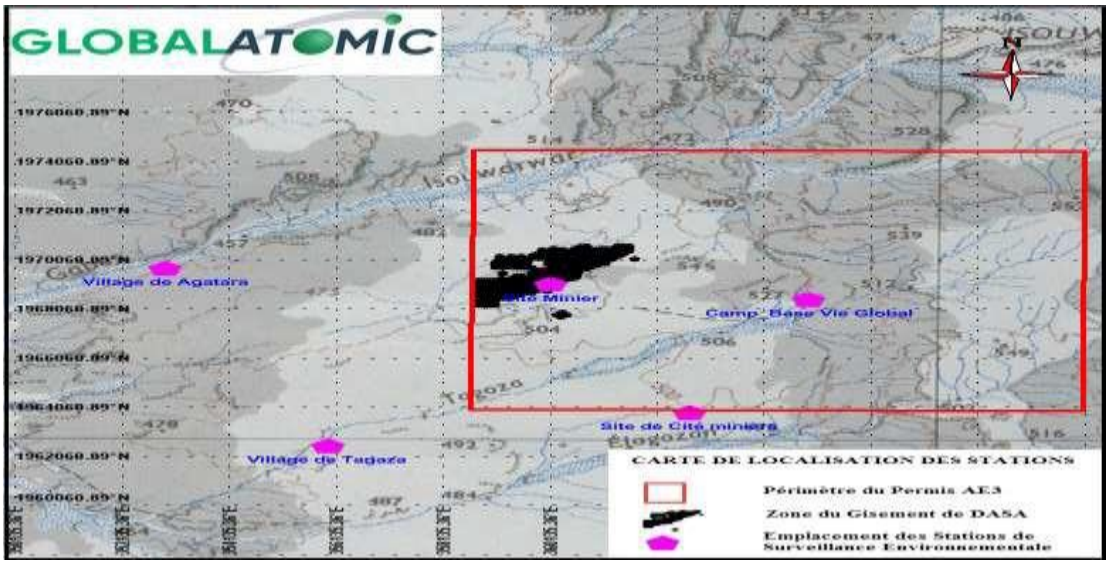
An annual subscription has been agreed with the national external dosimetry laboratory for the supply and reading of thermoluminescent dosimeters for the assessment of natural external exposure.

VII.2. Fencing and installation of the various supports

To ensure the security of the equipment against animals and vandalism, it was decided to protect it with square fences, 5 metres in size. Thus, at the locations previously identified to host the environmental monitoring stations, the following tasks were carried out:

- ✓ making the fences and installing the gates;
- ✓ installation of the air sampling equipment supports, provided in the centre of the fence;
- ✓ installation of shelters for the stabilizer, batteries and inverters;
- ✓ installation of the supports for the solar panels and the power supply batteries.

<u>Map showing the location of the points identified for the establishment of radiological environmental monitoring stations</u>



GPS coordinates of the selected points in UTM

SITE	Station	X	Y	Z
Camp_Base Life Global	ENV Station 1	364978	1968449	492
Mining site	ENV Station 2	360154	1969068	471
Village of Tagaza	ENV Station 3	355981	1962482	457
Village of Agatara	ENV Station 4	352944	1969718	449
Cité minière website	ENV Station 5	362741	1963831	460

Fencing of the station Mine site

VIII. INSTALLATION OF EQUIPMENT, COMMISSIONING AND MONITORING OF ENVIRONMENTAL RADIOLOGICAL MONITORING STATIONS

VIII.1 Installation of equipment

The following activities were carried out at the various environmental radiological monitoring stations:

- ✓ installation of the inverter and stabiliser of the Camp station (station N°1) whose sampler must be supplied with AC current;
- ✓ installation of panels, inverters and batteries for the power supply of the Site Minier (station N°2), Tagaza (station N°3), Agatara (station N°4) stations

and the Base Life Site of the mine (station N°5), whose samplers must be supplied with direct current;

- ✓ installation of air sampling equipment ;
- ✓ Placement of air sampling filters in the positions and locations provided.

The installed air samplers are: station N°1: W379; station N°2: N228; station N°3: L170; station N°4: U279 and station N°5: L187

At the end of these operations, the images of the equipped stations are presented as follows:

Camp Station (No. 1)Mine Site

Station (No. 2)

Tagaza Village Station (N°3)Agatara Village

Station (N°4)

Base Life Mine Station (N°5)

VIII.2 Start-up of environmental monitoring stations

The following activities were carried out:

- ✓ setting up and checking the correct functioning of each sampling device, launching the continuous air sampling operation at each equipped station.

  The manufacturer has provided the password to access the various settings and operating parameters of the units. The good operating condition established by the manufacturer is an air sampling rate of 80 litres per hour, with a margin of plus or minus 1 litre per hour. This flow rate may vary over time, especially with the possibility of some filter pores becoming clogged with dust.
- ✓ installation of thermoluminescent dosimeters (TLDs) for the assessment of external exposure to gamma and beta energy radiation.

VIII.3 Monitoring of the proper functioning of the stations and periodic replacement of air sampling heads and passive dosimeters.

The air sampling filters housed in special devices are removed and replaced with new ones at the end of each month. The used filters are then packaged and sent to the ALGADE Environment and Dosimetry Laboratory, located in Bessines Sur Gartempe, France, for analysis and expression of the results in terms of the quantities that can be used for the assessment of internal exposure by the air inhalation route.

The ALGADE laboratory is approved by the French authorities in charge of the nuclear field and holds COFRAC (French Accreditation Committee) accreditation.

The proper functioning of the sampling equipment is also checked during visits to the stations and at the end of each sampling period.

The passive TLD dosimeters are replaced every three months. Those that have been used and removed are sent to the external dosimetry laboratory of the Nigerian High Authority for Atomic Energy (HANEA) for exploitation and expression of the results in terms of ambient dose equivalent due to natural external exposure to ionising radiation.

IX. REMOVAL AND RETURN TO FRANCE OF AIR SAMPLING EQUIPMENT

At the end of the twelve-month rolling period (01 June 2021 - 31 May 2022) of radiological environmental monitoring, all service contracts with the laboratories were naturally terminated. As a result, the air samplers at the stations were removed, cleaned, packed and sent back to ALGADE (France), together with the last heads for radiological analysis.

Photos of the five (5) air samplers before they were packed are shown below:

X. PRESENTATION AND INTERPRETATION OF THE RESULTS OF THE AIR SAMPLING FILTERS ANALYSIS

X.1 Presentation of the results of the analysis of the air sampling filters

The air sampling heads are sent to the ALGADE laboratory for radiological analysis and expression of the results.

The results are expressed in terms of the following quantities and units:

- ✓ EAP(Rn222): Potential Alpha Energy due to short-lived radon-222 progeny, in nano joules (nJ); 1 nJ = 10^{-9} J,
- ✓ EAP(Rn220) : Potential Alpha Energy due to short-lived radon-220 progeny, in nJ ;
- ✓ ALET activity: activity of long-lived alpha emitters contained in airborne dust expressed in becquerels (Bq);
- ✓ EAPv(Rn222): Volume Alpha Potential Energy due to short-lived progeny of radon-222, in nano joules per cubic metre (nJ/m^3),
- ✓ EAPv(Rn220) : Volume Alpha Potential Energy due to short-lived radon-220 progeny, in nJ/m^3 ,
- ✓ ALET activity: Volume activity of long-lived alpha emitters contained in airborne dust, in milli becquerel per cubic metre (mBq/m^3); 1 mBq/m^3 = 0.001 Bq/m^3 .

During the study's 12-month rolling environmental radiological monitoring period (01 June 2021 - 30 May 2022), the stations operated as follows:

- The samplers at stations N°1 and N°3 were operating regularly for all 12 months;
- the sampler at station No. 2 did not work during the month of May 2022 for technical reasons: the screen was unreadable and it was therefore impossible to access the recorded data. For the same reason, the filter N°72483 was used during the months of March and April 2022 and the data necessary for the analysis could be extracted from the memory of the device, on its arrival at the ALGADE laboratory.

- Station No. 4 had a technical breakdown in February 2022, which did not allow sufficient air to be sampled for analysis;
- the sampler at station No. 5 was not installed until 1er December 2021, since the site of the mining estate or new camp planned to house it was not chosen until November 2021.

All monthly results of the radiological analyses of the air sampling filters of the five (5) radiological monitoring stations are annexed to this report.

The synthesis of the results provided by the ALGADE laboratory for the five (5) stations is given in the tables below:

Table N°1: Potential Alpha Energy by volume due to short-lived radon-220 progeny (EAPv Rn220) expressed in nJ/m³ of air, by station and by monitoring period.

MONTHS / STATION	June 2021 EAPv Rn220 nJ/m³	July 2021 EAPv Rn220 nJ/m³	August 2021 EAPv Rn220 nJ/m³	September 2021 EAPv Rn220 nJ/m³	October 2021 EAPv Rn220 nJ/m³	November 2021 EAPv Rn220 nJ/m³
Station 1: **Camp**	45	46	32	44	34	76
Station 2: **Mining site**	66	34	36	38	39	30
Station No. 3: **Tagaza**	47	43	30	28	31	42
Station No. 4: **Agatara**	43	38	39	35	38	40

MONTHS / STATION	December 2021 EAPv Rn220 nJ/m³	January 2022 EAPv Rn220 nJ/m³	February 2022 EAPv Rn220 nJ/m³	March 2022 EAPv Rn220 nJ/m³	April 2022 EAPv Rn220 nJ/m³	May 2022 EAPv Rn220 nJ/m³	**Average EAPv Rn220 nJ/m³**
Station 1: **Camp**	46	47	57	33	27	Breakdown	**44.3**
Station 2: **Mining site**	53	41	92	90	90	Breakdown	**55.4**
Station No. 3: **Tagaza**	48	43	91	29	26	32	**40.8**
Station No. 4: **Agatara**	54	58	Breakdown	31	38	74	**44.4**
Station No. 5: **Base Life**	35	39	69	26	23	15	**34.5**

Table 2: Potential Alpha Energy by volume due to short-lived radon-222 progeny (EAPv Rn222) expressed in nJ/m³ of air, by monitoring period.

MONTHS / STATION	June 2021 EAPv Rn222 nJ/m³	July 2021 EAPv Rn222 nJ/m³	August 2021 EAPv Rn222 nJ/m³	September 2021 EAPv Rn222 nJ/m³	October 2021 EAPv Rn222 nJ/m³	November 2021 EAPv Rn222 nJ/m³
Station 1: **Camp**	49	36	34	41	42	43
Station 2: **Mining site**	49	41	46	46	65	53
Station No. 3:	41	40	37	38	47	69

Tagaza						
Station No. 4: **Agatara**	61	50	39	40	63	79

MONTHS / STATION	December 2021 EAPv Rn222 nJ/m³	January 2022 EAPv Rn222 nJ/m³	Februa ry 2022 EAPv Rn222 nJ/m³	Marc h 2022 EAPv Rn222 nJ/m³	April 2022 EAPv Rn222 nJ/m³	May 2022 EAPv Rn222 nJ/m³	**Average EAPv Rn222 nJ/m³**
Station 1: **Camp**	66	55	62	50	45	Break down	**47.5**
Station 2: **Mining site**	104	95	103	98	98	Break down	**72.5**
Station No. 3: **Tagaza**	120	79	84	54	55	46	**59.2**
Station No. 4: **Agatara**	126	81	Breakd own	87	79	136	**76.5**
Station No. 5: **Base Life**	82	68	63	39	32	31	**52.5**

Table 3: Total activity by volume of long-lived alpha emitters (LLNA) contained in airborne dust, expressed in milli becquerels per cubic metre (mBq/m³) of air, by monitoring period.

MONTHS / STATIONS	June 2021 EAVLv mBq/m³	July 2021 EAVLv mBq/m³	Augu st 2021 EAVLv mBq/m³	September 2021 EAVLv mBq/m³	October 2021 EAVLv mBq/m³	November 2021 EAVLv mBq/m³
Station 1: **Camp**	≤ 0.4	≤ 0.4	0.2	≤ 0.3	≤ 0.	≤ 0.2
Station 2: **Mining site**	≤ 0.3	≤ 0.3	≤ 0.3	0.3	≤ 0.2	0.3
Station No. 3: **Tagaza**	≤ 0.3	≤ 0.2	≤ 0.2	0.3	≤ 0.2	≤ 0.2
Station No. 4: **Agatara**	≤ 0.4	≤ 0.4	≤ 0.3	0.4	≤ 0.3	0.4

MONTHS / STATION	December 2021 **EAVLv** mBq/m³	Januar y 2022 **EAVLv** mBq/m³	Februar y 2022 **EAVLv** mBq/m³	March 2022 **EAVLv** mBq/m³	April 2022 **EAVLv** mBq/m³	May 2022 **EAVLv** mBq/m³	**Average EAVLv mBq/m³**
Station 1**: Camp**	0.3	≤ 0.2	≤ 0.2	≤ 0.4	≤ 0.5	Breakdown	**0.2**
Station 2: **Mining site**	0.3	≤ 0.2	≤ 0.3	≤ 0.2	≤ 0.2	Breakdown	**0.2**
Station No. 3: **Tagaza**	≤ 0.2	≤ 0.2	≤ 0.2	≤ 0.3	≤ 0.2	≤ 0.4	**0.1**
Station No. 4: **Agatara**	≤ 0.3	≤ 0.9	Breakdown	≤ 0.3	≤ 0.3	≤ 0.8	**0.25**
Station No. 5: **Base Life**	≤ 0.2	≤ 0.2	≤ 0.2	≤ 0.3	≤ 0.2	≤ 0.5	**0.1**

X.2 INTERPRETATION OF THE RESULTS OF THE AIR SAMPLING FILTERS ANALYSIS

In order to assess these different results, it is necessary to calculate the effective doses for a standard member of the public, i.e. with the hypothesis of an air inhalation rate of 0.8 m^3 /h, in an atmospheric environment characterised by the different concentrations measured during the twelve sliding months and for each of the parameters considered.

In the IAEA's "Safety Standards for the Protection of Persons and the Environment", in particular in the publication "Radiation Protection and Safety of Radiation Sources: Basic International Safety Standards" and more specifically in the General Safety Requirements Part 3, No. GSR Part3, published in Vienna in 2016, the conventional conversion factors given for radon and allowing the calculation of the committed effective dose per unit of intake are the following:

- **In the workplace :**

✓ 1.4 Sv/J.h.m^{-3} (sievert per (joule hour per m^3)), for Rn222 ;

✓ 0.5 Sv/J.h.m^{-3} , for the Rn220 ;

- **In homes :**

✓ 1.1 Sv/J.h.m^{-3} , for Rn222 ;

The WHO reference level (WHO, 2009 Edition) for radon in indoor air (Publication 2009b) is 100 Bq/m^3 in dwellings. Even under specific regional conditions, this level should not exceed 300 Bq/m^3 in dwellings, which would lead to an exposure dose of ***10 milli Sievert per year (10 mSv/year).***

In addition to these practical provisions, Safety Series No. 115, IAEA, Vienna, 1997 and ICRP Publication 65 state that people spend 7,000 hours per year at home and 2,000 hours per year at work.

The same publication also specified the radon equilibrium factor of 0.4 for the selection of conversion factors for radon progeny.

These conventional data are used to calculate the committed effective doses by type of exposure for a member of the public, living in the study area for twelve
(12) rolling months.

X.2.1 Effective dose due to exposure to Potential Alpha Energy from short-lived radon-220 progeny expressed in milli Sievert per year.

For Rn220, the conversion factor in the workplace is: **0.5 Sv/J.h.m^{-3} in the workplace, or 500 mSv/J.h.m^{-3} .** And since ICRP Publication 2009b did not indicate another conventional conversion factor for radon220 in homes, we will then consider this same factor for the calculation of the effective dose due to EAPv exposure of short-lived radon-220 progeny.

The exposure (J.h.m^{-3}) is the product of the volume concentration of potential alpha energy in air (J/m^3) of the short-lived radon progeny and the time during which one is present in this environment (h).

The effective dose (mSv) is the product of the exposure (J.h.m^{-3}) and the conversion factor (mSv/J.h.m^{-3})

For a stay of one year (365 d x 24 h/d = 8760 h) in environments with the same characteristics as the atmospheric air of the radiological environmental monitoring stations, the calculations give the committed effective doses due to internal exposure to the potential alpha energies of the short-lived radon-220 progeny. The results are presented in the table below:

Table 4: Committed effective doses due to exposure to Potential Alpha Energy from short-lived radon-220 progeny

Station	Average EAPv (Rn220) $nJ.m^{-3}$	Exhibition $J.h.m^{-3}$	**Effective dose mSv/year**
Station 1: **Camp**	**44.3**	$0.4\ 10^{-3}$	**0.20**
Station 2: **Mining site**	**55.4**	$0.5\ 10^{-3}$	**0.25**
Station No. 3: **Tagaza**	**40.8**	$0.3\ 10^{-3}$	**0.15**
Station No. 4: **Agatara**	**44.4**	$0.4\ 10^{-3}$	**0.20**
Station No. 5 **Base Life**	**34.5**	$0.3\ 10^{-3}$	**0.15**
Average	**43.9**	$0.4\ 10^{-3}$	**0.19**

In the study area, the inhalation doses from radon-220 or thoron gas in atmospheric air range from 0.15 mSv/year to 0.25 mSv/year, which is very low and provides a low background for the detection and measurement of any possible increase in the volume concentration of radon-220 gas in air, which would be caused by subsequent mining and processing of uranium ore.

X.2.2 Effective dose due to exposure to Potential Alpha Energy from short-lived radon-222 progeny in air, expressed in mSv/year

For the case of radon-222, the conventional conversion factors, for a radon equilibrium factor of 0.4, given in the IAEA's International Basic Safety Standards, GSR Part3, Vienna, 2016 are :

- ✓ **1.1 Sv/J.h.m^3 in dwellings,**
- ✓ and **1.4 Sv/J.h.m^3 in the workplace**

These conventional conversion coefficients and the provisions of Safety Series No. 115, IAEA, Vienna, 1997 and ICRP Publication 65, i.e. 7,000 hours per year at home and 2,000 hours per year at work, make it possible to calculate the effective doses due to the short-lived progeny of radon-222 for one year's stay in atmospheres with the same characteristics as the atmospheric air of the radiological environmental monitoring stations. The results are presented in the following table:

Table 5: Committed effective doses due to exposure to Potential Alpha Energy from short-lived radon-222 progeny

Station	Average EAPv (Rn222) in nJ.m^{-3}		Exposure in J.h.m^{-3}	Effective dose in mSv/year	
				Dose per location	**Total dose**
Station 1: **Camp**	**47.5**	Place of work	0.10 10^{-3}	0.15	**0.51**
		Home	0.33 10^{-3}	0.36	
Station 2: **Mining site**	**72.5**	Place of work	0.15 10^{-3}	0.20	**0.76**
		Home	0.51 10^{-3}	0.56	
Station No. 3: **Tagaza**	**59.2**	Place of work	0.12 10^{-3}	0.17	**0.62**
		Home	0.41 10^{-3}	0.45	
Station No. 4: **Agatara**	**76.5**	Place of work	0.15 10^{-3}	0.20	**0.80**
		House	0.54 10^{-3}	0.60	
Station No. 5: **Base Life**	**52.5**	Place of work	0.11 10^{-3}	0.15	**0.52**
		Home	0.37 10^{-3}	0.37	
Average	**61.6**	Place of work	0.13 10^{-3}	0.17	**0.64**
		Home	0.43 10^{-3}	0.47	

In the study area, the inhalation doses from radon-222 range from 0.51 mSv/year and 0.80 mSv/year. Although these results are three times higher than those obtained for radon-220, they are also low from the point of view of radiation protection of members of the public.

X.2.3 Effective dose due to inhalation of dust containing long-lived alpha emitters in air, expressed in milli Sievert per year (mSv/year)

In the Annex to GSR Part 3, Table IIII-2. Persons in the Public: Committed effective dose per unit of intake e(g) (Sv/Bq) by inhalation, it is given for uranium-238, and for intake form S (slow form) which is the most penalising.

- For children under one year of age :
- ✓ $f_1 = 0.020$ (transfer factor in the intestine),
- ✓ $e(g) = 2.9 \times 10^{-5}$ Sv/Bq
- For adults, i.e. persons over 17 years of age:
- ✓ $f_1 = 0.002$,
- ✓ $e(g) = 8 \times 10^{-6}$ Sv/Bq

For a standard person living for one year in an environment containing airborne long-lived alpha emitters and with a known activity concentration (Bq/m^3), the total inhaled or incorporated alpha activity can be calculated from the following formula:

Intake (Bq) = Volume concentration (Bq/m^3) x inhalation rate (m^3 /h) x exposure time (h)
~~**The committed effective dose is the product of the intake (Bq) and the committed**~~ **effective dose per unit of intake e(g) (Sv/Bq)**

Considering the simple hypothesis of an inhalation rate of 0.8 m^3 /h (inhalation rate of a standard human at rest) and that all alpha activity is due to the radioactive decay of uranium-238 which represents 99.275 % of natural uranium (isotopic composition), the calculations gave the results presented in the table below, for one year of exposure (8760 hours):

Table 6: Committed effective doses due to exposure to airborne long-lived alpha emitters (LLAE)

Station	Average volume concentration mBq/m^3	Total inhaled alpha activity Bq	Adult Age > 17 years Effective dose mSv/year
Station 1: **Camp**	**0.2**	1.4	**0.011**
Station 2: **Mining site**	**0.2**	1.4	**0.011**
Station No. 3: **Tagaza**	**0.1**	0.7	**0.005**
Station No. 4: **Agatara**	**0.25**	1.8	**0.014**
Station No. 5: **Base Life**	**0.1**	0.7	**0.005**
Average	**0.17**	1.2	**0.01**

The calculated results are all in the order of a few hundredths of a mSv/year and can therefore be considered as zero. It can therefore be concluded that there is practically no uranium-238 or its long-lived alpha emitting progeny in the atmospheric air of the DASA mine project area.

XI. EVALUATION OF THE EXTERNAL EXPOSURE DOSE TO GAMMA AND BETA RADIATION

The dosimeters used for this assessment are thermoluminescent dosimeters (TLDs). The detectors are made of magnesium-doped lithium fluoride and have a very good sensitivity to ionising radiation, with a very low detection limit of the order of 10 micro Sievert (10.10^{-6} Sv).

In our study, the period considered for the assessment of the dose due to external exposure to natural ionising radiation is the quarter.

Dosimeters recovered at the end of the period of use are returned to the external dosimetry laboratory of the Nigerian High Authority for Atomic Energy (HANEA) for reading and expression of results.

The results sheets recorded by the TLD dosimeters placed at the five (5) radiological monitoring stations are annexed to this report (Annex 3).

The following table summarises the results:

<u>Table 7</u>: Dosimetric results recorded during the four (4) monitoring periods for external exposure to natural ionising radiation

STATION	Exposure dose per monitoring period expressed in mSv				Total dose for 12 rolling months of exposure mSv
	June 2021 August 2021	Sept 2021 Nov 2021	Dec. 2021 Februa ry 2022	March 2022 May 2022	
Station 1: **Camp**	0.753	0.436	0.465	0.355	**2.009**
Station 2: **Mining site**	1.316	0.391	0.554	0.114	**2.375**
Station No. 3: **Tagaza**	0.550	0.881	0.060	0.097	**1.588**
Station No. 4: **Agatara**	1.148	0.502	0.060	0.343	**2.053**
Station No. 5: **Base Life**	No installed	No installed	0.629	0.108	**1.474 ***

***** : value obtained by extrapolation

The dosimetric monitoring results for external exposure to natural gamma and beta ionising radiation recorded at Agatara (station No. 4) and at the mine site (station No. 2) are above 2 mSv/year, mainly due to the high values recorded at these stations during the first quarter of monitoring, which are 1,316 mSv and 1,148 mSv respectively. These results are relatively high compared to all others recorded in the following quarters.

Based on all the results obtained, the exposure to energetic gamma and beta radiation in the study area ranges from 1,474 mSv/year to 2,375 mSv/year, a difference of approximately 1 mSv/year.

<u>Recommendation 1</u>: The results of the first quarter of external gamma and beta radiation exposure assessment, recorded at stations 2 and 4, may contain anomalies. It would therefore be interesting to put these stations back into operation in order to have additional results to determine the most realistic reference values possible.

XII. <u>SUMMARY OF THE RESULTS OF T H E ASSESSMENT OF THE RADIOLOGICAL REFERENCE LEVEL OF THE ADRAR EMOLES AREA</u>

The strategy adopted to carry out radiological monitoring of the environment in the area of the DASA mining project perimeter made it possible to obtain data for twelve (12) continuous months for stations N)1, N°2, N°3 and N°4 and for six (6) continuous months for station N°5, covering the following parameters or quantities

- External exposure to natural gamma and beta energetic ionising radiation ;
- Exposure to radon-220 and radon-222 progeny;
- Exposure to long-lived alpha emitters in airborne dust.

The summary of the results for one year of exposure to these radiological parameters is presented in the table below:

Table 8: Summary of environmental radiological monitoring results

Stations	Dose External exposure mSv/year	Internal exposure dose mSv/year			**Total dose mSv/year**
		EAP Rn220 mSv/year	EAP Rn222 mSv/year	EAVL mSv/year	
Station 1 Camp	**2.009**	**0.20**	**0.51**	**0.011**	**2.73**
Station No. 2 Mining site	**2.375**	**0.25**	**0.76**	**0.011**	**3.396**
Station No. 3 Tagaza	**1.588**	**0.15**	**0.62**	**0.005**	**2.363**
Station No. 4 Agatara	**2.053**	**0.20**	**0.80**	**0.014**	**3.067**
Station No. 5 Base Life	**1.474**	**0.15**	**0.52**	**0.005**	**2.149**
Average	**1.899**	**0.19**	**0.642**	**0.009**	**2.74**

The above table shows that in the study area the average cumulative dose is 2.74 mSv/year, which is slightly higher than the global average background level of 2.40 mSv/year.

To better understand or appreciate this synthesis, we will make some graphical representations.

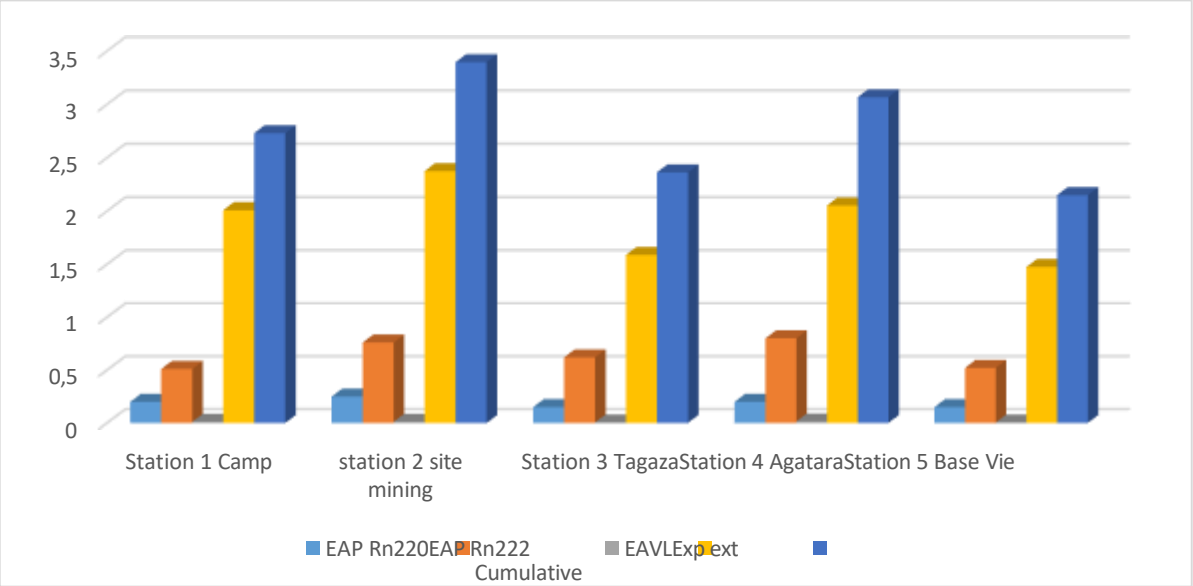


Figure 1: Dose histograms by station and exposure route

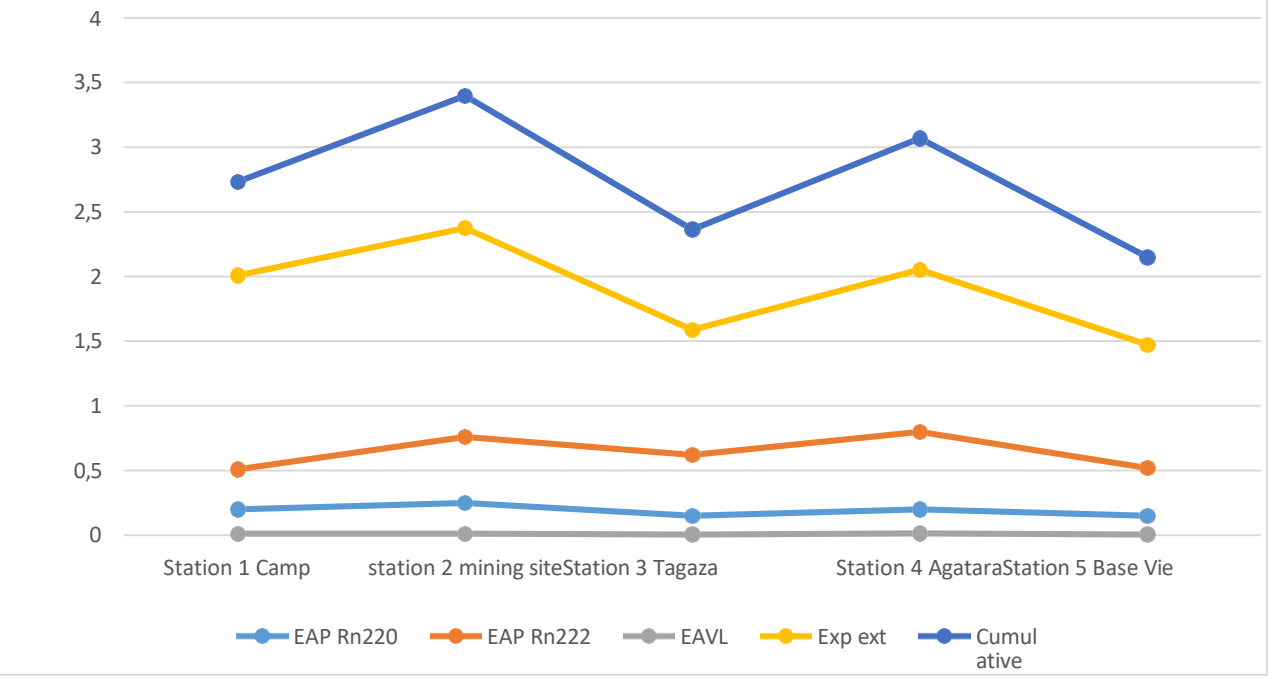


Figure 2: Dose graphs per station and per exposure route

The graphical representations above show that all the curves have the same shape, which demonstrates a very high degree of consistency between the recorded results.

It is also noted that in the study area, external exposure doses to natural ionising radiation (gamma and beta components) are higher than those due to internal exposure through inhalation of radionuclides contained in the atmospheric air (radon gas and its short-lived alpha emitting progeny, uranium and its long-lived alpha emitting solid progeny).

The contribution of the AVE component (activity of long-lived alpha emitters contained in atmospheric airborne dust) is practically zero and that of the Rn220 is also negligible.

The variations observed between the dosimetric results of the environmental monitoring stations N°1, N°3 and N°5 are relatively small for both external and internal exposure to natural ionising radiation, which is generally the case in the same region, if the soils are of similar composition and without any human disturbance. The results recorded at stations N°2 and N°4 are also of the same order of magnitude.

If it were not for the fact that the external exposure results recorded in the first quarter at stations N°2 and N°4 were high, the differences between the two groups of results would not necessarily constitute an anomaly, since in the same region, natural radioactivity may logically vary from one place to another.

Table 9: Cumulative doses per environmental monitoring station

Station / Doses	Station 1 Camp	station 2 mining site	Station 3 Tagaza	Station 4 Agatara	Station 5 New Camp	***Average annual exposure, worldwide
Dose accumulation in mSv/year	2.73	3,396	2,363	3,063	2,149	2,74

NB: Value of the average natural radiological level, worldwide = 2.40 mSv/year.

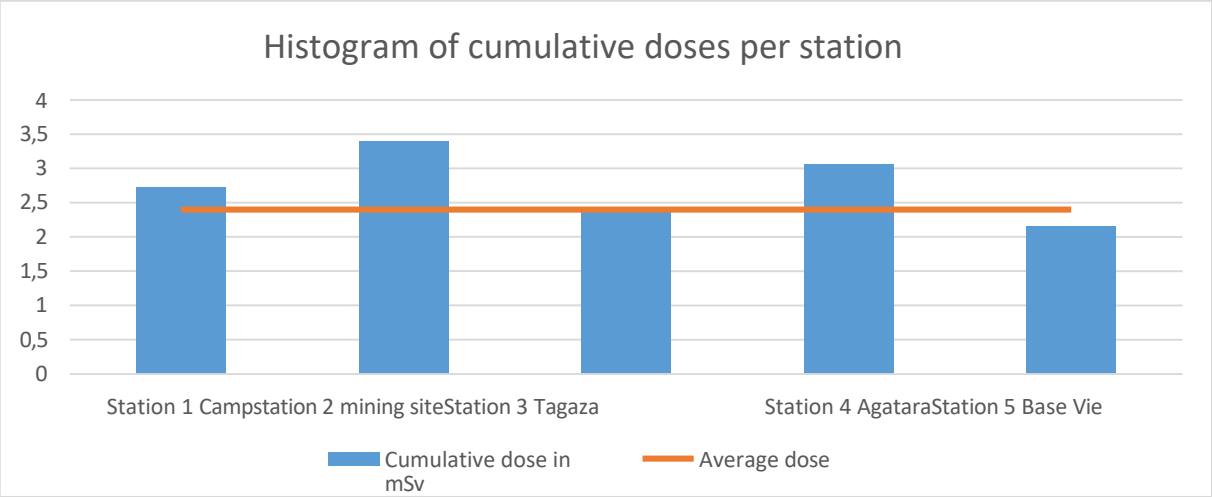


Figure 3: Representation of cumulative doses per station

The cumulative annual doses recorded at stations No. 1 (Camp), No. 2 (Mine site) and No. 4 (Agatara) are higher than the global average background radiation level of 2.40 mSv per year.

As a result of this assessment study of the natural background level of the DASA mining project area, it can be concluded that :

- the annual doses due to external exposure to gamma and beta energy radiation vary from 1.474 mSv/year (i.e. almost 1.50 mSv/year) to 2,375 mSv/year (almost 2.40 mSv/year), with a calculated average of 1,899 mSv/year (almost 1.90 mSv/year);

- the average air volume concentrations of radon Alpha Potential Energy (EAPv)220 range from 34.5 nJ/m³ to 5.4 nJ/m³ , with a calculated average of 43.9 nJ/m³ ;

- the mean air volume concentrations of Alpha Potential Energy (EAPv) of radon-222 range from 47.5 nJ/m³ to 76.5 nJ/m³ , with a calculated mean of 61.6 nJ/m³ ;

- the airborne volume-average concentrations of alpha activity of long-lived emitters (LLNA) of the uranium238 and thorium232 chains present in airborne dust are between 0.1 mBq/m³ and 0.25 mBq/m³ , with a calculated average of 0.17 mBq/m³ .

We conclude that the average values of the different parameters that characterize the natural background radiological level of the DASA mining project area are :

- **External exposure to gamma and beta radiation: 1.9 mSv/year;**
- **Air volume concentration in EAPv Rn220v: 43.9 nJ/m³**
- **Air volume concentration of EAPv Rn222: 61.6 nJ/m³**
- **Air volume concentration of AVEv: 0.17 mBq/m³**

This level of radiological exposure leads to a natural exposure dose of 2.74 mSv/year.

(1.9 + 0.19 + 0.642 + 0.009) mSv/year = 2.74 mSv/year

However, for subsequent assessments and evaluation of the dose values that would be caused by uranium mining, the higher values recorded for the different exposure parameters should be considered as initial background data (initial natural radiological level) and deduced from the different measurement or analysis results before estimating the radiological impact value.

Indeed, the requirements of international standards and national regulations on the radiation protection of populations relate to the value of the effective dose added (radiological impact) by human activities, including uranium mining, in addition to the natural level of exposure to ionising radiation existing without any environmental disturbance.

For the radiological parameters monitored, the highest values currently recorded are :

- **External exposure to gamma and beta radiation: 2.375 mSv/year;**
- **Air volume concentration in EAPv Rn220: 55.4 nJ/m³**
- **Air volume concentration of EAPv Rn222: 76.5 nJ/m³**
- **Air volume concentration of AVEv: 0.25 mBq/m³**

This level of exposure to ionising radiation leads to an annual effective dose of 3.44 mSv.

(2.375 + 0.25 + 0.80 + 0.014) mSv = 3.44 mSv.

This radiological level should be considered as the highest level of natural exposure to ionising radiation that can be encountered in the area of the DASA mine project.

XIII. RESULTS OF PREVIOUS RADIOLOGICAL ANALYSIS OF SAMPLES

As clearly stated in the introduction, soil and drinking water samples were taken in the field and analysed by the Environment and Dosimetry Laboratory of ALGADE (France), prior to the present study.

The sampling methodology, the results of the radiological analyses and their assessments are presented as follows:

XIII.1. Radiological analysis of drinking water samples

The use of groundwater for drinking is one of the main routes of internal human exposure to natural ionising radiation.

Indeed, depending on their origin and the geological formations they pass through, groundwater can contain several natural radionuclides including potassium-40, uranium (mainly uranium-238), thorium-232 and their radioactive descendants.

It is therefore important to determine the radiological quality of the water in the area of the mining licence prior to the extraction and processing of uranium ore, in order to ensure better monitoring of the impact of mining activities on the water.

XIII.1.1 Applied methodology

In order to obtain radiological data on the drinking water of the populations of the ADRAR EMOLES mining perimeter, the following steps were taken

- ✓ taking a water sample at each water supply point in the area of interest;
- ✓ sending the samples taken to ALGADE's service laboratory in France.

- ✓ analysis of the water samples and expression of the results by the ALGADE laboratory,
- ✓ interpretation of the results.

XIII.1.2 Collecting water samples

Using sterilised plastic bottles of one and a half litres each, water samples were taken from the main drinking water supply points in the study area.

The water points concerned are the following boreholes: INALAMANE village borehole, TAGAZA village borehole, Global Atomic Camp borehole (Base vie), FORACO Citernage borehole, AGATARA village borehole, INBATAKAN village borehole, Global ELAGOZAN-ISAKATAN borehole, a private individual's borehole located next to the tar road, and Ex Camp FORACO borehole.

XIII.1.3 Analysis of water samples and expression of results

The parameters analysed are :

- ✓ the potassium-40 activity volume (A_{k40}) expressed in Bq/l,
- ✓ the global alpha activity (Aα) expressed in Bq/l,
- ✓ the overall beta activity (Aβ) expressed in Bq/l,
- ✓ and the dissolved potassium density (M_{K+}) expressed in mg/l K+.

The results provided by the laboratory are compiled and presented in the following table:

Table N°10: Results of drinking water analyses

Water point	A_{k40} (Bq/l)	Aα (Bq/l)	Aβ (Bq/l)	M_{K+} (mg/l K+.)
1. Drilling in the village o f INALAMANE	0.031	0.18	0.20	1.0
2. Drilling of TAGAZA village	0.072	0.31	0.31	2.3
3. Drilling Camp Global Atomic	0.019	0.87	0.24	0.6
4. Drilling FORACO Cisternage	0.028	1.92	0.44	0.9
5. AGATARA village borehole	0.025	2.76	1.31	0.8
6. Drilling of the village of INBAKATAN	0.066	5.40	2.90	2.1
7. Global drilling ELAGOZAN	0.022	1.26	0.36	0.7
8. Drilling by an individual	0.047	0.37	0.24	1.5
9. Drilling Ex Camp FORACO	0.022	1.05	0.37	0.7

XIII.1.4 Interpretation of the results of radiological analyses of drinking water

At this initial investigation level, the parameters considered for the interpretation of the results of the radiological analyses of the water are the global alpha activity and the global beta activity.

It should be noted that in the Guidelines for Drinking Water Quality, Vol1, 3ème edition, the World Health Organization has taken into consideration radiological aspects, including the presence of naturally occurring radionuclides in water.

The IAEA NFI also indicates a practical reference level for drinking water, which is a gross alpha activity concentration of 0.5 Bq/l and a gross beta activity concentration of 1 Bq/l. Assuming an annual consumption of such water, i.e. a quantity of 730 litres (equivalent to 2 litres per day on average), this level corresponds to a Total Indicative Dose (TID) of 0.1 mSv/year.

The Standards state that "***the highest annual individual doses received by the drinking water should not exceed 1 mSv.***

This value should not be considered an "acceptable" dose or a dose limit, and every reasonable effort should be made to minimise the doses received. Each situation will be different and non-radiological factors such as rehabilitation costs and the availability of alternative drinking water supplies must be taken into account in making the final decision.

Considering the practical reference level of 0.5 Bq/l in total alpha activity and 1 Bq/l in total beta activity for which the annual consumption of 730 litres would lead to a committed effective dose of 0.1 mSv, the highest annual individual dose that must not exceed 1 mSv corresponds to the annual consumption of water containing 5 Bq/l in total alpha activity and 10 Bq/l in total beta activity, i.e. a total alpha beta activity concentration of 15 Bq/l. The results obtained from the radiological analyses of the drinking water from the various supply points located in the area of interest all satisfy this criterion (***the highest individual annual dose must not exceed 1 mSv***).

However, points where concentrations exceed the practical reference level should be subject to detailed radiological analysis and special attention during the operation of the uranium deposits, e.g. by periodically repeating sampling and radiological analysis, while seeking alternative, less contaminated sources of supply. The water supply points concerned are mainly the boreholes at INBAKATAN, AGATARA village, ELAGOZAN-ISAKATAN, FORACO Citernage and the former FORACO camp.

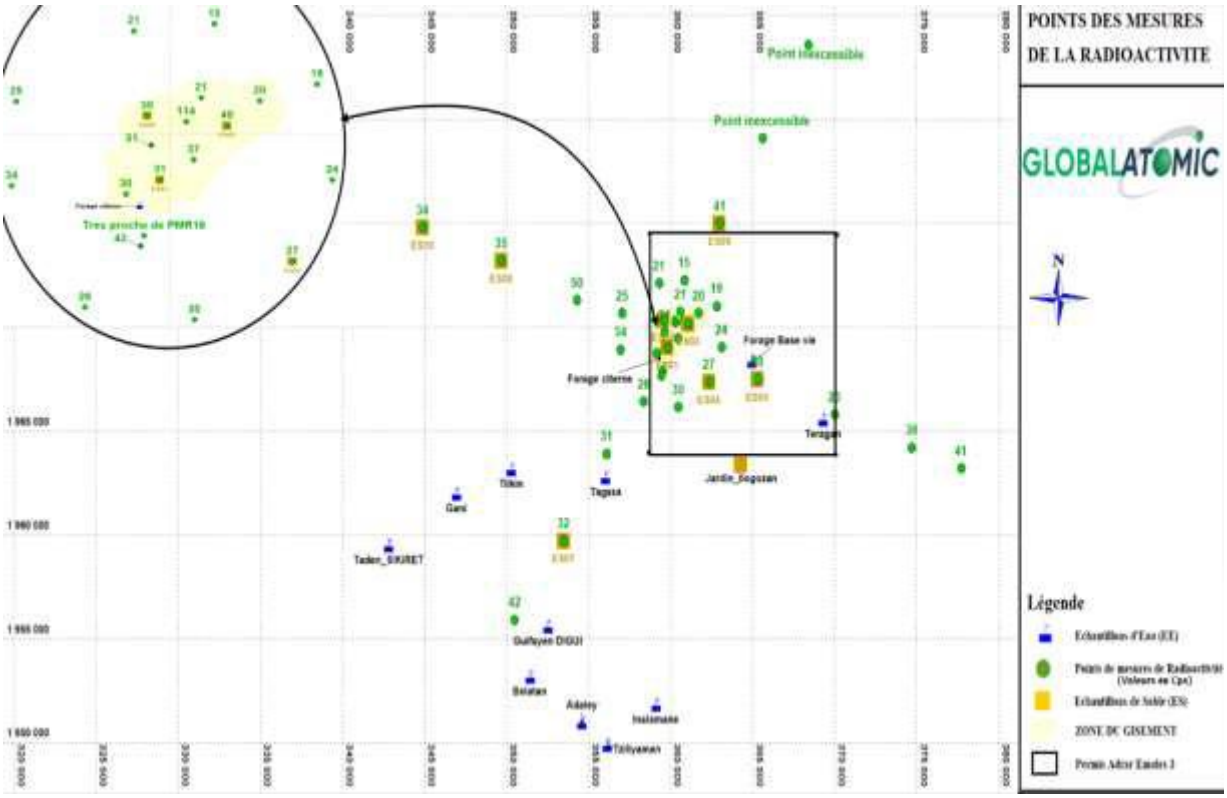
<u>Recommendation No. 2</u>: In accordance with the assessment methodology recommended by WHO (Guidelines for drinking water quality, 4th edition, 2017) to limit the health risks from radionuclides in drinking water, detailed radiological analyses should be carried out to determine the concentrations of individual radionuclides (uranium234, uranium238, radium226, radium228, lead210 and polonium210) present in labelled water (global alpha activity 0.50 Bq/l and/or global beta activity ≥ 1 Bq/l).

The results of these detailed radiological analyses should be used to calculate the Total Indicative Dose (TID), for each drinking water supply point.

XIII.2. Analysis of soil samples

Surface sand samples were taken, to a thickness of 0-5mm, at ten points with pre-defined geographical coordinates using the map of the mining perimeter and its surroundings. These points were then located in the field using a GPS unit.

The map below shows the positions of the various sampling points in relation to the mine site area (uranium deposit area).



The samples were analysed by ALGADE's Laboratoire Environnement et Dosimétrie (LED) to determine the mass concentrations of uranium in the soil.

