

History and consequences of uranium mining in Niger from 1969 to 2017

by Almoustapha Alhacen, Arlit, Niger

Geographical context

The region of Agadez is one of the eight regions of Niger, which are Niamey, Tillabery, Dosso, Tahoua, Maradi, Zinder, Diffa and Agadez. Agadez is in the heart of the Aïr massif on the southern edge of the Sahara, at an equal distance from the Mediterranean and the Gulf of Benin.

Arlit, the center of mining activities in Niger, a town with a few thousand inhabitants lies about 240 km North of Agadez. In the 1970ies, Arlit depended on Iferouane, a town with 18'000 inhabitants at about 100 km northeast of Arlit. It was a pastoral region on the edge of the desert, where wild animals such as ostriches and gazelles lived and camels and other domestic animals grazed in a pasture environment rich in firewood. In those years, no artificial mountains were visible within a radius of 50 km; the mountains of the Aïr massif, Bagzan (2200m altitude) and Tamgak (1800m altitude) are further away.

Historical context

In the late 1950ties, prospecting activities for uranium and other minerals were initiated in Niger and, of course, in other African countries (1). About ten years later, large uranium deposits were discovered in the area of Arlit. Because of earlier ties with France, much of the activities associated with uranium mining in Niger were - and still are - controlled by the French company AREVA. Currently, Niger produces about 8% of the world's uranium (1). Since Niger is one of the poorest countries in the world, uranium mining is a major contributor to its economy and is therefore supported by the government.

In the following, the events are described chronologically.

- On February 2, 1969, Diori Hamani, the first president of the Republic of Niger, which had been independent since 1960, traveled to Arlit to lay the foundation stone for the first uranium mine in Niger named SOMAIR (for "Société des Mines de l'Aïr"). This mine is operated to 63% by the French Atomic Energy Commission and the "Compagnie Générale des Matières Nucléaires" (COGEMA), founded in 1976. In September 2001, AREVA was formed as a merger between COGEMA and FRAMATOME, the builder of French nuclear power stations.
- Two years later, on February 2, 1971, Diori Hamani returned to Arlit to inaugurate the SOMAIR mine.
- Also in 1971, the first ton of Nigerian uranium was shipped to France to fuel its nuclear power plants.
- In this year, the chief of the department of Arlit, Elhadji Ibrahim, was 30 years old and was about to replace his father, who died a few years later. Elhadji Ibrahim remembers that they were promised the uranium prosperity from and the birth of a second "Paris". However, this promise was never fulfilled.
SOMAIR currently produces 2800 tons of uranium per year.
- On July 24, 1975, a second mine named COMINAK opened at about 12 km from SOMAIR; it was still dominated by the French giant AREVA (34%).
At this time, COMINAK produces 1500 tons of uranium every year.
- As well in 1975, the SONICAR mine in the Agadez region opened, where coal is mined to heat the thermal power plant for AREVA's uranium mining sites.
- During the period from 2000 to 2007, the State of Niger issued more than 200 mining permits, particularly for uranium, half of which were in the department of Arlit.
- In 2007, another mine opened in Ingall, 160 km West of Agadez. This mine is called SOMINA for "Société des Mines d'Azelik" and is mainly owned by a Chinese company.
It produces 700 tons of uranium per year.
- On May 4, 2009, the first stone of the IMOURAREN industrial complex was laid and operations began for the largest open pit mine in Africa, which is the second largest in the world after the McArthur River mine in Canada. IMOURAREN SA is mainly owned by AREVA and is located 80 km southwest of Arlit in the village of Dannat.
IMOURAREN's annual production forecast amounts to 5000 tons of uranium. Note that the McArthur River mine produced 7500 tons of uranium in 2012.

Political and social context

In Niger, the political and social context has had an important impact on the mining development. During the civilian government of Diori Hamani (1960-1974), Nigerians considered the exploitation of uranium as a "white" business, whereas during the military rule of Seyni Kountché and Ali Seybou (1974-1991), it was almost forbidden to ask questions, and any challenge was considered a national crime, punishable by a death sentence. The national conference of July 1991 ignored the mining sector because the Nigerian people were too afraid to speak out.

A second, politically unstable, period followed with a multiparty system, however, the democratic election of Mahamane Ousmane in 1993 was a real learning experience for freedom. But the years of freedom were already over in 1996: General Ibrahim Baré Mainassara and Major Daouda Malam Wanké executed a coup d'état - said to be the fruit of chronic political instability.

A third period began with the democratic election of Tanja Mamadou (2000-2010). During these years, the Nigerians began to question uranium mining and its consequences. It is in this context that the civil society organizations, that are active in the area of mining, were born.