The results are presented in the following table:

Table 11: Mass concentrations of uranium in soils

Identification of sampling	Contact details geographical		Identification of sand samples	Concentration soil mass in U, mg/kg
	UTM_X	UTM_Y		
PMR2	359803	1969047	ES01	1.70
PMR6	359557	1970370	ES02	1.69
PMR8	361086	1970166	ES03	4.28
PMR19	362345	1967357	ES04	< 0.99
PMR21	365300	1967500	ES05	2.00
Ilogozan Garden	364311	1963373	ES06	< 0.99
PMR32	353500	1959700	ES07	< 0.99
PMR26	349700	1973200	ES08	1.59
PMR28	363000	1975000	ES09	2.70
PMR27	344900	1974800	ES10	3.50

- Average mass concentration of uranium in soil, worldwide :
  3.2 mg/kg

We note that the results of eight of the ten samples are below the world average value for the mass concentration of uranium in soils. The result of the sample taken at PMR27 (3.5 mg/kg) is also comparable to this value, taking into account the measurement uncertainties.

The PMR8 point, whose result (4.28 mg/kg) represents about 134% of the world average value of the mass concentration of uranium in soils, is located in the area of the Adrar Emboles uranium deposit. This value is still lower than the uranium soil mass concentrations found in some granitic rocks, which are sometimes higher than 5 mg/kg, and it remains insignificant compared to the mass concentrations of uranium deposits, which are of the order of 10,000 mg/kg.

CONCLUSION

According to the results of the parameters monitored as part of the assessment of the natural background level of the DASA mining project area, the cumulative dose of exposure to ionising radiation in this area varies from 2.149 mSv (i.e. almost 2.15 mSv/year) to 3,396 mSv/year (i.e. almost 3.4 mSv), with an average of 2.74 mSv/year, which is slightly higher than the global average annual dose from natural ionising radiation of 2.4 mSv. In this desert area with a hot and dry climate and constantly downwind, the results of the analyses and measurements of the internal inhalation exposure parameters (EAPv Rn220, EAPv Rn222 and EAVLv) are low and negligible compared to the external exposure doses to gamma and energetic beta radiation.

The highest cumulative dose recorded at the radiological monitoring station N°2 (3.4 mSv/year), located at the mine site, represents about 142% of the value of the average dose from natural ionising radiation which is 2.4 mSv/year in the mode. A recommendation was made to rule on this value of 3.4 mSv/year as well as that recorded at station No. 4 (3.063 mSv/year), considering the first results of external exposure, with the forthcoming resumption of radiological environmental monitoring activities. However, these results should not be considered as a significant radiological exposure problem for the public. Indeed, these values are far below the levels of natural exposure measured in some regions of the world *(e.g. monazite beaches in Brazil: 24.50 mSv/year; alluvial regions in Iran: 184.1 mSv/year)* and in which no health effects have been observed, compared to other regions with very low doses of natural exposure to ionising radiation

The review of the results of the radiological analyses of the drinking water samples indicated that some of the groundwater sources were marked. A recommendation was made to request detailed radiological analyses to specify the concentrations of individual radionuclides required to calculate the Total Indicative Dose (TID) for each of the boreholes concerned.

The database of all the results of the radiological measurements and analyses should be completed with the results of radiological analyses of cheese samples, as there is no agriculture in the area and milk is the main local food product.

Finally, it should be noted that the importance of the results of the study is to provide a database for monitoring the radiological impacts of uranium mining activities in the mine project area and for conducting the rehabilitation and environmental restoration work that will be undertaken at the end of the mine's life.

These results of the natural background level would also facilitate communication with local populations and authorities as well as governmental and non-governmental organisations (NGOs) interested in protection against the dangers of ionising radiation, during awareness-raising or information sessions on the environmental impacts likely to be generated by the mining operations of the uranium mining company of the DASA mining project

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LIST OF APPENDICES

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APPENDIX I: RESULTS OF RADIOLOGICAL AIR ANALYSES

LIST OF RADIOLOGICAL ENVIRONMENTAL MONITORING STATIONS

1. ENV Station1: Global Atomic Camp (Life Base)

2. ENV Station 2: Mine Site

3. ENV Station 3: TAGAZA Village

4. ENV Station 4: AGATARA Village

5. ENV Station 5: New Global Atomic Camp

ALGADE

Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 21/05/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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A l'attention du chargé d'affaire: Roselyne Ameon

Pour le Client: Global Atomic Corporation
Koira Kano Nord
Niamey / NIGER

Edition du : 08/09/2021

Code Affaire Algade : GLATO 61

Périmètre : 529

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de réception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
65 893	Station 2	02/06/21	02/07/21	50.547	09/08/21	25/08/21	2467 ± 431	3345 ± 519	19/08/21	<=14	49 ± 10	66 ± 12	<=0.3	
65 894	Station 4	02/06/21	02/07/21	37.678	09/08/21	25/08/21	2305 ± 335	1608 ± 242	19/08/21	<=14	61 ± 11	43 ± 8	<=0.4	
65 895	Station 1	01/06/21	01/07/21	33.917	09/08/21	25/08/21	1673 ± 251	1522 ± 230	19/08/21	<=14	49 ± 9	45 ± 8	<=0.4	
65 896	Station 3	01/06/21	01/07/21	52.466	09/08/21	25/08/21	2160 ± 359	2480 ± 375	19/08/21	<=14	41 ± 8	47 ± 9	<=0.3	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
08/09/2021	

Expression des résultats

Résultat d'analyse (Ra)
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : Incertitude associée à Ra.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.

Résultat final (Rf), calculé avec le volume de prélèvement (v) fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : incertitude associée à Rf.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
- Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.

(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement établi selon le temps travaillé.

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ALGADE dégage sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

Page : 1/1

Référence documentation qualité : E-RE-6201 V17

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Laboratoire
Environnement et Dosimétrie

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Global Atomic Corporation

Année 2021

Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1	EAPv Rn 222						49							49		
	EAPv Rn 220						45							45		
Station 2	EAPv Rn 222						49							49		
	EAPv Rn 220						66							66		
Station 3	EAPv Rn 222						41							41		
	EAPv Rn 220						47							47		
Station 4	EAPv Rn 222						61							61		
	EAPv Rn 220						43							43		

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

ALGADE

Laboratoire
Environnement et Dosimétrie

Global Atomic Corporation

Année 2021

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR *

Unité mBq/m³ d'air

Edition du : 08/09/2021

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1						<=0.4							0.2		
Station 2						<=0.3							0.1		
Station 3						<=0.3							0.1		
Station 4						<=0.4							0.2		

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

July 2021 results

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RAPPORT D'ESSAIS N° ENV 21/06/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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Accréditation Cofrac N° 1-1639 portée disponible sur www.cofrac.fr

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Code Affaire Algade : GLATO 61
Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon
Pour le Client Global Atomic Corporation
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de réception	Date d'analyse EAP	EAP (Rn222) nJ (1)	EAP (Rn220) nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv (Rn222) nJ/m³ (3)	EAPv (Rn220) nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
65 898	Station 3	01/07/21	01/08/21	55.997	23/08/21	03/09/21	2248 ± 363	2435 ± 368	07/09/21	<=14	40 ± 8	43 ± 8	<=0.2	
65 899	Station 1	01/07/21	01/08/21	34.013	23/08/21	03/09/21	1209 ± 202	1553 ± 234	07/09/21	<=14	36 ± 7	46 ± 8	<=0.4	
65 900	Station 4	02/07/21	02/08/21	33.716	23/08/21	03/09/21	1681 ± 237	1265 ± 194	07/09/21	<=14	50 ± 9	38 ± 7	<=0.4	
65 901	Station 2	02/07/21	02/08/21	50.216	23/08/21	03/09/21	2072 ± 302	1706 ± 256	07/09/21	<=14	41 ± 7	34 ± 6	<=0.3	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
16/09/2021	

Expression des résultats :

Résultat d'analyse (Ra) :
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Créateurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : Incertitude associée à Ra.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.

Résultat final (Rf), calculé avec le volume de prélèvement (v) fourni par le client :
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Rf > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : Incertitude associée à Rf.
• Si Rf <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
• Si le volume prélevé est inférieur à 15 m3 (Non volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5)Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon la norme en vigueur.

ALGADE décline sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

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L'accréditation par le COFRAC atteste de la compétence du laboratoire pour les analyses couvertes par l'accréditation.
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Page : 1/1

Référence documentation qualité : E-RE 6201 V17

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Edition du : 17/09/2021

Global Atomic Corporation

Année 2021

Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1	EAPv Rn 222						49	36						42		
	EAPv Rn 220						45	46						45		
Station 2	EAPv Rn 222						49	41						45		
	EAPv Rn 220						66	34						50		
Station 3	EAPv Rn 222						41	40						41		
	EAPv Rn 220						47	43						45		
Station 4	EAPv Rn 222						61	50						56		
	EAPv Rn 220						43	38						40		

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

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Année 2021

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR *

Unité mBq/m³ d'air

Edition du : 17/09/2021

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2320	2919
Station 1						<=0.4	<=0.4						0.2		
Station 2						<=0.3	<=0.3						0.1		
Station 3						<=0.3	<=0.2						0.1		
Station 4						<=0.4	<=0.4						0.2		

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable

August 2021 results

ALGADE

Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 21/07/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M.AN 6201.

Accréditation Cofrac N° 1-1033 portée disponible sur www.cofrac.fr

Edition du : 18/10/2021

Code Affaire Algade : GLATO 61

Périmètre : 529

A l'attention du chargé d'affaire : Roselyne Ameon

Pour le Client : Global Atomic Corporation
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (3)	date de réception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
66 836	Station 4	02/08/21	02/09/21	53.451	01/10/21	07/10/21	2100 ± 315	2087 ± 313	11/10/21	<=14	39 ± 7	39 ± 7	<=0.3	
66 837	Station 2	02/08/21	02/09/21	53.575	01/10/21	07/10/21	2445 ± 357	1903 ± 285	11/10/21	<=14	46 ± 8	36 ± 6	<=0.3	
66 838	Station 3	01/08/21	01/09/21	59.833	01/10/21	07/10/21	2195 ± 325	1612 ± 272	11/10/21	<=14	37 ± 7	30 ± 5	<=0.2	
66 839	Station 1	01/08/21	01/09/21	59.56	01/10/21	07/10/21	2001 ± 305	1883 ± 282	11/10/21	15 ± 7	34 ± 6	32 ± 6	0.2 ± 0.1	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
18/10/2021	

Expression des résultats

Résultat d'analyse (Ra)
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : Incertitude associée à Ra.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final (Rf), calculé avec le volume de prélèvement (v) fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Rv > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : Incertitude associée à Rf.
- Si Rv <= Sd, alors le résultat est fourni sous la forme : <= Sd_{volume}, avec Sd: Seuil de décision.
- Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(3) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE dégage sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

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Environnement et Dosimétrie

Edition du : 19/10/2021

Global Atomic Corporation

Année 2021
Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1	EAPv Rn 222						49	35	34					39		
	EAPv Rn 220						45	46	32					41		
Station 2	EAPv Rn 222						49	41	46					45		
	EAPv Rn 220						66	34	36					45		
Station 3	EAPv Rn 222						41	40	37					39		
	EAPv Rn 220						47	43	30					40		
Station 4	EAPv Rn 222						61	50	39					50		
	EAPv Rn 220						43	38	39					40		

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

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Edition du : 19/10/2021

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Année 2021

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR **

Unité mBq/m³ d'air

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1						<=0.4	<=0.4	0.2					0.2		
Station 2						<=0.3	<=0.3	<=0.3					0.1		
Station 3						<=0.3	<=0.2	<=0.2					0.1		
Station 4						<=0.4	<=0.4	<=0.3					0.2		

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

Results for September 2021 and October 2021

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RAPPORT D'ESSAIS N° ENV 21/08/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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Code Affaire Algade : GLATO 61
Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon
Pour le Client **Global Atomic Corporation**
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
67 997	Station 4	02/09/21	01/10/21	50.457	20/10/21	27/10/21	2037 ± 288	1747 ± 262	03/11/21	20 ± 8	40 ± 7	35 ± 6	0.4 ± 0.2	
67 998	Station 2	02/09/21	01/10/21	55.547	20/10/21	27/10/21	2541 ± 359	2087 ± 313	03/11/21	19 ± 8	46 ± 8	38 ± 7	0.3 ± 0.2	
67 999	Station 3	01/09/21	01/10/21	57.683	20/10/21	27/10/21	2187 ± 298	1596 ± 240	03/11/21	17 ± 8	38 ± 6	28 ± 5	0.3 ± 0.1	
68 000	Station 1	01/09/21	01/10/21	51.825	01/12/21	09/12/21	2145 ± 324	2284 ± 344	09/12/21	<=14	41 ± 8	44 ± 8	<=0.3	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
15/12/2021	

Expression des résultats :
Résultat d'analyse [Ra]
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : Incertitude associée à Ra.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [Rf], calculé avec le volume de prélèvement [v] fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Rf > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : Incertitude associée à Rf.
• Si Rf <= Sd, alors le résultat est fourni sous la forme : <= Sd+volume, avec Sd: Seuil de décision.
• Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "nc" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE décharge sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

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RAPPORT D'ESSAIS N° ENV 21/09/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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Edition du : 15/12/2021

Code Affaire Algade : GLATO 61

Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon

Pour le Client **Global Atomic Corporation**
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
69 148	Station 1	01/10/21	01/11/21	52.093	01/12/21	09/12/21	2165 ± 309	1752 ± 263	09/12/21	<=14	42 ± 7	34 ± 6	<=0.3	
69 149	Station 2	01/10/21	01/11/21	55.686	01/12/21	09/12/21	3633 ± 548	2166 ± 325	09/12/21	<=14	65 ± 12	39 ± 7	<=0.2	
69 150	Station 4	01/10/21	01/11/21	50.621	01/12/21	09/12/21	3185 ± 477	1903 ± 285	09/12/21	<=14	63 ± 11	38 ± 7	<=0.3	
69 151	Station 3	01/10/21	01/11/21	57.387	01/12/21	09/12/21	2672 ± 384	1792 ± 269	09/12/21	<=14	47 ± 8	31 ± 6	<=0.2	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
15/12/2021	

Expression des résultats:
Résultat d'analyse (Ra)
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : Incertitude associée à Ra.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final (Rf), calculé avec le volume de prélèvement (v) fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : Incertitude associée à Rf.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd=volume, avec Sd: Seuil de décision.
- Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "<x" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE décline sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

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Laboratoire
Environnement et Dosimétrie

Edition du : 16/12/2021

Global Atomic Corporation

Année 2021

Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure :

Type : **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1	EAPv Rn 222						49	36	34	41	42			40		
	EAPv Rn 220						45	46	32	44	34			40		
Station 2	EAPv Rn 222						49	41	46	46	65			49		
	EAPv Rn 220						66	34	35	38	39			42		
Station 3	EAPv Rn 222						41	40	37	38	47			40		
	EAPv Rn 220						47	43	30	26	31			36		
Station 4	EAPv Rn 222						61	50	39	40	63			51		
	EAPv Rn 220						43	38	36	35	38			38		

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

ALGADE
Laboratoire
Environnement et Dosimétrie

Global Atomic Corporation

Année 2021

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR *

Edition du : 16/12/2021

Unité mBq/m³ d'air

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1						<=0.4	<=0.4	0.2	<=0.3	<=0.3			0.2		
Station 2						<=0.3	<=0.3	<=0.3	0.3	<=0.2			0.2		
Station 3						<=0.3	<=0.2	<=0.2	0.3	<=0.2			0.2		
Station 4						<=0.4	<=0.4	<=0.3	0.4	<=0.3			0.2		

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

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Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 21/11/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

cofrac ESSAIS
Accréditation Cofrac N° 1-1635 portée disponible sur www.cofrac.fr

A l'attention du chargé d'affaire : Roselyne Ameon

Pour le Client : **Global Atomic Corporation**
Koira Kano Nord
Niamey / NIGER

Edition du : 12/01/2022

Code Affaire Algade : **GLATO 61**

Périmètre : 529

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
65 892	Station 4	01/11/21	01/12/21	52.363	23/12/21	29/12/21	4160 ± 625	2087 ± 313	05/01/22	22 ± 9	79 ± 14	40 ± 7	0.4 ± 0.2	
65 897	Station 2	01/11/21	01/12/21	58.246	23/12/21	29/12/21	3096 ± 448	1732 ± 260	05/01/22	19 ± 8	53 ± 9	30 ± 5	0.3 ± 0.2	
66 840	Station 3	01/11/21	01/12/21	57.812	23/12/21	29/12/21	4015 ± 636	2408 ± 363	05/01/22	<=14	69 ± 13	42 ± 8	<=0.2	
67 996	Station 1	01/11/21	01/12/21	57.612	23/12/21	29/12/21	2483 ± 467	4356 ± 699	05/01/22	<=14	43 ± 9	76 ± 14	<=0.2	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
12/01/2022	

Expression des résultats:
Résultat d'analyse [Ra]
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : incertitude associée à Ra.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [A], calculé avec le volume de prélèvement [v] fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : incertitude associée à Rf.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
• Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "np" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE désengage sa responsabilité sur les données fournies par le client (volume, lieu d'exposition, dates de pose et dépose)

ALGADE
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Environnement et Dosimétrie

Edition du : 13/01/2022

Global Atomic Corporation

Année 2021

Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1	EAPv Rn 222						49	36	34	41	42	43		41		
	EAPv Rn 220						45	46	32	44	34	76		46		
Station 2	EAPv Rn 222						49	41	46	46	65	53		50		
	EAPv Rn 220						66	34	36	38	39	30		40		
Station 3	EAPv Rn 222						41	40	37	38	47	69		45		
	EAPv Rn 220						47	43	30	28	31	42		37		
Station 4	EAPv Rn 222						61	50	39	40	63	79		56		
	EAPv Rn 220						43	38	39	35	38	40		39		

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

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Année 2021

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR *

Edition du : 13/01/2022

Unité mBq/m³ d'air

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1						<=0.4	<=0.4	0.2	<=0.3	<=0.3	<=0.2		0.2		
Station 2						<=0.3	<=0.3	<=0.3	0.3	<=0.2	0.3		0.2		
Station 3						<=0.3	<=0.2	<=0.2	0.3	<=0.2	<=0.2		0.2		
Station 4						<=0.4	<=0.4	<=0.3	0.4	<=0.3	0.4		0.2		

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

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Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 21/10/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et MAN 6201.

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Accréditation Cofrac N° 1-1639 portée disponible sur www.cofrac.fr

Edition du : 18/02/2022
Code Affaire Algade : GLATO 61
Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon
Pour le Client **Global Atomic Corporation**
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
69 854	Station 1	01/12/21	01/01/22	59.762	25/01/22	10/02/22	3952 ± 635	2729 ± 415	09/02/22	16 ± 7	66 ± 13	46 ± 8	0.3 ± 0.1	
69 855	Station 5	01/12/21	01/01/22	59.762	25/01/22	10/02/22	4879 ± 799	2121 ± 318	09/02/22	<=14	82 ± 16	35 ± 6	<=0.2	
69 856	Station 3	01/12/21	01/01/22	59.602	25/01/22	10/02/22	7145 ± 1235	2849 ± 435	09/02/22	<=14	120 ± 24	48 ± 9	<=0.2	
69 857	Station 4	01/12/21	01/01/22	51.613	25/01/22	10/02/22	6519 ± 1127	2770 ± 422	09/02/22	<=14	126 ± 25	54 ± 10	<=0.3	
69 858	Station 2	01/12/21	01/01/22	58.927	25/01/22	10/02/22	6120 ± 1054	3149 ± 485	09/02/22	17 ± 8	104 ± 21	53 ± 10	0.3 ± 0.1	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
18/02/2022	

Expression des résultats :
Résultat d'analyse [Ra]
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : Incertitude associée à Ra.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [Rf], calculé avec le volume de prélèvement [v] fourni par le Client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : Incertitude associée à Rf.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
• Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE décline sa responsabilité sur les données fournies par le client (nature, lieu d'exposition, dates de pose et dépose).

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L'accréditation par le COFRAC atteste de la compétence du laboratoire pour les analyses couvertes par l'accréditation.
Ce rapport ne concerne que les objets soumis à essais tels qu'ils ont été reçus.

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Edition du : 18/02/2022

Global Atomic Corporation

Année 2021
Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" *

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1	EAPv Rn 222						49	36	34	41	42	43	66	44		
	EAPv Rn 220						45	46	32	44	34	76	46	46		
Station 2	EAPv Rn 222						49	41	46	46	66	53	104	58		
	EAPv Rn 220						66	34	36	38	39	30	53	42		
Station 3	EAPv Rn 222						41	40	37	38	47	69	120	56		
	EAPv Rn 220						47	43	30	28	31	42	48	38		
Station 4	EAPv Rn 222						61	50	39	40	63	79	126	66		
	EAPv Rn 220						43	38	39	35	38	40	54	41		
Station 5	EAPv Rn 222												82	82		
	EAPv Rn 220												35	35		

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

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Global Atomic Corporation

Année 2021

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR *

Unité mBq/m³ d'air

Edition du : 18/02/2022

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2021	2020	2019
Station 1						<=0.4	<=0.4	0.2	<=0.3	<=0.3	<=0.2	0.3	0.2		
Station 2						<=0.3	<=0.3	<=0.3	0.3	<=0.2	0.3	0.3	0.2		
Station 3						<=0.3	<=0.2	<=0.2	0.3	<=0.2	<=0.2	<=0.2	0.1		
Station 4						<=0.4	<=0.4	<=0.3	0.4	<=0.3	0.4	<=0.3	0.2		
Station 5												<=0.2	0.1		

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

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Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 22/01/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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Accréditation Cofrac N° 1-1039 portée disponible sur www.cofrac.fr

Edition du : 21/03/2022
Code Affaire Algade : GLATO 61
Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon
Pour le Client **Global Atomic Corporation**
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
73 599	Station 1	01/01/22	01/02/22	59.883	22/02/22	10/03/22	3276 ± 249	2808 ± 232	09/03/22	<=14	55 ± 7	47 ± 6	<=0.2	
73 600	Station 5	01/01/22	01/02/22	59.827	22/02/22	10/03/22	4054 ± 291	2336 ± 202	09/03/22	<=14	68 ± 8	39 ± 5	<=0.2	
73 601	Station 3	01/01/22	01/02/22	60.811	22/02/22	10/03/22	4807 ± 336	2593 ± 218	09/03/22	<=14	79 ± 10	43 ± 6	<=0.2	
73 602	Station 4	01/01/22	01/02/22	15.908	22/02/22	10/03/22	1282 ± 122	918 ± 108	09/03/22	<=14	81 ± 11	58 ± 9	<=0.9	
73 603	Station 2	01/01/22	01/02/22	59.665	22/02/22	10/03/22	5646 ± 383	2423 ± 208	09/03/22	<=14	95 ± 11	41 ± 5	<=0.2	

Commentaires

Expression des résultats :
Résultat d'analyse [Ra] :
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : incertitude associée à Ra.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [Rf], calculé avec le volume de prélèvement [v] fourni par le client :
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : incertitude associée à Rf.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
- Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE décline sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

Date	Visa du Responsable Technique Laboratoire R. AMEON
21/03/2022	

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L'accréditation par le COFRAC atteste de la compétence du laboratoire pour les analyses couvertes par l'accréditation.
Ce rapport ne concerne que les objets soumis à essais tels qu'ils ont été reçus.

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ALGADE
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Environnement et Dosimétrie

Edition du : 21/03/2022

Global Atomic Corporation

Année 2022
Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	EAPv Rn 222	55												55	44	
	EAPv Rn 220	47												47	46	
Station 2	EAPv Rn 222	95												95	58	
	EAPv Rn 220	41												41	42	
Station 3	EAPv Rn 222	79												79	56	
	EAPv Rn 220	43												43	38	
Station 4	EAPv Rn 222	81												81	66	
	EAPv Rn 220	58												58	41	
Station 5	EAPv Rn 222	68												68	82	
	EAPv Rn 220	39												39	35	

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

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Global Atomic Corporation

Année 2022

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR **

Edition du : 21/03/2022

Unité mBq/m³ d'air

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	<=0.2												0.1	0.2	
Station 2	<=0.2												0.1	0.2	
Station 3	<=0.2												0.1	0.1	
Station 4	<=0.9												0.4	0.2	
Station 5	<=0.2												0.1	0.1	

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

ALGADE

Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 22/02/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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Accréditation Cofrac N° 1-1039 portée disponible sur www.cofrac.fr

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Code Affaire Algade : GLATO 61

Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon

Pour le Client Global Atomic Corporation
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prelevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
71 488	Station 1	01/02/22	02/03/22	55.828	14/03/22	22/03/22	3447 ± 260	3194 ± 256	25/03/22	<=14	62 ± 8	57 ± 7	<=0.2	
71 489	Station 5	01/02/22	02/03/22	55.663	14/03/22	22/03/22	3483 ± 265	3863 ± 296	25/03/22	<=14	63 ± 8	69 ± 9	<=0.2	
71 490	Station 3	01/02/22	02/03/22	55.798	14/03/22	22/03/22	4699 ± 337	5073 ± 369	25/03/22	<=14	84 ± 10	91 ± 11	<=0.2	
71 491	Station 4	01/02/22	__/__/__		__/__/__									Panne ALGADE
71 492	Station 2	01/02/22	02/03/22	55.354	14/03/22	22/03/22	5709 ± 395	5087 ± 370	25/03/22	<=14	103 ± 13	92 ± 11	<=0.3	

Commentaires

Expression des résultats :
Résultat d'analyse [Ra]
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme : Ra ± U(Ra), avec U(Ra) : incertitude associée à Ra.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [Rf], calculé avec le volume de prélèvement [v] fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Rf > Sd, alors le résultat est fourni sous la forme : Rf ± U(Rf), avec U(Rf) : incertitude associée à Rf.
• Si Rf <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
• Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE décline sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

Date	Visa du Responsable Technique Laboratoire R. AMEON
01/04/2022	

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Environnement et Dosimétrie

Edition du : 01/04/2022

Global Atomic Corporation

Année 2022

Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	EAPv Rn 222	55	62											58	44	
	EAPv Rn 220	47	57											52	46	
Station 2	EAPv Rn 222	95	103											99	58	
	EAPv Rn 220	41	92											66	42	
Station 3	EAPv Rn 222	79	84											82	56	
	EAPv Rn 220	43	91											67	38	
Station 4	EAPv Rn 222	81	n.s.											81	66	
	EAPv Rn 220	58	n.s.											58	41	
Station 5	EAPv Rn 222	68	63											65	82	
	EAPv Rn 220	39	69											54	35	

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

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Global Atomic Corporation

Année 2022

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR **

Unité mBq/m³ d'air

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	<=0.2	<=0.2											0.1	0.2	
Station 2	<=0.2	<=0.3											0.1	0.2	
Station 3	<=0.2	<=0.2											0.1	0.1	
Station 4	<=0.9	n.s.											0.4	0.2	
Station 5	<=0.2	<=0.2											0.1	0.1	

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

March 2022 results

ALGADE

Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 22/03/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

cofrac ESSAIS
Accréditation Cofrac N° 1-1839 portée disponible sur www.cofrac.fr

Edition du : 11/05/2022
Code Affaire Algade : GLATO 61
Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon
Pour le Client Global Atomic Corporation
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
72 481	Station 3	02/03/22	01/04/22	48.337	19/04/22	06/05/22	2627 ± 205	1404 ± 142	09/05/22	<=14	54 ± 7	29 ± 4	<=0.3	
72 482	Station 4	02/03/22	01/04/22	40.189	19/04/22	06/05/22	3500 ± 255	1253 ± 132	09/05/22	<=14	87 ± 11	31 ± 5	<=0.3	
72 483	Station 2	02/03/22	__/__/__		__/__/__									Non reçu
72 484	Station 5	02/03/22	01/04/22	50.218	19/04/22	06/05/22	1945 ± 165	1292 ± 134	09/05/22	<=14	39 ± 5	26 ± 4	<=0.3	
72 485	Station 1	02/03/22	01/04/22	34.782	19/04/22	06/05/22	1754 ± 152	1160 ± 125	09/05/22	<=14	50 ± 7	33 ± 5	<=0.4	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
11/05/2022	

Expression des résultats :
Résultat d'analyse [Ra]
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : incertitude associée à Ra.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [R] calculé avec le volume de prélèvement [v] fourni par le client
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Rv > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : incertitude associée à Rf.
- Si Rv <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
- Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE décline sa responsabilité sur les données fournies par le client (volume, heure d'exposition, dates de pose et dépose).

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L'accréditation par le COFRAC atteste de la compétence du laboratoire pour les analyses couvertes par l'accréditation.
Ce rapport ne concerne que les objets soumis à essais tels qu'ils ont été reçus.

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Edition du : 11/05/2022

Global Atomic Corporation

Année 2022

Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	EAPv Rn 222	55	62	50										56	44	
	EAPv Rn 220	47	57	33										46	46	
Station 2	EAPv Rn 222	95	103											99	58	
	EAPv Rn 220	41	92											66	42	
Station 3	EAPv Rn 222	79	84	54										73	56	
	EAPv Rn 220	43	91	29										54	36	
Station 4	EAPv Rn 222	81	n.s.	87										84	66	
	EAPv Rn 220	58	n.s.	31										44	41	
Station 5	EAPv Rn 222	68	63	39										58	82	
	EAPv Rn 220	39	69	26										45	35	

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

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Année 2022

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR **

Unité mBq/m³ d'air

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	<=0.2	<=0.2	<=0.4										**0.1**	0.2	
Station 2	<=0.2	<=0.3											**0.1**	0.2	
Station 3	<=0.2	<=0.2	<=0.3										**0.1**	0.1	
Station 4	<=0.9	n.s.	<=0.3										**0.3**	0.2	
Station 5	<=0.2	<=0.2	<=0.3										**0.1**	0.1	

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

April 2022 results

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RAPPORT D'ESSAIS N° ENV 22/04/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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Accréditation Cofrac N° 1-1609 portée disponible sur www.cofrac.fr

A l'attention du chargé d'affaire : Roselyne Ameon

Pour le Client : Global Atomic Corporation
Koira Kano Nord
Niamey / NIGER

Edition du : 13/06/2022

Code Affaire Algade : GLATO 61

Périmètre : 529

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
76 979	Station 4	01/04/22	10/05/22	48.666	01/05/22	07/06/22	3831 ± 276	1864 ± 172	08/06/22	15 ± 7	79 ± 10	38 ± 5	0.3 ± 0.2	
76 980	Station 3	01/04/22	10/05/22	63.98	01/05/22	07/06/22	3518 ± 257	1634 ± 157	08/06/22	<=14	55 ± 7	26 ± 4	<=0.2	
76 981	Station 5	01/04/22	10/05/22	67.383	01/05/22	07/06/22	2173 ± 179	1555 ± 152	08/06/22	<=14	32 ± 4	23 ± 3	<=0.2	
76 982	Station 1	01/04/22	10/05/22	28.732	01/05/22	07/06/22	1298 ± 122	772 ± 97	08/06/22	<=14	45 ± 6	27 ± 4	<=0.5	

Commentaires

Date	Visa du Responsable Technique Laboratoire R. AMEON
13/06/2022	

Expression des résultats:
Résultat d'analyse [Ra]
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : Incertitude associée à Ra.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [Rf], calculé avec le volume de prélèvement [v] fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
• Si Ra > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : Incertitude associée à Rf.
• Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
• Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps travaillé.

ALGADE décline sa responsabilité sur les données fournies par le client (volume, lieux d'exposition, dates de pose et dépose).

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Edition du : 13/06/2022

Global Atomic Corporation

Année 2022
Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" *

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	EAPv Rn 222	55	62	50	45									53	44	
	EAPv Rn 220	47	57	33	27									41	46	
Station 2	EAPv Rn 222	95	103											99	58	
	EAPv Rn 220	41	92											66	42	
Station 3	EAPv Rn 222	79	84	54	55									68	56	
	EAPv Rn 220	43	91	29	26									47	38	
Station 4	EAPv Rn 222	81	n.s.	87	79									82	66	
	EAPv Rn 220	58	n.s.	31	38									42	41	
Station 5	EAPv Rn 222	68	63	39	32									50	82	
	EAPv Rn 220	39	89	26	23									39	35	

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non expicitable.
Stations sans résultats: Pas de suivi sur la période.

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Global Atomic Corporation

Année 2022

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR **

Unité mBq/m³ d'air

Edition du : 13/06/2022

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	<=0.2	<=0.2	<=0.4	<=0.5									0.2	0.2	
Station 2	<=0.2	<=0.3											0.1	0.2	
Station 3	<=0.2	<=0.2	<=0.3	<=0.2									0.1	0.1	
Station 4	<=0.9	n.s.	<=0.3	0.3									0.3	0.2	
Station 5	<=0.2	<=0.2	<=0.3	<=0.2									0.1	0.1	

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

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Laboratoire
Environnement et Dosimétrie

RAPPORT D'ESSAIS N° ENV 22/05/529000

Contrôle radiologique de l'atmosphère : Expositions Internes
Echantillonnage avec préleveur de site

En application de la norme NF EN ISO 11665-2 et selon les modes opératoires M-DE-6201 et M AN 6201.

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Accréditation Cofrac N° 1-1039 portée disponible sur www.cofrac.fr

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Code Affaire Algade : GLATO 61
Périmètre : 529

A l'attention du chargé d'affaire Roselyne Ameon
Pour le Client Global Atomic Corporation
Koira Kano Nord
Niamey / NIGER

	Prélèvement d'échantillon (Données fournies par le client)				Résultat d'analyse						Résultat final calculé			
Détecteur N°	Lieu d'exposition	Date de Pose	Date de Dépose	Volume prélevé m³ (5)	date de reception	Date d'analyse EAP	EAP [Rn222] nJ (1)	EAP [Rn220] nJ (1)	date d'analyse EAVL	Activité EAVL mBq (2)	EAPv [Rn222] nJ/m³ (3)	EAPv [Rn220] nJ/m³ (3)	EAVLv mBq/m³ (4)	Observations
77 982	Station 1	10/05/22	01/06/22	12.24	17/06/22	20/06/22	873 ± 95	633 ± 86	23/06/22	<=14	n.s.	n.s.	n.s.	Panne Client
77 983	Station 4	10/05/22	01/06/22	18.303	17/06/22	20/06/22	2493 ± 196	1351 ± 138	23/06/22	<=14	136 ± 17	74 ± 11	<=0.8	
77 984	Station 3	10/05/22	01/06/22	35.865	17/06/22	20/06/22	1665 ± 147	1148 ± 124	23/06/22	<=14	46 ± 6	32 ± 5	<=0.4	
77 985	Station 5	10/05/22	01/06/22	28.065	17/06/22	20/06/22	881 ± 93	429 ± 69	23/06/22	<=14	31 ± 5	15 ± 3	<=0.5	

Commentaires

Date	Visa du Technicien Laboratoire J. MELIER
13/07/2022	

Expression des résultats:
Résultat d'analyse [Ra]
(1) EAP : Energie Alpha Potentielle due aux descendants à vie courte du radon.
(2) EAVL : Emetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Ra ± U(Ra), avec U(Ra) : incertitude associée à Ra.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd, avec Sd: Seuil de décision.
Résultat final [Rf], calculé avec le volume de prélèvement [v] fourni par le client.
(3) EAPv : Energie Alpha Potentielle volumique due aux descendants à vie courte du radon.
(4) EAVLv : Activité volumique des émetteurs alpha à vie longue des aérosols en suspension dans l'air.
- Si Ra > Sd, alors le résultat est fourni sous la forme: Rf ± U(Rf), avec U(Rf) : incertitude associée à Rf.
- Si Ra <= Sd, alors le résultat est fourni sous la forme : <= Sd/volume, avec Sd: Seuil de décision.
- Si le volume prélevé est inférieur à 15 m3 (hors volume indiqué par le symbole « * ») et quelque soit le résultat d'analyse, le résultat final est fourni sous la forme "ns" pour non significatif.

Toutes les incertitudes sont données avec un facteur d'élargissement k =2.
(5) Le volume prélevé avec le symbole « * » indique un temps de prélèvement réduit selon le temps nécessité.

ALGADE décline sa responsabilité sur les données fournies par le client (volume, taux d'aspiration, dates de pose et dépose).

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L'accréditation par le COFRAC atteste de la compétence du laboratoire pour les analyses couvertes par l'accréditation.
Ce rapport ne concerne que les objets soumis à essais tels qu'ils ont été reçus.

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ALGADE

Laboratoire
Environnement et Dosimétrie

Edition du : 13/07/2022

Global Atomic Corporation

Année 2022

Tableau "EAP"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ENERGIE ALPHA POTENTIELLE VOLUMIQUE DUE AUX DESCENDANTS A VIE COURTE DU RADON 222 "EAPv Rn 222" ET DU RADON 220 "EAPv Rn 220" **

Unité en nanojoule par m³ d'air (nJ/m³)

Réseau de mesure

Type **Divers**

Stations	Analyse	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	EAPv Rn 222	55	62	50	45	n.s.								53	44	
	EAPv Rn 220	47	57	33	27	n.s.								41	46	
Station 2	EAPv Rn 222	95	103	88										99	58	
	EAPv Rn 220	41	92	90										74	42	
Station 3	EAPv Rn 222	79	84	54	55	45								64	56	
	EAPv Rn 220	43	91	29	28	32								44	38	
Station 4	EAPv Rn 222	81		87	79	136								96	66	
	EAPv Rn 220	58		31	38	74								50	41	
Station 5	EAPv Rn 222	68	63	39	32	31								47	82	
	EAPv Rn 220	39	69	26	23	15								35	35	

* Mesure intégrée avec dosimètre alpha de site (Norme NF EN ISO 11665-2)
n.s. : Valeur non significative, résultat non exploitable.
Stations sans résultats: Pas de suivi sur la période.

ALGADE

Laboratoire
Environnement et Dosimétrie

Global Atomic Corporation

Année 2022

Tableau "EAVL"

SURVEILLANCE RADIOLOGIQUE DE L'ATMOSPHERE

*ACTIVITE ALPHA VOLUMIQUE TOTALE DES POUSSIERES EN SUSPENSION DANS L'AIR **

Unité mBq/m³ d'air

Edition du : 13/07/2022

Réseau de mesure

Type **Divers**

Stations	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle 2022	2021	2020
Station 1	<=0.2	<=0.2	<=0.4	<=0.5	n.s.								0.2	0.2	
Station 2	<=0.2	<=0.3	<=0.2										0.1	0.2	
Station 3	<=0.2	<=0.2	<=0.3	<=0.2	<=0.4								0.1	0.1	
Station 4	<=0.9		<=0.3	0.3	<=0.8								0.3	0.2	
Station 5	<=0.2	<=0.2	<=0.3	<=0.2	<=0.5								0.1	0.1	

* Mesure intégrée avec dosimètre alpha de site
Pour le calcul des moyennes, si le résultat est < x, prendre x/2
Stations sans résultats: Pas de suivi sur la période.
N.S. : Valeur non significative, résultat non exploitable.

APPENDIX II: RESULTS OF THE EXTERNAL GAMMA AND BETA RADIATION DOSE ASSESSMENT

LIST OF STATIONS OF MONITORING RADIOLOGY OF THE ENVIRONMENT

1. ENV Station1: Global Atomic Camp (Life Base)
2. ENV Station 2: Mine Site
3. ENV Station 3: TAGAZA Village
4. ENV Station 4: AGATARA Village
5. ENV Station 5: New Global Atomic Camp

Results External exposure assessment from June 2021 to August 2021

REPUBLIQUE DU NIGER

Fraternité – Travail – Progrès

PRESIDENCE DE LA REPUBLIQUE

HANEA

HAUTE AUTORITE NIGERIENNE A L'ENERGIE ATOMIQUE

LABORATOIRE DE DOSIMETRIE EXTERNE

FICHE DE TRANSMISSION DES RESULTATS DE LA DOSIMETRIE D'AMBIANCE

PERIODE DE SURVEILLANCE : JUIN-JUILLET –AOUT 2021

INSTITUTION BENEFICIARE : GLOBAL

IDENTIFICATION DES DOIMETRES			DOSES ENREGISTREES µSv		INTERPRETATION
No	EN DESIGNATION	NUMERO	Hp(0,07)	Hp(10)	
1	Station 1	3053	749,94	753,64	I
2	Station 2	3046	1037,9	1316,3	I
3	Station 3	3043	565,37	550,88	I
4	Station 4	3017	626,82	1147,9	I

NB : si la dose est inférieure à 100 µSv qui est la dose le seuil d'enregistrement : elle est équivalente à zéro.

Catégorie d'interprétation des résultats

Catégorie I :

Le résultat du contrôle est conforme aux normes ou règles de sécurité actuellement en vigueur.

Catégorie II :

Le résultat du contrôle indique un dépassement des normes ou règles de sécurité, mais sans conséquence pour la sécurité des travailleurs.

Catégorie III :

Le résultat indique un dépassement des normes ou règles de sécurité, qui devra faire l'objet d'une surveillance particulière jusqu'au retour à la situation normale.

Signature et cachet du Chef service dosimétrie

KANE ISSA

HANEA DOSIMETRIE Chef Service

Results External exposure assessment from September 2021 to November 2021

REPUBLIQUE DU NIGER

Fraternité – Travail – Progrès

PRESIDENCE DE LA REPUBLIQUE

HAUTE AUTORITE NIGERIENNE
A L'ENERGIE ATOMIQUE

LABORATOIRE DE DOSIMETRIE EXTERNE

FICHE DE TRANSMISSION DES RESULTATS DE LA DOSIMETRIE D'AMBIANCE

PERIODE DE SURVEILLANCE : SEPTEMBRE-OCTOBRE-NOVEMBRE 2021

INSTITUTION BENEFICIARE : GLOBAL URANIUM

IDENTIFICATION DES DOIMETRES			DOSES ENREGISTREES EN µSv		INTERPRETATION
No	DESIGNATION	NUMERO	H(0,07)	H(10)	
1	Station 1	1651	436,26	436,26	I
2	Station 2	1632	391,26	391,26	I
3	Station 3	1518	881,43	881,43	I
4	Station 4	1544	502,11	502,11	I
5	Station 5	1513	455,66	455,66	I
6	Station 6	1526	3344,7	3344,7	I

NB : si la dose est inférieure à 100 µSv qui est la dose le seuil d'enregistrement : elle est équivalente à zéro.

Catégorie d'interprétation des résultats

Catégorie I :

Le résultat du contrôle est conforme aux normes ou règles de sécurité actuellement en vigueur.

Catégorie II :

Le résultat du contrôle indique un dépassement des normes ou règles de sécurité, mais sans conséquence pour la sécurité des travailleurs.

Catégorie III :

Le résultat indique un dépassement des normes ou règles de sécurité, qui devra faire l'objet d'une surveillance particulière jusqu'au retour à la situation normale.

Signature et cachet du Chef service dosimétrie

KANE ISSA

HANEA DOSIMETRIE

Results External exposure assessment from December 2021 to February 2022

REPUBLIQUE DU NIGER

Fraternité – Travail – Progrès

PRESIDENCE DE LA REPUBLIQUE

HANEA

HAUTE AUTORITE NIGERIENNE A L'ENERGIE ATOMIQUE

LABORATOIRE DE DOSIMETRIE EXTERNE

Période de surveillance : *Décembre - Janvier – Fevr 2021 Et 2022*

Nom de l'organisation : **GLOBAL ATOMIC CORPORATION**

LES RESULTATS BRUTS DE LA SURVEILLANCE ENVIRONNEMENTALE

N°	Stations	Numéros des dosimètres	ii en micro sievert	iii en micro sievert
1	**Station 1**	**1268**	465	597
2	**Station 2**	**0741**	554	313
3	**Station 3**	**1273**	60	77
4	**Station 4**	**0568**	60	102
5	**Station 5**	**1000**	629	524

Chef service dosimétrie

MR ISSA KANE

HANEA DOSIMETRIE

Results External exposure assessment from March 2022 to May 2022

REPUBLIQUE DU NIGER

Fraternité – Travail – Progrès

PRESIDENCE DE LA REPUBLIQUE

HAUTE AUTORITE NIGERIENNE A L'ENERGIE ATOMIQUE

LABORATOIRE DE DOSIMETRIE EXTERNE

Période de surveillance : *Mars- Avril– Mai 2022*

Nom de l'organisation : GLOBAL ATOMIC CORPORATION

LES RESULTATS BRUTS DE LA SURVEILLANCE ENVIRONNEMENTALE

N°	Stations	Numéros des dosimètres	ii en micro sievert	iii en miro sievert
1	Station 1	1276	355	214
2	Station 2	3047	114	137
3	Station 3	3079	97	134
4	Station 4	0719	343	802
5	Station 5	3063	108	168

Chef service dosimétrie

MR ISSA KANE

HANEA DOSIMETRIE Chef Service

APPENDIX III: RESULTS OF RADIOLOGICAL ANALYSES OF GROUNDWATER

LIST OF WATER SAMPLING POINTS

1. INALAMANE village borehole Sample identification: ALG2105-303
2. TAGAZA village borehole Sample identification: ALG2105-304
3. Drilling Camp Global Atomic (Base Life) Sample ID: ALG2105-305
4. FORACO Drilling Sample identification: ALG2105-306
5. AGATARA village borehole Sample identification: ALG2105-307
6. INBAKATAN village borehole Sample identification: ALG2105-308
7. Global drilling ELAGOZAN- ISAKANAN Sample identification: ALG2105-309
8. Drilling of a Tuareg individual next to the tar pit Sample ID: ALG2105-310
9. Drilling Ex Camp FORACO Sample identification: ALG2105-311

Results of radiological analysis of Global Atomic borehole water (base camp)

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-305-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLOBAL ATOMIC CORPORATION
DIN
Koira Kano Nord

- NIAMEY
NIGER

Le rapport établi ne concerne que les échantillons soumis à l'essai tels qu'ils ont été reçus. Il comporte 2 pages.
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Les paramètres sous-traités sont identifiés par (*).

Identification Echantillon : ALG2105-305
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE10
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage Camp Global Atomic (Base vie)

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58
Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (*)	0.019	Bq/l	0.009	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	0.07	Bq/l	0.24	0.04	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.24	Bq/l	0.08	0.08	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (*)	0.6	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

1 L'absence du logo Cofrac provient d'un délai de mise en analyse par rapport au prélèvement supérieur aux exigences normatives.

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Results of radiological analysis of the water from the former FORACO camp

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-311-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLO AL ATOMIC CORPORATION
IN
Koira Kano Nord
- NIAMEY
NIGER

Le rapport établi ne concerne que les échantillons soumis à l'essai tels qu'ils ont été reçus. Il comporte 2 pages.
ALGADE désengage sa responsabilité sur les données fournies par le client (libellé échantillon, date et lieu de prélèvement et volume prélevé le cas échéant).
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L'accréditation du COFRAC atteste de la compétence des laboratoires pour les seuls essais couverts par l'accréditation, identifiés par le symbole #.
Les paramètres sous-traités sont identifiés par (*).

Identification Echantillon : ALG2105-311
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE20
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage Ex Camp Foraco

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (*)	0.022	Bq/l	0.009	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	1.05	Bq/l	0.28	0.05	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.37	Bq/l	0.11	0.07	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (*)	0.7	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

1 L'absence du logo Cofrac provient d'un délai de mise en analyse par rapport au prélèvement supérieur aux exigences normatives.

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT
Technicien de Laboratoire

Results of radiological analysis of the FORACO borehole water

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-306-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLOBAL ATOMIC CORPORATION
DIN
Koira Kano Nord
-
NIAMEY
NIGER

Identification Echantillon : ALG2105-306
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE12
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage Foraco citernage

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (*)	0.028	Bq/l	0.011	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	1.92	Bq/l	0.52	0.04	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.44	Bq/l	0.13	0.08	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (*)	0.9	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

1 L'absence du logo Cofrac provient d'un délai de mise en analyse par rapport au prélèvement supérieur aux exigences normatives.

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Results of radiological analysis of the GLOBAL ELAGOZAN-ISAKANAN borehole

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-309-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLOBAL ATOMIC CORPORATION
DIN
Koira Kano Nord
-
NIAMEY
NIGER

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Les paramètres sous-traités sont identifiés par (*).

Identification Echantillon : ALG2105-309
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE17
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage Global Elagozan-Isakanan

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (*)	0.022	Bq/l	0.009	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	1.26	Bq/l	0.34	0.04	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.36	Bq/l	0.11	0.08	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (*)	0.7	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

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Expression des résultats :
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Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT
Technicien de Laboratoire

Results of radiological analysis of water from a private well in TAGAZA

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-310-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLOBAL ATOMIC CORPORATION
DIN
Koira Kano Nord

- NIAMEY
NIGER

Le rapport établi ne concerne que les échantillons soumis à l'essai tels qu'ils ont été reçus. Il comporte 2 pages.
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Les paramètres sous-traités sont identifiés par (*).

Identification Echantillon : ALG2105-310
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE18
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage d'un particulier Touareg à côté du goudron

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58
Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (*)	0.047	Bq/l	0.009	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	0.37	Bq/l	0.11	0.03	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.24	Bq/l	0.08	0.07	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (*)	1.5	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

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Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Results of radiological analysis of the AGATARA village borehole

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-307-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLOBAL ATOMIC CORPORATION
DIN
Koira Kano Nord

- NIAMEY
NIGER

Le rapport établi ne concerne que les échantillons soumis à l'essai tels qu'ils ont été reçus. Il comporte 2 pages.
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Les paramètres sous-traités sont identifiés par (°).

Identification Echantillon : ALG2105-307
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE15
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage du village de Agatara

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (°)	0.025	Bq/l	0.010	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	2.76	Bq/l	0.74	0.03	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	1.31	Bq/l	0.36	0.08	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (°)	0.8	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

1 L'absence du logo Cofrac provient d'un délai de mise en analyse par rapport au prélèvement supérieur aux exigences normatives.

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT
Technicien de Laboratoire

Results of radiological analysis of the borehole of the village of INBAKATAN

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-311-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLO AL ATOMIC CORPORATION
IN
Koira Kano Nord
- NIAMEY
NIGER

Le rapport établi ne concerne que les échantillons soumis à l'essai tels qu'ils ont été reçus. Il comporte 2 pages.
ALGADE désengage sa responsabilité sur les données fournies par le client (libellé échantillon, date et lieu de prélèvement et volume prélevé le cas échéant).
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Les paramètres sous-traités sont identifiés par (°).

Identification Echantillon : ALG2105-311
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE20
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage Ex Camp Foraco

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (°)	0.022	Bq/l	0.009	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	1.05	Bq/l	0.28	0.05	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.37	Bq/l	0.11	0.07	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (°)	0.7	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

1 L'absence du logo Cofrac provient d'un délai de mise en analyse par rapport au prélèvement supérieur aux exigences normatives.

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Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Avenue du Brugeaud - 87250 Bessines-sur-Gartempe - Tél. (33) 05 55 60 50 00 - Fax (33) 05 55 60 50 59
S.A.S au capital de 996.200 Euros - R.C.S Limoges B 389 321 746 - Siret 389 321 746 00015

Results of radiological analysis of the borehole of the village of INALAMANE

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-311-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLO AL ATOMIC CORPORATION
IN
Koira Kano Nord
- NIAMEY
NIGER

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Les paramètres sous-traités sont identifiés par (°).

Identification Echantillon : ALG2105-311
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE20
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage Ex Camp Foraco

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (°)	0.022	Bq/l	0.009	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	1.05	Bq/l	0.28	0.05	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.37	Bq/l	0.11	0.07	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (°)	0.7	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

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Expression des résultats :
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Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

S.A.S au capital de 996.200 Euros - R.C.S Limoges B 389 321 746 - Siret 389 321 746 00015

Results of radiological analysis of TAGAZA village borehole water

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 04/06/2021
ALG2105-311-V1

A l' attention du chargé d'affaire Frédéric SARRADIN
Pour le client GLO AL ATOMIC CORPORATION
IN
Koira Kano Nord
- NIAMEY
NIGER

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Les paramètres sous-traités sont identifiés par (*).

Identification Echantillon : ALG2105-311
Identification dossier : ALG21-445
Libellé Echantillon Client : N°EE20
Matrice : Eau propre
Date de prélèvement : 27/03/2021
Lieu de prélèvement : Forage Ex Camp Foraco

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 21/05/2021

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : ALG-SST								
Potassium 40 (*)	0.022	Bq/l	0.009	0.016	28/05/2021	Calcul		
Analyse réalisée par : LAE								
Activite alpha globale	1.05	Bq/l	0.28	0.05	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Activite beta globale	0.37	Bq/l	0.11	0.07	01/06/2021	Compteur à gaz proportionnel	NF EN ISO 10704	1
Analyse réalisée par : METAUX								
Potassium dissous (*)	0.7	mg/l K+			27/05/2021	ICP/AES après filtration	NF EN ISO 11885	1

ABSENCE DU LOGO COFRAC

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Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
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Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

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Technicien de Laboratoire

APPENDIX IV: SOIL ANALYSIS RESULTS

Result Soil Analysis Sample ES01

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-47-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

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Les paramètres sous-traités sont identifiés par (*).

Identification Echantillon : ALG2008-47	N° d'affaire : GLATO 60
Identification dossier : ALG20-654	Référence Contrat : ALGC20-58
Libellé Echantillon Client : ES01	
Matrice : Sols	
Date de prélèvement :	Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	1.70	mg/kg MS	0.51	1.00	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Result Soil Analysis Sample ES02

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-48-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

Identification Echantillon : ALG2008-48
Identification dossier : ALG20-654
Libellé Echantillon Client : ES02
Matrice : Sols
Date de prélèvement :

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	1.69	mg/kg MS	0.51	1.00	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Result Soil Analysis Sample ES03

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-49-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

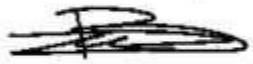
Identification Echantillon : ALG2008-49	N° d'affaire : GLATO 60
Identification dossier : ALG20-654	Référence Contrat : ALGC20-58
Libellé Echantillon Client : ES03	
Matrice : Sols	
Date de prélèvement :	Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	4.28	mg/kg MS	1.28	1.00	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire



Result Soil Analysis Sample ES04

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-50-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

Identification Echantillon : ALG2008-50	N° d'affaire : GLATO 60
Identification dossier : ALG20-654	Référence Contrat : ALGC20-58
Libellé Echantillon Client : ES04	
Matrice : Sols	
Date de prélèvement :	Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	<0.99	mg/kg MS	-	0.98	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Result Soil Analysis Sample ES05

Laboratoire d'Analyses Environnementales (LAE)
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Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-51-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

Identification Echantillon : ALG2008-51
Identification dossier : ALG20-654
Libellé Echantillon Client : ES05
Matrice : Sols
Date de prélèvement :

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	2.00	mg/kg MS	0.60	1.00	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Result Soil Analysis Sample ES06

Laboratoire d'Analyses Environnementales (LAE)
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Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-52-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

Identification Echantillon : ALG2008-52	N° d'affaire : GLATO 60
Identification dossier : ALG20-654	Référence Contrat : ALGC20-58
Libellé Echantillon Client : ES06	
Matrice : Sols	
Date de prélèvement : 20/03/2020 à 00h00	Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	<0.99	mg/kg MS	-	0.98	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Result Soil Analysis Sample ES07

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-53-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

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NIAMEY NIGER

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Identification Echantillon : ALG2008-53	N° d'affaire : GLATO 60
Identification dossier : ALG20-654	Référence Contrat : ALGC20-58
Libellé Echantillon Client : ES07	
Matrice : Sols	
Date de prélèvement : 20/03/2020 à 00h00	Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	<0.99	mg/kg MS	-	0.98	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Result Soil Analysis Sample ES08

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-54-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

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Koira Kano Nord BP 10.539
NIAMEY NIGER

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Les paramètres sous-traités sont identifiés par (*).

Identification Echantillon : ALG2008-54
Identification dossier : ALG20-654
Libellé Echantillon Client : ES08
Matrice : Sols
Date de prélèvement : 21/03/2020 à 00h00

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	1.59	mg/kg MS	0.48	1.00	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire

Result Soil Analysis Sample ES09

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-55-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

Identification Echantillon : ALG2008-55
Identification dossier : ALG20-654
Libellé Echantillon Client : ES09
Matrice : Sols
Date de prélèvement : 21/03/2020 à 00h00

N° d'affaire : GLATO 60
Référence Contrat : ALGC20-58

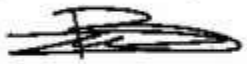
Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	2.70	mg/kg MS	0.81	1.00	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

Francis BEREIZIAT

Technicien de Laboratoire



Result Soil Analysis Sample ES10

Laboratoire d'Analyses Environnementales (LAE)
4 avenue Jean Moulin - 69200 Vénissieux

Laboratoire Environnement et Dosimétrie (LED)
Avenue du Brugeaud - 87250 Bessines-sur-Gartempe

Rapport d' Essais

Edité le : 19/08/2020
ALG2008-56-V1

A l' attention du chargé d'affaire Frédéric SARRADIN

Pour le client GLOBAL ATOMIC CORPORATION
Koira Kano Nord BP 10.539
NIAMEY NIGER

Identification Echantillon : ALG2008-56	N° d'affaire : GLATO 60
Identification dossier : ALG20-654	Référence Contrat : ALGC20-58
Libellé Echantillon Client : ES10	
Matrice : Sols	
Date de prélèvement : 21/03/2020 à 00h00	Date réception laboratoire : 31/07/2020

Paramètre	Résultats A	Unité	Incertitude élargie U(A) k=2	Limite de Détection LD	Date de la mesure	Méthode	Norme	cofrac
Analyse réalisée par : LAE								
Uranium total	3.50	mg/kg MS	1.05	1.00	14/08/2020	ICP/MS après minéralisation aux micro-ondes	Méthode interne	

Expression des résultats :
Si A est inférieur ou égal à SD alors le résultat est exprimé sous la forme : < SD
Si A>SD alors le resultat est exprimé sous la forme : A±U(A)
Avec SD : Seuil de décision, LD : Limite de détection, A : Activité, U(A) : Incertitude élargie associée à A.

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URANIUM DEPOSIT EXPLOITATION PROJECT OF THE *"ADRAR EMOLES 3"*

RESEARCH PERMIT

CULTURAL AND ARCHEOLOGICAL HERITAGE IN THE PROJECT AREA

March 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

CELTHO:	Centre for Linguistic and Historical Studies by Oral Tradition
CNR:	National Research Centre
CNRS:	Nigerien Centre for Research in Human Science
IRSH:	Institute for Research in Human Science
MCAL/PEA:	Ministry of Culture, Arts and Leisure and promotion of artistic entrepreneurship
MCC:	Ministry of Communication and Culture
MNBH:	Boubou Hamma National Museum
ORSTOM:	Office de Recherche Scientifique et Technique d'Outre-Mer
NCCR:	Presidency of the Republic of Niger

1. INTRODUCTION

To comply with the uranium mining project of the "ADRAR EMOLES 3" research permit with IFC performance standards and the principles of Ecuador, it requested the update of the Environmental and Social Impact Assessment (ESIA) of the said project. The latter includes the cultural and archaeological heritage component that will make it possible to assess the situation of the existing potential in the Agadez region in general and at the level of the site concerned by the project in particular. This is the purpose of this report, which is structured around two parts below:

- Reminder of the objectives;
- Expected results;
- Methodology;
- Reminder of the legal and institutional framework governing cultural heritage;
- Heritage potential of the region;
- Results of field visits;
- General considerations on the heritage sites of the project area;
- Potential impacts of the project on cultural and archaeological heritage;
- Mitigation and/or enhancement measures;
- Procedures in case of fortuitous discovery;
- Conclusion.

2. REMINDER OF OBJECTIVES

The main objectives related to the heritage component are:

- Conduct literature searches;
- Conduct community consultations to identify the cultural and archaeological sites existing in the project area and precisely at the level of the exploitation permit;
- Visit cultural sites;
- Visit the site of the rock engravings of Dabouss to geo-reference the site;
- Prepare a report and incorporate all observations made.

3. EXPECTED RESULTS

At the end of the study on the cultural and archaeological heritage component of the project area, the following results are achieved:

- Documentary research is carried out in order to have the situation at the regional level;
- Community consultations are conducted with a view to identifying the cultural and archaeological sites existing in the project area and precisely at the level of the exploitation permit;
- Sites identified during community consultations are visited, photographed and georeferenced;
- The site of rock engravings of giraffes of Dabous is visited and georeferenced;
- A report is prepared and the comments made are taken into account.

4. METHODOLOGY

To carry out this work, the methodological approach used includes the literature search, community consultations on the basis of a questionnaire developed for this purpose and the field visit which concerned all the sites identified.

5. REMINDER OF THE LEGAL AND INSTITUTIONAL FRAMEWORK GOVERNING CULTURAL HERITAGE

5.1. Legal framework

Niger has an important system for the protection and conservation of the rich cultural heritage, both tangible and intangible. This includes the international and national legal framework.

5.1.1. International legal framework

Niger has acceded to several international texts relating to the conservation, enhancement and protection of cultural heritage in all its tangible and non-tangible aspects these include:

- The 1954 Convention for the Protection of Cultural Property in the Event of Armed Conflict;
- The Convention on the Means of Prohibiting and Preventing the Illicit Import, Exploitation and Transfer of Cultural Property adopted on 14 November 1970 in Paris;
- The 1972 Convention for the Protection of the World Cultural and Natural Heritage;
- The 2003 Convention for the Safeguarding of the Intangible Cultural Heritage;
- The 2005 Convention on the Expression of Cultural Diversity;
- The code of local authorities;
- The Cultural Charter of Africa adopted in 1979.

In addition, the International Finance Corporation (IFC) it contains a series of 8 recommendations that define performance standards on sustainable social and environmental development. These recommendations are binding on the World Bank's clients. Performance Criterion 8 recognizes the importance of cultural heritage for current and future generations. The objectives of this criterion are:

- Protect cultural heritage from the negative impacts of project activities and support its conservation;
- Promote the equitable distribution of the benefits of the use of cultural heritage in commercial activities.

Finally, the International Council of Museums (ICOM) Code of Ethics on the acquisition of cultural property by museums and other museum institutions also contributes to the protection of the cultural heritage of a country like Niger.

5.1.2. National legal framework

The national legal framework governing cultural and archaeological heritage consists of:

- Constitution of 25 November 2010: Articles 37 and 41 of this constitution concern cultural and natural heritage: Article 37 states: "National and international companies have the obligation to comply with the legislation in force in environmental matters. They are obliged to protect human health and to contribute to the safeguarding and improvement of the environment. Article 41

states that public property is sacred and inviolable. Everyone must scrupulously respect them and protect them. Any act of sabotage, vandalism, corruption, embezzlement, squandering etc. is punishable by law.

- Law No. 97-022 of 30 June 1997 on the conservation, protection and enhancement of cultural heritage and its implementing decree No. 97-407/PRN/MCC/MERST/IA of 10 November 1997;
- Decree No. 2008-051/PRN/MCALPEA of 28 February 2008 approving the declaration of national cultural policy;
- Ordinance No. 2009-24 of 3 November 2009 on the Orientation Law on Culture.

5.2. Institutional framework

The actors involved in the management of cultural and archaeological heritage are:

- Ministry in charge of culture;
- Ministry in charge of Higher Education;
- Boubou Hama National Museum (MNBH);
- Institute for Research in Human Science (IRSH) and its bases in Agadez and Maradi;
- Centre for Linguistic and Historical Studies by Oral Tradition (CELTHO);
- Regional Museums of Zinder and Dosso;
- National Archives of Niger in Niamey and in the old circles;
- Institute of Isotope Radios (IRI) of the Abdou Moumouni University of Niamey;
- Decentralized services of the Minister in charge of culture;
- Ministry of Mines;
- Local authorities.

In addition to these institutions, we can mention the Nigerien National Commission for UNESCO and the IUCN representation in Niger. Through their material and financial support for the protection and enhancement of the cultural heritage of all member countries, they constitute a second category of institutions responsible for the cultural heritage of Niger.

6. HERITAGE POTENTIAL OF THE REGION

Niger has a heritage of immense richness both in its diversity and in its originality and authenticity located in all regions including Agadez.

Pre-Saharan land, the region of Agadez was green and humid millions of years ago, attests to the presence demonstrated by the various research carried out, skulls of crocodilians, trunks of silicified trees and the cemetery of dinosaurs.

Indeed, the human presence has been attested for several millennia. Thus, prehistoric man left us on the rocks, images through drawings and engravings that allow us to trace the history of ancient settlements.

In Niger from independence to the present day, we note that few inventories have been carried out by the Ministry in charge of Culture in the field of cultural heritage. The most important are those carried out in 1979-1980 and 1989-1990.

Thus, the inventory of 1979-80 focused on the safeguarding of the archaeological cultural heritage and that of 1989-90 on sites, historical monuments, movable objects, sacred places of worship, mystical tombs, festivals and traditional sports.

In the region of Agadez, the Paleolithic industry is mentioned at the level of several areas including Kawar and Djado between 30 thousand and 17 thousand years before today.

Concerning the Neolithic, it was discovered on Mount Bagazan, a 10 thousand year old Neolithic deposit that is one of the oldest in the domestication of nature by man.

During this Neolithic period, the lithic industry reached its peak, especially in the perfection of the tools produced in the countless workshops of the desert areas. It was during this period that engravings and cave paintings made their appearance.

The mastery of metallurgy in the region is of great importance and one of the great moments of human civilization.

The results of the research carried out have made it possible to attest to the presence of a 4000-year-old copper metallurgy (Afunfun, tiguidit cliff). To the east of the Tiguidit valley, it was noticed, the presence of a bronze metallurgy.

The considerable achievements of the ancient populations who had lived in the desert in terms of metallurgy, Neolithic, lithic industries, art and rock painting show how much this space was truly an important hotbed of civilization.

The main axes of archaeological research have concerned paleontology, prehistory, post-Neolithic, the age of metals of the ancient period and the contemporary period.

In all these areas, research and discoveries have been carried out under the administrative guidance and/or scientific and technical collaboration of the Institute for Research in Human Science (IRSH).

Among these discoveries we can note:

- Dinosaur and crocodilian deposits among the most important in the world dating from 150 million to 100 million years ago in the south of the Air Massif, notably in

Gadafoua southeast of Agadez by Philippe TAQUET of the Museum of Natural History in Paris from 1965 to 1975, by Neumann in 1983 and by Paul SERENO from 1993;

- Environmental pale and climatic pale deposits of the Air and Téneré, Tafassasset, Kawar and Djado massifs by researchers from ORSTOM, CNRS;
- Aterian Paleolithic deposits in the Adrar Bous and especially in the Kawar and Djado;
- Acheulean Paleolithic deposits dating from 34 thousand years to 60 thousand years;
- Prehistoric research in the Ténéré, the eastern edges of the Massif de l'Air on the paleoclimate, the Acheulean, the Neolithic, rock art and the beginnings of iron metallurgy;
- Rock art stations of the Massif de l'Air and Djado by Christian SINCE from CRNS;
- etc.

7. FIELD VISIT RESULTS

The visit to the project site made it possible to identify the existing heritage in certain villages in perfect consultation with the local communities.

In view of the richness and diversity of the cultural heritage existing in the region and especially in the project area, hypotheses can be made that during major works fortuitous discoveries can be obtained.

Incidental discoveries are governed by Law No. 97-22 of 30 June 1997 on the protection, conservation and enhancement of the national cultural heritage and its implementing decree No. 97-407/PRN/MCC/MERST/A of 1 November 1997.

7.1. Description of sites identified by village

The sites identified at the village level where the consultations were held with their geographical coordinates are given in Table 1 below.

Table 1 Identified Sites

NAME OF THE VILLAGE	SITE NAME	TYPE OF SITE	GEOGRAPHIC COORDINATES
Tagaza	Gani (Mouloud)	Cultural space	N : 17°43.88' E : 07°33.53'
	Engravings (Ali Gourane)	Prehistoric	N : 17°43.76' E : 07°37.30'
	Old Cemetery	Cultural	N : 17°45.40' E : 07°38.75'
	Dinosaur tracks	Paleontological	N : 17°47.85' E : 07°36.36'
	Old well location with trough supports (stone blocks)	Historical	N: 17, 77217° E: 07.68478°
Eghatrak	Rock carvings	Prehistoric	N : 17°49.71' E : 07°37.32'
	Ancient mosque (ruins)	Cultural	Number : 17°48.60' E : 07°35.88'
	Dinosaur tracks	Paleontological	Number : 17°42.85' E : 07°35.81'
Temilt -Dabous	Rock engravings (Giraffes of Dabous)	Prehistoric	N : 17°53.23' E : 07°37.70'
Gados	Rock carvings (Giraffes)	Prehistoric	N : 17°52.15' E : 07°44.10'
	Rock carvings (tifinagh)	Prehistoric	
	Old cemetery	Cultural	N : 17°52.45' E : 07°43.62'

7.1.1. Village of Tagaza

The description of the sites identified at the village level of Tagaza is indicated below.

- *Gani space*

Gani is a religious festival organized every year in commemoration of the birth of the Prophet Muhammad (peace and blessings be upon him) by the communities in the region of Agadez like the countries. Thus at the level of the village of Tagaza this ritual is organized on a space dedicated to this purpose on a plateau a few kilometers from the

village. All the populations of the village and those surrounding converge on this cultural space to commemorate this great event of importance. This meeting strengthens social cohesion and Islamic culture.

However, communities face a serious water supply problem during religious meetings. Management is carried out by the population.

Photo 1 Gani (Mouloud space)1

- *Aligourane*

The engravings of this site are constituted as we see of representations of the fauna with styles that probably existed in the area. There are several patterns on the rocks.

Photo 1 Rock engravings-Aligourane

- *Old cemetery*

This ancient cemetery site offers a set of tombs lined up on both sides.

Photo 2 Old cemetery (Islamic-type group of graves)

- *Dinosaur footprints*

They probably date back several millennia according to the information provided by the populations. As can be seen, these footprints undergo degradation due to natural phenomena.

Photo 3 Dinosaur borrowings4

- *Old well location*

This well existed long before the arrival of settlers in the area and continued to be operational until the time of the revolt of the great warrior Kaocen in 1926-1917. But the well as such does not exist; there are only a few stones that served as a support for the drinkers. The location of this well is 7 km east of the village.

Photo 5 Ancient well site of Tagaza

7.1.2. Village de Eghatrak

- *Old cemetery*

This site includes Islamic-type tombs on a vast area whose date is not established. Mais according to oral traditions, this cemetery had existed for several years.

Photo 6 Ancient cemetery (type tomb group, Islamic)

- *Rock carvings*

At this site of rock carvings, are represented giraffes and other animal species that existed in the area throughout these rocks.

Photo 7 Rock engravings

- *Old mosque*

This site is an old, ruined mosque built since time immemorial in the area, because the populations do not control the exact date of its construction (See photo 7 below).

Photo 8 Ruins of an old mosque

- *Dinosaur footprints*

These traces are those of dinosaurs that have existed for millennia according to the information collected on the spot.

Photo 9 Dinosaur borrowings

7.1.3. Village of Temilt – Daboss

- *Daboss giraffe*

Dabouss is a world-famous site because visited by tourists It is one of the important tourist assets of the Agadez region

We find on these rocks several motifs of animal spaces of which giraffes are the most represented, it is a site that is guarded and provides important income to tourist guides and children from the surroundings earn gifts of all kinds from tourists. It is also a site visited by schoolchildren. Photo 9 below illustrates the giraffes of Daboss.

Photo 10 Rock engravings

7.1.4. Village of Gadoss

- *Engravings*

This engraving depicts giraffes in a walking position, in picketing, the most remarkable of which has long legs and a long neck, and there is a certain degradation due to natural phenomena.

Photo 11 Rock engravings

- *Tifinar*

It is an inscription on this rock of the Tuareg script the Tifinar as shown in photo 12 below.

Photo 12 Rock engravings (tiginar)

- *Old cemetery*

This cemetery includes a group of Islamic-type graves that date back several years according to local oral traditions, so the date is not mastered but attests to the human presence in this area for a long time.

Photo 13 Ancient Cemetery (Islamic Tomb Group)

8. GENERAL CONSIDERATIONS ON HERITAGE SITES IN THE PROJECT AREA

Of all the sites identified only that of the large giraffes of Dabous is known and worldwide because attracting the visit of tourists and schoolchildren. The site of Dabouss is also managed by the community because there is even a guard guide.

The other sites are known by the communities but are not visited and have no management mechanism except the cultural space of Gani. All these sites have a public status because they belong to the entire community.

Overall, the state of conservation of these sites is acceptable despite some natural (erosion, wind) and human threats to denaturation.

9. POTENTIAL IMPACTS OF THE PROJECT ON CULTURAL AND ARCHAEOLOGICAL HERITAGE

The main potential negative impacts of the project on infrastructure:

- Site degradation networks due to the immense mobility of vehicles in the area;
- Pollution of the air that can act on the rock engravings;
- Waste (chemicals etc.) that can act on the sites;
- Destruction of fortuitous discoveries during major works.

10. MITIGATION AND/OR ENHANCEMENT MEASURES

The measures proposed to mitigate and/or enhance the impacts of the project are:

- Traffic planning;
- Take into account the probabilities of fortuitous discoveries during the great Tavaux;
- Create a tourist circuit concerning the existing cultural sites in the project area;
- Take the cultural heritage component in the environmental protection plan;
- Communicate with communities to better understand their achievements in the field of cultural heritage.

11. PROCEDURES IN CASE OF FORTUITOUS DISCOVERY

The procedures to be adopted in the event of incidental discoveries are governed and supported by Law No. 97-022 of 30 June 1997 on the protection, conservation and enhancement of the national cultural heritage in Title VII and Chapter 2 which stipulates that when as a result of work or any fact of cultural property that may be of interest to paleontology, prehistory, history, art, archaeology or numismatics are updated, the author of the discovery is required to make an immediate declaration to the administrative authority which notifies without delay the Minister in charge of Culture and the Minister in charge of research.

12. CONCLUSION

The region of Agadez contains a rich and varied cultural heritage and especially in the archaeological, prehistoric, and paleontological fields and the local populations are aware of the presence of this heritage on their territory.

It is also noted that Niger has taken measures to protect this rich heritage through international and national texts and by setting up an institutional framework for this purpose.

Regarding the project area, sites exist all around and deserve to be preserved and enhanced.

In view of the richness and variety of heritage attested by research, missions and expeditions in the field, one can probably project fortuitous discoveries of heritage objects in the area.

URANIUM DEPOSIT EXPLOITATION PROJECT OF THE *"ADRAR EMOLES 3"* RESEARCH PERMIT

STAKEHOLDER MOBILIZATION PLAN (PMPP)

March 2022

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ACRONYMS AND ABBREVIATIONS

NCEA:	National Environmental Assessment Office
UEY:	Informed Consultation and Participation
CR:	Regional Council
DRE/CLD:	Regional Directorate for the Environment and the Fight against Desertification
DREL:	Regional Directorate of Livestock
DRM:	Regional Directorate of Mines
GAFC:	Global Atomic Fuels Corporation
EAS/HS:	Sexual Exploitation and Abuse/Sexual Harassment
SEA:	Strategic Environmental Assessment
ESIA:	Environmental and Social Impact Assessment
ESIA:	Simple Environmental and Social Impact Assessment
ESDI:	Detailed Environmental and Social Impact Study
IFC:	International Finance Corporation
MGP:	Complaints Management Mechanism
NPE:	Environmental Performance Standard
NIES:	Environmental and Social Impact Notice
NGO:	Non-Governmental Organizations
CSOs:	Civil Society Organizations
PDES:	Economic and Social Development Plan
PEES:	Environmental and Social Commitment Plan
PGMO:	Workforce Management Procedures
PMPP:	Stakeholder Mobilization Plan
SDDCI:	Sustainable Development and Inclusive Growth Strategy
GBV:	Gender-Based Violence

INTRODUCTION

Sahelian country with an area of 1267000 ^{km2} and an estimated population of about 20 million inhabitants (INS, 2018). It faces multiple challenges in terms of socio-economic development. To address these challenges, several strategic documents have been developed and implemented. These include the Sustainable Development and Inclusive Growth Strategy (SDDCI) Niger 2035, the Economic and Social Development Plan PDES (2017-2021), the Mining Policy adopted in 2020, etc.
It is in this context that the company GLOBAL ATOMIC FUELS CORPERATION (GAFC) plans to put into operation the uranium deposit that it discovered on its research license "Adrar Emoles 3".

GLOBAL ATOMIC FUELS CORPERATION (GAFC) is a Canadian company that has been conducting mining research in Niger since 2007. It is considering the exploitation of the uranium deposit that it discovered in the "Adrar Emoles 3" research permit. This uranium deposit is located along the Agadez-Arlit road and is about 60 km NNW from the city of Tchirozérine, which houses the facilities of the Société Nigérienne du Charbon d'Anou-Araren. This location roughly corresponds to an area located halfway between the city of Agadez and the mining city of Arlit.

To make this operation internationally competitive, the preparation of this project is in compliance with the provisions of the Equator Principles which constitutes "*a financial sector reference for the determination, assessment and management of environmental and social risks of projects*" and the IFC Standards which " *requires its clients who benefit from its direct investments, (including project financing and corporate financing provided through financial intermediaries), to apply performance standards to manage environmental and social risks and impacts in a way that enhances development opportunities*."

In this sense, Ecuador's compliance with Principle 5 and IFC Standard No. 1 have made stakeholder engagement an obligation in terms of information and participation (including the establishment of a complaints management mechanism).

It is in compliance with these provisions, which are also in line with national legislation on environmental and social assessment on public participation, that this *Stakeholder Mobilization Plan (PMPP)* document is developed. It makes it possible to identify the different stakeholders of the project, inform them about the preparation, collect their concerns, define their roles and responsibilities in the implementation, the deadlines for the execution of the activities and the costs of the consultations.

The provisional report is based on the following points:

- Introduction
- Presentation of the Project
- Objectives and expected results of the study
- Regulatory framework for stakeholder consultations
- Potential impacts and risks

- Identification of stakeholders
- Stakeholder Engagement Program
- Complaints Management Mechanism;
- Implementation of the PMPP;
- Conclusion

1. PRESENTATION OF THE PROJECT

1.0. Presentation of the promoter

Global Atomic Corporation, is a corporation incorporated under the laws of Canada, which holds six (06) mining research licences for uranium and related substances. It has been present in Niger since 2007 where it conducts mineral exploration activities in the Agadez region from its country office located in Niamey and its liaison office located in Agadez.

In accordance with the provisions of the Treaty of the Organization for the Harmonization of Business Law in Africa (OHADA), the operations of the company's activity in Niger are managed by a company under Nigerien law called *Global Uranium Niger Inc. which was* created in 2009.

The address of this company is as follows:

- Headquarters: Koira Kano North, Island 5724
- BP: 10,539 Niamey, Niger
- Tel.:0022720370013
- Fax: 0022720370014
- Website: www.globalatomiccorp.com

1.2. Presentation of the Project

The Company Global Atomic Corporation, a Canadian company, which has been conducting mining research in Niger since 2007, is considering the exploitation of the uranium deposit that it discovered in the "Adrar Emoles 3" research permit.

The area of the operating permit, object of this project covers an area of 25.01 km² and is located in the Rural Commune of Tchirozérine (Department of Tchirozérine, Region of Agadez.

The geographic coordinates (Latitude/Longitude, ADINDAN – Clarke 1880) of the tops of the permit perimeter are given in Table 1 below. Figure 1 illustrates this on a topographical background.

Table 1 Coordinates of the peaks of the perimeter of operation

Point	Longitude	Latitude
Has	7° 39' 59, 8''	17° 50' 08''
B	7° 42' 50''	17° 50' 08''
C	7° 42' 50''	17° 47' 26''
D	7° 39' 59, 8''	17° 47' 26''

1.3. Project Objectives

The general objective of the project is the exploitation of the uranium deposit discovered in the "Adrar Emoles 3" research permit.

The specific objectives are:

- Build and install permanent surface infrastructures (life base, buildings including administrative and technical blocks, sanitary facilities, water and electricity

networks, basins, various workshops and garages, shops and warehouses of various products and equipment, etc.);

- Build the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) as well as all the installations associated with it (garage, workshops, crushing device, various cables, signals, instructions, etc.);
- Build the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouses, various networks, contact for the production of sulfuric acid, hydraulic works, worms, different input storage areas, etc.);
- Process the ore to obtain uranate, feed it and transport it to potential outlets;
- Create temporary and permanent jobs and contribute to the improvement of people's living conditions;
- Contribute significantly to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors;
- Redevelop all the sites operated when the project closes.

1.4. Expected results

The main expected results of the project implementation are:

- permanent surface infrastructures (life base, buildings including administrative and technical blocks, sanitary facilities, water and electricity networks, basins, various workshops and garages, shops and warehouses of various products and equipment, waste rock and residue deposit areas, etc.) are built and/or installed;
- the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) as well as all the installations associated with it (garage, workshops, crushing device, various cables, signaling, instructions, etc.) are built and/or installed;
- the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouse, various networks, contact for the production of sulfuric acid, hydraulic works, pours, pours, different input storage areas, etc.) are built;
- the ore extracted is processed, the uranate obtained swollen and transported to potential outlets;
- temporary and permanent jobs are created and the living conditions of the people of the area are improved;
- a significant contribution to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors is made;
- all the sites operated are redeveloped when the project closes.

2. REGULATORY FRAMEWORK FOR STAKEHOLDER CONSULTATIONS

2.1. National framework

With regard to stakeholder consultations at the national level, the regulatory framework is found in the basic text of the Constitution of the Republic of Niger and in several sectoral texts.

Table 2 presents the national texts related to the public consultations in Niger.

Table 2 Regulatory framework for public consultations in Niger

Entitled	Reference	Comments
Constitution of the 7th Republic of 25 November 2010	Article 31: *Everyone has the right to be informed and to have access to information held by public services under the conditions determined by law.*	The implementation of this uranium deposit exploitation project on the Adrar Emoles 3 research permit must consult stakeholders during all its phases.
	Article 43: *The State has the duty to ensure the translation and dissemination into national languages of the Constitution, as well as texts relating to human rights and fundamental freedoms. It guarantees the teaching of the Constitution, human rights and civic education at all levels of training.*	The Nigerien State has the obligation to provide adequate means of transmission, access and understanding of information to its populations in order to participate fully throughout the process of this project. The PMPP in this sense will be responsible for taking into account the particularity of the stakeholders, especially those who could be affected in the sense of easily understanding what is happening to them and the measures taken or that will be taken in accordance with the texts in force of Niger and those of the financial partner.
Law No. 98-56 of 29 December 1998 on the Framework Law on Environmental Management	Article 3: *The sound management of the environment and natural resources shall be guided by the following principles:* *[...] (e) The principle of participation, according to which every citizen has the duty to ensure the protection of the environment and to contribute to its improvement. To this end, public authorities are required on the one hand to facilitate access to information relating to the environment and on the other hand to act in consultation with the groups and populations concerned* ;	Environmental management can be more effective if the population is associated in time, having several local techniques to combat its degradation and feeling very concerned about its well-being.
	Article 5: *Everyone has the right to be informed about his environment and to participate in the making of decisions relating to it. An implementing enactment of this Law shall define the consistency and conditions for the exercise of this right.*	The opinion of the population on the management of the environment must be taken into account at the risk of missing the objectives pursued.
Law 2018-28 of 14 May 2018 determining the fundamental principles of environmental	Article 22: *Any promoter of policies, strategies, plans, programs and projects or any activities likely to have an impact on the environment informs and consults from the beginning of the process and by any*	For any public or private law project having repercussions on the militia, the initiator has the obligation to inform by any means, the actors who may be directly or indirectly concerned by the latter from the preparation stage preceding that of implementation or

assessment in Niger	*means, the public including administrative and customary authorities, the population as well as associations and NGOs working in the area where the project is located.*	enforcement. This legislative provision is in perfect convergence with Equator Principle No. 5 and IFC Standard No. 1.
	Article 23: *Without prejudice to the provisions of Article 22 above, the SEA, the ESDI, the ESIA (or NIES) and the ESA shall be supplemented, where appropriate, by a field verification mission and a public hearing*.	In this sense, the field verification mission must be accompanied by an audience to ensure the transmission of the message and fill in the gaps in relation to the concerns, suggestions and recommendations of the local populations.

2.2. IFC Standard No. 1 on Risk Assessment and Management and Environmental and Social Impacts

Standard 1 on stakeholder engagement places great importance on open and transparent collaboration between the project and all stakeholders as a determining factor in international good practice. This mobilization, if done well, will improve the environmental and social sustainability of a project, strengthen project buy-in, and contribute to the successful design and implementation of project activities.

The consultation and participation of stakeholders is based on an inclusive and participatory approach conducted throughout the project cycle, with the aim of building around stakeholders, effective and efficient buy-in and commitment for the assessment and management of environmental and social risks and impacts of the project. Consultation with the population is an integral part of the environmental and social assessment of the project and the project implementation process, monitoring and evaluation of activities.

The requirements set out in IFC Standard No. 1 on Stakeholder Engagement are as follows:

- Analysis and planning of stakeholder engagement. Clients will need to identify the variety of stakeholders potentially interested in their actions and consider how external communications are likely to facilitate dialogue with all stakeholders. Where a project involves specific physical elements, material aspects and/or facilities that are likely to have negative environmental impacts and impacts on the Affected Communities, the client shall identify such Affected Communities and comply with the relevant requirements described below.
- Disclosure of Information. Disclosure of relevant project information helps Affected Communities and other stakeholders understand the risks, impacts and opportunities resulting from the project. The client shall give the Affected Communities access to relevant information on:
    - the purpose, nature and scale of the project;
    - the duration of the activities proposed under the project;
    - the risks and impacts to which such Communities may be exposed and the corresponding mitigation measures;
    - the envisaged process for stakeholder participation;
    - the grievance mechanism;

- Consultation. When affected Communities are exposed to the risks and negative impacts of a project, the client will ensure that a consultation process allows the Affected Communities to express themselves freely on the risks of the project, its impacts and mitigation measures, and that the client reviews these views and formulates a response. The scope and level of commitments required for the consultation process should be commensurate with the risks and negative impacts of the project and the concerns raised by the affected Communities.

2.3. Ecuador's Principle 5 on Stakeholder Participation

Informed consultation and participation. When a project may have significant negative impacts on the Affected Communities, the client will be required to pursue an Informed Consultation and Participation (EPC) process that builds on the principles set out in the previous paragraph and allows for informed participation from the Affected Communities. This process of consultation and participation gives rise to more in-depth exchanges of views and information, as well as to organised consultations of an iterative nature, which result in the client taking into account, in its decision-making process, the views of the Affected Communities on issues of direct concern to them, for example, proposed mitigation measures, sharing of benefits and opportunities generated, and enforcement issues. The provisions of Equator Principle No. 5 on stakeholder participation are as follows:

- For all Category A and B Projects, EPFI will require the client to demonstrate effective stakeholder participation in a continuous and structured process adapted to the local culture of the Affected Communities, Workers and, where appropriate, other Stakeholders.
- For Projects with potentially significant negative impacts on affected Communities, the client will conduct a process of informed participation and consultation. The client will adapt its consultation process: to the risks and impacts of the Project; the development phase of the Project; the linguistic preferences of the Communities concerned; their decision-making processes and the needs of disadvantaged and vulnerable groups. This process must be free from external manipulation, interference, coercion and intimidation.
- In order to facilitate stakeholder participation, the client will ensure, depending on the risks and impacts of the project, that the appropriate Assessment Documents are easily accessible to affected Communities and, where appropriate, other stakeholders, in the local language and adapting to the local culture. The client will take into account, and record, the results of the stakeholder engagement process, including any actions agreed upon at the end of that process. For Projects with negative environmental or social risks or impacts, communication must take place well in advance of the assessment process and, in any case, before the start of construction, and continue on an ongoing basis.

2.4. Comparative analysis

Tables 3 and 4 present a comparative analysis of the national framework and IFC's performance standard No. 1 as well as Ecuador's principle 5 on stakeholder participation. In these tables all the points of convergence as well as divergence on the mobilization of stakeholders will have emerged.

Table 3 Comparative analysis of the national framework and the requirements of FI Standard No. 1

IFC Standard No. 1	Objectives of IFC Standard No. 1 on PP	National provisions	Convergence/Divergence Links
IFC Standard No. 1 on The Assessment and Management of Risks and Environmental and Social Impacts that supports the participation of Stakeholders	IFC Standard No. 1 recognizes the relevance of: • Ensure that grievances from affected Communities and external communications from other stakeholders are addressed and appropriately managed. • Promote and provide the means Necessary for a concrete dialogue with the Affected Communities during the entire project cycle to cover issues that may affect these communities, and to ensure that relevant environmental and social information is disclosed and disseminated.	Law 98-56 on the framework law on environmental management	In CHAPTER II: OF THE FUNDAMENTAL PRINCIPLES, in its article 3, paragraph e) it establishes the principle of participation in these terms*: "every citizen has the duty to ensure the protection of the environment and to contribute to its improvement. To this end, public authorities are required on the one hand to facilitate access to information relating to the environment and on the other hand to act in consultation with the groups and populations concerned".* Article 5 states that; "*Everyone has the right to be informed about his environment and to participate in the decision-making relating thereto ...".* This corresponds to the statements in paragraphs 29 and 30 of this performance standard.
		Decree 2019-027/PRN/MESUD/ DD of 11 January 2019 on the modalities of application of Law 2018-28 of 14 May 2018 determining the fundamental principles in Environmental Assessment in Niger.	Article 41 of this Decree describes the basic steps for the publicity of environmental studies and the approach to be followed for the effective participation of stakeholders. This article corresponds to the provision of paragraph 29 of Standard No. 1 where it is stated that: *"Disclosure of relevant information about the project helps affected Communities and other stakeholders to understand the risks, impacts and opportunities resulting from the project. The client gives the Affected Communities access to relevant information on: (i) the purpose, nature and scale of the project; (ii) the duration of the activities proposed under the project; (iii) the risks and impacts to which such Communities may be exposed and the corresponding mitigation measures; (iv) the envisaged process for stakeholder participation; and (v) the grievance mechanism."*

Table 4 Comparative analysis of the national framework and the requirements of Ecuador's Principle 5

Principle 5	Objectives of the principle	National provisions	Convergence and divergence
Ecuador's principle on stakeholder participation	The objectives of this principle are that: • The entire project must provide evidence of stakeholder consultation in a clear and concise manner; • All stakeholders, especially those affected, are imbued with all the risks and impacts associated with the project as well as the planned measures; • The project facilitates the conditions for affected communities to access environmental assessment documents.	Law 98-56 on the framework law on environmental management	In CHAPTER II: OF THE FUNDAMENTAL PRINCIPLES, in its article 3, paragraph e) it establishes the principle of participation in these terms: " *every citizen has the duty to ensure the protection of the environment and to contribute to its improvement. To this end, public authorities are required on the one hand to facilitate access to information relating to the environment and on the other hand to act in consultation with the groups and populations concerned".* The provisions of this article correspond genuinely to certain provisions of this principle. However, the only discrepancy between these two frameworks is that Principle 5 takes into account a particular treatment of vulnerable groups, which is not the case with the provisions of this law at the national level.
		Decree 2019-027/PRN/MESUD/DD of 11 January 2019 on the modalities of application of Law 2018-28 of 14 May 2018 determining the fundamental principles in Environmental Assessment in Niger.	Article 41 of this Decree describes the basic steps for the publicity of environmental studies and the approach to be followed for the effective participation of stakeholders. The provisions of this article are perfectly in line with certain provisions of principle No. 5 of Ecuador. Indeed, in relation to the divergence the observation is almost the same as the previous text, that is to say a lack of special mention to disadvantaged and vulnerable groups at the level of this decree.

3. POTENTIAL IMPACTS AND RISKS OF THE PROJECT ON THE HUMAN ENVIRONMENT

Table 5 below presents the potential impacts associated with this project during the three different phases of its implementation, namely construction, operation and closure.

Table 5 Risk Source Activities and Impacts

Phases	Components	Potential impacts
Construction	Air	Alteration of air quality by dust and gaseous particles
		Contribution to climate change
	Ground	Modification of the structure and texture of soil, Soil compaction; Erosion, contamination and/or soil pollution
	Water	Disruption of the hydrological regime Risk of contamination and water pollution Drop in groundwater levels
	Vegetation	Loss of vegetation Disturbance of photosynthesis by dust deposition on vegetation
	Fauna	Destruction of areas of refuge and habitats, Destruction of individuals, temporary disturbance and, relocation.
	Landscape	Visual modification of the local landscape
	Soundscape	Increased sound and vibration
		Job Creation & Increase in Income Tax Revenues
	Economy	Improving the local economy
	Health safety	Risks of accidents for the workforce and for local populations; Respiratory infections, Increased risk of STI/HIV/AIDS and Covid 19 infection in the area, Staff Interactions and Biological Risks
	Pastoral lands	Reduction of grazing areas, Degradation of pastoral rangelands
	Archaeological and cultural heritage	Destruction of cultural heritage including cemeteries

	Population and Community Change	Pressure on basic socio-community infrastructure Disruption of communities (STI-HIV/AIDS and Covid 19; alcohol abuse, theft, violence, conflict, inflation), Improvement of the local socio-economic framework
Exploitation	Air	Impaired air quality
		Contribution to climate change
	Ground	Disturbance of biological and physicochemical properties of soils Soil erosion
		Soil contamination and pollution
	Soundscape and vibrations	Increased soundscape and Vibration
	Landscape	Modification of the visual quality of the landscape
	Water	Modification of geochemical and hydrogeological parameters Decrease in groundwater levels; Water contamination and pollution; Modification of the hydrological regime.
	Vegetation	Destruction of vegetation Disturbance of photosynthesis by dust deposition on vegetation
		Vegetation restoration, Increasing uranium bioaccumulation potential for plants
	Fauna	Disturbance and relocation of wildlife Crushing and destruction Habitat loss, Risks of poisoning for wildlife
	Employment and income	Job creation Improved income
	Economy	Improvement of the local economy; regional and national
	Health and safety	Diseases related to radiation exposure either by inhalation of radon, ingestion of radionuclides, and by exposure Risks of respiratory and cardiovascular diseases Increase in the frequency of STIs/HIV AIDS and Covid19 Risks of incidents and accidents
	Archaeological and cultural heritage	Loss and/or disruption of historical, archaeological and cultural heritage in the presence
	Population and Community Change	Pressure on basic socio-community infrastructure; Disruption of communities (STI-HIV/AIDS and Covid 19, alcohol abuse, theft, violence, conflict, inflation);

		Potential destabilization on the internal community and the dynamics of local authorities.
Closure	Air	Impaired air quality
	Ground	Soil contamination and/or pollution
	Water	Groundwater and surface water contamination
	Vegetation	Improvement of local vegetation cover
	Fauna	Formation of new habitats Return of wildlife
	Landscape	Restoration of the local landscape
	Sound and vibration	Increased noise level
	Employment and income	Loss of employment Allocation of workers' income
	Economy	Allocation of local, regional and/or national economy Reduction of expenditure and livelihoods
	Population and Community Change	Risk of declining quality of life and well-being; Change in livelihoods and modes driven by the Project

4. IDENTIFICATION OF STAKEHOLDERS

According to the provisions of IFC Performance Standard No. 1 on the Assessment and Management of Environmental and Social Risks and Impacts, which supports stakeholder engagement, **individuals or groups are** considered to be Stakeholders who:

- **are or could be directly affected by the project** (the parties affected by the project). For this purpose, these are the persons or groups of persons likely to be affected, whether physically, morally, by equipment or any other form of assignment during all phases of the implementation of the project. This is precisely the case of individuals or groups that will be recruited by the company, subcontractors, residents of the perimeter of exploitation permits including Touareg breeders and some market gardeners identified all around the perimeter local populations, service providers in terms of the mining project. In this group, vulnerable people are specifically taken into account;
- **may have an interest in the project** are those who are not directly concerned by the project but who may have an interest in the project. This may include, in particular, national and local authorities, neighbouring projects and/or non-governmental organisations. It is specifically the Ministry of Mines, the Regional and Departmental Authorities of Agadez and Tchirozérine, the town hall of Tchirozérine, somaïr, SONICHAR, and CSOs working in the mining field.

In all categories, performance standard No. 1 gives special mention to individuals or groups of people who may be disadvantaged or vulnerable.

4.1. Parties affected by the project

Depending on the company's response mode, stakeholders who are directly affected or likely to be directly affected by project activities include:

- Direct workers belonging to the GLOBAL ATOMIC team with formal contracts (technical, administrative and support staff) at the international level;
- Workers specifically recruited as part of this project (these are staff recruited at national level to conduct the work of the company GLOBAL ATOMIC within the scope of operation);
- Indirect workers who may be:
    - external mining and energy consultants recruited to perform a specific task;
    - subcontractors and service providers who will potentially be recruited by the company.
    - community workers who are individuals or groups employed by the corporation to carry out an activity related to the project.
    - Migrants present in the region who will be recruited either by the gobal company or subcontracting companies;
- Local populations bordering the impacted area who may be market gardeners or livestock farmers with their livestock whose grazing areas are included in the perimeter of the operating permit.

- Customers who will be supplied with products.

4.2. Other parties involved in the project

The other parties involved in the project concern individuals, groups or organisations:

- who have an interest in the project, either because of its location, characteristics, impacts, or for matters of public interest. Examples include nationals of the area whose activities could be disrupted, youth organizations, women's organizations, etc.
- who by virtue of their position within society can influence the project and derive benefits for them. These are senior state officials, politicians, influential economic operators, SMIs and local SMEs who will be solicited for subcontracting etc.
- who by virtue of their status and missions may have a right of scrutiny over the implementation of the Project (the Ministry and the decentralized services at the level of the Agadez Region, local authorities, Civil Society Organizations).

To anticipate the management of these different interests, a continuous and transparent process of stakeholder mobilization will be put in place to enable the identification of the various risks in time and the identification of appropriate mitigation measures.

To do this, the Environmental Component Manager of the GLOBAL company with the support of the National Office of Environmental Assessment (BNEE) will be called upon to continue to inform and raise awareness among the populations of the areas concerned on the risks and potential impacts of the Project. They will also be involved in the implementation of capacity building activities of the Project's stakeholders in environmental and social risk management.

Civil society organizations, Non-Governmental Organizations (NGOs) and associations working in the mining sector will be involved to inform, raise awareness and train other stakeholders in the management of the project's environmental and social risks and impacts.

NGOs and local associations working in the field of respect for human rights, in the fight against poverty, in conflict prevention, in the promotion of women or with expertise in GBV will be involved to help the project in raising awareness related to EAS / HS risks, codes of conduct, to the MGP and to the VBG services and referencing centers available.

Table 6 Needs of affected and affected stakeholders

Stakeholder Group	**Key Features**	**Language needs**	**Preferred means of notification**	**Special needs (accessibility, daytime meetings)**
Stakeholders affected at the institutional level	Institutional actors (DRE/LCD, DRM, IRT, DRE, DRA, DRH/A, GLOBAL workers consultants	French	Official letters; Emails; Telephone WhatsApp	Plan and inform in advance; Business day meetings

	specialized in mining or energy; The Administrative Authorities (governor, prefect, mayor),			
	traditional authorities (Sultan, heads of groups)	Local languages (Tamashek or Hausa)	Telephone Information by official couriers	Inform in time
Stakeholders at the local level	Local populations bordering or not the affected areas (village chiefs, men, women, young people)	Local languages (Tamasheq and derisory Hausa)	Proximity visit Community relay Radio release;	Assist the area with telephone network coverage; Information in local languages through the emissaries of the village chiefs on motorcycles; Avoid interference with the hours of watering animals
Relevant stakeholders	Nationals of zones, youth and women's organizations (OCBs)	French Local languages: Tamasheq Hausa;	Prospectus; Calls WhatsApp Group	Inform in time
Relevant stakeholders	NGOs and local associations working in the field of respect for human rights and the fight against poverty	French	Official mail WhatsApp Group Calls	Targeting with assistance from local authorities and opinion leaders; Plan and inform in advance; Business day meetings

4.3. Vulnerable individuals or groups

Vulnerable individuals or groups who are part of both the affected parties and other relevant parties are likely to be affected unequally or disproportionately compared to actors without a vulnerability characteristic. These vulnerability factors are specific difficulties in accessing and/or understanding disclosed information about the project including its environmental and social risks and impacts, mitigation measures or exclusion factors related to their social status. In order to enable vulnerable persons or groups to enjoy and have the same benefits and opportunities as other groups or categories of persons, particular attention shall be paid to them. As part of this project to exploit this Adrar Imoless perimeter, the groups or persons likely to be unequally or disproportionately affected have the following characteristics:

- sedentary or semi-sedentary pastoralists who depend only on these activities, part of whose grazing areas are included in the perimeter;

- persons with disabilities;
- young people without permanent jobs;
- the elderly without support;
- destitute people living alone;
- widows who are heads of household with no constant income;
- people with no or fewer herds;
- migrants;

In order not to further weigh on their vulnerability in the context of this project, particular attention will be paid to them on the basis of the preliminary results of the consultations carried out during the preparation and reported in Table No. 7 which give the related guidelines:

Table 7 Specific needs of vulnerable individuals or groups

Community	Stakeholder Group	Key Features	Language needs	Preferred means of notification	Special needs
ISSAKANAN	Elderly Young people without fixed jobs	Inhabitants of the village mostly young people without fixed jobs	Message in local language (Tamasheq or derisory Hausa)	Proximity visit Community relay	Hydraulic works; Health centre; Recruitment of the workforce at the local level; Purchase of local products; Livestock feed bank; Vaccination of animals;
INILAMANE	Elderly Young people without fixed jobs	Inhabitants of the village mostly young people without fixed jobs	Message in local language (Tamasheq or derisory Hausa)	Proximity visit Community relay	Hydraulic works; Health centre; Recruitment of the workforce at the local level; Classes in final materials; Livestock feed bank; Vaccination of animals;
TAGAZA	Older men and women, some of whom are disabled	Elderly people in majority of breeders with fewer herds and disabled	Message in local language (Tamasheq or derisory Hausa)	Proximity visit Community relay	Health centre; Recruitment of the workforce at the local level; Electrification of the village Telephone network coverage
TEMIL DAABOUS	Elderly women and men, young people without permanent jobs living in the village	Elderly - Poor people living alone or widows - Women in general heads of groups and heads of households - Men opinion leaders of the village	Message in local language (Tamasheq or derisory Hausa)	Proximity visit Community relay Telephone call	Health centre; Recruitment of the workforce at the local level; Avoid using highly toxic chemical elements in the project Classes in final materials
EGHATRAK	Elderly Young people without fixed	Elderly people in majority of breeders with	Message in local language (Tamasheq or	Proximity visit Community relay Telephone call	Care of the students of the village; Health centre;

	jobs	fewer herds and disabled	derisory Hausa)		Recruitment of the workforce at the local level; Classes in final materials
GALELO	Elderly Young people without fixed jobs	Elderly people in majority of breeders with fewer herds and disabled	Message in local language (Tamasheq or derisory Hausa)	Proximity visit Community relay	Hydraulic structure; Health centre; Recruitment of the workforce at the local level; Electrification of the village Telephone network coverage Avoid using toxic chemicals
OUFOUD	Elderly Young people without fixed jobs	Elderly people in majority of breeders with fewer herds and disabled	Message in local language (Tamasheq or derisory Hausa)	Proximity visit Community relay	Training of women in AGR; Health centre; Recruitment of the workforce at the local level;
GADOS	Elderly women and men, young people without permanent jobs living in the village	Elderly - Poor people living alone or widows - Women in general heads of groups and heads of households - Men opinion leaders of the village	Message in local language (Tamasheq or derisory Hausa)	Proximity visit Community relay	Hydraulic structure; Health centre; Recruitment of the workforce at the local level; Telephone network coverage Feed Bank and AGR Training

4.4. Summaries of stakeholder consultations conducted

As part of the process of preparing the Stakeholder Mobilization Plan (PMPP) document for the Uranium Deposit Exploitation Project in the ADRAR EMOLES 3 research permit by GLOBAL ATOMIC, a schedule of meetings was established and validated after the framing with the team responsible for ensuring the quality of the environmental and social safeguarding instruments to be produced.

In this sense, this program which included visits and interviews with Regional and Departmental Authorities, Traditional Chiefs, technical services at regional and also departmental level and the local population was able to take place from 5 to 17 December 2021. All the points discussed and the results are presented in Table 8 below:

Table 8 Summary of Stakeholder Discussions

Structures/Localities	Date	Participant	Points discussed	Answers
Regional Authorities				
Governorate	07/012/21	Elh Attahir Adam SG/GR/AZ	Roles to be played in this project	Accompany and facilitate the project installation process; Ensure relay between the company and the populations bordering the site

			The other institutions to be involved in order of importance	Governorate, Regional Council, Communal Councils, Prefecture, Traditional Chefferie, Civil Society Actors
			Obstacles to the smooth running of the project in the area	Insecurity, the absence of conditions for the viability of the project, the decrease in the cost of products, the support of the populations
			The way forward to overcome these obstacles	Create the conditions for in-depth consultation with the actors concerned by the project; Avoid the mistakes of previous companies
			The most effective ways to easily mobilize actors	Create conditions to facilitate communication; Improve the conditions of the population.
Regional Council	08/12/21	Mr Ibrahim Ixa 2°VPCR/AZ	Roles to be played in this project	Awareness-raising and training (mobilization) of local elected officials and the population to join the project; Contribution to the preservation of the environment especially the pastoral areas in the area; Associate with the control/monitoring of project activities and also associate with the security of the area.
			The other institutions to be involved in order of importance	Governorate, Regional Council, Tchiro Prefecture, Tchiro Commune, Dannet Commune, Civil Society, ANPE and Traditional Chiefs.
			Obstacles to the smooth running	Misunderstanding between the different parties and

			of the project in the area	miscommunication on the part of society.
			The way forward to overcome these obstacles	Organize a regional workshop on the explanation of the project as a whole; Develop a good communication plan; Involve all stakeholders.
			The most effective ways to easily mobilize actors	All communications must go through the competent authorities (Governorate and Regional Council) by correspondence. At the community level, the focus group or prospectus remain the most effective means.
			Concerns about project implementation	Positively, we mention the creation of jobs for the benefit of the local population, the reduction of unemployment, the mining royalty. On the other hand, negatively we expect the destruction of the environment and the post-mine situation.
			Suggestions and Recommendations to be made with regard to the project	Conduct a long reflection before implementing the project, adopt a means of communication, make concrete achievements for the benefit of the communities, conduct regular studies to compare the evolution of the different components in relation to the reference level and popularize them.
			Impact of the closure of the COMINAK mine on this project	This will facilitate the mobilization of the workforce for the project to the extent

				that this closure frees up plains of expertise in mine. This will allow the company to draw on the experience of existing companies in order to avoid the various mistakes in this case avoid approaching the areas of exploitation.
Central Services at the Regional Level				
Regional Directorate of Mines	07/12/21	Abass Ibro DR Mines/AZ	Roles to be played in this project	Monitoring/control during all phases of the project (preparation, operation and closure)
			The other institutions to be involved in order of importance	Governorate, Regional Council, Local Authorities, technical services of the State (Regional Directorate of Mines, Regional Directorate of the Environment and the Fight against Desertification, Regional Directorate for the Promotion of Women and Child Protection), NGOs and Civil Society Organizations.
			Environmental, social and economic issues in the area	On the environment: reduction of water resources and degradation of water and air quality; On the social level: job creation, increased income of the population and reduction of insecurity with the reduction of unemployment. On the economic level: boosting the Region's economy
			Recommendations to follow to take these issues into account	Create the conditions for the viability and sustainability of the project;

				Involve all stakeholders from the start of the project.
			The most effective ways to easily mobilize actors	Create a framework for consultation that takes into account all stakeholders. Use Community Radio and ICT, traditional channels according to their organization and flyers.
			Level of engagement	High
			Impact of the closure of the COMINAK mine on this project	This closure will facilitate the mobilization of skilled workers and it will also reduce the cost allocated to staff training.
Regional Directorate for the Environment and the Fight against Desertification	07/12/21	Abdou Moussa DEE/SE/DRE/LCD Abdoulhaziz Yacouba DRE/LCD/A	Roles to be played in this project	Ensure the implementation of environmental and social measures through periodic monitoring and follow-up/control during and after the implementation of the project.
			The other institutions to be involved in order of importance	Administrative and customary authorities, DRM, DRE, DRHA, Regional Labour Inspectorate, Civil Society Organization
			Environmental, social and economic issues in the area	On the environment: radiation effects on soil, water and air On the social level: improvement of income, improvement of security through the creation of water points, reduction of pastoral spaces. Economically: job creation
			Recommendations to follow to take	Adopt a participatory approach that involves

			these issues into account	involving the population, implementing the planned measures and taking into account the concerns of local populations.
			The most effective ways to easily mobilize actors	Create a framework for consultation between the various stakeholders, make it functional, make it also accessible to local populations through the media and training
			Level of engagement	High
			Impact of the closure of the COMINAK mine on this project	Facilitating labour mobilization
			Expectations	The project must be concerned with the preservation of the environment; Create synergies of action to ensure the correct and effective application of environmental and social measures; A complaints management mechanism needs to be put in place to manage complaints within the framework of project activities, including the environmental and social order.
Regional Directorate for the Advancement of Women and Child Protection	08/12/21	Amadou Alhassan DRPF/PE/AZ	Roles to be played in this project	The prevention of all forms of violence within the framework of the project; Support/advice and referral of workers to the competent courts if necessary; Gender support within the framework of the project.

			The other institutions to be involved in order of importance	The Dismemberments of the Regional Directorate for the Promotion of Women and Child Protection; Religious Observatory of the Region; Women's Organizations; Nigerien Association of Women Against War; National Agency for Legal and Judicial Assistance; Office of the Juvenile Judge; ANPE and the Dismemberments of the Regional Directorate of Employment; Local Authorities; NGO (PRE, COOPY), Mother and Child Centre
			Uneasiness	Lack of a holistic GBV centre (mental health, food, health care, legal and AGR assistance); Lack of training on promising sectors.
			The most effective ways to easily mobilize actors	Community Radio, Meeting, Advocacy session, local awareness-raising, participatory theatre
			Level of engagement	High
			Expectations	Fully deal with communities; Support local development through sustainable actions.
Regional Directorate of Hydraulics and Sanitation	07/12/21	Seini Hama COMHVSP Mother Elh Abdou CDR/Assai Moussa Issoufou CDHU/AZ	Roles to be played in this project	Control of the quality and quantity of water and Monitoring/control of hygiene and sanitation rules in the site during all phases of the project.

			Environmental, social and economic issues in the area	Creation of a deficit in water resources; Reduction of water quality by contamination of the water table; Proliferation of peril-fecal diseases.
			Recommendations to follow to take these issues into account	Create a collaboration between the Regional Directorate of Hydraulics and Sanitation and the GLOBAL Company; Build hydraulic structures for the benefit of the populations; Periodically monitor the piezometric level of the area's groundwater; Implement the measures referred to in the GGP of this project.
			The most effective ways to easily mobilize actors	The memorandum of understanding or agreement in the manner in which the company deems more appropriate; Official email.
			Level of engagement	High
			Expectations	Fulfilment of commitments in relation to all sectors, including those relating to water and sanitation resources.
Regional Labour Inspectorate	07/12/21	Oumarou Djibo DRT/AZ	Roles to be played in this project	Contribute to ensuring social peace within the framework of the project through a call for strict compliance with labour texts
			Environmental, social and economic issues in the area	Job creation; Reduction of unemployment rates in the area where the

				project is located and even at the national level; Contribution to economic and social development
			Recommendations to follow to take these issues into account	Strict compliance with the texts on work within the framework of the project; Involving workers' representatives
			The most effective ways to easily mobilize actors	Sensitize all stakeholders each in its field of competence to be able to fully accomplish their roles; Strengthen their capacities within the framework of the project.
			Level of engagement	High
			Impact of the closure of the COMINAK mine on this project	This will facilitate the mobilization of the well-experienced workforce if the project does not take long to start.
			Expectations	Respect for labour texts throughout the project; Compliance with all commitments made.
Regional Directorate of Livestock	07/12/21	Mm Moctar Salamatou DREL/AZ	Roles to be played in this project	Preservation of pastoralism in the area so that the project does not hinder the smooth running of this sector
			Other actors to be involved in order of importance	Departmental Directorate of Livestock; The town hall; The Breeders.
			Environmental, social and economic issues in the area	Destruction of pasture; Disappearance of the most appetized species; Hindering the movement of animals;

				Contamination of pastures and water points.
			Recommendations to follow to take these issues into account	Development of spaces for the production of fodder as compensation; Drilling in areas that are not exploited due to lack of water; Support livestock farming with the implementation of livestock feed and animal health.
			The most effective ways to easily mobilize actors	Workshop; Official email;
			Level of engagement	High
			Expectations	The project must avoid as much as possible the disruption of pastoral activities in the area.
Departmental Authorities				
Town hall	09/12/21	Chimadou Mouddour 2°Adjt to the Mayor	Roles to be played in this project	Mobilization of the local population in the implementation of the project through the workforce; Assist in the development of the local development plan; Help protect the environment through control/follow-up on the company's commitments.
			Approach to these roles	Awareness/information of the population; Training of actors with the support of the project; Mobilization.
			Concerns	Non-compliance with commitments made at the start of the project;

				Degradation of the environment in all its components; Lack of support for the project due to lack of awareness.
			Recommendations to follow to take these issues into account	Respect all commitments made at the start of the project; Adopt an adequate mechanism for the preservation of the environment by implementing all the measures provided for; Popularize awareness and involve the population.
			The most effective ways to easily mobilize actors	Information/awareness through community radio; Training of all stakeholders including the town hall as well as other relevant stakeholders.
			Level of engagement	High
			Expectations	Massive use of the local workforce by inserting the young people of the commune; The population's access to basic social services; Support for the revitalization of the local economy (agriculture, livestock) through modern fattening techniques; Strengthening social cohesion.
Prefecture	09/12/21	Tahida Abdou SG Prefecture Tchirozérine	Roles to be played in this project	Ensure the safety of property and people in the context of this project;

				Demand compliance with impact resolutions; Monitor and verify the operation of the site; Manage conflicts between different parties; Monitor the state of water resources, grazing; Monitor the conformity of the products that will be used;
			Other actors to be involved in order of importance	Town Hall; Departmental technical services (Livestock, Environment, Promotion of Women, Education, Agriculture and Health); Traditional Chefferies; COFO, OSC, etc.
			Environmental, social and economic issues in the area	Pollution of resources; Occupation of grazing areas and gardens; Risk of conflict; Risk of new diseases; Depravity of morals and cart of life.
			Recommendations to follow to take these issues into account	Apply the measures provided for in the GGP; Development of pastoral areas; Supply of Livestock Feed Banks; Support for the installation of water pumping stations; Development for fodder cultivation.
			The most effective ways to easily mobilize actors	Community radio, Foster, WhatsApp, NTIC, Public criers, awareness caravan.
			Level of engagement	High
		Local populations		

ISSAKANANE	10/12/21	Village chief and some inhabitants	Roles to be played in this project	Facilitate access to the resources of the area; Labour mobilization for the project
			Approach to these roles	Informing the public on how to make it easier for GLOBAL agents to access resources; By raising awareness of the importance of joining the project.
			Uneasiness	Problem of access to drinking water, Problem of access to basic health care; Lack of school in the village; Impairment of gardening activities; Lack of work for local youth; Lack of livestock feed bank; Non-local recruitment; Animal diseases; Depravity of morals; Insufficient remuneration
			Recommendations to follow to take these issues into account	Build hydraulic structures to facilitate access to drinking water; Build health centers and classrooms made of final materials in the village; Recruit local youth as unskilled labour in the project account; Buy products; Vaccination of animals; Installation of the Livestock Feed Bank; Raising awareness on the depravity of morals.
			The most effective ways to easily mobilize actors	Information of the village chief in order to inform the community

				in turn by his emissary on the motorcycle
			Level of engagement	High
INOLAMANE	10/12/21	Village chief and some inhabitants	Roles to be played in this project	Facilitate access to existing resources in the area; Facilitate the mobilization of actors including the workforce.
			Approach to these roles	By prioritizing the consultation approach on collective adherence to the project
			Uneasiness	Lack of access to drinking water; Lack of classes in final materials; Lack of basic health care; Destruction of pastures; Degradation of pastoral areas; Appearance of new animal diseases; Non-local recruitment of labour.
			Recommendations to follow to take these issues into account	Construction of hydraulic works in the area; Construction of classrooms made of final materials in the village; Construction of health centre; Recruit local labor in the company's account not subcontracting; Improvement of animal health through vaccination sessions; Provide the village with a livestock feed bank.
			The most effective ways to	Inform the Village Chief in order to mobilize the

			easily mobilize actors	community through his emissary
			Level of engagement	High
TAGAZA	10/12/21	Village chief and some inhabitants	Roles to be played in this project	Assist in achieving the stability and security of the area; Labour mobilization
			Approach to these roles	Raising public awareness of the security of the area; Collaboration with SDF; By orienting towards a reassuring choice in relation to the recruitment of the workforce
			Uneasiness	Occupation of pastoral spaces by project activities; Environmental destruction; Lack of access to basic health care; lack of access to electricity; Involvement of traditional leaders.
			Recommendations to follow to take these issues into account	Build health and energy facilities in the village; Fully involve traditional leaders; Avoid the proliferation of passageways during the transport of products;
			The most effective ways to easily mobilize actors	Create a climate of understanding between different ethnic groups; Create a framework for community consultation.
			Level of engagement	High
TEMILT DAABOUS	11/12/21	Village chief and some inhabitants	Roles to be played in this project	Mobilization of the workforce; Help in the stability of the area.

			Approach to these roles	Raising awareness on the importance of peace in the area; Awareness of good conduct.
			Uneasiness	Groundwater pollution; Insufficient access to drinking water; Insufficient grazing in the area.
			Recommendations to follow to take these issues into account	Avoid using highly harmful chemical elements in the project; Build hydraulic structures for people and livestock; Livestock feed bank.
			The most effective ways to easily mobilize actors	Use of ICT and community relay; Information from the village chief in order to mobilize the community through his relay
			Level of engagement	High
EGHATRAK	11/12/21	Village chief and some inhabitants	Roles to be played in this project	Labour mobilization
			Approach to these roles	Informing the community about the importance of joining the project as their main activities will be affected
			Uneasiness	The recruitment of the workforce as part of the project; Lack of health centre in the village; Insufficient classes of final materials in the village; Problem of accommodation of the Pupils.
			Recommendations to follow to take these issues into account	Recruit the workforce at the local level; Build a health care centre in the village;

				Build classrooms made of final materials; Consider taking care of the students of the village.
			The most effective ways to easily mobilize actors	Phone call, public criers, community relay
			Level of engagement	High
GALELO	12/12/21	Director of the village school and some inhabitants	Roles to be played in this project	Mobilization of the workforce; Contribution to the security of the area.
			Approach to these roles	Raising awareness about joining the project; Raising awareness on peace and social cohesion
			Uneasiness	Harm to the well-being of people and animals; Water pollution; Disruption of pastoral activities; Reduction of pastoral spaces; Lack of health care centre
			Recommendations to follow to take these issues into account	Build a health care centre in the village; Realization of hydraulic works in the village; Provide the village with a livestock feed bank; Avoid using highly toxic chemical elements in the project.
			The most effective ways to easily mobilize actors	Information of the village chief in order to mobilize the community through his emissaries
			Level of engagement	High

OUFOUD	12/12/21	Village chief and some inhabitants Village chief and some inhabitants	Roles to be played in this project	Mobilization of the workforce for the project; Contribution to the consolidation of peace and social tranquility.
			Approach to these roles	By seeking a grievance to the integration of young people into the project in order to reduce the unemployment rate as a factor of insecurity in the area.
			Uneasiness	Recruitment of the workforce; Impact of the project on the socio-economic activities of the area; Lack of health care center.
			Recommendations to follow to take these issues into account	Recruit the workforce at the local level or give a quota for the local population; Build a health centre at the village level; Provide the village with a livestock feed bank; Train women in AGR.
			The most effective ways to easily mobilize actors	Information of the village chief in order to mobilize the community through his emissaries
			Level of engagement	High
GADOS	13/12/21		Roles to be played in this project	Mobilization of the workforce; Contribution to strengthening social cohesion.
			Approach to these roles	Awareness of project membership
			Uneasiness	Reduction of pastoral areas with the delimitation of permits; Contamination of the water table and

				reduced access to water supply sources; Politicization of the recruitment of the local workforce.
			Recommendations to follow to take these issues into account	Depoliticize the recruitment system at the local level by doing local recruitment; Build hydraulic structures; Periodically vaccinate animals in the area; Provide the village with a livestock feed bank.
			The most effective ways to easily mobilize actors	Mobilization of proximity under the command of the village chief
			Level of engagement	High

4.5. Some illustrative images of these meetings

Figure 1 Meeting with the population of TAGAZA (10/12/ 2021)

Figure 2 Interview with the SG of the Governorate of Agadez (07/12/2021)

Figure 3 Interview with the 2nd Vice-President of the Regional Council of Agadez (08/12/2021)

Figure 4 Public meeting in Galelo (12/12/2021)

Figure 5 Public meeting in Temilt Daabous (11/12 2021)

Figure 6 Meeting with the Regional Director of Livestock of Agadez (07/12/2021)

4.6. Continued consultations and stakeholder engagement

The process of stakeholder consultation and participation will continue throughout the preparation and implementation of the Project through public meetings, group discussions, one-on-one interviews and information and awareness-raising workshops that will be organised on a regular basis.

Indeed, after the first part of the consultations that led to this first version of the stakeholder mobilization plan, the process will continue with the parties who have not been available for this stage or those whose interest or link will be revealed later with the project. Where appropriate, these activities will be under the responsibility of the Specialist in charge of environmental and social risk management including gender/GBV aspects of GLOBAL ATOMIC, with the support of technical services officers, NGOs/Local Associations, etc. Customary and religious authorities will be involved as necessary to inform and sensitize the local populations of their territory.

At the stages of evaluation and implementation of the Project, consultations will be strengthened to ensure knowledge in terms of potential negative issues and risks of

the Project by stakeholders, involvement and participation in the preparation including the assessment of impacts and the determination of mitigation measures through the development of appropriate mitigation documents. During the implementation of the project, consultations will accompany environmental and social monitoring activities. During the evaluations (mid-term and final), they will support the collection of information necessary for the implementation of the various activities.

As illustrated during the consultations with the populations, they want to be informed in a punctual way of the activities and timetable of the project. The aim of the implementation of the PMPP is to ensure that the project shares information with stakeholders in a comprehensible, accessible and timely manner. The continuous commitment will be a space to monitor the environment and the social impact of the project on the ground through the annual stakeholder surveys. The comments received will be collected in a database, which will be set up to aggregate the results by household/company, woman/man, rural/urban area.

5. STAKEHOLDER ENGAGEMENT PROGRAM

5.1. Objectives and timing of the Stakeholder Engagement Plan

The main objective is to define the roles and responsibilities of the different stakeholders at different stages of life after their identification, including the exchanges that have raised their concerns.

Thus, under the responsibility of the Global Atomic Country Director, the stakeholder participation plan will be translated into a clear programme of activities with related costs at each stage of the project (start and end of activities).

As this is an inclusive process, stakeholder engagement will take into account social and gender norms that may limit the participation of certain groups (women, girls, minorities, people living with disabilities, HIV, etc.). In this sense, there will be restricted meetings specific by gender/age and facilitated by a person of the same sex.

During implementation, it is expected that continuous monitoring and flexible adjustment of social and environmental risk management will allow this PMPP to be adapted to the implementation situation of the Project.

5.2. Proposed strategy for the dissemination of information

The notification and dissemination of information on the uranium mining project in the ADRAR EMOLES 3 permit will be done through the national media including public and private radio stations with national coverage (Voix du Sahel, Bonferey, Ténéré FM, Challenge FM,...), public and private television with national coverage (ORTN, Bonferey TV, Ténére TV, ...) and mainstream newspapers such as the "Sahel" in its version of the daily and its weekly version (Sahel Dimanche). This information will also be put online through the sites of the implementation structures of the Global Atomic Company and the sites of the various media and specific sites for public procurement for example.

In regional headquarters or representations of stakeholders in the field of mines such as the Ministry of Mines, the Regional Directorate of Mines of Agadez, SOPAMIN posters, leaflets, brochures will be affixed or deposited and accessible to all.

To reach the maximum number of people likely to be impacted, the information will be disseminated at least three times a week before the meetings are held.

In addition to these identified means, brochures, leaflets, posters, documents and non-technical synthesis reports in French and local languages will be distributed to facilitate the dissemination of information on the Project.

Also, this information will be disseminated via two most used social networks namely **WhatsApp** and **Facebook**.

Meetings with administrative and technical authorities will be announced through official letters sent to stakeholders at least 72 hours in advance, to allow their integration into the agendas. These different mechanisms will make it possible to provide up-to-date information to stakeholders. The accessibility of this information dissemination strategy will be verified by stakeholders, in particular vulnerable groups, during the initial consultations.

Table 9 summarizes the information dissemination strategy.

Table 9 Summary of information dissemination strategy

Project Phase	List of information to be communicated	Proposed methods[1]	Calendar Places/dates	Targeted stakeholders	Responsibilities
Preparation	Content of the Project; Participation in the formulation of safeguarding instruments (PEES, PMPP, ESIA, and PGMO) Facilitation of consultations	Email Telephone; Individual interview Dissemination of project documents	72 hours before in the Meeting Rooms of institutional actors such as the Ministry of Mines, SOPAMIN, the meeting room of the Regional Directorate of Mines, Regional Council, the room of municipal councils	Technical Ministries (Mines--Environment – Advancement of Women – Work – Health –– Interior) (Head of environment component of the Company) Companies operating in the mining sector, Civil society	Ministry of Mines Bank GLOBAL ATOMIC
	Objectives of each instrument, Impacts and mitigation measures of the project, opportunities, means of participation	Email Telephone On-site meeting Stakeholder consultation Dissemination of the project summary Video conference	One week at 24 hours before in the meeting room of the targeted actors	Responsible for the environmental component of the Company GLOBAL ATOMIC - Contacts - Consultants – BNEE – CSOs in the mining sector – Opinion leaders of the project integration area including vulnerable groups	Global atomic Company Team Ministry of Mines Ministry of the Environment and the Fight against Desertification
Before the start of work	Nature and scope of the work; Management of accident risks and work-related impacts; Awareness raising on the MGP; the risks of GBV and child labour	On-site meeting Stakeholder consultation by the most appropriate means	One week at 24 hours before in the meeting room of the targeted actors	Head of the environmental component of the company GLOBAL ATOMIC - Resource persons - Consultants - BNEE - CSO of the mining sector - Opinion leaders of the project integration zone - energy sector including vulnerable groups	Global atomic team Subcontracting companies that will work on behalf of the company GLOBAL
Execution	Contents of environmental and social safeguard documents	Email	One week before at the respective headquarters of	The project team within the company	The project team within the company GLOBAL

[1] Consultations with women and girls should be organized in separate groups led by a woman in a safe place that ensures confidentiality.

Project Phase	List of information to be communicated	Proposed methods[1]	Calendar Places/dates	Targeted stakeholders	Responsibilities
	Mechanism for implementing environmental and social safeguard measures Deadline for implementation of environmental and social safeguarding activities Role of the different actors responsible for implementation EAS/HS risks, worker codes of conduct, access to the MGP and available GBV services	Telephone On-site meetings Dissemination of documents Training Brochures Pamphlets Posters posters	the institutions in the field or at the headquarters of the subcontracting companies	Project workers including vulnerable groups NCEA	ATOMIC Responsible for the environmental aspect of the company; Subcontracting companies Monitoring mission
Monitoring and evaluation	Monitoring indicators Indicator intelligence methods/techniques Roles of actors in data collection Data collection period	Email Telephone On-site meeting Dissemination of documents Formation	Headquarters of the company GLOBAL ATOMIC	Project Team Project workers including vulnerable groups	Monitoring and Evaluation Specialists of the company GLOBAL ATOMIC Project Team

5.3. Proposed consultation strategy

Stakeholder consultation methods will be tailored to the targets:

- the interviews will be organized with the various state actors, including the National Bureau of Environmental Assessment (BNEE) of the Ministry of the Environment, the Directorate of Studies and Programming of the Ministry of Mines;
- The surveys, polls and questionnaires will be used to take the opinions of the people likely to be affected by the project (residents of the works, people affected by the project, potential workforces ...);
- Public or community meetings or focus groups will be regularly organized for the various actors in the mining industry. Stakeholders will be well identified and involved according to the themes to be discussed.

5.4. Proposed strategy for taking into account the views of vulnerable groups

Consultations with communities will be based on the principle of inclusion, i.e. the participation of all segments of communities, including people with reduced mobility and other vulnerable people, in order to understand their perspective on the project and in particular on accessibility, barriers and social risks, including the risks of SEA/HS. If necessary, logistical assistance would be provided to representatives of remote sites, persons with reduced physical capacity and insufficient financial means to attend public meetings organized by the Project.

In cases where vulnerable status may result in people being reluctant or physically unable to participate in large-scale community meetings, the project will organize separate discussions in small groups in an easily accessible location, allowing the project to contact groups that wish to do so under normal circumstances. To facilitate contacts, some of the options for reaching vulnerable groups are suggested below:

- Involve leaders of vulnerable and marginalized groups at the level of the project area of intervention. These are religious observatories in the region, Nigerien Association of Women Against War, G5 Sahel Women's Platform,
- Involve community leaders (heads of villages legally installed by prefectural decree, heads of religious congregations with a legal mandate from the territorial administration), civil societies and NGOs oriented towards awareness and gender-based violence (COOPY, APBE), environmental protection organizations (CDR, KARKARA), pastoral organizations (AREN, COPPAN, TABITAL) installed the project intervention area;
- Organize individual interviews and focus groups with vulnerable people;
- Raise awareness and facilitate access for these people to the complaints management mechanism set up by the Project.
- Women and girls will be specifically targeted for women-only meetings led by a woman and in a safe place, to encourage free and open exchanges about the project's activities and risks. This should be done both for women community members as well as for direct and indirect workers involved in the project.

In all communication strategies described in this PMPP, issues related to the impact

of project activities on girls and women will be addressed and in particular on the risks of sexual exploitation and abuse or sexual harassment (SEA/HS). Girls and women will also be informed about the content of the code of conduct and consulted by female sociologists on safe and accessible ways in which survivors of EAS/HS could report misconduct by project staff.

They will also be informed of the services available to survivors of GBV issues in their communities and consultations will try to identify survivors of violence without dwelling on general trends and challenges.

If a person, during or after the consultation meeting, discloses the violence they are experiencing, the facilitator should refer them to the nearest GBV service provider (information on locally available services should be collected prior to consultations).

This approach will be used throughout the implementation of the project according to the strategy described in Table 10.

Table 10 Strategy for Consultations on the ADRAR EMOLES 3 Uranium Deposit Project by GLOBAL

Activities	Consultation Topic	Method used	Dates and locations	Targeted stakeholders	Responsibility
PROJECT PREPARATION PHASE					
Preparation of prerequisites for project evaluation	Elaboration of the Environmental and Social Safeguards documents of the Project (Environmental and Social Commitment Plan (PEES), Stakeholder Mobilization Plan (PMPP); ESIA; PGMO)	Meetings of exchange and work the project team at the national level and the company GLOBAL ATOMIC at the international level	Throughout the preparation phase in Niamey and in the Public consultation meetings took place from 7 to 13 December 2021 in the city of Agadez in part and in the localities concerned in the municipality of Tchirozérine	TTL Project Contact Person Ministry of Planning GLOBAL Office	GLOBAL project team; Ministry of Planning
	Elaboration of safeguarding documents: Environmental and Social Impact Assessment (ESIA); Stakeholder Mobilization Plan (PMPP); Environmental and Social Commitment Plan (PEES) Workforce Management Procedure (PGMO)	Environmental and social risk assessments and determination of mitigation measures (public meetings, interviews, focus groups, etc.)		The populations bordering the site, Local authorities, Technical services; Vulnerable groups Local authorities Communities & CSOs, BNEE	Consultants; Specialists in Environmental and Social Safeguarding and Gender/GBV
PROJECT IMPLEMENTATION PHASE					
Implementation of the measures recommended in the PEES, ESIA, PMPP and PGMO	Information and consultation on the potential environmental and social risks and impacts of the project and determination of management measures as well as the consideration of	Approval and strict application of the Environmental and Social Management Plan	At the start of the project and throughout its cycle	Vulnerable groups Local authorities Project Workers Local Communities & NGOs, NCEA	Project team through the environmental and social component manager; GBV Specialist, Monitoring and Evaluation Specialist

Activities	Consultation Topic	Method used	Dates and locations	Targeted stakeholders	Responsibility
	gender and vulnerable people.				
Implementation of the GGP	Operational measures	Monitoring and evaluation of the implementation of the GGP based on The Fact Sheets, Formal meetings and individual or group interviews with stakeholders	Throughout the implementation of the Project	Service providers and subcontractors Vulnerable groups Local authorities Local Communities & NGOs, NCEA	Responsible for the environmental and social aspects including GBV NCEA
MONITORING PHASE - EVALUATION IMPLEMENTATION OF THE PMPP					
Follow-up to the implementation of the PMPP	Preparation of reports on how stakeholders experienced the project, the concerns raised during implementation and how these were managed by the project and their assessment of them.	Field visit Interview with workers and the local population	Throughout the Project cycle	Service providers and subcontractors Vulnerable groups Local authorities Communities & CSOs, BNEE	Responsible for the environmental and social aspects including GBV NCEA
Evaluation of the implementation of the PMPP	Preparation of evaluation reports	Field visit Interview with beneficiaries	Mid-term or at the end of the Project	Consultants Vulnerable groups Local authorities Local Communities & NGOs, NCEA	Project Team

5.5. Review of comments

For a better treatment and a good consideration of the comments, the project team which has the responsibility of the environmental and social component will take care of the regular review and the consideration of the comments from the stakeholders of the Project.

Comments (written and oral) will be collected, reviewed and kept in a register that will be opened for this purpose. Suggestions, complaints and other contributions from stakeholders will be compiled into a feedback form that will be completed during the consultation meetings. In addition, stakeholders have the possibility to send their feedback by email and physical mail or by phone, via social networks or the email address of the company GLOBAL ATOMIC.

The compiled feedback will be shared with the project manager and other team staff for support, if needed or for information. If necessary, the decision will be formally notified to the interested party by mail. For people who cannot read or write, the project must provide them with the oral translation of the documents. The terms of the letter will have to be adapted to the recipient intellectually and culturally. This response may include:

- A summary of the understanding of the submitted comment;
- Explanations of the proposed solution(s);
- The chosen solution;
- The procedure for implementing the chosen solution, including deadlines.

5.6. Project Implementation Phases

As the Project is implemented, the activities carried out and those programmed will be brought to the attention of stakeholders. Thus, they will be kept informed of the progress of the implementation of the Project through the accountability strategy. These points will be made through summary documents of the quarterly activity reports or two (2) reports.

5.7. Resources

The resources that will be devoted to the management and implementation of the Stakeholder Mobilization Plan will focus on:

- Stakeholders

In this case, the main persons responsible for the implementation of the Stakeholder Mobilization Plan (PMPP) will be the Environment Component Manager and the one who takes care of GBV issues who will be recruited by the company GLOBAL ATOMIC.

- Dedicated budget

Stakeholder engagement activities require a full-fledged budget that must be clearly reflected in the cost of the Project components.

- Designated Responsible Person

Contact information for the person responsible for responding to comments or questions about the Project or the consultation process, namely that person's telephone number, address, email and job title, within the project team must be

published and accessible for professional purposes.

5.8. Management functions and responsibilities

Stakeholder mobilization activities are an integral part of the environmental and social safeguards measures that fall within the scope of this project. To this end, all these activities must be in this component and will be carried out under the responsibility of the Environmental Component Manager and that of the social component of the project team. These activities will be carried out in depth in conjunction with the technical support of the project manager, the monitoring and evaluation officer and the internal Financial Management Specialist, as well as the NCEA and the external intermediation agencies.

A functional process established in common agreement with the other main actors serves as a basis for the transmission of information to the person in charge of the environment component of the team. This transmission will be in written form on the basis of registers, or other forms established and accepted by all. The transmission frequency will be retained by mutual agreement. It can be monthly, bi-monthly or quarterly

6. COMPLAINTS MANAGEMENT MECHANISM

To deal with any disputes between the actors likely to be involved in this ADRAR EMOLES 3 permit uranium deposit exploitation project, a Complaints Management Mechanism (MGP) will be set up, which is a procedure based on a system for handling complaints and other issues of misunderstanding which, when they are abused, can lead to conflict and reduced project benefits.

This Complaints Management Mechanism (PMM) is based on other similar project documents and reports on key information related to the complaints system, namely milestones including deadlines and actors.

6.1. Complaints procedure

The complaint management procedure for the ADRAR EMOLES 3 uranium deposit project consists of nine (9) steps ranging from the registration of the complaint to the archiving of the resolution file. Where complaints are sensitive in nature such as SEA/HS, the handling will have different aspects and will be finalised with external support with a view to having the best options to manage and validate such complaints in a safe and confidential manner and on the basis of an approach based on the needs of survivors.

Complaints Body

This Complaints Management Mechanism covers the entire scope of this project where committees created at local, communal and project level will be formed and equipped through the provision of a complaint register, telephone devices and numbers made public in the localities of intervention of the project.

These committees can be contacted by phone, sms, WhatsApp, orally or through the register of complaints.

The MGP will be organized into three levels, which also makes it possible to define the management bodies at each level.

- Local level → Local Committee
- Communal Complaints → Management Committee;
- Project level → The project team.

The project team oversees the implementation of the MGP. It works closely with local and communal authorities. Complaints addressed to projects are referred to the person in charge of the environmental component for treatment.

6.1.1. Step 1: Registration of the complaint

The first step in the process is to set up complaint reception channels that will be adapted to the socio-cultural context of project implementation. Complaints will be made verbally (where the complainant is not literate) or in writing. Verbal complaints will first be transcribed, before the rest of the process to ensure their traceability. Any complaint, whether oral or written, is recorded in a register available at the level of the deposit and management body called the Complaints Management Committee.
The addresses and contacts of the members of the bodies will be notified to potential complainants during dissemination activities. The complainant receives an acknowledgement of receipt within 48 hours of filing his complaint. The channels for

transmitting complaints will be the telephone, the referral directly or through an intermediary (relative, relative, local authorities, workers' unions, the CSST, the filing by the complainant himself.

6.1.2. Step 2: Review of complaints

Once the complaint has been registered, a triage is carried out by the complaints bodies to distinguish the ordinary or sensitive nature of the complaints, taking into account the precise criteria used.

Non-sensitive complaints include:

- Requests for information about the project or any other concerns raised by stakeholders;
- The quality of services;
- Questions about project procedures;
- Feedback from the community;
- Circulation of machines;
- Management of nuisances related to works
- Suggestions or proposals from the community;

Sensitive complaints include:

- Ethnic and/or religious discrimination;
- Exclusion of workers who meet the eligibility criteria;
- Exclusion of workers by pressure for their participation
- Lack of respect for confidentiality rules and the survivor-centered approach of EAS/HS;
- Financial misconduct (fraud, corruption, extortion, embezzlement, etc.);
- Cases of sexual exploitation or abuse, sexual harassment;
- Violation of children's rights;
- Non-respect of local customs and customs; desecration of sacred sites or cemeteries
- Destruction of private property or damage to community property;
- Non-compensation for PAPs;
- Serious pollution of the living environment;
- Disruption of livelihoods;
- Serious accidents or deaths of a person related to project activities.

On the basis of these criteria, a study procedure adapted to each type of grievance will be chosen.

Non-sensitive complaints will be dealt with by all bodies. For sensitive complaints, after registration at local level of the MGP, only the regional and national bodies will proceed with the treatment while maintaining the confidential nature of the file limited to one or two persons at most. They shall immediately carry out the necessary investigations

and shall ensure the processing, resolution and closure of the proceedings. The outcome of the processing of a grievance is addressed directly to the complainant.

For the consideration of GBV complaints, GBV focal points will be set up among the members of the MGP Committee and will serve as confidential contact points to receive information on possible incidents related to SEA/HS to trigger the referral system to provide survivors with information and access to services. It would be desirable for these focal points to act as valuable community human resources to refer survivors to services and survivors continue to turn to them for help after the project is completed. These GBV focal points set up will be trained on all response procedures with the appropriate reporting and referral mechanisms that will be defined in case of GBV (including especially EAS/HS) within the framework of the project as well as its coordination with stakeholders and the ethical standards that will be followed.

The time taken to process complaints by category is shown in Table 11 below:

Table 11 Complaint Categories and Processing Time

No	Categories of Complaints	Processing time	Comments
1	Non-sensitive complaints	5 days	Acknowledgement of receipt and feedback to the complainant before investigation.
2	Sensitive complaints	10 days	Acknowledgment of receipt to the Complainant and transmission of the complaint to the project for information via the municipal committee before investigation.

6.1.3. Step 3: Investigation to verify the merits of the complaint

This very important step would allow for the gathering of information and evidence to affirm or refute the grievance and to find solutions in response to the complainant's concerns. Specific skills may be requested if they are not available within the bodies of the MGP.
A maximum of five (05) business days after classification and preliminary analysis is used for this stage for all complaints whose resolution requires further investigation. The complainants concerned must be informed of the additional time limits in writing from the chairperson of the body.

6.1.4. Step 4: Proposed responses

On the basis of the documented results of the investigations, a written reply shall be sent to the complainant. This reply highlights whether or not the complaint is valid. In case of validity, the complaints management body (depending on the level), notifies the complainant in writing, the conclusions of their investigations, the solutions chosen, the means of implementation of the corrective measures, the implementation schedule and the budget. The proposed response shall be made within two (2) working days after the investigations. Similarly, where the complaint is unfounded, a reasoned written notification will be sent to the complainant.

6.1.5. Step 5: Review responses in case of non-resolution

In the event of dissatisfaction, the complainant may contest the measures adopted. It then has the possibility to request a review of the resolutions of the complaints management body seized. The duration of the period allowed to do so is a maximum

of ten (10) working days from the date of receipt of the notification of resolutions by the complainant. In such circumstances, the Management Authority has five (5) working days to review its decision and propose additional measures if necessary. The revised measures must be notified to the complainant in writing.
The possibility is offered to the complainant in case of dissatisfaction to make a judicial appeal with the assumption of legal costs if necessary at his expense.

6.1.6. Step 6: Implement corrective actions

The implementation of the measures adopted by the Complaints Management Committee cannot take place without the prior agreement of both parties, especially the complainant, to avoid any form of dissatisfaction and abuse. The procedure for the implementation of the corrective action(s) will be initiated five (05) working days after the acknowledgement of receipt by the complainant, of the letter notifying him of the solutions chosen and in return following the agreement of the complainant recorded in a Minutes (MINUTES) of consent.

The complaints management body will put in place all the necessary means to implement the resolutions agreed and will play its part in order to respect the schedule chosen. A report signed by the Chairman of the Complaints Management Committee and the complainant will sanction the end of the implementation of the solutions.

6.1.7. Step 7: Close or extinguish the complaint

The procedure will be closed by the bodies of the complaints management body if the mediation is satisfactory for the various parties, in this case the complainant, and the agreement proved by a Minutes signed by both parties. The closure of the file occurs after three (03) working days from the date of implementation of the response attested for local or intermediate authorities and five (5) working days by the national authority. The extinction will then be documented by these different instances according to the level(s) of treatment involved.

6.1.8. Step 8: Reporting

All complaints received under the Project's MGP will be recorded in a processing register, within a period not exceeding five (05) working days from the date of implementation of the resolution, for local or intermediate authorities and seven (07) working days for the national authority. This operation will make it possible to document the entire complaint management process and draw the necessary lessons through a simple and adapted database designed for this purpose.

6.1.9. Step 9: Archiving

The project will set up a physical and electronic archiving system for the filing of complaints. Archiving will take place within six (06) working days from the end of the report. All supporting documents for the meetings that were necessary to reach the resolution will be recorded in the complaint file. The archiving system will provide access to information on: (i) complaints received (ii) solutions found and (iii) unresolved complaints requiring further action.

However, the complainant may lodge his complaint with the judicial authorities at any stage of the complaint management mechanism. This referral may in some cases delay the implementation of the project. Also, it is necessary to sensitize the community to favor the amicable settlement for which the MGP is established.
It should also be noted that EAS/HS complaints will be dealt with specifically within the MGP. The project will work closely with entities dedicated to addressing these issues.

Thus, all complaints and denunciations of EAS/HS cases registered under the project will be directly transferred and processed by the specialized entities.

6.2. Device

The complaint resolution mechanism will be based on a system comprising complaint management committees at three different levels, namely national, regional and communal or local. At the level of each scale, the Complaints Management Committee is composed of five (5) members including two (2) women to fill the positions of:

- President,
- Secretary (Male or Female),
- Communication Officer (Male or Female) and
- Two (2) members (One man and one woman).

At the communal level and in order to limit external influence, opinion leaders will be excluded and at least one member of the committee must be literate.

This Local Complaints Management Committee, which will be led by local actors from local communities who are the potential workers of the project, will comply with local customs and customs, in the image of traditional local mechanisms that work in social mediation.

7. IMPLEMENTATION OF THE PMPP

For the proper implementation of this Stakeholder Mobilization Plan (PMPP), an implementation plan of activities in this direction has been developed by the company GLOBAL ATOMIC where it provides for a monthly, quarterly and annual review of the implementation.

This plan will specify, among other things, for each planned action or activity, the person in charge, the actors involved, the necessary resources (budget) and the deadlines for implementation.

The balance sheets will be developed through tools specifically dedicated to this to be capitalized in the global document of monitoring the current activities of the Project.

The follow-up reports will provide strengths and weaknesses, difficulties encountered and recommendations for improving the implementation of planned activities.

All these activities will be carried out jointly by the environmental and social component manager of the project, the one who takes care of GBV/EAS/HS issues and the Project Monitoring and Evaluation Specialist.

If necessary, the MGP will be opened to provide for the participation of third parties in the local monitoring of areas at risk of the project on aspects of fragility, conflict and violence (FCV) will expand the indicators. Similarly, third parties could assist in the establishment and monitoring of PGMs in areas inaccessible due to insecurity or the nature of the terrain.

Based on the activities programmed in this PMPP, an estimated budget will be developed.

CONCLUSION

The Stakeholder Mobilization Plan (PMPP) is a social performance tool for a consistent implementation of the project.

Stakeholder engagement or Stakeholder Participations according to the Equator Principles in the true sense of the terms, is referred to as the publication of environmental and social information, informed participation and consultation as well as the grievance mechanism in the context of the implementation of the project.

This document, which enshrines the PMPP of this ADRAR EMOLES 3 permit uranium deposit exploitation project, meets the provisions of Principle 5 of the Equator and ifc Performance Standard No. 1 at the international level as well as Law 2018-28 of 14 May 2018 determining the fundamental principles of Environmental Assessment in Niger at the national level.

It is a flexible and iterative document consisting of a regulatory framework, a synthesis of the potential environmental and social impacts and risks of the project, the stakeholder engagement program, a complaints management mechanism and the implementation plan with the schedule and estimated budget for implementation.

APPENDICES

Appendix 1: Summary of Stakeholder Consultations
Appendix 2: Complaint Registry Canvas
Appendix 3: Sample Complaint Resolution Minutes

Appendix 1: Summary of the Results of the Public Consultations

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
REGIONAL AUTHORITIES		
Governorate	Roles to be played in this project	- Accompany and facilitate the project installation process - Ensure relay between the company and the populations bordering the site
	Other institutions to be involved in the implementation of the project (in order of importance)	- Governorate, Regional Council, Communal Councils, Prefecture, Traditional Chefferie, Civil Society Actors
	Possible obstacles that may hinder the smooth running of the project in the area	- Insecurity, the absence of conditions for the viability of the project, the fall in the cost of products, the support of the populations
	The way forward to overcome these obstacles	- Create the conditions for in-depth consultation with the actors concerned by the project - Avoid the mistakes of previous companies
	The most effective means to be used to ensure the mobilization of actors	- Create the conditions to facilitate communication - Improving the conditions of the population
Regional Council	Roles to be played in this project	- Awareness-raising and training (mobilization) of local elected officials and the population to join the project - Contribution to the preservation of the environment especially the pastoral areas in the area - Involve in the control/monitoring of project activities and also associate with the security of the area
	The other institutions to be involved in order of importance in the implementation of the project	- Governorate, Regional Council, Prefecture of Tchirozérine, Commune of Tchirozérine, Commune of Dannet, Civil Society, ANPE and Traditional Chiefs.
	Obstacles that may hinder the smooth running of the project in the area	- Misunderstanding between the different parties and miscommunication on the part of society.
	The way forward to overcome these obstacles	- Organize a regional workshop on the explanation of the project as a whole - Develop a good communication plan - Involve all stakeholders
	The most effective ways to mobilize actors easily	- All communication must go through the competent authorities (Governorate and Regional Council) by correspondence. At the

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
		community level, the focus group or prospectus remains the most effective means.
	Concerns about project implementation	- Positively, we mention the creation of jobs for the benefit of the local population, the reduction of unemployment, the mining royalty. - On the other hand, negatively we expect the destruction of the environment and the post-mine situation.
	Suggestions and Recommendations to be made with regard to the project	- Adopt a means of communication, make concrete achievements for the benefit of communities, regularly monitor the evolution of the different components and communicate on the results.
	Impact of the closure of the COMINAK mine on this project	- It will facilitate the mobilization of the workforce for the project to the extent that this closure frees up expertise in mine. This will allow the company to draw on the experience of existing companies in order to avoid the various mistakes in this case avoiding the progression of the habitat areas to the exploitation area.
CENTRAL SERVICES AT THE REGIONAL LEVEL		
Regional Directorate of Mines	Roles to be played in this project	- Monitoring/control during all phases of the project (preparation, operation and closure)
	The other institutions to be involved in order of importance	- Governorate, Regional Council, Local Authorities, technical services of the State (Regional Directorate of Mines, Regional Directorate of the Environment and the Fight against Desertification, Regional Directorate for the Promotion of Women and Child Protection), NGOs and Civil Society Organizations.
	Environmental, social and economic issues in the area	- On the environment: reduction of water resources and degradation of water and air quality; - On the social level: job creation, increased income of the population and reduction of insecurity with the reduction of unemployment. - On the economic level: boosting the Region's economy
	Recommendations to follow to take into account these issues (especially negative)	- Create the conditions for the viability and sustainability of the project; - Involve all stakeholders from the start of the project.

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
	The most effective ways to easily mobilize actors	- Create a framework for consultation that takes into account all stakeholders. Use Community Radio and ICT, traditional channels according to their organization and flyers.
	Level of engagement	- High
	Impact of the closure of the COMINAK mine on this project	- This closure will facilitate the mobilization of the qualified workforce and it will also reduce the cost allocated to staff training.
Regional Directorate for the Environment and the Fight against Desertification	Roles to be played in this project	- Ensure the implementation of environmental and social measures through periodic monitoring and follow-up/control during and after the implementation of the project.
	The other institutions to be involved in the implementation of the project in order of importance	- Administrative and customary authorities, Direction Régionale des Mines, Direction Régionale de l'Elevage, Direction Régionale de l'Hydraulique et de l'Assainissement, Inspection Régionale de Travail, Organisation des Sociétés Civiles
	Environmental, social and economic issues in the area	- On the environment: effects of radiation on soil, water and air - On the social level: improvement of income, improvement of security through the creation of water points, reduction of pastoral spaces. - Economically: job creation
	Recommendations to follow to take into account these especially negative issues	- Adopt a participatory approach that involves involving the population, implementing the planned measures and taking into account the concerns of local populations.
	The most effective ways to easily mobilize actors	- Create a framework for consultation between the various stakeholders, make it functional, make it also accessible to local populations through the media and training
	Level of engagement	- High
	Impact of the closure of the COMINAK mine on this project	- Facilitating labour mobilization
	Expectations	- The project must be concerned with the preservation of the environment; - Create synergies of action to ensure the correct and effective application of environmental and social measures;

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
		- A complaints management mechanism needs to be put in place to manage complaints as part of project activities, including environmental and social activities.
Regional Directorate for the Advancement of Women and Child Protection	Roles to be played in this project	- Prevention of all forms of violence within the framework of the project - Support/advice and referral of workers to the competent courts if necessary - Gender support within the framework of the project.
	The other institutions to be involved in order of importance	- The Dismemberments of the Regional Directorate for the Advancement of Women and Child Protection - Religious Observatory of the Region - Women's Organizations - Nigerien Association of Women Against War - National Agency for Legal and Judicial Assistance - Office of the Juvenile Judge - ANPE and the Dismemberments of the Regional Directorate of Employment - Local Authorities - NGO (PRE, COOPY), Mother and Child Centre
	Uneasiness	- Lack of a holistic GBV centre (mental health, food, health care, legal and AGR assistance) - Lack of training on promising sectors.
	The most effective ways to easily mobilize actors	- Community Radio - Meeting, Advocacy session, local awareness-raising, participatory theatre
	Level of engagement	- High
	Expectations	- Fully engaging with communities - Support local development through sustainable actions.
Regional Directorate of Hydraulics and Sanitation	Roles to be played in this project	- Control of the quality and quantity of water and monitoring/control of hygiene and sanitation rules on the site during all phases of the project.

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
	Environmental, social and economic issues in the area	- Creating a water resources deficit - Reduction of water quality by groundwater contamination - Proliferation of fecal-peril diseases
	Recommendations to follow to take these issues into account	- Create a collaboration between the Regional Directorate of Hydraulics and Sanitation and the GLOBAL Company; - Build hydraulic structures for the benefit of the populations; - Periodically monitor the piezometric level of the area's groundwater; - Implement the measures referred to in the GGP of this project.
	The most effective ways to easily mobilize actors	- The memorandum of understanding or agreement of how the company deems more appropriate - Official Email
	Level of engagement	- High
	Expectations	- Fulfilment of commitments in relation to all sectors, including those relating to water and sanitation resources.
Regional Labour Inspectorate	Roles to be played in this project	- Contribute to ensuring social peace within the framework of the project through a call for strict compliance with labour texts
	Environmental, social and economic issues in the area	- Job creation - Reduction of unemployment rates in the area where the project is located and even at the national level - Contribution to economic and social development
	Recommendations to follow to take these issues into account	- Strict compliance with the texts on work within the framework of the project - Involving workers' representatives
	The most effective ways to easily mobilize actors	- Sensitize all stakeholders each in their area of competence to be able to fully fulfill their roles - Strengthen their capacities within the framework of the project.
	Level of engagement	- High
	Impact of the closure of the COMINAK mine on this project	- This will facilitate the mobilization of the well-experienced workforce if the project does not take long to start.
	Expectations	- Compliance with labour texts throughout the project - Compliance with all commitments made.

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
Regional Directorate of Livestock	Roles to be played in this project	- Preservation of pastoralism in the area so that the project does not hinder the smooth running of this sector
	Other actors to be involved in order of importance	- Departmental Directorate of Livestock; - The town hall; - The Breeders.
	Environmental, social and economic issues in the area	- Destruction of pasture; - Disappearance of the most appetized species; - Hindering the movement of animals; - Contamination of pastures and water points.
	Recommendations to follow to take these issues into account	- Development of spaces for the production of fodder as compensation - Drilling in areas that are not in operation due to lack of water - Support livestock farming with the implementation of livestock feed and animal health.
	The most effective ways to easily mobilize actors	- Workshop - Official Email
	Level of engagement	- High
	Expectations	- The project must avoid as much as possible the disruption of pastoral activities in the area
DEPARTMENTAL AND COMMUNAL AUTHORITIES (SG OF THE PREFECTURE AND HEADS OF SERVICES, TOWN HALL) OF TCHIROZÉRINE		
Town hall	Roles to be played in this project	- Mobilization of the local population in the implementation of the project through the recruitment of local labour - Assist in the development of the local development plan - Help protect the environment through control/follow-up on the company's commitments.
	Approach to these roles	- Public awareness/information - Training of actors with the support of the project
	Concerns	- Non-compliance with commitments made at the start of the project - Environmental degradation in all its components - Lack of support for the project due to lack of awareness.

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
	Recommendations to follow to take these issues into account	- Respect all commitments made at the start of the project - Adopt an adequate mechanism for the preservation of the environment by implementing all the measures provided for - Popularize awareness and involve the population.
	The most effective ways to easily mobilize actors	- Information/awareness through community radio - Training of all stakeholders including the town hall and other relevant stakeholders
	Level of engagement	- High
	Expectations	- Massive use of local labour by inserting young people from the community - Access of the population to basic social services - Support for the revitalization of the local economy (agriculture, livestock) through modern fattening techniques - Strengthening social cohesion
Prefecture	Roles to be played in this project	- Ensuring the safety of property and people in this project - Demand compliance with impact resolutions - Monitor and verify the operation of the site - Managing conflicts between different parties - Monitor the state of water resources, grazing
	Other actors to be involved in order of importance	- Town hall - Departmental technical services (Livestock, Environment, Promotion of Women, Education, Agriculture and Health) - Traditional Chefferies - COFO, OSC, etc.
	Environmental, social and economic issues in the area	- Pollution of resources - Occupation of grazing areas and gardens - Risk of conflict - Risk of new diseases - Risks of depravation of morals and carrying of life
	Recommendations to follow to take these issues into account	- Apply the measures provided for in the EMP - Development of pastoral areas - Supply of Livestock Feed Banks

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
		- Support for the installation of water pumping stations - Development for fodder cultivation
	The most effective ways to easily mobilize actors	- Community radio, Poster, WhatsApp, NTIC, Public criers, awareness caravan.
	Level of engagement	- High
LOCAL COMMUNITIES (VILLAGE LEVEL)		
ISSAKANANE	Roles to be played in this project	- Facilitate access to area resources - Labour mobilization for the project
	Approach to these roles	- Educating the public on how to make it easier for GLOBAL agents to access resources - By raising awareness of the importance of joining the project.
	Uneasiness	- Problem of access to drinking water - Problem of access to basic health care - Lack of school in the village - Impairment of gardening activities - Lack of work for local youth - Lack of feed bank - Non-local recruitment - Animal diseases - Risks of depravation of morals - Insufficient remuneration
	Recommendations to follow to take these issues into account	- Build hydraulic structures to facilitate access to drinking water - Build health centre and classrooms made of final materials in the village - Recruit local youth as unskilled labour in the project account - Buy local products - Vaccination of animals - Installation of the Livestock Feed Bank - Raising awareness on the depravity of morals
	The most effective ways to easily mobilize actors	- Information of the village chief in order to inform the community in turn through his emissary
	Level of engagement	- High

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
INOLAMANE	Roles to be played in the implementation of this project	- Facilitate access to existing resources in the area - Facilitate the mobilization of actors including the workforce
	Approach to these roles	- By prioritizing the consultation approach for a collective adherence to the project
	Uneasiness	- Lack of access to drinking water - Lack of classes in definitive materials - Lack of basic health care - Destruction of pastures - Degradation of pastoral areas - Emergence of new animal diseases - Non-local recruitment of labour
	Recommendations to follow to take these issues into account	- Construction of hydraulic works in the area - Construction of classrooms made of final materials in the village - Construction of health centre - Recruit local labor in the company's account not subcontracting - Improving animal health through vaccination sessions - Provide the village with a livestock feed bank
	The most effective ways to easily mobilize actors	- Inform the Village Chief in order to mobilize the community through his emissary
	Level of engagement	- High
TAGAZA	Roles to be played in this project	- Helping to achieve the stability and security of the area - Labour mobilization
	Approach to these roles	- Raising public awareness of the security of the area - Collaboration with SDF; - By orienting towards a reassuring choice in relation to the recruitment of the workforce
	Uneasiness	- Occupation of pastoral spaces by project activities - Environmental destruction - Lack of access to basic health careCanding of access to electricity - Involvement of traditional chiefs

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
	Recommendations to follow to take these issues into account	- Build a health centre and an energy system in the village - Fully involve traditional leaders - Avoid the proliferation of passageways during the transport of products
	The most effective ways to easily mobilize actors	- Create a climate of understanding between different ethnic groups - Creating a framework for Community consultation
	Level of engagement	- High
TEMILT DAABOUS	Roles to be played in this project	- Labour mobilization - Help the stability of the area
	Approach to these roles	- Raising awareness on the importance of peace in the zone - Raising awareness about good conduct
	Uneasiness	- Groundwater pollution - Lack of access to drinking water - Insufficient grazing in the area
	Recommendations to follow to take these issues into account	- Avoid using highly harmful chemical elements in the project - Building hydraulic structures for people and livestock - Feed Bank
	The most effective ways to easily mobilize actors	- Use of ICT and Community relays - Information from the village chief in order to mobilize the community through his relay
	Level of engagement	- High
EGHATRAK	Roles to be played in this project	- Labour mobilization
	Approach to these roles	- Informing the community about the importance of joining the project as their core activities will be affected
	Uneasiness	- Recruitment of the workforce as part of the project - Lack of health centre in the village - Insufficient classes of final materials in the village - Problem of accommodation of pupils
	Recommendations to follow to take these issues into account	- Recruiting the workforce at the local level - Build a health care centre in the village - Build classrooms out of final materials

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
		- Consider taking care of the village's students
	The most effective ways to easily mobilize actors	- Phone call, public criers, community relay
	Level of engagement	- High
GALELO	Roles to be played in this project	- Labour mobilization - Contribution to the security of the area
	Approach to these roles	- Raising awareness about project membership - Raising awareness on peace and social cohesion
	Uneasiness	- Harm to the well-being of people and animals - Water pollution - Disruption of pastoral activities - Reduction of pastoral spaces - Lack of health care centre
	Recommendations to follow to take these issues into account	- Build a health care centre in the village - Realization of hydraulic works in the village - Provide the village with a livestock feed bank - Avoid using highly toxic chemical elements in the project
	The most effective ways to easily mobilize actors	- Information of the village chief in order to mobilize the community through his emissaries
	Level of engagement	- High
OUFOUD	Roles to be played in this project	- Mobilization of the workforce for the project - Contribution to peacebuilding and social tranquility
	Approach to these roles	- By seeking a grievance to the integration of young people into the project in order to reduce the unemployment rate as a factor of insecurity in the area.
	Uneasiness	- Workforce Recruitment - Impact of the project on the socio-economic activities of the area - Lack of health care centre
	Recommendations to follow to take these issues into account	- Recruit the workforce at the local level or give a quota for the local population - Build a health centre at the village level - Provide the village with a livestock feed bank

STRUCTURES/LOCALITIES	POINTS DISCUSSED	ANSWERS PROVIDED BY THE PERSON(S) MET
		- Training women in AGRs
	The most effective ways to easily mobilize actors	- Information of the village chief in order to mobilize the community through his emissaries
	Level of engagement	- High
GADOS	Roles to be played in this project	- Labour mobilization - Contribution to strengthening social cohesion
	Approach to these roles	- Awareness of project membership
	Uneasiness	- Reduction of pastoral areas with the delimitation of the permit area - Risks of groundwater contamination and reduced access to water supply sources
	Recommendations to follow to take these issues into account	- Recruitment of local/local workers - Building hydraulic structures - Periodically vaccinate animals in the area - Provide the village with a livestock feed bank
	The most effective ways to easily mobilize actors	- Mobilization of proximity under the leadership of the village chief
	Level of engagement	- High

Appendix 2: Complaint Registry Canvas

File No.	Date of receipt of the complaint	Name of the person receiving the complaint	Where/how the complaint was received	Name and contact of complainant (if known)	Content of the complaint (include all complaints, suggestions, inquiries)	Has the complaint been confirmed to the complainant? (Y/N - if yes, indicate the date, method of communication and by whom)	Expected decision date	Outcome of the decision (include the names of the participants and the date of the decision)	Was the decision communicated to the complainant? Y/N If yes, indicate when, by whom and by what means of communication	Was the complainant satisfied with the decision? Y/N State the decision. If not, explain why and if you know, will he continue the appeal process.	A follow-up action (by whom, on what date)?

Appendix 3: Sample Complaint Resolution Minutes

BASIC INFORMATION	IDENTIFIER NUMBER
Region of:	
Department	
Commune	
Date:	
Supporting documents (Report, Contract, agreement, ...)	
Complainant's signature	
Signature of the Backup Manager	

The Year two thousand and twenty-one __ and the __
A complaint resolution meeting was held in connection with the ADRAR EMOLES 3 licence uranium deposit project by GLOBAL ATOMIC.
Information on the reason for the complaint is given in the table above. Subsequently, the work of the Complaints Management Committee led to a successful outcome.
It is in this context that these Minutes are drawn up to serve and assert what is rightful.

At the end of this resolution, the following members signed:

President (e) Mr. /Mme_____

Secretary General (e): Mr. /Mrs_ ___

Complainant: __

Done at _____

- GENDER-BASED VIOLENCE PLAN

These clauses on Gender-Based Violence (GBV) and child labour will be included in the DAOs of all service providers who will intervene on the site of the uranium mining project of the Adrar Emoles 3 research permit.

Preamble

The human person is sacred in his dignity and may not be subjected to inhuman, cruel and degrading treatment in any form whatsoever. Therefore, the following acts of barbarism are severely punished:

- ***Moral harassment***

No Employee and learner of the Company, its subcontractors as well as its security and other partners must suffer or subject repeated acts of moral harassment having as its object or effect a deterioration of working conditions likely to infringe rights and dignity, to alter his physical health or to compromise his professional future.
No employee may be sanctioned, dismissed or discriminated against for having suffered or refused to undergo the acts defined above or for having testified to such acts or having recounted them.

Any Employee and learner of the Company, its subcontractors and security partners who have committed such reprehensible acts is therefore liable to disciplinary action.

- ***Physical violence***

No Employee and learner of the Company, its subcontractors as well as its security and other partners shall suffer or cause to be subjected to physical violence, in all its forms, assault, assault and battery, physical mutilation against any human being or his personal property.

- ***Pimping, sexual harassment and violence and paedophilia***

In accordance with national, regional and international texts on procuring, harassment and sexual violence against women, paedophilia and respect for the habits and customs of populations and human relations in general, any act of pimping, harassment, abuse, sexual violence (gender-based violence/GBV), paedophilia (cf: (i) United Nations Resolution 48/104 on the Declaration on the Elimination of Violence against Women and (ii) Resolution 2011/33 on prevention, protection and international cooperation against the use of new information technologies to abuse and/or exploit children) shall be immediately punished by dismissal upon the first finding of fault, with transmission of the characteristic elements of fault for prosecution by the competent public authority.

- ***Exploitation of children***

In accordance with national, regional and international legislation: ((i) Resolution 2011/33 on prevention, protection and international cooperation against the use of new information technologies to abuse and/or exploit children and (ii) Resolution 44/25 of 20 November 1989 on the rights of children), the employment and exploitation of children is strictly prohibited within the company.

How community mobilization programs can address gender-based violence

- Support activities that integrate GBV community mobilization into existing health and development programs.
- Support activities that seek to reduce tolerance of violence at the community level, involving boys and men
- Support programs that mobilize a broad representative section of the community at the grassroots level.
- Support efforts to create partnerships between community leaders, government officials and NGOs in the fight against GBV at the community level.
- Supporting community mobilization to improve survivors' access to services
- Provide long-term financial support to ensure that community engagement activities have sufficient time to effect change and that results are visible.

Minimum Standards for the Prevention and Response to Gender-Based Violence in Emergencies

- **Participation**
  Communities, especially women and girls, are engaged as active partners to end GBV and promote access to services for survivors.
- **National systems**
  Actions to prevent, mitigate and respond to GBV in emergencies strengthen national systems and local capacities.
- **Gender and social norms**
  The Emergency Preparedness, Prevention and Response Program promotes gender and social norms to treat GBV.
- **Socio-economic empowerment**
  Women and adolescent girls have access to livelihoods to mitigate the risk of GBV as well as access to socio-economic assistance as part of a multisectoral response.
- **Guidance systems**
  Referral systems are developed to connect women, girls and other at-risk groups to appropriate multi-sectoral GBV prevention and intervention services in a timely and safe manner.
- **Integration**
  GBV risk mitigation and survivor support are integrated into all humanitarian sectors at all stages of the programme cycle and throughout the emergency response.

Six areas of action

- Protection of children from sexual and gender-based violence
- Combating the practice of survival sex as a coping mechanism in displacement situations
- Involvement of men and boys
- Providing a secure environment and secure access to home energy and natural resources

URANIUM DEPOSIT EXPLOITATION PROJECT OF THE *"ADRAR EMOLES 3"*

RESEARCH PERMIT

WORKFORCE MANAGEMENT PROCEDURES (WMP)

March 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

NCEA: National Environmental Assessment Office
CO: Carbon Monoxide
CO2: Carbon Dioxides
CNSS: National Social Security Fund
CSST: Occupational Safety and Health Committee
EAS/HS: Sexual Exploitation and Abuse/Sexual Harassment
EHS: Environment, Health and Safety
SDF: Defence and Security Forces
GAFC: Global Atomic Fuels Corporation
EIG: Economic Interest Grouping
IFC: International Finance Corporation
INS: National Institute of Statistics
STIs: Sexually Transmitted Infections
MGP: Complaints Management Mechanism
MSP: Ministry of Public Health
NES: Environmental and Social Standards
NOx: Nitrogen Oxides
NP: Performance Standards
OHADA: Organization for the Harmonization of Business Law in Africa
ILO: International Labour Organization
NGO: Non-governmental organization
PAR: Resettlement Action Plan
GGP: Environmental and Social Management Plan
BMMP: Workforce Management Procedures
PS: Social Performance
Minutes: Minutes
SDDCI: Sustainable Development and Inclusive Growth Strategy
AIDS: Acquired Immunodeficiency Syndrome
SOx: Sulfur Oxides
OSH: Occupational Safety and Health
TDR: Terms of Reference
GBV: Gender-Based Violence
HIV: Human Immunodeficiency Virus

LISTS OF TABLES

1. INTRODUCTION

1.1. Project Context

Vast Sahelian country of 1267000 km2 of area and an estimated population of about 20 million inhabitants (INS, 2018). It is a country very rich in mineral and energy resources but faces enormous challenges in terms of socio-economic development. To address these challenges, several strategic documents have been developed and implemented. These include the Sustainable Development and Inclusive Growth Strategy (SDDCI) Niger 2035, the Economic and Social Development Plan PDES (2017-2021), the Mining Policy adopted in 2020, etc.

In this sense, the company GLOBAL ATOMIC FUELS CORPERATION (GAFC), is part of the same logic by considering putting into operation the uranium deposit that it discovered on its research license "Adrar Emoles 3".

GLOBAL ATOMIC FUELS CORPERATION (GAFC) is a Canadian company that has been conducting mining research in Niger since 2007. It is considering the exploitation of the uranium deposit that it discovered in the "Adrar Emoles 3" research permit. This uranium deposit is located along the Agadez-Arlit road and is about 60 km NNW from the city of Tchirozérine, which houses the facilities of the Société Nigérienne du Charbon d'Anou-Araren. This location roughly corresponds to an area located halfway between the city of Agadez and the mining city of Arlit.

Indeed, to effectively supervise and manage the workforce and mitigate the negative impacts related to its use during the implementation of this project, these Workforce Management Procedures (WMP) are developed in accordance with the provisions of the Equator Principles and IFC standards.

1.2. Study methodology

The methodological approach used in the development of this BMMP document involved the following steps:

- Documentary review that consisted of the research and exploitation of the technical documents of the project, the principles of Ecuador including the PS2 Performance Note, the IFC performance standard number 2, other PGMO developed at the national level, or even beyond, etc.
- Conduct of field missions for the meeting of the stakeholders concerned (technical services, administrative, communal and customary authorities, beneficiary populations) in particular the administrations in charge of labour issues with a view to taking into account their opinions and orientations.
- Analysis of the data and writing of the report structured around the following points:
    - Introduction;
    - Objectives of the Workforce Management Procedures;
    - Brief overview of the Project;
    - Overview of labour use;
    - Description of risks and impacts;
    - Mitigation Proposals;

- Legal and institutional framework for employment and occupational safety and health;
- Responsible staff;
- Policies and procedures;
- Complaints Management Mechanism;
- Management of contractors and suppliers
- Conclusion;
- Appendices.

2. OBJECTIVES OF WORKFORCE MANAGEMENT PROCEDURES

The general objective of the Workforce Management Procedures (PGMO) is to describe how the workers of global will be managed, in accordance with the provisions of Law No. 2012-45 of 25 September 2012 on the Labour Code of the Republic of Niger and the requirements of IFC Performance Standards Number 2 and the Ecuador Principles on Labour and Working Conditions.

More specifically, the objectives of the WMP document are:

- protect the fundamental rights of workers as a whole;
- promote decent work, including fair treatment, non-discrimination, fairness and equal opportunities for all workers without gender-based discrimination;
- establish, maintain and improve a healthy relationship between society and workers;
- protect and promote the safety and health of workers, in particular by promoting safe and healthy working conditions;
- prevent the use of forced labour and child labour;
- protect workers, especially those who are vulnerable such as women, people with disabilities;
- support the principles of freedom of association and collective agreements for workers in accordance with national law;
- provide the company's workers with accessible mechanisms to adequately manage claims and complaints.

3. BRIEF PROJECT OVERVIEW

3.1. Project Objectives

The overall objective of the project is the exploitation of the uranium deposit discovered in the "Adrar Emoles 3" research permit.

Specifically, this project aims to:

- Build and install permanent surface infrastructures (life base, buildings including administrative and technical blocks, sanitary facilities, water and electricity networks, basins, various workshops and garages, shops and warehouses of various products and equipment, etc.);
- Build the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) as well as all the installations associated with it (garage, workshops, crushing device, various cables, signals, instructions, etc.);
- Build the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouses, various networks, contact for the production of sulfuric acid, hydraulic works, worms, different input storage areas, etc.);
- Process the ore to obtain uranate, feed it and transport it to potential outlets;
- Create temporary and permanent jobs and contribute to the improvement of people's living conditions;
- Contribute significantly to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors;
- Redevelop all the sites operated when the project closes.

3.2. Expected results

The main expected results of the project implementation are:

- permanent surface infrastructures (life base, buildings including administrative and technical blocks, sanitary facilities, water and electricity networks, basins, various workshops and garages, shops and warehouses of various products and equipment, waste rock and residue deposit areas, etc.) are built and/or installed;
- the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) as well as all the installations associated with it (garage, workshops, crushing device, various cables, signalling, instructions, etc.) are built and/or installed;
- the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouse, various networks, contact for the production of sulfuric acid, hydraulic works, pours, pours, different input storage areas, etc.) are built;
- the ore extracted is processed, the uranate obtained swollen and transported to potential outlets;
- temporary and permanent jobs are created and the living conditions of the people of the area are improved;

- a significant contribution to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors is made;
- all the sites operated are redeveloped when the project closes.

3.3. Project Components

The Uranium Deposit Exploitation Project of the Adrar Emoles 3 research permit by global atomic consists of four (4) components as illustrated in Table 1 below.

Table 1 Project Components1

Components	**Activities**
Component 1: Development work:	construction of access roads such as runways and ramps
	stripping or removal of overburden
	implantation of sterile verses
	implantation of ore verses
	installation of an ore sorting station
	realization of the basins
	implantation of the verses, the descent, the ventilation holes
Component 2: Mining	Drilling
	Shots
	Ltris
	transport of ore.
Component 3: Ore processing work	crushing, grinding and spraying
	attack, impregnation, ripening and disintegration
	Precipitation
	purification and drying
	runaway and transport of uranate to port
Component 4: Mine closure	site restoration and monitoring project

3.4. Institutional arrangement

The institutional set-up for the implementation of the uranium mining project of the "Adrar Emoles 3" research permit by the Global Atomic Company is arranged from its country office located in Niamey and its liaison office located in Agadez which jointly ensure the coordination as well as the monitoring and control of the work in compliance with the rules of the art. In accordance with the provisions of the Mining Code and the Uniform Act on the Rights of Companies and Economic Interest Groupings (GIE) of the Treaty

of the Organization for the Harmonization of Business Law in Africa (OHADA). The operations of the company's activity in Niger are managed by a company incorporated under Nigerien law called Global Uranium Niger Inc., created in 2009. Global Uranium Niger Inc., headquartered in Niamey, is registered in the Trade and Movable Credit Register under number E: 1176/RCCM/2007/Niamey and has a share capital of ten million (10,000,000) CFA francs.

The staff of this company is mainly composed of Nigeriens trained in the fields of earth sciences (geology, prospecting, geophysics, hydrology, hydrogeology), logistics, accounting, labor law, etc. In this sense, these staff will be responsible for: (i) monitoring and evaluation (M&E) and knowledge sharing services to inform the implementation of the project; (ii) technical implementation and monitoring of activities; (iii) fiduciary management (financial management, accounting, internal audit and procurement); (iv) environmental and social management for compliance with safeguard measures, including a Complaints Management Mechanism (PMM); and (v) gender and social inclusion and gender-based violence mainstreaming in all project operations. Coordination of all partnership agreements with public and private implementing partners. However, this company could call on other expertise that it deems necessary if necessary.

The ministerial institutions concerned by the project, in particular the Ministry of Mines, the Ministry of the Environment and the Fight against Desertification, the Ministry of Employment, Labour and Social Protection as well as certain services attached to them, in particular the Directorate of the Mining Environment and Classified Establishments, the National Environmental Assessment Office and the Regional Labour Inspectorate, will be at the centre of the project's interventions. They will rightly have the roles of validating the technical, financial and environmental studies in order to proceed with the issuance of certain authorizations necessary for the implementation of this project. They will also monitor and monitor compliance with the commitments that conditioned the issuance of these authorizations.

The municipalities will be at the centre in the implementation of the project's activities. As such, they will be responsible for: (i) participating in the identification and planning of community development activities, (ii) participating in the procurement process for community development activities, (iii) supervising the implementation of these actions on the ground, (iv) participating in the receptions of investments made in their entities.

4. OVERVIEW OF LABOUR USE

4.1. Number of project workers

Based on the current operation of existing mining companies in Niger and the forecasts of additional staff at certain workstations, the Uranium Mining Project of the research permit "Adrar Emoles 3" by the company GLOBAL ATOMIC, will have an estimated workforce of two hundred and seventeen (217) **direct workers**.

As other workers, the Project will employ contract workers as service providers, particularly in studies and controls, audits, etc. At the current stage, it remains to be determined the number of contract workers who will be hired on the basis of the project's themes.

For community workers, the number of workers also remains to be determined to the extent that the project being installed.

Several subcontractor workers, of national or international status will be employed for the need of financial and even environmental technical studies upstream as well as downstream of the project.

All workers will be subject to the signature and compliance with a Code of Ethics according to their profile.

4.2. Characteristics and types of workers

In accordance with the requirements of IFC Performance Standard No. 2, as part of the implementation of the project, direct and indirect workers will be mobilized.

4.2.1. Direct workers

Direct workers are persons directly employed on behalf of the uranium mining project of the "Adrar Emoles 3" research permit, recruited by the company GLOBAL ATOMIC to perform tasks that are directly related to this project.

These direct workers will be civil servants with a special status or consultants with proven and justified experience. Their profiles will be compatible with the specific objectives of the uranium mining project of the "Adrar Emoles 3" research permit. They will be subject periodically to an evaluation of professional performance.

4.2.2. Contract workers

Persons employed or recruited by third parties (firms, project stakeholders, companies that have a contract with the company) to perform work related to the essential functions of the project, regardless of the location of this work.

The terms and conditions of the contracts for all the workers involved will be consistent with national labour legislation, in particular Law No. 2012-45 of 25 September 2012 on the Labour Code of the Republic of Niger and its implementing decree with a view to guaranteeing acceptable working conditions (a safe and healthy working environment, non-discrimination, equal opportunities and workers' organizations).

4.2.3. Employees of primary suppliers

This category includes persons employed or recruited by the main suppliers to ensure the implementation of the Uranium Mining Project of the research permit "Adrar Emoles 3" by the company GLOBAL ATOMIC.

The number of workers will be known and published when the project work begins.

4.2.4. Migrant workers

Since the uranium mining project of the "Adrar Emoles 3" research permit is located in the Agadez Region, which is a transit zone for migrants (national or international), the latter could be recruited or employed as part of this project.

At the national level, the Labour Code in several of its articles refers to non-discrimination against workers on the basis of their status, such as article 5, which states that "*Subject to the express provisions of this Code or any other legislative or regulatory text protecting women and children, as well as to provisions relating to the status of aliens, no employer may take into account sex, age, national descent or social origin, race, religion, colour, political and religious opinion, disability, HIV/AIDS, sickle cell disease, trade union membership or non-membership and trade union activity of workers in making decisions concerning, inter alia, employment, conduct and distribution of work, vocational training, advancement, promotion, remuneration, granting of social benefits, discipline or termination of the employment contract. Any provision or act to the contrary shall be void*."

This is the case with the provisions of Articles 41, 48 to 52, 133, Articles 158 to 160 and 190 – which protect without discrimination the rights of migrant workers and members of their families.

Particular attention will be paid to a non-discriminatory hiring process. Decisions regarding the recruitment or treatment of the company's employees will not be made on the basis of personal characteristics unrelated to the needs inherent in the position concerned. The company's workers will be employed according to the principle of equal opportunity and fair treatment and there will be no discrimination in any aspect of the employment relationship, be it recruitment and hiring, remuneration (including wages and benefits), working conditions and terms of employment, access to training, job missions, promotion, dismissal or retirement, or disciplinary measures. This presupposes that in the event of non-compliance with this principle, liability will be located and the related sanctions will be applied.

5. DESCRIPTION OF RISKS AND IMPACTS

5.1. Activities that are sources of risk

The Uranium Deposit Exploitation Project of the "Adrar Emoles 3" research permit by global atomic will be implemented through four (4) distinct phases. Thus, depending on the latter, the activities identified in Table 2 below will be sources of risks to the safety and health of workers.

Table 2 Risk Source Activities and Impacts

PROJECT PHASES	ACTIVITIES THAT ARE SOURCES OF IMPACTS
Development (Preparation and construction)	Construction/development of access roads/tracks
	Site preparation of temporary equipment
	Installation of temporary infrastructure and equipment
	Exploitation of loans and quarries (sand, gravel, laterite, etc.)
	Movement of construction machinery and supply of construction materials and materials to the site
	Preparation of rights-of-way for permanent project facilities
	Construction/installation of surface structures and equipment
	Underground mine construction and background support services
	Maintenance of fixed and mobile machinery on site
	Fuel storage and supply
	Recruitment of the workforce and functioning of the life base
Exploitation	Recruitment of the workforce and operation of the project life bases and subcontractors
	Extraction of ore from the underground mine (drilling, logging by explosive fire, transport of ore to the primary crusher, dayway conveying through a conveyor belt)
	Truck movements for input supply
	Storage of inputs (chemicals including sulphur, hydrocarbons, etc.)

PROJECT PHASES	ACTIVITIES THAT ARE SOURCES OF IMPACTS
	Operation of workshops (maintenance of machinery and equipment, reconditioning of machinery, manufacture of spare parts, etc.) and the contact workshop
	Ore storage, crushing and conveying to the plant
	Ore processing at the plant level
	Storage of ore processing tailings
	Effluent storage at the basin level
	Construction of new basins
	Exploitation of loans for the needs of the site in laterites and gravel
	Loading and shipping uranate
	Periodic maintenance work on the plant
	Movement of project equipment and subcontractors
Closure	Dismantling of installations
	Site Cleanup
	Site redevelopment/rehabilitation
	Gear movements
	Presence of the hand in the context of the work

5.2. Key Labour Risks

The main risks to which workers may be exposed, depending on the sources identified, during the implementation of project activities are:

- Risks of occupational accidents and physical injuries;
- Fire or explosion hazards
- Psychosocial risks;
- Risks of respiratory diseases;
- Risks of sexually transmitted diseases;
- Risks of biological contamination;
- Risks of exposure to thermal environments;
- Risks of low back pain;
- Risks of tensions/conflicts between local populations and workers;
- Risks of diseases related to the modification of the sound environment;
- Risks of radiological contamination;
- Risks of intoxication;
- Risks of drowning;
- Risks of visual and ergonomic fatigue;
- Risks of infection with COVID-19 and other biological contaminations;
- Security risks related to banditry ;
- Risks of use of labour under the age of 18 and not complying with the provisions of articles 163 to 172 of the Decree implementing the law on the Labour Code. In this case, the company is exposed to sanctions.
- Risks of occurrence of sexual exploitation and abuse (EAS) or sexual harassment (HS).

5.2.1. Risks of accidents at work

The implementation of the present project to exploit uranium deposits in the "Adrar Emoles 3" research permit, presents risks of occupational accidents for the company's workers, on the animals and other populations bordering the site, in this case the breeders. These risks will manifest themselves during the preparation as well as during the operation of the project through in particular the construction / development of access roads / tracks, the preparation of sites for the construction of temporary equipment, the installation of infrastructure and temporary equipment that will contribute to the construction of the project (life base to accommodate the staff of the construction companies, material base, etc.). They will also be felt with the exploitation of loans and quarries (sand, gravel, laterite, etc.), the movements of the machinery of the works and the supply of the site with materials and construction materials, the preparation of the rights-of-way of the permanent installations of the project. Finally, during the construction of the underground mine and underground support services and the maintenance of the fixed and mobile machinery of the site, the construction/installation of the surface structures and equipment.

5.2.2. Psychosocial risks

The practical organisation of work and managerial choices also present psychosocial risks that can have an impact on workers' health. These psychosocial risks are: psychological harassment at work, chronic stress, exacerbated conflicts that can lead to serious damage to workers' health and disrupt work operations.

5.2.3. Risks of respiratory diseases

The risks of respiratory diseases will be linked to the modification of the ambient air quality by the dust that will be generated during the work. In addition, exhaust gases (flue gases) from stationary and mobile machinery that may contain carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (Nox), sulphur oxides (SOx), fine cement particles and those attached to stacks, ore conveying, tailings deposits, movements of mining machinery will contribute to changes in air quality and consequently be sources of respiratory diseases. especially for workers. Weather conditions such as winds can contribute to the exposure of people from surrounding villages. Finally, heavy metals and toxic substances contained in emissions (fluorine, cadmium, lead, silica and radioactive minerals such as uranium and its derivatives) will alter air quality with the consequence of respiratory diseases.

5.2.4. Risks of visual fatigue and ergonomic risks

As part of this project, certain poor working conditions on screens, particularly among the company's administrative staff, can cause visual fatigue and promote stress. These include inadequate lighting of rooms and prolonged exposure to the screen.

Ergonomic risks will be related to activities that often involve postural constraints with a strong demand on members such as wearing objects or tools, sitting in offices, etc.

5.2.5. Risks of conflict between populations and workers in society

The risks of conflicts between populations and workers in society can develop if of course local communities feel that they are unfairly treated or insufficiently taken into account, especially in the context of the recruitment of labour. This can also be manifested by the failure to address the concerns of the residents of the site, particularly on issues related to pastoralism and other subsistence activities of the populations.

5.2.6. Risks of COVID-19 infection and other biological contaminations

The risks of COVID-19 contamination will mainly result from non-compliance with barrier measures through the use of common areas such as restaurants, toilets and living bases.

5.2.7. Security risks

During the implementation of this project, workers may be exposed to the security risks associated with ordinary banditry. Indeed, the security situation in the Sahelian sub-region in general and in Niger in particular has begun to deteriorate since the dismantling of Libya in 2011. This has allowed the easy circulation of advanced firearms and jihadist claims. Thus, within the Sahelian region, particularly in Mali, Burkina Faso and Niger, attacks against both the defence and security forces (FDS) and the civilian population have increased. Such a situation in the context of the implementation of the uranium deposit exploitation project of the "Adrar Emoles 3" research permit may affect the smooth running of activities on the site and disrupt the conditions of transport of the products.

5.2.8. Risks of occurrence of sexual exploitation and abuse or sexual harassment

SEA/HS risks may arise during the implementation of project activities. These risks could be fostered by mixing with local populations, especially since the activities that will be implemented will generate a massive influx of workers from diverse backgrounds. This influx of labour presents risks of exploitation, abuse, sexual harassment, risks of trafficking in women and children for prostitution, with the consequent spread of STIs, HIV/AIDS, unwanted pregnancies, clandestine abortions, especially on vulnerable women and girls.

At the end of the discussions with those responsible for GBV issues at the level of the Agadez Region and in Tchirozérine, the following observation emerges:

GBV cases are recorded both in the resident population and in the migrant camp.

The most common cases identified are:

- Sexual abuse;
- Domestic and non-spousal physical violence;
- Sexual assault, unwanted pregnancy;
- Psychological violence, economic violence;
- Exclusion;
- Child labour in the gold panning site where the children enter the well and also do pounding, sieving and washing.

5.2.9. Risks of radiological contamination

The risks of radiological contamination and its consequences are related to exposure to radon in the mine (underground) and dust that may contain radioactive elements. Also, the contamination of soil and water by radioactive elements that can have an impact on the health safety of workers and populations living near the site.

5.2.10. Risks of exposure to thermal environments

The risks of exposure to thermal environments (cold or heat) will depend on the period or season during the year the project will take place because the area is extremely hot from April to June and cold from October to March.

5.2.11. Risks of diseases related to the modification of the sound environment

This is the loss of hearing acuity in workers linked in particular to the modification of the sound environment in the context of project activities, especially those who expose themselves to noisy workstations whose level exceeds the threshold recommended by the WHO.

6. MITIGATION PROPOSALS

To mitigate labour risks in the implementation of the project, the measures that will be implemented are defined in Table 3 below.

Table 3 Workforce Risk Mitigation Measures

Identified risks	**Mitigation measures for identified risks**
Risks of traffic accidents and injuries	• Equip workers with appropriate Personal Protective Equipment (PPE) • Equipping sites with community protective equipment (CFE) • Set up an infirmary at the level of the living base • Set up pharmacy boxes on the construction site • Organize a security minute at each workstation before the start of work • Set up signs and safety instructions as well as posters on the work sites • Set up an Occupational Safety and Health Committee and its training to make it operational
Psychosocial risks	• Choose sound management methods that minimize the risks associated with occupational stress, that value the worker • Clarify the roles and responsibilities of each worker • Establish a framework for exchanges, communication and social dialogue between all actors
Risks of respiratory diseases	• Educating workers about the risks of respiratory diseases • Water the site regularly and wherever necessary to reduce dust growth • Belt conveyor capping to reduce dust • Air conditioning of machine cabins in order to keep them closed during the work and thus avoid the exposure of drivers to dust • Health monitoring of workers through annual medical visits
Risks of visual and ergonomic fatigue	• Alternate on-screen work with other tasks. • Raising workers' awareness of occupational risks • Create the best working conditions (such as flexible hours, flexible office and IT equipment, the possibility of working remotely, etc.)

Identified risks	Mitigation measures for identified risks
Risks of conflict between populations and workers in society	• Sensitize workers on respect for local customs • Develop and take into account a code of conduct in the contract of all suppliers and service providers of the project • Prioritizing the local workforce in recruitment • Set up a consultation framework within the framework of the project
Risks of COVID-19 infection and other biological contaminations	• Develop and implement procedures for the protection of workers with regard to occupational safety and health • Raise awareness among workers about compliance with barrier measures (wearing a mask, distance of at least 1 m to be respected by all employees, installation of handwashing devices) • Respect the hygienic conditions in the context of the use of common areas • Establish sanitary facilities and appropriate facilities for hand washing • Make available to workers drinking water in sufficient quantity and under satisfactory conditions
Security risks	• Develop a Security Risk Management Plan • Escort the teams on the ground, particularly in the sensitive areas of the project (high-risk areas) • Educate staff on safety instructions and actions to follow in the event of a security incident • Involve the local authorities concerned in the implementation of activities on the ground in order to avoid misunderstandings and accidents.
Risks of exposure to thermal environments	• Equip workers with adequate clothing according to the seasons
Risques of diseases related to the modification of the sound environment	• Equip workers with an anti-noise kit
Risks of low back pain	• Implement mechanical handling aids (devil, trolley, etc.) wherever necessary to reduce ergonomic risks

Identified risks	Mitigation measures for identified risks
	• Create the right working conditions in offices with adapted chairs
Risks of occurrence of SEA/HS	• Organize awareness campaigns for workers and local populations on the prevention of SEA/HS, STIs, HIV/AIDS and unwanted pregnancies • Insert the code of conduct in the contract of suppliers and service providers and ensure that it is known to all • Organize "quarters of an hour like" on a regular basis (at least once a month) with themes related to EAS/HS/VCE, for the benefit of project workers • Strengthen the capacity of the project management/coordination team on gender mainstreaming and prevention of SEA/HS/VCE • Implementation of the provisions of the complaints mechanism • Organization of awareness campaigns for local communities on EAS/HS/VCE

7. LEGAL AND INSTITUTIONAL FRAMEWORK FOR EMPLOYMENT AND OCCUPATIONAL SAFETY AND HEALTH

7.1. Legal framework for labour

7.1.1. International legal framework

The international legal framework for labour is based on the conventions signed and ratified by Niger applicable to the uranium deposit exploitation project of the "Adrar Emoles 3" research permit, which include:

- ILO Convention No. 87 on Freedom of Association and Protection of the Right to Organize, concerning Freedom of Association and Protection of the Right to Organize. Ratified by Niger on 27. 02. 1961.
- ILO Convention No. 98 on the Right to Organize and Collective Bargaining, concerning the Application of the Principles of the Right to Organize and Collective Bargaining. Ratified by Niger on 23. 05. 1962.
- ILO Convention No. 29 on Forced Labour is one of the fundamental Conventions. Ratified by Niger on 27. 02. 1961
- ILO Convention No. 105 on the Abolition of Forced Labour is one of the fundamental Conventions and ratified by Niger on the 23rd. 03. 1962.
- ILO Convention No. 138 on Minimum Age (for Admission to Employment) ratified by Niger on 04. 12. 1978
- ILO Convention No. 182 on the Worst Forms of Child Labour, concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour. Ratified by Niger on 23. 10. 2000.
- ILO Convention No. 100 on Equal Remuneration for Men and Women for Work of Equal Value. Ratification by Niger: 09. 08. 1966
- ILO Convention No. 111 concerning Discrimination (Employment and Occupation), Concerning Discrimination in Respect of Employment and Occupation. Ratified by Niger on 23. 03. 1962.

7.1.2. National legal framework

The national legal framework for employment in Niger applicable within the framework of the Uranium Deposit Exploitation Project of the "Adrar Emoles 3" research permit is based on the following main texts:

- Constitution of 25 November 2010 which recognizes the right of all citizens to work, freedom of association and the right to strike;
- Decree No. 96-411/PRN/MRPT/E establishing the organization and functioning of the labour inspection services;
- Decree No. 96-412 /PRN/MFPT/E laying down the regulations for temporary work;
- Decree No. 96-413 /PRN/MFPT/E determining the conditions of certain forms of employment contracts;

- Law No. 2012-45 of 25 September 2012 on the Labour Code of the Republic of Niger;
- Law No. 2018-22 of 27 April 2018, determining the fundamental principles of social protection;
- Decree No. 2015-541/PRN/MET/SS/MEF of 15 December 2015, amending and supplementing Decree No. 65-117/PRN/MFPT of 18 August 1965, determining the rules for the management of the compensation and prevention of occupational accidents and diseases scheme by the National Social Security Fund;
- Decree No. 2017-682/PRN/MET/PS of 10 August 2017 on the regulatory part of the Labour Code;
- Decree No. 2020-014/PRN/MET/PS of 10 January 2020, setting the modalities of application of Law No. 2018-22 of 27 April 2018, determining the fundamental principles of social protection;
- Interprofessional collective agreement.

The implementation of this project will comply with the following general labour conditions as provided for in the relevant national texts.

➢ ***Wages and payroll deductions***

Under the conditions provided for by Law No. 2012-45 of 25 September 2012 on the Labour Code of the Republic of Niger (Article 158), every employer is required to ensure, for the same work or work of equal value, equal remuneration for employees, regardless of their origin, sex, age and status.

In accordance with the provisions of article 159 of the above-mentioned Act, the various elements of remuneration must be established according to the same standards for men and women. The occupational categories and classifications, as well as the criteria for professional promotion, must be identical for workers of both sexes. In all cases, job evaluation methods must be based on objective considerations based essentially on the nature of the work involved in those jobs.

Apart from the compulsory levies and deposits that may be provided for by collective agreements and contracts, deductions from salaries or wages can only be made by garnishment or voluntary transfer, subscribed before the magistrate of the place of residence or failing that, the labour inspector, for the reimbursement of advances of money granted by the employer to the worker (Article 180 of Law No. 2012-45 of 25 September 2012). However, according to Article 182 (paragraph 3), the provisions relating to deductions from pay do not preclude the establishment of statutory or regulatory pension or pension schemes.

➢ ***Working time***

The legal working hours of employees or workers of either sex, of any age, working on time, on a task or on a piecework basis, is set at forty (40) hours per week (Article 99 of Law No. 2012-45 of 25 September 2012). Hours worked beyond the legal working hours give rise to a wage increase.

➢ ***Leave***

Annual leave is a right granted to all employees under employment contracts. Thus, according to Article 116, paragraph 1 of Law No. 2012-45 of 25 September 2012, "*Except for more favourable provisions of collective agreements or individual contracts, the worker acquires the right to paid leave, at the expense of the employer, at the rate of two and a half (2.5) calendar days per month of actual service, regardless of age."*

According to Article 119: "*Employed or apprentice women under the age of twenty-one (21) on the first of January of the current year are entitled to two (2) working days of additional leave per dependent child; those who are twenty-one years of age (21) or older receive the same benefit for any dependent child after the third.*"

For the purpose of calculating the duration of the leave acquired, absences due to accidents at work or occupational diseases, rest periods for women in childbirth, provided for in Article 111 (Labour Code), nor, within a maximum of six (6) months, absences due to illness duly recorded by an approved medical practitioner, nor periods of compulsory military service, are not deducted.

Also deducted, on the basis indicated above, services performed without corresponding leave on behalf of the same employer regardless of the place of employment.

Exceptional permissions granted to the worker on the occasion of family events cannot be deducted from the duration of the leave acquired. On the other hand, special leave granted in addition to public holidays may be deducted if it has not been compensated or recovered for the days thus granted (article 120 of the Labour Code).

In addition, Article 204 of Decree No. 2017-682/PRN/MET/PS of 10 August 2017 on the regulatory part of the Labour Code stipulates: *"When the number of days of leave to which a worker is entitled is not a whole number, the duration of the leave is rounded up to the next higher whole number of days."*

- ***Freedom of association***

Persons exercising the same profession, similar trades or related professions contributing to the establishment of specific products or the same liberal profession, may freely constitute a professional union (Article 183 of Law No. 2012-45 of 25 September 2012 on the Labour Code of the Republic of Niger).

Any worker or employer may freely join a trade union of his choice within the framework of his profession. The same applies to persons who have left the exercise of their functions or profession provided that they have exercised them for at least one year.

- ***Forced labor***

Forced or compulsory labour is prohibited in accordance with Article 4 of Law No. 2012-45 of 25 September 2012. The term "*forced or compulsory labour*" means any work or service required of an individual under threat of any penalty or punishment and for which the individual has not voluntarily offered himself.

Thus, for this project of exploitation of uranium deposits of the research permit "Adrar Emoles 3" by the company GLOBAL ATOMIC, forced labor is prohibited.

- ***Child labour and human trafficking***

Article 106 of Law No. 2012-45 of 25 September 2012 on the Labour Code of the Republic of Niger states: "*Children may not be employed in a company, even as apprentices, before the age of fourteen (14) years, unless derogation is issued by decree issued by decree adopted in the Council of Ministers, after consulting the*

Consultative Commission on Labour and Employment, taking into account local circumstances and the tasks that may be required of them."

Under article 107, paragraph 2, of Law No. 2012-45, the worst forms of child labour are prohibited. Subjecting a child to the worst forms of child labour shall be punishable in accordance with the provisions of this Code (article 107, paragraph 4)."

- ***Vulnerable or disadvantaged people***

The employment of project workers will be based on the principle of equal opportunities and fair treatment, and there will be no discrimination with regard to aspects of the employment relationship, such as recruitment and hiring, conditions of employment (including wages and benefits), dismissal and access to training.

Article 10 of Law No. 2012-45 on the Labour Code of the Republic of Niger states: "*Every employer is required to reserve at least 5% of the positions to be filled for the benefit of persons with disabilities during the recruitments he makes, under the conditions set by regulation."*

The employer has the obligation to provide disabled persons who cannot be employed under normal working conditions with adapted jobs and conditions, as well as the right to specialized training under the conditions set by regulation, after consulting the Consultative Commission on Labour and Employment (Article 46 of Law No. 2012-45 of 25 September 2012).

- ***Employment contract***

Being in the private sector, the workers who will be recruited under this project will be governed by Law No. 2012-45 of 25 September 2012, on the Labour Code in Niger and its implementing texts. This law regulates individual and collective labour relations, specifies working conditions and remuneration, as well as provides for mechanisms for the settlement of individual and collective labour disputes.

With regard to insurance at work, in accordance with the provisions in force, the CNSS, which has legal and financial personality under the supervision of the Ministry of Labour and administered by a tripartite Board of Directors composed of members representing State administrations, employers and workers, has the task of managing the various branches of social security established for the benefit of salaried workers, which are:

- the branch of family benefits aimed at alleviating to insured persons the burdens inherent in the birth, maintenance and education of the child;
- the branch of occupational risks which aims to prevent accidents at work and occupational diseases and, where appropriate, to compensate for the consequences resulting from the occurrence of these risks (temporary or permanent incapacity and death);
- the branch of old-age, invalidity and survivors' pensions which aims to guarantee an income to the employed person admitted to retirement and in the event of his death to his dependants. In addition, as part of its mission, the CNSS manages Health and Social Action funds whose purpose is the provision of benefits in kind for employees and their families.

Today, some of these benefits are extended to the entire population (insured or not), namely health care provided by the Medical-Social Centers of the CNSS.

Within a week of the worker's engagement, he must be registered with the CNSS. This is an obligation on the employer. And to register a worker, the employer on his side must join the CNSS.

7.1.3. IFC Guidelines

Performance Standard 2 (NP2) recognizes that further economic growth through job and income creation must be balanced with the protection of workers' fundamental rights.

The workforce is a valuable asset to any company, and sound management of worker relations is an essential factor in sustainability for the company. Failure to establish and promote sound management of management-worker relationships can compromise worker engagement and retention and the success of a project.

The main objectives of NP 2 are:

- Promote fair treatment, non-discrimination and equal opportunities for workers;
- Establish, maintain and improve relations between workers and management;
- Promote respect for national labour and employment law;
- Protect workers, including vulnerable categories of workers such as children, migrant workers, workers recruited by third parties and workers in the customer's supply chain;
- Promote safe and healthy working conditions and protect workers' health;
- Avoid the use of forced labour.

This standard applies to workers employed directly by the company (direct workers), workers employed through third parties to perform tasks that are directly related to the project's critical business processes for a significant period of time (contract workers), and workers employed by the company's primary suppliers (supply chain workers).

7.2. Legal framework on occupational safety and health

7.2.1. International conventions

Niger has ratified several Conventions on occupational safety and health. In this sense, the international conventions applicable in the context of this project to exploit uranium deposits of the "Adrar Emoles 3" research permit are among others:

- Convention No. 148 on the Working Environment (Air Pollution, Noise and Vibration) ratified on 28 January 1993;
- Convention No. 155 on Health and Safety at Work, ratified by Niger on 19 February 2009;
- Convention No. 161 on Occupational Health Services, ratified by Niger on 19 February 2009;
- Convention No. 187 on the promotional framework for occupational safety and health, ratified by Niger on 19 February 2009;
- ILO Convention No. 182 on the Worst Forms of Child Labour ratified by Niger on 23 October 2000;

- ILO Convention No. 138 on Minimum Working Age ratified by Niger on 4 December 1978.

7.2.2. National texts

Niger has drafted several laws and regulations for the protection of occupational safety and health. Thus, the texts of general application in this area are:

- the Labour Code: Law No. 2012-45 of 25 September 2012, in particular in Chapter II – Hygiene, safety and health at work;
- the regulatory part of the Labour Code: Decree No. 2017-682/PRN/MET/PS of 10 August 2017;
- Decree No. 96-408/PRN/MFPT/E on the procedures for the creation of the organization and functioning of occupational health and safety committees of 4 November 1996;
- Decree 2012-358/PRN/MFPT/E fixing the minimum wage by professional category of workers governed by the inter-professional collective agreement;
- Decree No. 65-117 of 18/08/1965 determining the rules of management of the compensation and prevention regime for Accidents at Work and Occupational Diseases by the CNSS amended by Decree No. 67-123/MFP/T of 07/09/1967 and Decree No. 67-168/MFP/T of 30/11/1967.

7.2.3. Occupational Safety and Health Provisions of IFC Performance Standard No. 2

IFC Performance Standard Number 2 provides for a mechanism to protect the workforce and consistently prevent occupational health and safety conditions.

With regard to the protection of the workforce within the framework of this project, the company GLOBAL ATOMIC must at all costs avoid the employment of children in the context of its activities. This is a way of protecting them from all forms of exploitation, harm to their health or their physical, mental, spiritual, moral or social development and preserving their right to education. However, this company must take care of forced labour in all its forms, including work or service that is not performed voluntarily, but extorted from a person by the threat of the application of force or a penalty.

For the prevention of health and safety conditions at work within the framework of this project, the company GLOBAL ATOMIC must, as far as it is concerned, make the site and the living base more livable so as to prevent all physical, chemical, biological and radiological dangers, and the specific dangers incurred by women.

In addition, this company will take measures to prevent accidents, injuries and illnesses resulting from work, associated with work or occurring in the course of work by minimizing as far as reasonably possible the causes of these hazards.

Thus, always the company GLOBAL ATOMIC will treat aspects such as:

- identification of potential hazards to workers, including those that may pose a threat to their lives;
- implementation of preventive and protective measures including the modification, substitution or elimination of dangerous situations or substances;
- training of workers;

- written recording of accidents, illnesses and occupational incidents and the drafting of reports on them;
- provisions for the prevention, preparedness and response to emergencies.

7.3. Institutional framework

As part of the implementation of this project, the institutional framework for employment and working conditions, including occupational safety and health issues, consists of the following institutions.

7.3.1. Ministry of the Environment and the Fight against Desertification

It is responsible, in conjunction with the other ministries concerned, for the design, development, implementation, monitoring and evaluation of the national environmental policy. Its responsibilities include:

- the definition and implementation of policies and strategies in the fields of environmental restoration and preservation, combating desertification, climate change, biodiversity, sustainable management of natural resources and wetlands;
- the definition and implementation of policies and strategies in the field of sustainable development;
- the integration of national sectoral policies and strategies on environment and sustainable development into other national policies and strategies;
- [...] ;
- the validation of environmental assessment reports of development programs and projects, the issuance of environmental compliance certificates, the carrying out of environmental and ecological monitoring, audits and environmental assessments;
- etc.

As part of the implementation of this project, through its technical services including the National Bureau of Environmental Assessment (BNEE), this ministry will monitor the implementation of risk mitigation measures on the safety and health of workers.

7.3.2. Ministry of Employment, Labour and Social Protection

The Minister of Employment, Labour and Social Protection is responsible, in conjunction with the other Ministers concerned, for the design, elaboration, implementation, monitoring and evaluation of national policies and strategies in the field of Employment, Labour and Social Protection, in accordance with the guidelines defined by the Government.

As part of this project, this Ministry will intervene in prevention through the missions devolved to the General Inspectorate of Services and Occupational Medicine, the Directorate of Occupational Safety and Health, its representation at the level of the Agadez region including the Regional Labour Inspectorate of Agadez) and the National Social Security Fund (CNSS).

- ***General Inspectorate of Services and Occupational Medicine***

Pursuant to the provisions of article 279 of the Labour Code, which provides that "*occupational inspectors may be appointed to the labour inspection services*", the

regulatory part of the Labour Code in its articles 11 to 15 defines the powers of labour inspectors. The latter shall take permanent action to protect the health of workers at the place of work.

- ***Directorate of Occupational Safety and Health***

The Directorate of Occupational Safety and Health was created by Decree No. 2016-379/PRN/MET/PS of 22 July 2016, on the organization of the Ministry of Employment, Labour and Social Protection.

As part of the implementation of this project, this directorate will monitor the application of the texts on occupational safety and health and the improvement of working conditions and the working environment. It will also ensure that workers are informed and educated in the field of occupational safety and health.

- ***Labour Inspectorate***

The Labour Inspectorate is the administrative structure responsible at regional level for the prevention of occupational risks and the improvement of working conditions.

Headed by a Labour Inspector, the Labour Inspectorate is responsible for ensuring the application of labour regulations as a whole. In this context, it is responsible for enforcing legislation and regulations on occupational safety and health within its territorial jurisdiction.

- ***National Social Security Fund***

The National Social Security Fund plays an important role in the implementation of the occupational risk prevention policy. Thus, Decree No. 65-117MFP/T of 18 August 1965, determining the rules governing the management of the compensation and prevention scheme for accidents at work and occupational diseases, amended and supplemented by Decree No. 2015-641/PRN/MET/SS/MEF of 15 December 2015, provided for in Articles 125 and 126, the mission of the CNSS in the prevention of occupational accidents and diseases.

As part of this mission, the CNSS has created within it a service for the prevention of occupational risks.

7.3.3. Ministry of Public Health, Population and Social Affairs

The Minister of Public Health (MSP), in conjunction with the other Ministers concerned, is responsible for the design, development, implementation, monitoring and evaluation of the national public health policy, in accordance with the guidelines defined by the Government.

In the field of occupational health, the MSP monitors the work of occupational inspectors, doctors and nurses practising in companies, through the Directorate of Health Promotion. They must provide him with reports of the findings made during the visits carried out. These reports also contain proposals for solutions.

7.3.4. Advisory bodies

- ***Technical Advisory Committee on Occupational Safety and Health***

It is established by article 261 of the Labour Code at the Ministry in charge of Labour for the study of issues concerning the health and safety of workers. It is composed in equal numbers, representatives of the State, workers and employers.

- ***Occupational Safety and Health Committee***

It is established through Article 145 of Law No. 2012-45 of the Labour Code, and has the following missions, among other things, to ensure:

- the application of the laws, regulations and instructions concerning safety, in particular compliance with the requirements relating to the verification of machinery, installations and appliances in establishments,
- the proper maintenance and use of collective and individual protection devices.
- carry out investigations in the event of serious accidents at work and occupational diseases, with a view to determining the causes and proposing measures to remedy them;
- Compile statistics on accidents at work and occupational diseases and other work-related health injuries and widely disseminate to all workers information on health protection and the smooth running of work;
- Etc.

8. RESPONSIBLE STAFF

Through Table No. 4 below, it is defined, the responsibilities of the staff in the context of the implementation of the project of exploitation of the Uranium Deposits of the research permit "Adrar Emoles 3" by the company GLOBAL ATOMIC.

Table 4 Staff Responsibilities

No	Functions and/or persons	Responsibilities
1	Country manager	• Overall coordination of the Project • Recruitment of company staff • Recruitment of Consultants and subcontracting companies • Recruitment and management of suppliers/service providers
2	Administrative and Financial Managers	• Administrative and Financial Management during the implementation of the project
3	Procurement Specialist	• Contract management (Preparation and procurement) including consultations and subcontracting
4	SHERQ Manager	• Development of RDTs for environmental assessments taking into account working conditions • Monitoring and follow-up of workers in the implementation of GVPs • Development of RDTs for social assessments (PAR, PSR etc.) taking into account working conditions at the social level • Monitoring and follow-up of the implementation of social measures on workers • Managing EAS/HS issues

9. POLICIES AND PROCEDURES

They concern the provisions and procedures to be followed in the event of an accident at work and an occupational disease.

9.1. Accident at work

In accordance with the provisions of Article 16 of Decree No. 65-117 of 18 August 1965, the victim of an accident at work must immediately, except in cases of force majeure, absolute impossibility or legitimate reasons, inform or have informed the employer or one of his employees. The same obligation is incumbent on the beneficiaries of the deceased insured.

The declaration is drawn up by the employer, in two (2) copies, on the official printouts published by the Fund; both copies must be sent within 48 hours, one to the labour inspectorate of the jurisdiction or to its legal substitute, the other to the National Social Security Fund.

The employer is required, as soon as the accident occurs, in accordance with the provisions of article 18 of the above-mentioned decree:

- to provide first-aid care;
- to notify the doctor in charge of the medical services of the company or, failing that, the nearest doctor;
- possibly, to direct the victim to the company or inter-company medical centre, failing that to the public health facility or the public or private hospital closest to the place of the accident;
- to give the victim a duly completed accident sheet.

The victim will present his work accident sheet to the doctor, hospital or private clinic of his choice. However, private clinics will have to be approved by joint decree of the Ministers of Labour and Health. The attending physician will draw up a medical certificate indicating the victim's condition, the consequences of the accident or, if the consequences are not exactly known, the possible consequences and, in particular, the probable duration of incapacity for work (Article 19 of Decree No. 65-117 of 18 August 1965).

The medical certificate is drawn up in triplicate by the practitioner who sends the first two to the Fund. It is up to the latter to transmit without delay one of these copies to the labour inspector and to give the third to the victim (Article 20).

When the injury is healed without incapacity or, if there is permanent incapacity, at the time of consideration, a medical certificate indicating the definitive consequences if these could not have been previously ascertained shall be drawn up by the attending physician.

The practitioner sends or delivers within 24 hours a copy of the certificate to each of the recipients indicated in Article 20 of Decree No. 65-117 of 18 August 1965). Upon view of this certificate, the Fund shall fix the date of healing or consideration. In the event of a doctor's deficiency, the Fund calls on another practitioner. The certificate sent to the victim is accompanied by all the documents used by his establishment.

The employer is required to issue to the victim an accident booklet conforming to the model set by the Fund and is approved by the Minister of Labour. The issue of the

accident booklet does not automatically entail the assumption of compensation for compensation for accidents at work and occupational diseases.

The benefits granted to the beneficiaries of this Decree include, whether or not there is an interruption of work:

- coverage of the costs of medical and surgical care;
- pharmaceutical and ancillary costs;
- coverage of hospital costs;
- the supply, repair and renewal of prosthesis and orthopaedic appliances necessitated by the infirmity resulting from the accident and recognized as indispensable under the conditions laid down in the following articles, and, under the same conditions, the repair and replacement of those which the accident has rendered unusable;
- covering the costs of transporting the victim to his or her habitual residence, to the inter-company medical centre or to the health facility or hospital;
- and, in general, the reimbursement of the costs necessary for the treatment, functional rehabilitation, vocational rehabilitation and reclassification of the victim.

With the exception of primary emergency care, which is the responsibility of the employer under the conditions laid down in Article 18 of the Decree, these benefits are borne by the Fund, which pays the amount directly to practitioners, pharmacists, medical auxiliaries and public health facilities, hospitals. , corporate or business-to-business medical centres. However, transportation costs may give rise to reimbursement to the victim.

Where the victim of an accident at work is hospitalised in a public establishment, the hospital rate shall be the lowest rate applicable to paying patients and the same rule shall apply as regards the rate of hours and ancillary costs due to practitioners and medical assistants of that establishment in connection with the care given to the victim.

In the event that the victim is hospitalized in a private institution where the rates are higher than those of the nearest public hospital of the same nature, the Fund, except in cases of emergency and exceptional circumstances, is required to pay the costs only at the limit of the rates applicable in the nearest public institution.

In the event of an emergency (in accordance with the provisions of the decree), the National Social Security Fund can only cover the costs of hospitalization, treatment and, if necessary, transport of the victim to a private institution if this establishment has been approved under the regulatory conditions.

Allowances due to beneficiaries include:

- the daily allowance due to the victim during the period of temporary incapacity which forced him to interrupt his work;
- benefits other than pensions due in the event of an accident followed by death (funeral expenses);
- the pension due to the victim permanently incapacitated for work and, in the event of death, the pensions due to the victim's dependents.

The salary for the day on which the work was interrupted shall be borne in full by the employer.

9.2. Occupational diseases

Any occupational disease for which compensation is sought must be declared by the victim or his representative within fifteen days of the cessation of work to the labour inspector. The certificate drawn up by the patrician must indicate the nature of the disease, in particular the manifestations observed and mentioned in the tables, as well as the probable consequences.

The list of diseases considered occupational as well as the deadlines for coverage by the Fund and the indicative list of the main works likely to cause them are set out in Annex IV of Decree No. 2015-641/PRN/MET/SS/MEF of 15 December 2015 amending and supplementing Decree No. 65-117 of 18 August 1965, determining the rules for the management of the compensation and prevention scheme for accidents at work and occupational diseases by the National Social Security Fund.

10. COMPLAINTS MANAGEMENT MECHANISM

To deal with any disputes between the actors likely to be involved in this uranium deposit exploitation project of the "ADRAR EMOLES 3" research permit, a Complaints Management Mechanism (MGP) will be set up, which is a procedure based on a system for handling complaints and other issues of misunderstanding which, when they are abused, can lead to conflict and reduced project benefits.

This Complaints Management Mechanism (PMM) is based on other similar project documents and reports on key information related to the complaints system, namely milestones including deadlines and actors.

10.1 Complaints procedure

The complaint management procedure for the uranium deposit project of the "ADRAR EMOLES 3" research licence consists of nine (9) steps ranging from the registration of the complaint to the archiving of the resolution file. Where complaints are sensitive in nature such as SEA/HS, the handling will have different aspects and will be finalised with external support with a view to having the best options to manage and validate such complaints in a safe and confidential manner and on the basis of an approach based on the needs of survivors.

Complaints Body

This Complaints Management Mechanism covers the entire scope of this project where committees created at local, communal and project level will be formed and equipped through the provision of a complaint register, telephone devices and numbers made public in the localities of intervention of the project.

These committees can be contacted by phone, sms, WhatsApp, orally or through the register of complaints.

The MGP will be organized into three levels, which also makes it possible to define the management bodies at each level.

- Local level → Local Committee
- Communal Complaints → Management Committee;
- Project level → The project team.

The project team oversees the implementation of the MGP. It works closely with local and communal authorities. Complaints addressed to projects are referred to the person in charge of the environmental component for treatment.

10.1.1. Step 1: Registration of the complaint

The first step in the process is to set up complaint reception channels that will be adapted to the socio-cultural context of project implementation. Complaints will be made verbally (where the complainant is not literate) or in writing. Verbal complaints will first be transcribed, before the rest of the process to ensure their traceability. Any complaint, whether oral or written, is recorded in a register available at the level of the deposit and management body called the Complaints Management Committee.

The addresses and contacts of the members of the bodies will be notified to potential complainants during dissemination activities. The complainant receives an

acknowledgement of receipt within 48 hours of filing his complaint. The channels for transmitting complaints will be the telephone, the referral directly or through an intermediary (relative, relative, local authorities, workers' unions, the CSST, the filing by the complainant himself.

10.1.2. Step 2: Review of Complaints

Once the complaint has been registered, a triage is carried out by the complaints bodies to distinguish the ordinary or sensitive nature of the complaints, taking into account the precise criteria used.

Non-sensitive complaints include:

- Requests for information about the project or any other concerns raised by stakeholders;
- The quality of services;
- Questions about project procedures;
- Feedback from the community;
- Circulation of machines;
- Management of nuisances related to works
- Suggestions or proposals from the community;

Sensitive complaints include:

- Ethnic and/or religious discrimination;
- Exclusion of workers who meet the eligibility criteria;
- Exclusion of workers by pressure for their participation
- Lack of respect for confidentiality rules and the survivor-centered approach of EAS/HS;
- Financial misconduct (fraud, corruption, extortion, embezzlement, etc.);
- Cases of sexual exploitation or abuse, sexual harassment;
- Violation of children's rights;
- Non-respect of local customs and customs;
- Profanation of sacred sites or cemeteries;
- Destruction of private property or damage to community property;
- Non-compensation for PAPs;
- Serious pollution of the living environment;
- Disruption of livelihoods;

- Serious accidents or deaths of a person related to project activities.

On the basis of these criteria, a study procedure adapted to each type of grievance will be chosen.

Non-sensitive complaints will be dealt with by all bodies. For sensitive complaints, after registration at local level of the MGP, only the regional and national bodies will proceed with the treatment while maintaining the confidential nature of the file limited to one or two persons at most. They shall immediately carry out the necessary investigations and shall ensure the processing, resolution and closure of the proceedings. The outcome of the processing of a grievance is addressed directly to the complainant.

For the consideration of GBV plaints of the VBG focal points will be set up among the members of the MGP Committee and will serve as confidential contact points to receive information on possible incidents related to EAS/HS to trigger the referral system to provide survivors with information and access to services. It would be desirable for these focal points to act as valuable community human resources to refer survivors to services and survivors continue to turn to them for help after the project is completed. These GBV focal points set up will be trained on all response procedures with the appropriate reporting and referral mechanisms that will be defined in case of GBV (including especially EAS/HS) within the framework of the project as well as its coordination with stakeholders and the ethical standards that will be followed.

The time taken to process complaints by category is shown in Table 5 below:

Table 5 Complaint Categories and Processing Time6

No	Categories of Complaints	Processing time	Comments
1	Non-sensitive complaints	5 days	Acknowledgement of receipt and feedback to the complainant before investigation.
2	Sensitive complaints	10 days	Acknowledgment of receipt to the Complainant and forwarding of the complaint to the company for information via the Complaints Committee before investigation.

10.1.3. Step 3: Investigation to verify the merits of the complaint

This very important step would allow for the gathering of information and evidence to affirm or refute the grievance and to find solutions in response to the complainant's concerns. Specific skills may be requested if they are not available within the bodies of the MGP.

A maximum of five (05) business days after classification and preliminary analysis is used for this stage for all complaints whose resolution requires further investigation. The complainants concerned must be informed of the additional time limits in writing from the chairperson of the body.

10.1.4. Step 4: Proposed Responses

On the basis of the documented results of the investigations, a written reply shall be sent to the complainant. This reply highlights whether or not the complaint is valid. In case of validity, the complaints management body (depending on the level), notifies the complainant in writing, the conclusions of their investigations, the solutions chosen, the means of implementation of the corrective measures, the implementation schedule and the budget. The proposed response shall be made within two (2) working days after the investigations. Similarly, where the complaint is unfounded, a reasoned written notification will be sent to the complainant.

10.1.5. Step 5: Review responses in case of non-resolution

In the event of dissatisfaction, the complainant may contest the measures adopted. It then has the possibility to request a review of the resolutions of the complaints management body seized. The duration of the period allowed to do so is a maximum of ten (10) working days from the date of receipt of the notification of resolutions by the complainant. In such circumstances, the Management Authority has five (5) working days to review its decision and propose additional measures if necessary. The revised measures must be notified to the complainant in writing.

The possibility is offered to the complainant in case of dissatisfaction to make a judicial appeal with the assumption of legal costs if necessary at his expense.

10.1.6. Step 6: Implement corrective actions

The implementation of the measures adopted by the Complaints Management Committee cannot take place without the prior agreement of both parties, especially the complainant, to avoid any form of dissatisfaction and abuse. The procedure for the implementation of the corrective action(s) will be initiated five (05) working days after the acknowledgement of receipt by the complainant, of the letter notifying him of the solutions chosen and in return following the agreement of the complainant recorded in a Minutes (MINUTES) of consent.

The complaints management body will put in place all the necessary means to implement the resolutions agreed and will play its part in order to respect the schedule chosen. A report signed by the Chairman of the Complaints Management Committee and the complainant will sanction the end of the implementation of the solutions.

10.1.7. Step 7: Close or extinguish the complaint

The procedure will be closed by the bodies of the complaints management body if the mediation is satisfactory for the various parties, in this case the complainant, and the agreement proved by a Minutes signed by both parties. The closure of the file occurs after three (03) working days from the date of implementation of the response attested for local or intermediate authorities and five (5) working days by the national authority. The extinction will then be documented by these different instances according to the level(s) of treatment involved.

10.1.8. Step 8: Reporting

All complaints received under the Project's MGP will be recorded in a processing register, within a period not exceeding five (05) working days from the date of implementation of the resolution, for local or intermediate authorities and seven (07) working days for the national authority. This operation will make it possible to document

the entire complaint management process and draw the necessary lessons through a simple and adapted database designed for this purpose.

10.1.9. Step 9: Archive

The project will set up a physical and electronic archiving system for the filing of complaints. Archiving will take place within six (06) working days from the end of the report. All supporting documents for the meetings that were necessary to reach the resolution will be recorded in the complaint file. The archiving system will provide access to information on: (i) complaints received (ii) solutions found and (iii) unresolved complaints requiring further action.

However, the complainant may lodge his complaint with the judicial authorities at any stage of the complaint management mechanism. This referral may in some cases delay the implementation of the project. Also, it is necessary to sensitize the community to favor the amicable settlement for which the MGP is established.

It should also be noted that EAS/HS complaints will be dealt with specifically within the MGP. The project will work closely with entities dedicated to addressing these issues. Thus, all complaints and denunciations of EAS/HS cases registered under the project will be directly transferred and processed by the specialized entities.

11. MANAGEMENT OF CONTRACTORS AND SUPPLIERS

11.1. Management of Workers employed by third parties

As part of the implementation of the project, suppliers of goods and service providers will be selected according to the procedures of the project procurement plan in accordance with national procurement procedures. The services will be governed by the Labor Code and the General Tax Code and will be performed in compliance with the IFC Performance Standards.

Around these service providers gravitate third parties for whom they must ensure that they are reputable and legitimate and that they have appropriate EMS to conduct their activities in accordance with the requirements of Performance Standard Number 2.

Indeed, global atomic will put in place policies and procedures to manage and monitor the performance of these third employers in accordance with the requirements of this Performance Standard. In addition, it will use commercially reasonable efforts to incorporate these requirements into contractual agreements with these third-party employers.

In addition, GLOBAL ATOMIC will ensure that employers of third parties have access to a complaint management mechanism. If the latter are unable to provide these workers with a complaint management mechanism, global atomic puts its own complaint management mechanism at the service of workers provided by the third party.

11.2. Supply Chain Management

As part of the environmental and social assessment, the potential risks of child labour, forced labour and serious safety issues that may arise from primary suppliers will be identified.

After the constitution of the database of suppliers of the Company GLOBAL ATOMIC, they will all be required to sign the specific Codes of Good Conduct to avoid abuse and in particular child labor or forced labor.

In addition, where there is a serious risk related to security issues relating to employees of primary suppliers, the company will require the primary supplier to develop procedures and mitigation measures to address it in accordance with the Security Risk Assessment. These procedures and mitigation measures will be reviewed periodically to verify their effectiveness.

Quarterly to semi-annual control depending on the size of the company and the duration of its service contract will be exercised on primary suppliers, particularly as part of the risk management related to the activities they will implement. Following the results, the company will replace, within a reasonable period of time, the defaulting primary suppliers with suppliers who can demonstrate that they will meet the relevant requirements.

CONCLUSION

The project to exploit the uranium deposits of the *"Adrar Emoles 3*" research permit (Agadez region, Niger), will be implemented in compliance with national and international labour texts.

During its implementation, this project will mobilize a workforce that can consist of direct workers, contract workers, employees of primary suppliers and migrant workers.

In order to promote occupational safety and health, and encourage fair treatment, non-discrimination and equal opportunities for project workers, these PGMOs have been developed in accordance with the requirements of the IFC Performance Standards, the Equator Principles and national texts including Law No. 2012-45 of 25 September 2012, on the Labour Code of the Republic of Niger and Decree No. 2017-682/PRN/MET/PS of 10 August 2017 on the regulatory part of the Labour Code.

The activities that will be implemented within the framework of this project, employer/employee and employee/employee relations can be a source of accident risks, psychosocial risks, risks of respiratory diseases, risks of visual and ergonomic fatigue and other biological contaminations, risks of tensions/conflicts between local populations and workers, the risks of diseases related to the modification of the sound environment, the risks of radiological contamination, security risks and the risks of occurrence of gender-based violence.

To manage these different risks, measures were proposed at the end of the present study. These include the establishment of a Complaints Management Mechanism and the development of procedures for the proper management of suppliers and service providers and employees of primary suppliers.

APPENDICES

Appendix 1: Bibliographic References
Appendix 2: Codes of Conduct

Appendix 1: Bibliographic References

- **World Bank**, *Environmental and Social Framework*, 2017, 121 pages. **Mandated Financial Institution (EPFI),** *Equator Principles,* July 2020, 42 pages.
- **International Finance Corporation,** *Environmental and Social Sustainability Performance Standards,* January 2012, 64 pages.
- **GLOBAL ATOMIC FUELS CORPORATION,** *Environmental and Social Impact Study of the Uranium Deposits Exploitation Project of the Research Permit "Adrar Emoles 3" (Agadez Region, Niger)*, February 2022, 206 pages.
- **USAID,** *Environmental and Social Feasibility Study of the Mini-Grid Project in Niger,* February 2020, 98 pages.
- **Integrated Urban Development and Multisectoral Resilience Project (P175857),Workforce** *Management Procedures (BMMP), December 2021*, 66 pages.
- **MINISTRY OF PETROLEUM, ENERGY AND RENEWABLE ENERGIES,** *Procedures for Workforce Management of the Project to Accelerate Access to Electricity in Niger,* May 2021, 76 pages.

Appendix 2: Codes of conduct for the implementation of EHS and HST standards and the prevention of GBV and ECV

In order to establish an EAS/HS risk mitigation system, the following provisions should be required:

- All employees of the company (including its subcontractors), the prime contractor and other consultants who have an imprint in the project area must sign a code of conduct;
- A real action plan for preventing and combating sexual exploitation and abuse and sexual harassment must be put in place so that workers have a clear understanding of the policy and expected behaviour, as well as a complaint management mechanism. This action plan should include training and communication programmes as well as measures to inform the community affected by the project of the code of conduct that project staff have just signed; and
- The action plan should set out accountability and response protocols that set out the procedures to be followed to hold people accountable and to punish staff who have violated SEA/HS policies.

Note to the tenderer: The minimum content of the form or code of conduct, as defined by the contracting authority, shall not be substantially altered. However, the tenderer may add rules it deems appropriate, including to take into account issues/risks specific to the contract or contract.

Note to the contracting authority: The following minimum rules shall not be changed. The developer may add additional rules concerning specific issues identified as a result of a relevant environmental and social assessment. Among the issues identified were risks associated with: the influx of labour, the spread of communicable diseases, sexual exploitation and abuse, etc. Delete this box before publishing tender documents.

A. GENERAL

The purpose of these *Codes of Conduct and Action Plan for the Implementation of Environmental and Social, Health and Safety (ESHS) and Occupational Health and Safety (HST) Standards and the Prevention of Gender-Based Violence (GBV), Sexual Exploitation and Abuse (EAS), Sexual Harassment (HS), and Violence against Children (VCE)* consists of introducing a set of key definitions, codes of conduct and guidelines in order to:

- Clearly define the obligations of all project staff (including subcontractors and day labourers) regarding the implementation of environmental, social, health and safety (ESHS) and occupational health and safety (HST) standards; and
- Contribute to the prevention, identification and control of GBV/EAS/HS and ECV on the construction site and in surrounding communities.

The application of these Codes of Conduct will ensure that the project achieves its objectives in terms of ESHS and HST standards, as well as prevent and/or mitigate the risks of GBV/EAS/HS and VCE at the project site and in local communities.

Those working in the project must adopt these Codes of Conduct which aim to:

- Sensitize the staff operating in the project to the expectations in terms of ESHS and HST;

- Create awareness about GBV/EAS/HS and HCVs, and:
- Create a consensus that such acts have no place in the project;
- Establish a protocol to identify GBV/EAS/HS and HCV incidents; respond to such incidents; and sanction them.

The purpose of the Codes of Conduct is to ensure that all project personnel understand the moral values of the project, the conduct that every employee is required to follow, and the consequences of violations of those values. This understanding will contribute to a smoother, more respectful and productive implementation of the project, to ensure that the project objectives are achieved.

B. DEFINITIONS

In these Codes of Conduct, the following terms will be defined below:

Environmental, Social, Health and Safety Standards (ESHS): a general term covering issues related to the project's impact on the environment, communities and workers.

Occupational Health and Safety (HST): Occupational health and safety aims to protect the safety, health and well-being of people working or employed in the project. Respect for these standards at the highest level is a fundamental human right that should be guaranteed to every worker.

Gender-based violence (GBV): A generic term for any harmful act perpetrated against a person's will and based on the differences that society establishes between men and women (gender). It includes acts that cause physical, sexual or psychological harm or suffering, the threat of such acts, coercion, and other forms of deprivation of liberty. These acts can occur in the public or private sphere (Inter-Agency Standing Committee Guidelines on Gender-Based Violence, 2015, p.5).

Sexual exploitation: Taking advantage of or attempting to take advantage of a state of vulnerability, unequal power or trust for sexual purposes, including but not limited to obtaining a pecuniary, social or political benefit (United Nations Glossary on Sexual Exploitation and Abuse, 2017, p.6).

Sexual abuse: Any physical intrusion of a sexual nature committed by force, coercion or through unequal intercourse, or the threat of such intrusion (United Nations Glossary on Sexual Exploitation and Abuse, 2017, p. 5).

Sexual Harassment: Any unwanted sexual advance or request for sexual favors or any other verbal or physical behavior with a sexual connotation.

Violence against children (VCE): physical, sexual, emotional and/or psychological harm, neglect or neglectful treatment of minor children (i.e. under 18 years of age), including the fact that a child is exposed to such harm to a third person that results in actual or potential harm to his or her health, survival, development or dignity, in the context of a relationship of responsibility, trust or power. This includes the use of children for profit, work, sexual gratification or any other personal or financial benefit. This also includes other activities such as using computers, mobile phones, video devices, digital cameras or any other means to exploit or harass children or to access child pornography.

Malicious solicitation of children: these are behaviors that allow an aggressor to gain the trust of a child for sexual purposes. This is how an offender can establish a

relationship of trust with the child and then seek to sexualize that relationship (for example, by encouraging romantic feelings or exposing the child to sexual concepts through pornography).

Liability and confidentiality measures: measures put in place to ensure the confidentiality of survivors and to hold contractors, consultants and the client accountable for the establishment of a fair system for dealing with GBV and ECV cases.

Child: a term used interchangeably with the term "minor" which refers to a person under the age of 18. This is in line with Article 1 of the United Nations Convention on the Rights of the Child.

Child protection: an activity or initiative aimed at protecting children from any form of harm, in particular as a result of the VCE.

Consent: is the informed choice that underlies a person's free and voluntary intention, acceptance or agreement. There can be no consent when such acceptance or agreement is obtained by threat, force or other forms of coercion, kidnapping, fraud, deception or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even if the national legislation of the country where the Code of Conduct is introduced considers sexual majority at a lower age. Ignorance of the child's age and consent cannot be invoked as a defence.

Consultant: any company, company, organization or other institution that has been awarded a contract to provide consulting services for the project and has hired managers and/or employees to perform this work.

Contractor: any company, corporation, organization or other institution that has been awarded a contract to provide construction services as part of the project and has hired managers and/or employees to perform this work. This includes subcontractors hired to perform activities on behalf of the contractor.

Employee: any person who provides labour to the contractor or consultant in the country, at the project site or outside, under a contract or employment agreement for wages, performed formally or informally (including unpaid interns and volunteers), without responsibility for managing or supervising other employees.

GBV Incident Allegation Procedure: Prescribed procedure for reporting GBV or ECV incidents.

CODE OF CONDUCT FOR GBVs: Code of Conduct adopted for the project covering the commitment of the company and the responsibility of managers and individuals regarding GBVs and CEVs.

Complaints and Grievance Management Mechanism (PMM): the process established by a project to receive and process complaints.

Manager: any person offering labour to a contractor or consultant, on or off site, under a formal or informal employment contract and in exchange for a salary, with responsibility for controlling or directing the activities of the team, unit, division or

similar of a contractor or consultant and with the responsibility of supervising and managing a predefined number of employees.

Perpetrator: the person(s) who commits or threatens to commit an act or acts of GBV or ECV.

Intervention Protocol: Mechanisms in place to respond to GBV and ECV (see Section 4.7 Intervention Protocol).

Survivor(s): the person(s) negatively affected by GBV or ECV. Women, men and children can be survivors of GBV; only children can be survivors of VCE.

Construction site: the place where the infrastructure development work is taking place under the project. Consultancy missions are considered to have as their site the places where they take place.

Site environment: the "project area of influence" which is any place, urban or rural, directly affected by the project, including human settlements.

C. CODE OF CONDUCT FOR COMPANY PERSONNEL

We are the Entrepreneur *[insert name of entrepreneur]*. We have signed a contract with [*insert the name of the Client]* to *[insert the description of the works]*. This work will be carried out at *[insert site or other locations where the work will be performed]*. Our market requires that measures be implemented to prevent the environmental and social risks associated with this work, including the risks of sexual exploitation, abuse and harassment.

This Code of Conduct is part of our measures to take into account the environmental and social risks associated with the work. This applies to all our staff, workers and other employees at the site of the work or other places where the work is performed. This also applies to the staff of each of our subcontractors and any other personnel accompanying us in the execution of work. All such persons are referred to as **"The Contractor's Personnel"** and who are subject to this Code of Conduct.

This Code of Conduct identifies the behavior we require of the Contractor's Personnel.

Our workplace is an environment where all dangerous, abusive or violent behaviour will not be tolerated and where all people should feel entitled to report any problems or concerns without fear of reprisal.

REQUIRED CONDUCT

The Contractor's Personnel must:

1. carry out its duties in a competent and diligent manner;

2. comply with the Code of Conduct and all applicable laws, regulations and other requirements including requirements to protect the health, safety and well-being of the Contractor's personnel and any other persons;

3. maintain a safe working environment including:

a. ensure that workplaces, machinery, equipment and manufacturing processes are safe and free of health risks;

b. wear the required personnel protective equipment;

c. apply appropriate measures relating to chemical, physical and biological substances and agents; and

d. follow applicable safety procedures in operations.

4. report work situations that he/she does not believe to be safe or healthy and withdraw from a work situation that he/she believes reasonably presents an imminent and serious danger to his/her life or health;

5. treat other people with respect and not discriminate against specific groups such as women, people with disabilities, migrant workers or children;

6. not engage in Sexual Harassment activities, which means unwelcome sexual advances, requests for sexual favours and other verbal or physical behaviour with a sexual connotation towards the Contractor's or The Owner's staff;

7. not engage in Sexual Exploitation activities, meaning abusing or attempting to abuse a state of vulnerability, differential power or trust for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another person;

8. not engage in Sexual Abuse, which means physical intrusion or threat of physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;

9. not engage in any form of sexual activity with anyone under the age of 18, except in the case of a pre-existing marriage;

10. attend relevant training courses to be provided on the environmental and social aspects of the Market, including health and safety issues, and Sexual Exploitation and Abuse (SEA), and Sexual Harassment (HS);

11. formally report violations of this Code of Conduct; and

12. not to retaliate against any person who reports violations of this Code of Conduct, whether to us or to the Client, or who uses the Contractor's personnel complaint mechanism or the Project Grievance Mechanism.

REPORT CONCERNS

If a person becomes aware of conduct that he or she believes may constitute a violation of this Code of Conduct, or that is otherwise of concern to the individual, he or she should report it as soon as possible. This can be done in either of the following ways:

1. Contact *[insert name of the Contractor's social expert with relevant experience in the treatment of GBV, or if such person is not required under the Contract,*

another person designated by the Contractor to deal with such matters] in writing at that address [*insert*] or by telephone to [*insert*] or in person to [*insert*]; or

2. Call [*insert*] the Contractor's hotline (if applicable) and leave a message.

The identity of the person will remain confidential, unless the reporting of allegations is required by the country's legislation. Anonymous complaints or allegations can also be submitted and will be investigated anyway. We take all reports of possible misconduct seriously and will investigate and take appropriate action. We will provide referrals from service providers who may be able to assist the person who experienced the alleged incident, if any.

There will be no retaliation against a person who, in good faith, reports a concern about any conduct prohibited by this Code of Conduct. Such retaliation would constitute a violation of this Code of Conduct.

CONSEQUENCES OF VIOLATION OF THE CODE OF CONDUCT

Any violation of this Code of Conduct by the Entrepreneur's staff may result in serious consequences, up to and including dismissal and possible referral to the judicial authorities.

FOR CONTRACTOR'S STAFF:

I have received a copy of this Code of Conduct in a language that I understand. I understand that if I have any questions about this Code of Conduct, I may contact *[insert name of Contractor contact person with relevant experience]* to request an explanation.

Company employee name: [insert name].

Signature: _____

Date: (Day/month/year): _____

Countersignature of the authorized representative of the company:

Signature: _____

Date: (Day/month/year): _____

URANIUM GIS OPERATION PROJECT OF THE *"ADRAR EMOLES 3"*
RESEARCH PERMIT (AGADEZ REGION, NIGER)

HYGIENE, SAFETY, HEALTH PLAN

March 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

AT: Accidents at work

CNSS: National Social Security Fund

PPE: Collective Protection Equipment

PPE: Personal Protective Equipment

GAC: Global Atomic Corporation

HSE: Health, Safety, Environment

MG: Complaints Management Mechanism

PHSS: Health, Safety and Environment Plan

PVC: Polyvinyl chloride

1. INTRODUCTION

The implementation of the Adrar Emoles 3 Exploration Permit will generate potential risks to the human and biophysical environment in the area concerned.

In order to ensure that these identified risks and impacts are taken into account, this Health, Safety and Environment Management Plan has been drawn up.

The general objective is to define all the conditions necessary to ensure the safe implementation of the project.

Specifically, this plan will:

- Identify project risks;
- Plan the measures to be put in place to control the risks and situations arising from the project activities;
- Inform, raise awareness and train staff on the risks associated with the work and the need to use protective equipment;
- To protect the health and safety of workers and surrounding populations in the context of project activities;
- Define and describe the responsibilities and obligations of each stakeholder with regard to health, safety and security during the execution of the project;
- Define and describe the responsibilities and obligations of each stakeholder for engagement with local communities during project implementation;
- Put in place the rules for planning and coordinating work safely;
- Implement actions in case of accidents and incidents.

The Health, Safety and Security objectives can be summarised as follows:

- To achieve the principle of "zero fatalities", which implies the rapid elimination of accident factors through the analysis of causes;
- Minimise the time staff are unfit for work, due to work-related and non-work-related injuries and illnesses, by providing an adequate medical service;
- Promote compliance with the safety policy on and off the job;
- Improve working conditions for staff;
- Ensuring good health;
- Ensuring the preservation of assets.

2. BRIEF DESCRIPTION OF THE PROJECT

The Canadian company Global Atomic Corporation, which has been conducting mining research in Niger since 2007, is considering the exploitation of the uranium deposit it has discovered in the "Adrar Emoles 3" research permit.

The area of the exploitation permit, which is the subject of this project, covers an area of 25.01 km² and is located in the rural commune of Tchirozérine (Department of Tchirozérine, Agadez Region).

The geographical coordinates (Latitude/Longitude, ADINDAN - Clarke 1880) of the vertices within the licence area are given in Table 1 below.

Table 1 Coordinates of the vertices of the exploitation perimeter

Point	Longitude	Latitude
A	7° 39' 59, 8''	17° 50' 08''
B	7° 42' 50''	17° 50' 08''
C	7° 42' 50''	17° 47' 26''
D	7° 39' 59, 8''	17° 47' 26''

2.1. Project objectives

The overall objective of the project is to develop the uranium deposit discovered in the "Adrar Emoles 3" exploration permit.

The specific objectives are:

- Construct and install the permanent surface infrastructure (base camp, buildings including administrative and technical blocks, sanitary installations, water and electricity networks, ponds, various workshops and garages, shops and warehouses for various products and equipment, etc.);
- Construct the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) and all associated facilities (garage, workshops, crushing plant, various cables, signalling, instructions, etc.);
- Build the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouses, various networks, contact for the production of sulphuric acid, hydraulic works, sluices, various input storage areas, etc.);
- Processing the ore to uranate, smelting it and transporting it to potential markets;
- Create temporary and permanent jobs and contribute to the improvement of people's living conditions;
- To contribute significantly to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors;
- Redevelop all the sites operated at the closure of the project.

2.2. Expected results

The main results expected from the implementation of the project are:

- the permanent surface infrastructure (base camp, administrative and technical buildings, sanitary facilities, water and electricity networks, ponds, various

workshops and garages, shops and warehouses for various products and equipment, waste rock and tailings disposal areas, etc.) are built and/or installed;

- the underground mine (access ramp (tunnel), galleries, shafts/ventilation holes) and all associated facilities (garage, workshops, crushing plant, various cables, signalling, instructions, etc.) are constructed and/or installed;
- the ore processing plant and the various support services (administrative and technical blocks, workshops, garage, warehouse, various networks, contact for the production of sulphuric acid, hydraulic works, slurry pits, slurry pits, various storage areas for inputs, etc.) are built;
- the ore extracted is processed, the uranate obtained is smelted and transported to potential outlets;
- temporary and permanent jobs are created and the living conditions of the people in the area are improved;
- a significant contribution to the improvement of tax revenues at local, regional and national levels as well as to socio-economic development through investments in various sectors is made;
- all operated sites are redeveloped at project closure.

2.3. Description of the deposit

All known uranium deposits in Niger are located in sandstones and conglomerates of the Tim Mersoi basin. They are all classified as belonging to the tabular sedimentary types.

Sandstone-hosted uranium deposits are marked by epigenetic concentrations of uranium in fluvial/lacustrine or deltaic sandstones deposited in fluvial continental environments frequently in transition zones from higher to lower flow regimes, such as along paleo ridges or domes. Roll-front deposits contain impermeable shales or mudstones overlying or underlying or separating the mineralised sandstones and ensuring that fluids move along the sandstone bodies.

In sandstone-type deposits, uranium is usually precipitated by oxidising fluids from reducing agents such as plant material, amorphous humate, sulphides, iron minerals and hydrocarbons. The oxidation and reduction facies display typical colours and can assist in the selection of exploration targets. Fluid migration and deposition of uranium leaves a colour change from red hematite (oxidised) to grey-green (reduced). The main uranium minerals in most sandstone-type deposits are uraninite, pitchblende, coffinite

In general, it can be noted from north to south in eastern Niger that uranium mineralisation appears to occur in increasingly younger strata. This is most likely a combination of a change in source zones and uranium supply over time, and the fact that in the south the younger strata are exposed at the surface, necessitating increasingly deeper drilling in the southern areas (e.g. Carboniferous - older targets).

The best grade and tonnage of uranium in the Adrar Emoles 3 deposit is found in the sandstone of the Tchirezrine 2 formation, the same formation that also contains the large ORANO Imouraren deposit, located about 40 km northwest of Adrar Emoles 3.

In contrast to the carboniferous mineralisation in the Arlit area, the uranium in the Tchirezrine 2 formation occurs mainly as hexavalent uranium minerals in an oxidised environment. Uranophane is the most abundant mineral. It can form small aggregates or appear as a continuous coating parallel to the layering. Uranophane is commonly associated with chrysocolla and in small quantities also with boltwoodite. Metatyuyamunite has also been found. Coffinite exists in the residual reduced areas, as well as chalcocite and native copper. Pitchblende was observed in small quantities. This mineralisation occurs in two main forms: interstitial in the sandstones, and massive sulphide mineralisation in the microcracks with galena and blende.

2.4. Project activities

The main activities that will be implemented within the framework of the "Adrar Emoles 3" exploration permit are given in Table 2 below.

Table 2 Project activities

Project phases	Activities
Development (Preparation and construction)	- Construction/development of access roads/tracks - Site preparation (stripping or removal of overburden) for the construction of temporary facilities - Installation of temporary infrastructure and equipment that will contribute to the construction of the project (living quarters for the personnel of the construction companies, material base, etc.) - Borrowing and quarrying (sand, gravel, laterite, etc.) - Preparing the right of way for the facilities - Construction/installation of surface structures and equipment (employee living quarters, administrative and technical blocks, plant and support services including machine maintenance and reconditioning workshops/garages, boiler rooms, pneumatics, etc., input warehouses, contact workshop for the production of sulphuric acid, ponds, dykes, boreholes, tailings facility, waste treatment facilities, electrical power generation system, etc.) - Construction of the underground mine (ramps, galleries, ventilation holes) and its support services at the bottom (garage, workshops, crushing plant, various networks, signposts and instructions, etc.).
Operation	- Extraction of ore from the underground mine (drilling, blasting, transport of ore to the primary crusher, conveying to daylight through a conveyor belt) - Storage of inputs (chemicals including sulphur, hydrocarbon products, etc.) - Operation of workshops (maintenance of machinery and equipment, reconditioning of machinery, manufacture of spare parts, etc.) - Ore storage, crushing and conveying to the plant - Plant level ore processing (crushing, grinding and classification, etching, liquid/solid separation, clarification, precipitation, purification, uranate drying/calcination and smelting) - Storage of tailings from ore processing

Project phases	Activities
	- Loading and shipping of uranate - Periodic maintenance of the plant
Closing	- Dismantling of facilities - Site clean-up - Site redevelopment/restoration

2.5. Main project infrastructure

The main infrastructure to be built under the project :

- the living quarters: staff housing, sanitary, social, cultural, educational, electrical and drinking water infrastructures, roads, etc.
- the mining area: mine access roads, overburden, ore heaps, explosives storage, mechanical workshops, storage shops, truck loading facilities and other related infrastructure such as internal roads, buildings (administration, changing rooms, etc.) and services.
- the ore processing plant, the contact workshop for the production of sulphuric acid and the solvent extraction process for uranium.
- transport tracks, service corridors, overhead power lines and water pipes.
- Tailings storage facilities and waste rock piles - Tailings from the mill will be stored dry in a clay-lined tailings storage facility. Mine waste rock will be disposed of in waste rock piles.

2.6. Working hours on the project site

The working hours will respect the regulations in force in Niger.

In case of derogation, a request for authorisation will be sent to the competent authority, notably the Agadez labour inspectorate.

3. LEGAL AND INSTITUTIONAL FRAMEWORK

3.1. Legal framework

3.1.1. International legal framework

The international conventions on hygiene, health and safety to which Niger has acceded and which are relevant to the project are the following (date of ratification/date of entry into force):

- C029 - Forced Labour Convention (No. 29) - Protocol of 2014 to the Forced Labour Convention, 1930 ratified on 14 May 2015;
- C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87) (27 February 1961);
- C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98) (23 March 1962);
- C100 - Equal Remuneration Convention, 1951 (No. 100) (9 August 1966) ;
- C105 - Abolition of Forced Labour Convention, 1957 (No. 105) (23 March 1962) ;
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111) (23 March 1962) ;
- C138 - Minimum Age Convention, 1973 (No. 138)Minimum age specified: 14 years (04 December 1978) ;
- C182 - Worst Forms of Child Labour Convention, 1999 (No. 182) (23 October 2000).

3.1.2. National legal framework

The different national texts that can be activated in the framework of the project in relation to the implementation of the Health and Safety plan are the following:

- **Law 2012 - 45 of 25 September 2012 on the Labour Code in Niger.** According to Article 8, "*Companies shall use their own labour force. They may also call upon external personnel in the framework of temporary work and make their employees available to other companies. They may also use the services of a labourer*". For Article 9: *"Subject to compliance with the provisions of Articles 11, 13 and 48, employers shall directly recruit the employees they employ. They may also use the services of public or private employment agencies. Article 155: "Stress, smoking, alcoholism, drug addiction and HIV/AIDS are emerging health risks in the workplace. Every employer is obliged to inform and sensitize his workers about emerging risks and to provide psychosocial assistance. Article 156: "The employer may not, under any circumstances, require a job applicant to undergo an HIV-AIDS or sickle cell test on the occasion of his recruitment;*
- **Law No. 93-13 of 2 March 1993 establishing the Public Health Code.** This code regulates several aspects related to the management of waste and its effects on the environment. It also deals with the hygiene of industrial

installations, public roads and places, water and the natural environment. The code also regulates the management of toxic products, the protection of human health and the fight against noise;

- **Decree N° 2011-404/PRN /MH/E of 31 August 2011** determining the nomenclature of developments, installations, works and activities subject to declaration, authorisation and water use concession.

3.2. Institutional framework

The different institutions that will be involved in the implementation of the Health and Safety Plan are

- The Ministry of the Environment t and the Fight against Desertification;
- The Ministry of the Interior and Decentralisation;
- The Ministry of Employment, Labour and Social Protection;
- Global Atomic Fuels Corporation;
- Companies and service providers;

Also, civil society organisations may be involved in the project if necessary.

4. HSE RESOURCES

4.1. Organisation of the HSE function

4.1.1. Head of site

He is responsible for hygiene, health and safety at work throughout the site.

It ensures that an effective prevention strategy is in place:

- Against accidents, damage and loss of property;
- Against the risk of incidents that may occur to any person employed by the Company or victim of the consequences of its activities.

It takes disciplinary action against supervisory members who have not observed or are not observing their responsibility for health and safety.

In the event of serious or fatal accidents, he/she is responsible, in collaboration with the HSE manager, for:

- Informing the families of the injured;
- Report the accident to the CNSS;
- Ensuring the availability of care;
- Monitoring the evolution of the health status of accident victims;
- Collaborate with the treating physician to obtain a certificate to return to work, even in part-time work if necessary.

4.1.2. HSE Manager

He/she is responsible for the implementation and enforcement of the project's health and safety policy and ensures that this is communicated to the staff under his/her authority in general, and to new recruits in particular.

It ensures that all Supervisors and Operators are aware of their health and safety responsibilities and do not take unnecessary risks.

It ensures that all work to be carried out on the site presents the minimum risk to employees, the public, equipment and materials.

It guarantees care for all staff in the event of both injury and occupational illness.

It sets up an organisation with subcontractors and others to avoid any confusion of areas of competence in health, hygiene and safety.

It ensures that adequate provisions including any special requirements are made for fire prevention on all project facilities.

He/she shall collaborate with any person in charge of the work before adopting new working methods or carrying out any handling that poses serious safety or health risks.

It ensures that every accident that occurs on any site is reported in accordance with this procedure.

In addition, it is responsible for carrying out the initial investigation of any accident or incident resulting in work stoppage.

The HSE manager sets an example by following the various safety instructions.

Its tasks also include:

- Ensure that safety rules are posted throughout the site;
- Participate in the implementation of HSE policies;
- Participate in the risk analysis of the site;
- Participate in the drafting of task analyses;
- Write the HSE activity reports for the site (Non-Conformity, Compliance);
- Participate in the drafting of operating modes, procedures and HSE methodologies for the site and ensure their application;
- Advise management on the drafting of the PHSS, and ensure its implementation;
- Carry out regular field visits and checks;
- Check, control and update safety records for machinery and equipment;
- Ensure the correct use of collective protective equipment (CPE);
- Ensure the use, provision and stock management of personal protective equipment (PPE);
- Analyse work accidents and near misses and propose a corrective action plan to the site management;
- Produce and file accident, near miss and incident reports;
- Manage crises in the event of fatal accidents, and stop the site in the event of an actual or potential danger in consultation with the site manager;
- Propose sanctions for repeated failure to comply with safety rules;
- Organise awareness-raising sessions on hygiene, health and safety issues for all employees and archive the attendance lists resulting from these awareness-raising sessions (Environmental Safety Minutes);
- Manage and monitor the site's safety and environmental reception areas;
- Organise team training in the HSE field;
- Organise the management of the site infirmary and define the contents of the first aid kits in collaboration with the occupational physician;
- Ensure that the telephone numbers of doctors, nurses and ambulance staff are posted;
- Ensure that a copy of the PHSS is available at all levels of the hierarchy;
- Keep all inspection, accident/incident report forms;
- If necessary, train the various managers in the use and operation of HSE recording media.

4.1.3. Service providers and subcontractors

All subcontractors will be required to comply with Global Atomic Fuels Corporation's Health and Safety Policy.

They will sign the subcontractor membership letter before starting their activities. They will commit to the HSE requirements of the project.

They will sign the PHSS organisation note after writing: "We have read the contents and undertake to comply with the GAC PHSS in its entirety".

They will have to communicate to the management on site, all the difficulties which would block the implementation of this policy, so that solutions are quickly found.

They must ensure that the potential risks of accidents/incidents have been analysed for their work before it is carried out.

Similarly, when installing electrical equipment or machinery, they must ensure that this is done in accordance with standard safety rules.

Any substance, material or equipment brought onto the site by them which presents an explosion or fire hazard or which may seriously harm people's health must be declared for storage in accordance with the prescribed recommendations and the regulations in force.

Finally, subcontractors and service providers will be required to provide their employees with all the personal protective equipment necessary for the proper execution of the work entrusted to them. They shall ensure that their staff are trained in the use of this equipment.

4.2. Conflict resolution

It should be noted that should any conflict arise during the implementation of the project, its resolution will follow the Complaints Management Mechanism (CMM) in place.

5. RESCUE AND EVACUATION ARRANGEMENTS

Each person intervening on the project site (employee, subcontractor, service provider, accompanied visitor, control mission, etc.) must know the means and the way to call for help, the assembly points and the conduct to follow according to their skills and functions.

5.1. Alert procedure

As prevention is one of the best options for safety, the HSE manager will ensure that workers know what to do in the event of an incident or accident.

To this end, emergency preparedness for the worker should be provided by the HSE officer.

The main objective is to avoid improvisations that worsen the consequences of an accident. The aim is to show what to do and what not to do in the event of an incident or accident. To do this, it is necessary to:

- make staff aware of the risks of panic that may arise in the event of an accident;
- comment on the "Accident Calls" poster displayed in workplaces;
- indicate access to workstations to facilitate the organisation of rescue operations.

Of course, workers prepared in this way do not replace first aiders, whose special training remains indispensable.

Finally, each worker on the site should be aware of the following points depending on the undesired events.

In case:

- **Accident:** notify the safety department or follow the posted instructions;
- **Fire:** Fight the fire and notify safety personnel on site;
- **Siren:** Go to the nearest assembly point.

5.2. Assembly points

Depending on the organisation of the whole site, assembly points should be defined. Signs indicating these places should be made and placed.

5.3. Lists of first aid workers

As part of the implementation of this plan, the project must have a list of trained first aiders. This list must include the following information Names and surnames, duties and place of employment.

The HSE manager ensures that the list of first aiders on the project sites is updated in real time.

5.4. Medical equipment

5.4.1. Infirmary

In accordance with the regulations and depending on the number of employees on the site, an infirmary will be set up in accordance. Indeed, paragraph 1 of Decree No. 2017 017-682/PRN/MET/PS of 10 August 2017 on the regulatory part of the Labour Code stipulates that: *"There must be provided at least : in 1st category establishments, the permanent service of one doctor and two (2) nurses up to one thousand (1000) workers, one additional doctor for every 500 workers and one additional nurse for every 300 workers; when the establishment comprises less than one thousand (1000) workers and is located less than twenty-five (25) kilometres from an official medical centre or a centre of activity of a private doctor, it may be classified as 2nd category by decision of the Minister in charge of Labour, after the opinion of the Minister in charge of Public Health."*

This infirmary will be set up in a four-compartment container comprising: a waiting room; a consultation room equipped with furniture and medical equipment; a treatment room and a rest room.

For the purposes of the operation of this establishment, the GAC will comply with the texts in force, in particular the conditions of recruitment of care personnel in companies.

5.4.2. First aid kit

First aid kits for first aid will be provided in some of the light and heavy vehicles operating on the various project sites.

No medication is accepted in the first aid boxes, unless prescribed by the occupational physician.

The use of emergency boxes must be systematically reported to the HSE manager for replenishment.

The contents and durability of these emergency boxes will be checked regularly. If an item is found to be missing, it will be replaced as soon as possible.

5.5. Evacuation procedure

In the event that the infirmary does not have the means to receive a patient following a serious accident or a serious health problem, the HSE manager informs the site manager of the need to evacuate the patient to a health centre that will be agreed upon, particularly in Agadez.

In this case, the person in charge of the infirmary fills in an evacuation request form which will be submitted by the HSE to the site manager for approval.

5.6. Fire

The HSE manager maintains a list of officers with firefighting skills

5.6.1. Prevention and fire-fighting measures

Effective means of fire prevention and fire-fighting should be available. They should comply with national legislation and approved standards.

They should be placed within easy reach to facilitate their accessibility and use in case of emergency. They will consist of: Sandbox, Fireproof suit, ABC powder extinguisher (6 and 9 kg), Safety shower.

Fire-fighting equipment should be inspected, maintained and tested in accordance with the manufacturers' recommendations and the relevant regulations.

5.6.2. List of firefighting equipment:

A situation of the firefighting equipment distribution plan will be developed and maintained by the HSE manager.

5.6.3. Fire prevention

The best way to fight a fire is to prevent it. Fires can be prevented or their damage greatly reduced by applying storage rules and by thinking through each stage of the operation. This includes removing waste, separating flammable liquids from combustible products such as boxes of cardboard and paper, storing a limited amount of flammable products and keeping traffic areas unobstructed and clean.

Check the site and observe if there are broken electrical wires; if there is an electric motor that can generate sparks near flammable liquids; if there are bottles of flammable substances too close to the heat; if the work area is cluttered, etc. It is strictly forbidden to light fires inside the work site or to cause bush fires. Prevention measures will be posted wherever necessary on the Company's facilities.

5.6.4. Reflexes in case of fire

In case of fire:

- Protecting the area;
- Use on-site extinguishers at the base of the fire;
- Notify the emergency service and wait for instructions.

5.7. Emergency service

The emergency service will consist of the personnel listed in the table below.

Heading	Function	Name	Contact
Head of site	----------	----------	----------
HSE Manager	----------	----------	----------
Law enforcement officer	----------	----------	----------

6. HEALTH AND HYGIENE MEASURES

6.1. General health and safety rules

The general rules of health and safety are :

- Regular cleaning of the work premises and annexes;
- Sanitary facilities in a ventilated room ;
- Ventilation of rooms and sufficient lighting;
- Clean, uncluttered floor, with marked footpaths and machine paths;
- Isolated heat sources, hot spot interventions only in specific areas, powder extinguishers, sand trays, well distributed and regularly checked;
- Appropriate evacuation of explosive gases, fumes and vapours;
- Electricity network compliant and regularly checked;
- Earthing of electrical appliances, protected sockets ;
- Noise reduction at source, machine insulation ;
- Store hazardous materials in ventilated and well-ventilated areas, away from sources of heat;
- At the workstation: limit the quantity of products present, use safety signs;
- Recovery of used oil in tanks and disposal in a specialised circuit;
- Regular monitoring of equipment and maintenance records;
- Provide workers with personal protective equipment and wear it whenever necessary;
- Equipping the site with the appropriate collective protective equipment;
- Etc.

6.2. Health

- *Routine and emergency medical service*

The Project will organise a routine and emergency medical service in all its facilities (base camp, offices, work sites). This service will include :

- An infirmary during the construction and operation phases of the project;
- An occupational health agreement with an occupational physician;
- A sufficient number of trained permanent first aiders whose contact details are readily available;
- First aid kits and adequate first aid kits in vehicles and machinery;
- An agreement with the hospital in Agadez for the management of cases beyond the competence of the site's infirmary.

- *Operation of the infirmary*

The infirmary will operate as follows:

- Presence of a permanent nurse: who will provide basic care and dressings. His/her services will be limited to cases of minor accidents and illnesses that are not proven to be dangerous or contaminating.
- Temporary hospitalisations will be carried out depending on the case, notably required to take medication or to carry out dressings.
- Supplies of medicinal products defined according to the epidemiological map of the region and the staff's health status sheet will be carried out regularly.
- An occupational physician will visit the infirmary once a week to consult with staff and provide occupational medicine.

➢ *Medical evacuation service*

Evacuations will be carried out to health centres agreed with GAC or the service provider, as appropriate. In the event of complications or aggravation of the injuries of an accident victim, the victim may be evacuated to other centres in Niamey.

6.3. Management of Hazardous Materials and Substances in Service

Safety Data Sheets (SDS) for the products in this range will be available from the HSE Manager and displayed in appropriate places accessible to user personnel.

In collaboration with the medical team, he will draw up summary tables to help manage the risks arising from contact with the human body.

The Medical Team should be equipped for primary care in case of poisoning (antidotes, oxygen, etc.)

6.4. Dust

Appropriate measures shall be taken to control inhalable and respirable dusts in all workplaces, in particular in areas where such dusts may be generated, e.g. at loading, unloading and transhipment points of materials and wastes, at crushing plants and on taxiways.

6.5. Ionising radiation

Within the framework of the activities on the project site, the necessary measures will be implemented to combat the effects of ionising radiation. The competent authority will be consulted on the national legislation and standards for radiation exposure. In concrete terms, the following measures will be defined and applied:

- Monitoring and dose assessment measures;
- Technical measures, including;
- Administrative protection measures;
- Personal hygiene measures.

6.6. Hygiene

The base's facilities will include toilet facilities for all company personnel.

Cloakroom facilities will be provided at the expense of the contractors to allow workers to exchange clothes.

The cleanliness of the facilities will be ensured by a team of maintenance staff who will be responsible for their daily maintenance.

As a result, identified bins or skips will be placed in the designated areas to accommodate ordinary waste consisting mainly of organic material for office areas.

This type of waste will be collected, stored and disposed of according to the recommendations of the waste management plan.

On site, the work areas will be cleared of all residues (off-cuts of planks, iron, cables, etc.) during the work and at the end of the day. This waste will be piled up, collected and stored according to the recommendations of the Environmental Management Plan.

Workstations will be left clean and tidy.

Awareness-raising campaigns on personal hygiene and cleanliness will be conducted among staff.

Drinking water will be available to all workers.

6.7. Policy on alcohol, drugs and unauthorised substances

The possession, consumption or distribution of alcohol, drugs or unauthorised substances is strictly prohibited at all workplaces in this project.

Employees who arrive at work or perform their duties under the influence of these products will be severely punished.

All necessary measures will be taken to detect, monitor and prevent any infringement of this prohibition.

The detection methods will consist of a systematic search of luggage at the entrance to the facilities or the findings of the HSE manager during surveillance rounds.

All employees of the company, of a contractor and of its subcontractors are subject to this prohibition.

Awareness-raising pictograms will be displayed on site explaining the harmful effects on health and prohibiting the introduction and consumption of alcohol, drugs and unauthorised substances on GAC premises.

6.8. Order and cleanliness

Arrangements will be made for:

- Improve working conditions;
- Reduce the risk of all types of accidents;
- To facilitate travel;
- Save time and costs;
- Waste management at all levels to avoid clutter;
- Do not pour any product without the agreement of the site manager;

- Please take all measures to avoid any pollution, even accidental;
- Use the bins provided for each waste product.

7. SECURITY MEASURES

7.1. HSE points

The HSE points will be held during the technical meetings of the site on a frequency to be determined and will concern the situation of the questions on the HSE aspects established by the HSE manager. They allow the site manager to inquire about HSE issues on the site and to take the necessary measures in accordance with regulations, the client's expectations, the donors' procedures and GAC's HSE policy.

HSE points allow:

- ensuring compliance with the rules on safety, health and working conditions;
- check the application of the measures decided at the HSE meetings;
- update the risk map and the measures to be adopted;
- to ensure that the HSE Plan is harmonised and updated in line with the activities on the site;
- to define common rules intended to contribute to the coordination of measures taken to ensure compliance with safety and health protection measures;
- to examine work-related accidents or incidents that occur at the workplace and to participate in the investigation of serious accidents,
- propose additional safety training and review regulatory training;
- Continuous review of health and safety measures;
- ensuring compliance with Health and Safety measures for workers

The HSE manager follows up on site the actions retained following the HSE points and integrates them into his situation presented during the site meetings

7.2. Reception of the worker on the site

The HSE manager ensures that every worker arriving on site is informed about the HSE measures to be applied in the work area, the general instructions and the HSE plan.

This training concerns permanent staff, subcontractors, unqualified staff and visitors, particularly with regard to reception and traffic procedures on the site.

The purpose of this training is to instruct on the precautions to be taken to ensure one's own safety and, if necessary, that of others on site.

This training must enable the worker to carry out his work under the best HSE conditions, both for himself and his colleagues, and to carry out his visit for the visitor.

The security reception is an important moment, too often neglected. It allows a good integration into the company, the project and the team. All personnel working on the site will therefore undergo a type of safety induction training beforehand.

This reception has two aspects:

- one material (administrative formalities, provision of tools or individual equipment);
- the other human.

Depending on the newcomer, the basics of the "Hygiene-Health-Safety Reception" training or awareness-raising may cover, among other things

- The presentation of the site;
- The HSE policy in place;
- Description of medical facilities and evacuation plan;
- Disciplinary measures in case of violation of safety rules;
- Collective and individual protective equipment;
- Emergency procedures;
- Security gatherings (security minutes);
- Accident/workplace accident/fire alert procedures;
- HSE guidelines;
- A training course on the reception of the work station which will deal with the technical aspect and the respect of the safety rules;
- Specific risks related to the workplace;
- Health and safety measures specific to the site;
- Etc.

In order to ensure the regular functioning of the procedures put in place and to enable their internalisation, simulation sessions will be organised.

7.3. Safety minutes

Safety minutes will be conducted by the team leaders (team leaders, site managers, department managers, etc.) in each section at a frequency to be determined by the subcontracting companies in agreement with the HSE manager. An attendance list will be signed to serve as a record.

7.4. Specific training

Depending on the findings of the internal and external (by regulatory bodies) inspections carried out, the relevant contractor companies will organise specific safety training. This training will be provided by the HSE manager, a service provider or by internal staff with good experience in the subject matter of the training.

All training will be coordinated by the HSE Manager and programmes may include

- Rescue and first aid at work ;
- The use of various devices and tools;

- Stress in the workplace ;
- Risks related to the activities ;
- The line of conduct and road safety ;
- Fire prevention and control ;
- Etc.

7.5. Staff information and communication

To ensure staff information and communication, signs will be installed at the work areas on the site. They will indicate:

- The place concerned;
- Safety results (in accidents at work and days off work);
- Mandatory PPE;

In addition, signs with essential safety and prevention notices will also be placed in appropriate places that can be easily read by all.

The rules recalled concern:

- Wearing PPE;
- Prohibition of public access to the site;
- Seatbelt use in vehicles;
- Compliance with speed limits;
- Not drinking and driving and not drinking and driving at work.

Finally, the various officials will be provided with modern means of communication (mobile phones) enabling them to seek advice or receive any information related to accident prevention.

7.6. Protection of personnel on site

7.6.1. Collective protection

Collective protection equipment will be installed wherever necessary and used by workers against hazards (falling from heights, falling objects, etc.). All collective protection equipment is subject to periodic monitoring.

The partial or total dismantling of collective protection is strictly forbidden without compensatory measure(s) and without the agreement of the site manager and the HSE Manager.

Any person who notices a collective protection defect must immediately notify the site manager or the person in charge of the work being carried out.

7.6.2. Personal Protection

To ensure the personal protection of workers, the wearing of PPE will be one of the fundamental elements of HSE actions at the GAC site. This includes wearing the following basic mandatory PPE:

- Safety helmet;
- Safety shoes;
- Working clothes;
- Safety waistcoat.

Specific PPE, therefore depending on the position, will be provided to the staff concerned on request. These are (es):

- Safety glasses with side protection;
- Earplugs, earmuffs or headphones;
- Handling gloves;
- PVC safety boots;
- Gloves of different types (welder, PVC);
- Respiratory protection mask (dust, gas, etc.);
- Specific protective glasses (grinding, welding, flame cutting, etc.);
- Aprons and other specific work clothing;
- Rain sets;
- Etc.

The HSE manager will ensure the supply and distribution of this PPE.

7.6.3. Staff transport

The transport of personnel to and from the work sites will be provided by vehicles equipped for the transport of personnel, thus ensuring their safety.

For holidays or recuperation, the subcontracting companies will establish agreements with the transport companies of their choice to bring the workers to Agadez. Depending on their destination, each company will bear the corresponding transport costs.

7.7. Main registers to be kept at the work site

To ensure good control of information on hygiene, health and safety on the site, registers that are continuously maintained and filled in will be set up for each workstation. These will include the following registers:

- Fire prevention plan;
- Register of the Labour Inspection (administration and HSE);

- Safety and control register for machinery and installations (electrical installations, lifting equipment, safety devices, cables - chains - ropes - hooks, mobile cranes, compressed gas containers, self-propelled trucks, etc.);
- Maintenance and intervention register (kept in the maintenance department office);
- Register of periodic inspections (kept in the Material Services office);
- Near miss, accident, near miss and incident register;
- Fire register (HSE Officer);
- Register of minor accidents (infirmary);
- Complaint Register (HSE Officer);
- First aid register (infirmary).

8. HAZARD PREVENTION MEASURES

8.1. Cohabitation of pedestrian equipment:

Traffic will be regulated in accordance with the needs of the site to avoid the risks associated with machine/pedestrian cohabitation.

8.2. Machinery and vehicles

All personnel (GAC, subcontractors, etc.) will respect the highway code on the public space and the traffic rules on the site. Signage and internal instructions must be strictly respected.

The following provisions must be observed:

- Mandatory wearing of seat belts while driving ;
- The 30 km/h speed limit;
- Supervision of the manoeuvres of large machines;
- Authorisations to operate large machinery;
- Regular monitoring of the sensitive points of the equipment (lighting, glass surfaces to ensure good visibility, etc.).

8.3. Handling

Materials, products and waste will be moved with the help of machinery.

Manual handling is only used for occasional operations with small loads and small spaces.

Gloves must be worn during handling.

Staff should adopt a good posture to avoid the risk of low back pain.

8.4. Crane guiding Slinging

The main risks are:

- Impact with the load (with the installation or a person) ;
- Load drop;
- Hand contusions, entrapment;
- Collision.

The obligations to be respected are:

- Use and wearing of appropriate protective equipment (collective and individual);
- Trained and identified chief of labour;
- Know the load to be moved;
- Mark out the safety zone;
- Do not use the telephone while driving.

During the manoeuvre, it is strictly forbidden:

- Move the load over the workstations;
- Use the equipment without specific training.

8.5. Periodic General Checks

Machines with annual or biannual periodic checks will be used. The HSE manager will carry out regular inspections.

Reports of machine checks are kept by the equipment manager with a copy to the HSE manager.

8.6. Care and maintenance

All machinery (fixed and mobile), including that of subcontractors, will be regularly maintained and kept in good working order.

8.7. Signage, marking, access, lighting

8.7.1. Signalling

The presence of the works and the construction site rights of way are indicated. The signs and their layout comply with the rules and good practices in force in this area.

8.7.2. Access

Entry to and exit from the rights of way are in forward gear. Truck accesses are designed to avoid manoeuvring.

When lorries arrive or leave the site, which requires manoeuvring, a person in high-visibility clothing helps the driver to manoeuvre safely for both road users and site personnel. During the manoeuvre, visual contact between the driver and the pedestrian is permanent.

Reverse driving must be exceptional (technical necessity) and assisted by a person (pedestrian) equipped with high visibility clothing.

8.7.3. Beaconing

Depending on the case, two types of markings should be used:

- Light marking: (tape) to indicate a temporary low-risk area (cutting work, lifting, etc.);
- Hard markings: (barriers, scaffolding elements, netting) to physically prevent people from passing (e.g. hole in a deck, heavy handling, etc.).

8.8. Working at height

Risk: falling person or object

Preventive measures:

- Wearing a safety helmet;
- Wearing a safety harness;
- Marking of the work area;

- Electrical lockout if working near potentially dangerous electrical installations.
- Ladder in conformity (presence of runners in good condition, rungs and structure in good condition,...), hung (to be used only to access the work area);
- Platform, equipment and use in compliance;
- Authorisation to operate lifting equipment (permits will be issued prior to handing over the work);
- Stable rolling scaffold with wheel lock;
- Use of stable stepladders equipped with a working platform surrounded by railings;
- Authorisation to work at height;
- Recording in the work permit.

8.8.1. Scales

Ladders are primarily a means of access to equipment at a height and should not be used instead of scaffolding, platforms or aerial work platforms, except for short-term work.

- Use ladders in good condition, adapted (length) to the work to be done, equipped with anti-slip systems;
- Check that the ladder is clean. No grease (e.g. grease);
- Secure the ladder at the top or place a person to hold the bottom of the ladder for the duration of the operation;
- Use a ladder that is one metre higher than where you are climbing;
- Install a ladder at approximately 70°;
- Always climb up and down facing the ladder and hold on with both hands;
- Mount the equipment in a bag with a rope;
- Respect the 3-point rule.

8.9. Storage

Materials, equipment and waste will be stored in dedicated and purpose-built facilities.

8.9.1. Storage of flammable products

The storage of flammable products shall be carried out exclusively in appropriate places equipped for this purpose. These places must be secured and equipped with all the necessary fire prevention and fire fighting equipment.

Safety data sheets for the products will be displayed and clearly visible.

Finally, the actions and knowledge to be taken in the event of a fire will also be displayed.

8.10. Loading and unloading

When loading or unloading, the truck must be stopped with the parking brake on and the gear lever in neutral.

In case of slopes, chocks are used to complete the immobilisation. The engine is stopped.

Personnel involved in loading or unloading must have the necessary training and authorisation.

8.10.1. Fuel distribution

The person responsible for the management of the station (distribution point) will ensure strict compliance with the relevant safety and environmental management guidelines.

8.10.2. Lighting

Each work area will be sufficiently lit to provide a sense of visual comfort for all operators.

8.11. Electricity

Electrical installations are designed, installed and maintained by qualified personnel. The personnel are trained and have the appropriate authorisations.

All electrical cabinets are locked and padlocked (or equivalent). All work on electrical equipment is carried out by an electrician.

The metal grounds are earthed.

Only electricians are authorised to work on an electrical installation.

An examination of the conformity of the electrical installations is carried out by an approved body at the time of commissioning. This initial verification is the subject of a report.

8.12. What to do in case of an accident on the project site

The right reflexes to cultivate in the event of an accident:

- In case of personal injury:
  - Protecting the casualty;
  - Call the first aider in the area, the nurse, the HSE manager who will call for help;
  - Helping the victim while waiting for help;
  - After giving first aid, have the victim transported to hospital by the competent services.
- In case of alarm:
  - Do not panic;
  - Take every precaution to ensure that the equipment is stationary and safe;
  - Go to the nearest assembly point.

9. HYGIENE, SAFETY AND HEALTH ACTION PLAN

Table 3 below shows the Health, Safety and Security Plan for the Adrar Emoles 3 Exploration Permit Project, which may be adapted to suit the activities at the project site.

Table 3 Health, Safety and Security Plan

COMPONENT	DOMAIN	MEASURES	OBJECTIVE OF THE MEASURE	MONITORING INDICATOR	MEANS OF VERIFICATION	MONITORING OFFICER	FREQUENCY
Rescue and evacuation arrangements	Alert procedure	Awareness-raising for all staff by means of posters at the safety reception, HSE Round	Mastering what to do in an emergency	Presence of emergency procedure signage ; Number of hosts	HSE points ; Monthly HSE report ; Scoreboard	HSE Manager	Monthly
	Assembly point	Putting up signs indicating assembly points	Gather staff in a specific location, count them and evacuate them in an emergency	Number of assembly points with signs in place, known to all staff and visible	Findings	HSE Manager	Monthly
	First aid workers	Training staff in first aid and rescue at work	Giving first aid	Number of workers trained in first aid	Attendance list	HSE Manager	Quarterly
	Infirmary	Setting up the nurse and his or her medical equipment	First aid management	Sick bay installed and medical equipment set up	Findings	HSE Manager	Monthly
	Evacuation procedure	Awareness-raising for all staff by means of posters, during the safety reception	Mastering what to do in an emergency	Display emergency procedure	Findings	HSE Manager	Monthly
	Workers trained in firefighting	Train workers in first aid in case of fire	Carrying out the first fire response	Number of workers trained	Attendance list for courses	HSE Manager	Quarterly
	Fire-fighting equipment	Place fire extinguishers in all fire risk areas	Facilitating the first firefighting response	Fire extinguishers in all fire risk areas	List and findings	HSE Manager	Weekly
Hygiene	Workers' changing rooms	Provision of equipped changing rooms	Improvement of the living environment of workers	Lockers available and maintained	Findings	HSE Manager Subcontracting companies	Monthly
	Sanitary facilities	Installation of toilets consisting of showers, hand-washing facilities, toilets	Improvement of hygiene conditions at work	Sanitary facilities available	Findings	HSE Manager Subcontracting companies	Monthly
	Water points	Availability of water points	Improving hygiene conditions at work	Presence of water points	Findings	HSE Manager Subcontracting companies	Monthly

	Waste management	Provision of waste bins and skips	Improvement of the living environment on the site	Presence of bins and skips	Findings	HSE Manager Subcontracting companies	Monthly
Health	Medical service	Establishment of: A site infirmary; An occupational health agreement; A team of trained permanent first aiders; Means of evacuation in the event of a serious accident	Preventing occupational diseases and providing basic care and support for victims of work-related accidents	Medical service in place and functioning	HSE points ; Monthly HSE report ; Findings	HSE Manager	Monthly
	Policy on alcohol, drugs and unauthorised substances	Raising staff awareness through posters and during safety meetings; Organisation of unannounced checks on alcohol and drug consumption on the site.	Fight against the use of alcohol, drugs and unauthorised substances on the site	Visible display and security reception carried out developing this aspect; Number of unannounced checks carried out	Attendance list ; Minutes of unannounced checks	HSE Manager	Monthly
	Management of Hazardous Materials and Substances in Service	Availability of safety data sheets (SDS)	Controlling the risks of chemicals used on the site	SDS available	Findings	HSE Manager	Monthly
Security	HSE Home	Raise the newcomer's awareness of the HSE issues on the site	Facilitate the HSE integration of the newcomer	Number of awareness sessions conducted	Attendance list ; HSE points, Monthly HSE report	HSE Manager	Monthly
	HSE minutes	Raise staff awareness of the risks and preventive measures to be respected	Controlling risks and prevention measures	Number of safety minutes achieved	Attendance list ; HSE points, Monthly HSE report	HSE Manager	Monthly
	Specific training	Train workers to optimise their skills and know-how	Capacity building for workers	Number of training courses carried out	Attendance list ; HSE points, Monthly HSE report	HSE Manager	Monthly

	Staff information and communication	Installation of awareness and information boards and panels	Awareness raising and information for staff and visitors	Panels and boards installed	Findings	HSE Manager	Monthly
	Collective protection	Setting up collective protection against dangers (falling from heights, falling objects, etc.), and of defensive forces and safety devices	Protection of staff and local residents	Collective protection in place Presence of defence and security forces on site	Findings	HSE Manager	Monthly
	Personal protection	Equip operational staff with PPE	Protection of the worker	Equipped operational worker	Findings	HSE Manager	Monthly
Social security	Social protection	Social security registration of workers	Social security of the worker	Registered workers	Findings	Administration; Subcontracting company	Monthly
Hazard prevention measures	Coexistence of pedestrians and machinery	Traffic management on the site	Eliminate the risk of machine/pedestrian collision	Traffic control system in place	Findings	HSE Manager	Monthly
	Vehicles and machinery	Compulsory wearing of seat belts; dismounting from the cabs of machines in compliance with the 3-step rule; speed limit for vehicles; switching on flashing lights and code lights at night and in poor visibility.	Prevent accidents to people and possible material damage.	Compliance with seatbelt use ; Respecting the speed limit ; Flashing lights and code lights on.	Findings	HSE Manager	Monthly
	Subcontractors	Monitoring the condition of subcontractors' machinery and vehicles	Conformity of the material used	Monitoring carried out	Inspection report; Monthly HSE report	HSE Manager	Monthly
	Care and maintenance	Inspection of rolling stock and equipment	Conformity of the material used	Equipment and rolling stock inspected	Inspection report; Monthly HSE report	HSE Manager	Monthly

	Signage, access, lighting	Installation of signage; Access to the workstation; Adequate lighting of the facilities	Limiting the risk of accidents and occupational diseases	Signs posted; access to workstation well laid out; sufficient lighting of facilities	Findings	HSE Manager	Monthly
	Electricity	Maintenance of electrical installations by qualified and authorised personnel; electrical cabinets are closed and padlocked (or equivalent); earthing of metallic grounds	Prevent accidents to people and possible damage to property.	Entitlement available; Number of non-conformities found; Cabinets closed; Metal grounds grounded	Register, Findings	HSE Manager	Monthly
	Storage	Correct storage of materials in dedicated areas	Freeing up traffic lanes and reducing the risk of accidents	Well stored and tidy equipment	Findings	HSE Manager	Monthly
	Handling	Training in gestures and postures; provision of PPE	Safety of the worker during handling work	Safety minutes, Provision of PPE	Attendance list ; Findings	HSE Manager	Monthly

CONCLUSION

Despite the significant positive impacts associated with the implementation of the Adrar Emoles 3 Exploration Permit, the project will be a source of potential risks to the health, safety and security of workers and neighbouring populations. The present Health, Safety and Occupational Health Plan developed within the framework of the said permit has made it possible to define the conditions necessary to ensure the implementation of activities in complete safety. It concerns the provisions for rescue, health and hygiene measures, safety measures and measures to prevent dangers.

In order to monitor the indicators linked to the implementation of the planned measures, a Health, Safety and Security Action Plan has been drawn up based on the following points: components, areas of measures to be implemented, objectives to be achieved, monitoring indicators, person responsible for monitoring and frequency.

Reference HSE/SEC PR 02	Index 0	**PROCEDURE** **EMERGENCIES**	
Page : 1/10			

Date of implementation: / /2022

Recipient	DG	DS/CP	MINE	CPCMAC	HSE	DSA	CG	SRH
Number	1	1	1	1	1	1	1	1

Recipient								
Number								

DS/CP :
CPCMAC :
MINE
HSE:
DSA:
CG:
SRH :
CSST :

Related documents

HISTORY OF CHANGES		
Index	**Date**	**Nature of the changes**

SOMIDA	Electronically validated by	Electronically validated by	Electronically validated by
	Editor	Auditor	Approver

SUMMARY

I. THE GOAL

The purpose of this emergency response plan is to establish and maintain a procedure for :

- Identify all potential HSE emergencies on the DASA site
- Define a response plan for each potential emergency
- Define the responsibilities of all those involved in the event of a real emergency
- Inform the relevant SOMIDA staff and/or regulatory authorities of an emergency situation
- Ensure that the danger to those involved in an emergency is minimised
- Test, review and improve the emergency response plan as necessary

In an emergency, the objectives and priorities of all relief efforts are as follows

- The preservation of human life
- Environmental protection
- Asset protection
- The resumption of operations

II. THE INTRODUCTION

SOMIDA , a subsidiary of Global Atomic Corporation, is headquartered in Niamey and has its operating site in DASA.

This plan covers all operations throughout the site, to ensure consistency and continuity in the management of emergency response arrangements.

In the first instance, this emergency response plan only takes into account cases of "**Serious injury**" and "**Death"**, on the first 4 active Installations:

- THE CONSTRUCTION AND OCCUPATION OF THE BASE CAMP
- UNDERGROUND MINING DURING THE EXCAVATION PHASE
- WAREHOUSING AND DISTRIBUTION SERVICES
- MAINTENANCE WORK (MACHINERY AND STRUCTURES)

Note: It is clear that other emergencies will be added to this list in the future as activities progress, risk assessments are made and new additional control resources are acquired. The Emergency Plan will be updated accordingly.

III. DEFINITIONS/ABBREVIATIONS

Emergency situation (SOMIDA definition): Situation caused by an accident or media event requiring rapid action to avoid or limit its consequences on the environment and/or workers' health and safety.

ECP: Emergency Command Post: DASA management team (Director and all heads of departments/services)

Emergency Cell: ECP meeting room

EIUEmergency Response Team

PPE Personal Protective Equipment

HSES Health , Safety and Environment

GAC Global Atomic Corporation

CMAC: CMACThyssen Mining Group

IV. PRE-URGENCE

Under normal operating conditions, the Site Manager is responsible for all emergency preparedness required under this plan to be available and updated.

All senior managers are aware of this plan and the related emergency measures.

In order to prepare for an emergency and ensure that an effective response can be carried out as quickly as possible, a number of local planning tasks are necessary:

IV.1 Off-site

a) Contact SOMAIR to conclude a care agreement to evacuate potential victims to the hospital in Arlit

b) Contact SONICHAR for a mutual assistance agreement in case of an emergency (fire truck, first aiders...)

c) Ensure that the contact details of the above organisations are correct and displayed on the site's Emergency Contact Panel.

IV.2 On site

a) All senior managers on site should be aware of this plan and make it known.

(b) All senior managers must be fully aware when they are in an official position under this plan due to staff rotation or otherwise.

c) Senior managers should be aware of the roles that may be required of them under this plan and participate in training on this contingency plan.

(d) They should work in different positions during the tests once every six months to ensure a high degree of familiarity with the emergency response procedure.

e) Ensure that SOMAIR and SONICAHR understand their roles in this emergency plan

g) Try to organise the participation of other companies in training exercises.

h) Ensure that all emergency documents are printed and available (contacts, maps, files, reports, etc.) in the emergency room

i) Agree on the preferred location of the emergency cell room

k) All first aiders should know their role in an emergency situation: upon receiving the alarm, go to the scene of the emergency and make themselves available to the Emergency Response Team Leader.

IV.3 Major Emergency

In the event of a major and prolonged emergency, SOMIDA may, if necessary, expand the Emergency Command Post at the Niamey head office and even at the Group's headquarters.
This expanded Emergency Command Post will be composed of staff from SOMIDA and its parent company, GAC, based in Toronto, Canada, and will be located in both countries, with telephone communications. Its main role is to support the emergency response team in its technical, logistical and financial response and to consider strategies for the operation.
The expanded ECP will only be formed in extreme emergency situations where local conditions, where SOMIDA operates, have deteriorated to the point where emergency response capacity is compromised. Except for the most extreme situations, the most likely source of additional resources to respond to emergencies will be other major companies operating nearby.

V. ROLES AND RESPONSIBILITIES

V.1 The Head of ECP (Site Director)

In emergency situations, as people arrive, they must :

- Appoint the Emergency Response Team Leader (primarily the Safety Leader). His/her role is described in paragraph V.2
- Appoint a permanent secretary (as a priority, the HSE manager) responsible for the memory secretary function, who must keep a logbook to collect and save as much information as possible in order to manage the necessary elements and analyse the incident after the event (legal investigation, insurers, feedback)
- Appoint a Personnel Control Officer (preferably an HSE officer or the head of the HR department) who must ensure that the disaster area is marked and that sentries are present at the access points. He/she should regularly check on the number of missing persons based on information received from the hierarchy and the sentries
- Appoint a Communications and External Relations Officer who should Inform the ECP of external information requests and prepare internal or external communiqués
- Appoint a Logistics Manager who ensures the supply of the means necessary for the intervention (transport, telephone, fax, equipment, etc.)
- Appoint assistants for each manager as required.
- Notify SOMIDA/GAC and CMAC senior management.
- Ensure that all regulatory and governmental contacts are made, such as local and national authorities, police, environmental services, etc.

V.2 The Head of the Emergency Response Team EIU

- The Emergency Response Team Leader is the one who decides to activate the emergency situation when he/she receives an alert
- must liaise closely with his/her team the Emergency Response Team (all first aiders present on site).
- assesses the initial situation
- activates / reviews the required emergency response roles
- assesses the need for additional resources
- initiate the call for any additional personnel required
- interface with external response teams/emergency services - assist as required
- Informs the response team of the response strategy according to the nature of the disaster
- Initiates the purchase of additional equipment or supplies
- Ensures priority actions according to the nature of the disaster (electrical isolation, removal of explosives, restricting access of unauthorised persons until "all clear", control of chemical hazards, decontamination, ...)
- Ensures that the entrances to the disaster area are secured
- may decide to reduce the number of intervention staff and, in the event of a prolonged incident, to replace them in the execution of the tasks
- ensure that the Emergency Response Plan (ERP) is updated annually and after any incident or test. It will review and approve all changes to the emergency response system and facilities (including action on any post-incident or exercise report recommendations).
- Establishes a schedule of EIU exercises that identifies realistic scenarios and regularly tests the effectiveness of response mechanisms.
- ensures that any third party (non-SOMIDA) personnel who may be co-opted into a response are fully aware of the expectations placed on them and are prepared to move immediately into action in the event of an emergency.
- Promote the SOMIDA site's emergency response arrangements to all site staff.

VI. EMERGENCY RESPONSE STRUCTURE

VI.1 ACTIVATION

In the event of an accident, the nearest responsible person should inform the Emergency Response Team Leader (EIU) who will decide whether to initiate an emergency situation. To do so, he/she should take all relevant information (e.g. location, type and extent of the incident)

If the event is on the list, it should trigger the emergency immediately.

If this is not the case, the following questions should be asked:

- Is external support needed beyond the site's resources?

- Could the incident affect the Company's operations or seriously impact the operations of other companies? If the answer to any of the above questions is "YES", then the ECP should be formed.

VI.2 EMERGENCY PROCEDURES

VI.2.1 The Head of EIU

- Alert all the first aiders present on the site
- Alert the Site Manager and the HSE Manager
- Start the siren(s) (day/background/camp)
- Goes to the site to take charge of the treatment of the disaster: initial state, securing the site, treatment strategy, allocation of resources
- Regularly reports on the evolution of the situation to the ECP, taking into account the observations and instructions given to him/her
- Seeks additional resources if necessary

VI.2.2 First aiders

- All first aiders on site, regardless of their rotation, should go to the scene with the equipment provided
- Make themselves available to the intervention team leader

VI.2.3 The Head of ECP

- Goes to the emergency room as soon as the alert is received
- It makes the following appointments
- Receives reports and requests from the Response Team Leader and gives further instructions as required
- Provides the intervention team with all necessary internal and external resources
- Also receives reports from the various appointed officials
- Reports regularly to the General Management and may request, depending on the scale of the crisis, the expansion of the ECP

VI 2.4 ECP members

- These are all heads of departments/services.
- They should go immediately to the emergency cell room (Mine meeting room for the Industrial Zone and the Grand Office for the Dajy camp) to perform the role assigned to them by the head of the ECP
- HSE coordinators can join the cell to provide input

VII. HANDLING OF DIFFERENT TYPES OF EMERGENCIES

VII.1 SERIOUS INJURY CASE

VII.1.1 First witness at the scene

- Alert the immediate supervisor or the nearest manager
- Alert the First Aid Driver
- Provides first aid if qualified to do so
- Remain at the scene of the incident with the injured person(s) until help arrives if it is safe to do so

VII.1.2 The Direct Manager or the closest manager

Alert the Emergency Response Team Leader (ERT Leader)

VII.1.3 The Emergency Response Team Leader

- Raises the alarm by informing the first aiders, Site Manager, HSE, and activating the siren(s) (day/ground/camp) while reporting the location, type and extent of the incident.
- Goes to the scene to take charge of the treatment of the disaster:
  - Securing the location
  - If it is a minor injury and the patient can be moved, have him/her transferred to the infirmary
  - If not, he/she brings the nurse to the scene, and assists him/her (with the other first aiders) in the stabilisation treatment of the injured person(s)
  - Report the situation to the ECP
  - Help to investigate the incident and take immediate action

VII.1.4 The nurse

Upon receiving the alert, he/she should prepare to receive the injured person(s) or go to the victim(s).

For serious injuries, he must administer the necessary care to stabilise the victim(s) before evacuating them to Somair Hospital by accompanying them.

He takes care to notify the Somair Hospital of the arrival of the injured.

VII.1.5 The Head of the ECP

- After receiving the alert, he assembles the ECP and waits for the report of the Chief ERT
- It mobilises all the necessary means to ensure the evacuation of the injured person(s)
- If a victim is hospitalised, it is necessary to :
- set up a group to inform the family by telephone. This group will include the head of HR, his or her manager and one of his or her colleagues/friends.
- Transporting a family member to the bedside at Somair Hospital

VII.2 CASES OF DEATH

The following tasks are specific to a death and are in addition to all the actions listed above in Section VII.1

The Head of ECP shall:

- inform the authorities (Prefect, Labour Inspector, Mines Department) of the event
- Bring in the Gendarmerie to make the Constat
- Designate a manager (preferably an HSE or SRH) to act as a contact person with the family
- Arrange for the next of kin to be informed of the accident in person by a SOMIDA Representative, agree with the family on the location of the funeral and secure any immediate assistance the Company may be able to provide;
- Informing all staff
- Collect the employee's personal belongings from the site and return them home as soon as possible
- Organise a condolence visit to the family on behalf of all SOMIDA staff: letter of condolence from the CEO of Somida, ask the family to appoint a proxy who will be SOMIDA's contact person
- Half-mast the flags on the site
- Ensure that the scene of the accident is not disturbed until it is inspected by the mine inspector, the labour inspector, the Gendarmerie Brigade Commander
- Ensure that the accident investigation report is completed and forwarded to the authorities (Labour Inspector, Mining Department):
- Obtain signed statements from all personnel involved in collaboration with the company lawyer
- Accompanying the authorities to the scene

VIII. FINAL MEASURES

The Chief of the ECP, at the end of the emergency, must ensure that all responsible persons complete their tasks.

In particular, it must:

- debrief all staff present before release
- Ensure that the affected area is completely safe before allowing return of staff
- Arrange for the return and verification of equipment
- provide data on the costs incurred in the financing service
- Provide the log of events, actions, messages and decisions to the EIU**.**

The Communication Officer, for the duration of the emergency or until relieved of his/her duties, shall:

- Manage all communications on behalf of the ECP
- Serve as an information centre for the duration of the response.
- Keep the ECP leader informed of the status of the incident
- Contact the emergency services or other services if necessary.
- Keep an accurate record of;
  - Who was contacted
  - In which organisation
  - At what time
  - The nature of the discussion
- Record and file all information received from staff leaving the premises the incident
- Archive all event logs and provide all information for the post-emergency surveys.

The Personnel Control Officer

In the event of an emergency and for the duration of the emergency or until relieved, he/she shall:

- record as many activities as possible
- Ensure that response personnel have been cleared and are familiar with the conditions of the website
- Provide Material Safety Data Sheets (MSDS) for products likely to be encountered
- Ensure that appropriate personal protective equipment (PPE) is used to protect and prevent contamination of response personnel
- Gathering and reporting on all staff
- Ensure that any injured personnel are moved to a safe place
- Provide medical treatment if necessary.
- Organise the search for any missing staff members

IX. RELATED DOCUMENTS

- HSE SEC PR 02 Procedure for handling accidents at work

DASA SITE REDEVELOPMENT FRAMEWORK PLAN

GLOBAL ATOMIC AND PROJECTED COSTS OF THE WORKS

Reference : GA-PCRDS-COUTS TRAVAUX - RECOMMENDATIONS

Prepared by :	SKS SERVICES Niamey	
Verified by :		
Approved by :	GLOBAL ATOMIC FC	

GLOBAL ATOMIC/DASA **AUGUST 2022**

Master Plan for Site Redevelopment

TECHNICAL REPORT

Technical options and associated cost figures

I - Preamble: In Niger, article 58 of the framework law 98 - 56 of 29 December 1998, relating to environmental management and the Environmental Impact Assessment carried out on the site, oblige mining companies to deal with all the impacts linked to their activities at the end of the operations. These impacts listed in the Environmental and Social Impact Assessment must be monitored through an environmental monitoring network, which the company must put in place. The responses to these requirements are expressed in :

- Technical treatment options for each impact
- Cost of implementation.

The document containing all this information, called the Master Site Rehabilitation Plan, must accompany the operational plan. This Master Site Rehabilitation Plan should be updated regularly. This exercise allows the evolution of impacts and economic factors to be taken into account.

The sources of impacts from the operation or mine site are called "source terms".

The technical site redevelopment plan, the subject of this document, proposes treatment options for each of the source terms identified on the future DASA industrial site and the associated costs for their implementation.

These proposed technical solutions should meet the following objectives:

- ✓ Comply with the regulations in force and the recommendations of the ICMM and the IAEA, particularly for uranium mines
- ✓ Ensuring sustainable public safety and health
- ✓ Limit residual impacts to as low as reasonably achievable (ALARA principle)
- ✓ Share these redevelopment options with local stakeholders and submit them to the competent authorities for assessment and approval.
- ✓ Implement the possibility of restricting the use of certain surfaces in order to ensure the sustainability of the solutions put in place.

II - Plan of deliverables :

- ➢ Identification of the various source terms on the site and their impacts (the risks associated with the source terms)

- ✓ Proposal of an optimal treatment solution or solutions for each source term (technical options)
- ✓ Explanation of the basis for the costing elements
- ✓ Estimated implementation costs for each proposed treatment solution
- ✓ Any recommendations for further studies to improve the effectiveness of the options and optimise costs.
- ✓ Any relevant remarks regarding the incompatibility of certain processes that the company is planning to apply, in relation to the environmental requirements in force, and proposals for improving the design of certain works (taking into account the experience of certain industrial sites, for example the case of COMINAK)

III - The different source terms of the DASA website :

III - 1 The Mine :

- Underground Mining
- The day/ground connections (Downpipe and ventilation shafts)
- Backfill manufacturing and placement facilities
- Ventilation facilities at the mine
- Mining equipment
- Evaporation ponds (storage ponds for water from the mine) or mine drainage ponds

III - 2 The Treatment Plant

- The different workshops in the ore processing process
- Reagent preparation facilities
- The sulphuric acid workshop
- The effluent storage tank

III - 3 The Industrial Site

- Water and electricity production facilities and distribution networks
- Shops and storage areas for consumables and reagents
- Offices, maintenance workshops and staff accommodation
- Cloakrooms and lamp room
- Site security features
- The waste disposal centres
- The different strippings
- The raw water basin or industrial water basin

III - 4 - The Residue Pour

- Proposal of the treatment method
- Estimated costs for

III - 5 - Quarries for the extraction of materials (tracks, dams, etc.)

These are the future quarries for the materials that will be used for the redevelopment of the industrial site. Their number and size will depend on the quantities of materials that will be required for this phase.

Impacts related to the different terms and redevelopment options:

III - 1 the Mine :

III - 1a - Underground Mining :

The main risks associated with these structures are:

- Public safety: risks related to the subsidence of structures and repercussions on the surface
- Public health: risks linked to the marking of the different water tables by contact with the water contained in the mining works

Redevelopment option: de-equipping and natural flooding of the mine.

III - 1b - Day/ground connections: down conduits and ventilation shafts

The main risks

They are :

- Safety: intrusions for various reasons and accidental falls of humans and animals
- Radiological: emanation of radon, marking of slicks
- Environmental: depletion of groundwater by runoff if it is crossed by these structures, pollution of groundwater

Redevelopment Option :

- Downhill: construction of reinforced concrete walls separating the aquifers used for drinking water, crossed by this downhill
- Construction of an anti-intrusion device consisting of backfill and a reinforced concrete wall at the access point, then filling in the access pit to the shaft.
  The walls will have an optimal thickness obtained according to a calculation note which takes into account the characteristics of the ground and the physical constraints which will be exerted in the long term.

  The aquifers likely to be crossed by the descent are: the Izégouande, the Teloua, the Tarat and the Guezouman. Of these aquifers, only the Teloua and the Tarat are

drinking water aquifers in terms of quality. From a hydrogeological point of view, each aquifer has a zone of low natural impermeability at its roof and wall. This is a kind of natural protection of the water table. On the basis of this hydrogeological principle, it will be proposed to position plugs in correspondence with the natural screens (zones of low permeability from the hydrogeological point of view), at depths corresponding to these screens for the water tables in question.

A low wall and a high wall will be built for each of these two aquifers.

The main concern in this option is the preservation of the groundwater, as it is crossed by these structures. To address this aspect, the hydrogeological principle was put forward, which states that each water table has a zone of low natural impermeability at its roof and wall. This is a kind of natural protection of the water table. On the basis of this hydrogeological principle, it was recommended and validated that plugs should be placed in correspondence with the natural screens (areas of low permeability from the hydrogeological point of view), at depths corresponding to these screens for the water tables in question.
For DASA, it appears that the downspout crosses the TELOUA and TARAT aquifers, which are the most important aquifers in terms of exploitation.
A low wall and a high wall will be built for each of these two aquifers.

- Ventilation stack: complete plugging of the column with suitable materials, following a procedure.

III - 1c - Mining Equipment :

These are: mining machinery, electrical installations, crushing installations, dewatering and secondary ventilation installations, maintenance workshop equipment

The main risk is the pollution of water by hydrocarbons, certain chemical substances and heavy metals, contained in, or components of, this equipment

The chosen mode of redevelopment

- ✓ Equipment that is not allowed to be dumped on the seabed will be inventoried and hauled up: this includes equipment containing hydrocarbons, machine batteries, and other equipment containing heavy metals, pyralene, etc.
- ✓ Some equipment may be dismantled and recycled depending on the cost of dismantling or for societal use.

III - 1d - Backfill manufacturing and placement facilities

It is a complex that will be composed of the following elements

- A 'hopper' for drying tailings from ore processing
- A "hopper" for storing dewatered residues
- A series of residue screens
- A belt conveyor for transporting the residues to the mixer
- Cement storage silos
- Water sheets
- A mixer
- A concrete pump (backfill pump) to send the resulting backfill to the bottom of the mine
- Refuse storage areas and/or ponds

The main risks associated with these facilities are:

- Safe
- Radiological, due to the use of ore processing residues
- Environmental

Abandoning them could lead to degradation due to lack of maintenance and acts of vandalism causing the scattering of marked equipment in the public domain and accidents

The selected redevelopment options:

- Dismantling and transfer of marked equipment to the tailings pond
- Valuation or disposal of unmarked equipment in the societal context
- Demolition of concrete pads and transfer to the tailings pond
- Soil stripping and treatment according to the X-ray counter plan (reprofiling and/or covering the right-of-way)
- Filling of pits

III - 1 e - Primary ventilation systems

These are primary ventilation fans

The main risks associated with these facilities are:

- Safe
- Environmental.

Abandoning them could lead to degradation through lack of maintenance and vandalism causing accidents

The chosen redevelopment option: dismantling and recovery or disposal within the societal framework

III - 1f - Pumping installations and drainage network Mine

The main risks associated with these facilities are:

- Radiological
- Safe

This equipment, which was used to pump and dispose of water from the mine, will be potentially marked. It will not be recoverable except for a similar use.

Redevelopment option: dismantle only the surface facilities and transfer them to the tailings pond

III - 1g - Mine drainage basin :

This is the storage basin for water that has risen from the mine.

This basin will have a projected volume of 350 m X 350 m X 2.5 m = 306 250 m^3 . Its surface area of 350m x 350m, i.e. 12.25 hectares, combined with the hot desert climate, is a factor favourable to evaporation. It is also equipped with a mechanical evaporation aid system to prevent overflow. The inner walls will be protected by liners to ensure that it remains watertight for the duration of its operation. This impermeability will be monitored by means of piezometers drilled around the basin.

The risks associated with these pools are :

- Radiological (mine drainage water is water containing finely ground uranium ore that settles to the bottom of the ponds)
- Environmental
- Safety (getting stuck, drowning)

Treatment method: This pond can be treated in the following way

- Drainage of settled water (used for watering the runways during site redevelopment)
- Cleaning of the fine ore carried by the water and deposited at the bottom of the basin
  There are 2 options for disposal of this product:
  - Valuation through an agreement with an active company for its processing in a formal framework
  - Transfer to residue dumping in the absence of any interest in this product
- De-equipping of liners
- Raising the dikes halfway into the basin
- Backfilling with external cover material, reprofiling and covering with a 0.5 m layer of crushed stone.
- **The storage area for the fines from the dredging of the basin**: a potential source of various types of pollution (radioactivity, hydrocarbons from mining activities) will be stripped and reprofiled. The stripping product will be evacuated to the tailings pond.

III - 2 - Ore processing plant and its annexes :

III - 2a - the successive workshops of ore treatment processes :

The plant will consist of the following workshops

- Shredding and its feeding facilities
- The attack
- Filtration
- The solvent
- The finish
- Burning

This arrangement is imposed by the mechanical treatment of the ore, the dissolving of the uranium, its concentration and its conditioning.

And its annexes, the reagents and the contact (the sulphuric acid production workshop)

The main risks are:

- Radiological (radiological marking of equipment and soil)
- Chemical (soil contamination over a certain depth)
- Safety: unmaintained facilities, risk of accidents)
- Environmental

Redevelopment options :

- ➢ Emptying, rinsing and dismantling and transfer to the tailings storage facility in the absence of an express request for use in a similar field, together with legal and regulatory tripartite provisions (the company, the purchaser and the state) which will release the company from the conditions of its operation and post processing operations.
- ✓ Demolition of massifs and civil engineering structures and transfer to waste disposal
- ✓ Stripping of 50 cm of soil in areas where the depth of marking and contamination does not exceed 40 cm and reprofiling
- ✓ Covering with a layer of suitable material to mitigate the various radiological risks so that the regulatory added dose is not exceeded.

III - 2b - Reagent preparation workshop :

The risks associated with this workshop are

- Chemical

- Safe
- Environmental

Proposed redevelopment options:

- ✓ Emptying, rinsing, dismantling and transfer to the residue bin
- ✓ Demolition of the civil engineering structures and transfer to the waste dump
- ✓ Stripping of 50 cm of soil in areas where the depth of marking and contamination does not exceed 40 cm and reprofiling
- ✓ Reprofiling and covering with a layer of suitable material

III - 2c - Sulphuric acid production workshop: contact

The risks associated with this workshop are

- Chemical
- Safe
- Environmental

The proposed redevelopment options: in the absence of a particular interest by a buyer and which must be framed by clauses allowing the company to release all responsibility for the continuation of the business of this workshop, the proposed options are the following

- ✓ Emptying, flushing and dismantling for disposal or recovery
- ✓ Demolition of massifs and other civil engineering works and transfer to waste disposal
- ✓ Stripping of 50 cm of soil in areas where the depth of marking and contamination does not exceed 40 cm and reprofiling
- ✓ Reprofiling and covering with a layer of suitable material as required

III - 2e - effluent storage tank :

It is a tank intended for the storage of liquid effluents from the treatment plant. It will be built on a site which will ensure natural impermeability, but also the internal walls will be lined to ensure double impermeability. In accordance with the recommendations of the environmental impact assessment, the watertightness of the pond will be monitored by means of piezometers drilled and installed around it. The pond will be equipped with an evaporator system, but also its shallow depth and large surface area will ensure that it is heated to intensify evaporation.

Pool dimensions
Length = 200 m
Width = 100 m
Depth = 3 m

Number of pools = 1
Area occupied = 2 ha
Volume = 60,000 m3

The risks associated with this book and its contents are :

- Chemicals
- Radiological
- Environmental
- Safe
- Sanitary

The chosen redevelopment option :

It will consist of filling and covering the whole of the basin's right-of-way with a suitable material to a thickness that will allow sufficient containment of these residues and will be resistant to the weather in a permanent manner.

- **Filling phase**: Given the corrosiveness of this product, siliceous materials such as dune sand are recommended to absorb the residual juice, mixed with large blocks of unmarked material, which will ensure stability in the evolution of the filling front for the earthmoving machines.
- **Re-profiling and covering phase**: clay over a thickness of 1m (double impermeability) and crushed sand over 50cm (resistance to bad weather: rain and wind)

This perimeter may be a restricted access zone if necessary

III - 3 The Industrial Site

III - 3a - Water and electricity production facilities and distribution networks

These are :

- All electrical power generation equipment (generators, solar or wind power plants)
- The entire electrical energy transformation and distribution network (electrical transformers and distribution lines)
- Wells and pumping equipment
- The entire network of water pipes, storage, treatment and distribution.

This equipment will in principle be unmarked and may go into the public domain

The risks are:

- Environmental
- Safe.

The possible modes of redevelopment are :

- A societal treatment, with the transfer of these facilities to the state or locality. This option assumes sufficient capacity on the part of the beneficiary to maintain and operate the facilities wisely. Also, the proximity to restricted use areas can pose a lot of problems, which requires the implementation of provisions allowing the company to release all its responsibilities in case of abnormal events.
- Outright dismantling of all facilities and recovery (sale or transfer to third parties) and treatment of the areas. This option appears to be the safest.

III - 3b - Stores and storage areas for consumables and reagents:

The risks associated with these facilities are :

- Safe
- Environmental
- And Chemicals for some

The proposed redevelopment option :

At the end of the operations, spare parts, reagents and other residual consumables are recovered or sold to third parties. At the end of these processes, the shops and storage areas are dismantled, the areas are stripped and the stripping products are transferred to the waste dump and stored according to their environmental classification, as special waste (soil contaminated with hydrocarbons, specific chemicals), ordinary waste (civil engineering rubble and other inert materials). The treatment of special waste requires special packaging. It can be packaged in drums or containers and placed in covered cells within the waste dump. Other wastes are simply identified, accounted for, transported and placed in the tailings pond to be covered before reprofiling.

III - 3c - Offices, maintenance workshops, staff accommodation, cloakrooms and lamp room

The risks associated with these facilities are :

- Unsafe if left unattended, without maintenance
- Environmental,

Redevelopment option: The whole complex could be treated in the same way and operated within a formal framework set up as part of the site redevelopment dossier with the State of Niger. But this will depend on the sensitivity of the restricted use areas and any residual source terms. If this formal framework were to be established, it should contain clauses that would release the company from all responsibility for any negative post-sale impacts.

The safest way to deal with it will be to dismantle it in one of two ways:

- Dismantling by the company itself (subcontracting) and recovery of recoverable materials and transfer of the rubble to the waste dump
- Sale of these buildings to potential service providers who will dismantle them to recover

the recoverable materials and transfer the rubble to the waste dump. The company will be responsible for monitoring and controlling the effectiveness of the process. This option will reduce the cost of redevelopment to some extent.

III - 3d - Products and special waste :

These are products that are generally contained in certain equipment or by-products of the ore processing and which, according to the regulations, must be given special treatment according to their nature and impact. These are :

- Sealed sources,
- Pyralene contained in electrical transformers, or contaminated by a pyralene spill (e.g. pyralene contaminated soil)
- Asbestos or equipment containing asbestos,
- Soil contaminated by hydrocarbons
- Active residual solvent
- Etc...

The main risks associated with these products are

- Safe
- Sanitary
- Environmental
- Radiological for some

The proposed mode of treatment:

- Disposal through authorised channels: taken back by manufacturers or organisations that must in principle have approved disposal procedures.
- Disposal through transfer or sale to licensed users
- Burial in the tailings pond, prior to reprofiling: placing them in specially designed cells, using specific materials (waterproof, resistant to any chemical reactions that could damage the liner and lead to damaging environmental accidents. The cells are basins made of inert materials (clays), with lined walls. The waste is packaged either in special big bags, metal or plastic drums, or containers.)
- For waste or liquid products, they can be eliminated in the effluent ponds, if the discharge into this environment does not cause chemical chain reactions likely to cause uncontrollable health or environmental accidents.
  NB: the volume of the cells depends on the volume of waste and/or products to be treated. And the site of their burial must be identified for monitoring purposes.

III - 3 e - the various strippings of industrial areas:

These are the sites of accidental spills or surface infiltration of radioactive products (ore, processing residues, etc.), liquid or solid chemicals. Their importance depends on the number of sites where these products are stored and handled. The company will take steps to limit these impact zones to a controllable level and to put in place devices to manage any accidents (slabs, retention, fences and other containment barriers, etc.)

The risks associated with these areas are :

- Chemicals
- Sanitary (through contamination of water, air etc.)
- Radiological (soil marking, air pollution)
- Environmental (soil and groundwater pollution, etc.)

The proposed treatment method: the determination of the marking and contamination zones will be based on the radiological counter plan outside the site's tailings repository and on the completion of research works for chemical and hydrocarbon contamination.

Despite the implementation of devices to limit negative impacts, in the event of contamination, the proposed treatment method is to strip the soil and transfer it to the tailings pond. Within the tailings pond, the soil will be transferred to the special waste and ordinary waste areas, depending on the nature of the pollutant.

- If the depth of marking and/or contamination does not exceed 50 cm, the area will be stripped and reprofiled
- If the depth of marking and/or contamination exceeds 50 cm, carry out a covering study with a suitable material, so as to block any other infiltration that would advance the impact (e.g. rainwater).

At this stage it is extremely difficult to quantify the surface area to be stripped and the depths of contamination. This aspect will be taken into account by setting a lump sum which will be updated in real terms.

III - 3f - Site security devices :

These are the earthen security walls and trenches set up around and inside the industrial site to combat ill-intentioned intrusions. And the devices used to protect highly sensitive areas of activity within the site. These are usually made of used tyres from machinery, fencing, used drums and other packaging and large boulders.
The perimeter of the DASA site = 144.2 km2
They must be dismantled.
In this document the decommissioning cost allocated to these facilities will be a flat rate and will be done by site similarity.

III - 3g - the industrial water basin or raw water basin

It is a mini retention structure for industrial water without tailings, designed for industrial use (use in the ore processing process, in the fire-fighting network, cleaning operations in the maintenance workshops, watering of the tracks and underground mining operations). This pond has a volume of approximately 6000 m3.

The risks associated with this basin are safety and environmental

The proposed redevelopment method: simple filling with simple materials (sand and/or clay)

III - 3h - Hydrocarbon storage and distribution facilities :

These are mainly storage tanks, siphoning and regulating devices, concrete support, protection and retention infrastructures.

The main risk is environmental with the pollution of soil or water by hydrocarbons.

Proposed redevelopment option :

- When they are de-equipped, they can be valorised, especially as they can go into the public domain.
- Demolition of the retaining walls and support structures and transfer to the tailings pond
- Stripping off any dirt and transferring it to the waste bin.

III - 4 - Residue lodging

The following data were taken into account, for the choice of the site and the projection of its most important shape and dimensions:

- The company's production plan over the life of the project and 50% of the amount of tailings that will be generated.
- The recommendations of the environmental impact assessment
- The physical characteristics of the site, based on numerous studies, for a better choice of the location of the tailings pond.

These dimensions are :

- The floor area
- Its geometry on the ground
- And the maximum possible storage height

The system will consist of retention dams and the storage area will be fully covered. The water contained in the tailings will also be drained using a system built into the tailings and operated during the operations phase.

Externally it will be protected by a surface runoff drainage system

This tailings repository will initially consist mainly of solid tailings from ore processing, but the principle of minimising the number of radiological and chemical impact zones militates in favour

of transferring the following wastes to it.

These are :

- Mine waste rock brought up from the bottom
- Stripping products from the industrial area
- Waste from the life of the site in the operation phase
- Buried special waste
- Rubble from the demolition of buildings and other civil engineering structures of the facilities
- TFA from the dismantling of non-recovered surface installations and other solid waste

It will potentially be the main source term for the site, in terms of radiological and chemical impacts

The main risks associated with this source term are

- Radiological (external and internal exposures) due to the nature of the tailings, risk of intrusion, use of the tailings, risk of soil and groundwater marking
- Environmental (intrusion, waste or tailings exploitation, groundwater, soil and air pollution)
- Health and safety (various ailments) environmental (trespassing, waste or tailings exploitation, groundwater, soil and air pollution)
- Chemicals, groundwater marking, soil pollution.

Proposed redevelopment option :

In contrast to ordinary waste, radioactive waste has the reputation of requiring an often expensive treatment, allowing the protection of the post-operational environment in an efficient and most sustainable way.

This mass of radioactive waste, which contains a number of other special wastes, must be catalogued, collected, circumscribed and separated from the public domain by a physical barrier that meets a number of regulatory requirements, both from the point of view of safety, security and environmental protection.

This barrier must have the properties of protecting the remediated site and its surroundings; from any emanation, possible diffusion of radionuclides; from water infiltration that could reach the waste stockpile, pass through it and lead to groundwater contamination.

It must be constructed (the barrier) using materials whose properties must be able to withstand any physico-chemical reactions that may occur on contact with the waste. They must be impermeable to the possible movement of fluids in both directions. Finally, they must be able to withstand all weather conditions for as long as possible. Their availability on site and in sufficient quantity is a significant advantage. The processes for their operation and installation must be technically controllable and economically efficient.

- Therefore, the tailings pond, once constructed, will be re-profiled over its entire surface, for better stormwater drainage management
- The reprofiled slope will be covered with a 1m thick compacted clay material to ensure double impermeability
- The clay layer will be protected from the weather by a 0.5 m layer of crushed sand with a mesh size of 0 - 250 mm, compacted.

  By applying the erosion rate for desert areas of 40t/km2/year for bare ground (Inter-African Pedological Service) to the North Niger area and to this cover thus constituted (sheltered from human actions), it can remain for thousands of years.

- It is surrounded by a safety barrier 4 m wide and 3 m high
- This area will be a restricted area.

NB: If the DASA ore is processed off-site, 100% of the tailings from the ore processing will go to the tailings pond

But DASA has taken the option of using 50% of the tailings from its ore processing in the composition of the backfill.

III - 5 - Quarrying of materials

These are shallow quarries that will be opened for the purpose of extracting materials for the construction of the runways and dykes of the ponds and other structures, for the operations phase.

The same quarries will be used for the removal of materials during the redevelopment phase of the site. Despite its relatively shallow depth, it poses a risk to human and animal traffic.

- Coarse material quarries: depth: 4 m
- Clay pits: maximum depth 4 m

The associated risks are :

- Mud flats
- Fall

The proposed mode of treatment:

- Reprofiling (re-sloping) , which consists of felling the edges to soften the slope of the embankment (proposed slope: 45°) and then building the merlons at the accesses.

IV - the costs associated with the work :

GA/PC/RdS

ESTIMATED COSTS OF SITE REDEVELOPMENT

GLOBAL ATOMIC FC

MINE

Activities	Description		Total	Comments
Closure of day/background links	closing downstairs, plugging chimneys and filling up the downstairs pit		274,618,316	4 reinforced concrete walls in the downspout to isolate the slicks, plugging of the 2 chimneys on the whole column and filling and covering of the downspout pit, according to options validated with the stakeholders
Dismantling of primary fans	de-equipping of chimneys		6,000,000	dismantling and recovery of all primary fans
		Total MINE	280,618,316	

CAREERS

Activities	Description		Total	Comments
Coarse material quarry used for site redevelopment	Shoring and staking of accesses		9,467,152	felling and reprofiling of the edges of the future quarry to give it a slope of about 45° and closing off the accesses with bunds
Clay quarry	Shoring and staking of accesses		5,000,000	softening of bull's eye edges and merlonnage of accesses
		Total CARRIERS	14,467,152	

BASINS

Activities	Description		Total	Comments
dewatering basins	Drainage basin Dyke lowering and capping and reprofiling		657,865,833	lowering of the dikes to half height towards t h e interior of the basins in the bull, then covering the basin itself
industrial water basins	Industrial water basin filling (raw water basin)		4,800,000	simple filling of the pelvis
factory effluent basin	filling, reprofiling and covering		201,940,267	filling with suitable materials (sand and large sandstone blocks), covering with clay, reprofiling and covering with crushed sandstone
		Total BASINS	864,606,100	

DISMANTLING OF INDUSTRIAL SITE

Activities	Description		Total	Comments
storage areas for chemicals and other reagents	Stripping of marked and/or polluted areas of the site		147,000,000	stripping of radiolabelled surfaces, storage areas for reagents, hydrocarbons and various other polluting consumables
Industrial facilities excluding mines and factories	Dismantling of industrial facilities outside factories and mines		295,000,000	de-equipping
Processing plant and other surface facilities	Dismantling of surface industrial facilities (factory and annexes, hydrocarbons, landfill and power plant)		2,500,000,000	dismantling, demolition and stripping of the areas of the processing plant facilities, its annexes and other industrial surface facilities and transfer of the waste to the tailings pond
		Total industrial site	2,942,000,000	

RESIDUE DUMP

Activities	Description		Total	Comments
storage of radioactive waste	reprofiling, covering and staggering		1,045,139,530	collection of all radioactive residues, reprofiling, capping and co-laying of the final tailings pile with a layer of clay and sandstone
			39,857,600	creation of a safety barrier around the covered slope
		Total VERSE TO RESIDUE	1,084,997,130	
Costs related to the operation of SOMIDA's internal structures during the works (lump sum)			1,000,000,000	
		TOTAL	5,906,070,382	
		UNCERTAINTIES	590,607,038	10% of TOTAL
maintenance of the monitoring system for workers, populations and the environment, maintenance of structures		MONITORING	500,000,000	five (5) years of monitoring
		TOTAL technical work	6,996,677,420	technical component
		Amount in Euros	10,665,667 €	

Recommendations:

1 - **Underground Mining Works**: In relation to the option of redeveloping the underground mining works
List of studies to be compiled if already carried out or to be carried out during the operations or before the implementation of this option

- Flooding study of underground mine workings based on :

- Studies of the characteristics of the different geological formations above and below the deposit,
- The geotechnical studies used to select the mining method and the various support methods,
- Geotechnical data collected during the operation.

- Mine flooding modelling studies
- Studies of the impact of flooding on the quality of groundwater and the contact and exchange of water contained in the underground structures and the different water tables

Comment on the company's decision to use mill tailings as a component of the cemented backfill at the Mine:

- The highly chemical nature of this product may be a reason to question the only reasonable option for dealing with underground mine workings and may be a dark spot in the process.

- **Day/ground connections: Downspouts and ventilation stacks**: as the subject of water and aquifers is very sensitive, it is preferable that the routes of these structures be drawn up, highlighting the areas where the different aquifers in the region are crossed. It will be the main document for arguing the treatment options for these structures.

2 - **Tailings disposal site**: relative to its final configuration created by the site redevelopment works
The tailings disposal site: the company must carry out additional geological studies, with a view to integrating other radioactive and non-radioactive waste into the tailings disposal site and monitoring its evolution and potential impact on the water table.

3 - **Covering materials**:

The choice of covering materials

Investigate the site and its surroundings with a view to locating and characterising as exhaustively as possible the materials likely to meet the company's needs in terms of the construction of structures (dams, runways, etc.) and the various treatments during the site redevelopment phase.

4 - **Implementation of source terms** :

In general, the location of source terms that are very sensitive from the point of view of environmental risks (treatment plant, liquid tailings ponds, tailings pits, chemical and other hydrocarbon storage areas) must be subject to studies whose results will allow the company to make the best choice and prevent certain environmental accidents that could have a lasting impact on all treatment actions.

5 - Hot water settling tanks

The DASA process includes a hot water treatment plant. In order to avoid production stoppage in case of unavailability of the hot water treatment system, it would be necessary to provide a storage tank for the cleaning water from the filtration process.