The agreements between the government of Niger and the AREVA group

Throughout 2014, negotiations had taken place between the two partners, namely the government of Niger and the AREVA group, representing the French State. The result of these negotiations was the signing of the Mining Convention of 16 July 2015. Unfortunately, this Convention is largely based on the one of 17 January 1969, which extends until 2043. The 2015 Convention does not take into account the legal and fiscal developments of Niger and of ECOWAS and UEMOA, and even stipulates that in the event of dispute between the two parties, the provisions of the 1969 Convention will apply. Thus, the sovereignty of the State was severely hurt by the convention of 2015. The State of Niger found itself in a position of weakness because of the consequences of the Libyan crisis, the fall of Gaddafi, the crises in Mali and Nigeria linked to the actions of the terrorist sect of Boko Haram.

The actions of civil society organizations in Niamey had no influence on the ability of AREVA and France to carve out the lion's share in the negotiations with the government, as has been the case since 1969.

Methods of mining and processing

Open pit mines: uranium mining is carried out in open pits at 40 to 130 meters below the surface; this is the case of the SOMAIR and Imouraren mines. It consists of a prospecting phase and a mining phase. Processing of the ore is done either by crushing uranium-rich ore, or – in the case of uranium-poor ore – by grinding it; then follow various procedures such as the treatment with sulfuric and nitric acids, the solid-liquid separation on band filters, the extraction of uranium by solvents, the re-extraction with sodium carbonate, and finally the precipitation and production of yellowcake that contains more than 70% uranium. This method leads to a complete deformation of the landscape, and the mining waste is heaped up to radioactive "tailings" in the size of mountains.

Underground mines: here, mining takes place at about 250 m below ground. The access to the mine is provided via a path with a slope of 20% over a distance of 1300 meters. Conveyor belts lift up the extracted ore to the factory located just above the mine. Processing of the ore consists of mechanical grinding and dissolution by sulfuric and nitric acids, purification and concentration in basic solvents, precipitation by neutralization with magnesium hydroxide and drying. The final product is called magnesium uranate and contains more than 70% uranium. This method has the advantage of not deforming the landscape by mountains of mining waste.

In both cases, the product is packaged into 200 liter containers and shipped to the various customers such as AREVA, SOPAMIN, OURD and ENUSA.

Both mining methods produce various types of waste after processing the ore in factories or by leaching. Liquid waste is discharged into special tanks, whereas solid waste, such as rocks and sand, but also sludge, is disposed off as tailings. Apart from the radioactive uranium which is extracted to be further processed, about 85% of the uranium-associated radioactivity remain in the waste as well as in the decay products. This includes, for example, very long half-life products such as thorium-230 and radium-226. In addition, the chemicals used in the leaching process as well as

other pollutants, such as arsenic and heavy metals - copper, manganese, etc. - are all also left in the tailings.

Waste products from uranium mining

This waste consists of:

- a. Rocks that result from the lands above the uranium containing layers. In the case of the open pit mine of SOMAIR, this waste forms enormous mountains. From a distance of 30 km you can see how they have drastically changed the landscape.
- b. Radioactive residues of the ore; these are deposited on 50 ha of land and today reach a height of 30 m near the factories. The quantity of these residues is estimated at 40 million tons, of which 14 million tons for COMINAK, 16 million tons for SOMAIR and 11 million tons of leach residues from SOMAIR. As mentioned, these tailings contain 85% of the original radioactivity and are stored in the open air. There are several risks associated with these, namely radioactive contamination of the ground water, propagation of radon radioactivity via the air and dispersal into the environment by wind or rain. AREVA and its subsidiaries in Niger report every year that there is no risk - without providing irrefutable proof.
- c. Other solid waste: paper and cardboard, plastic, rags, scrap, glass, tubes, vegetable waste, waste oils, batteries and wood. The mining companies maintained that they had produced a total of 400 tons of waste, whereas the reality was quite different because already the contaminated scrap that we discovered during August 2012 measured about 1600 tons of which 1000 t came from the COMINAK and 600 t from the SOMAIR mine.
- d. Liquid waste: these are the effluents from milling procedures and the wastewater from the maintenance activities. These liquids usually contain low levels of uranium and other metals. They are collected and the water is evaporating in large basins that are tight - according to the mining operators. These basins are bordered by 4 to 7 m high dikes constructed of mineral waste rock with a central clay core. The external sealing is ensured by welded polyethylene sheeting.
- e. Atmospheric releases consist primarily of radon, a radioactive gas. In addition, there is dust, vehicle exhaust and volatile vapors, such as carbon dioxide, nitrogen dioxide, sulfur dioxide and other volatile compounds.
Radon originates from the the decay of uranium. Nitrogen dioxide is produced by leaching uranium ore in the mill. Sulfur dioxide is produced during the combustion of coal or mineral oil.
- f. Chemicals used in the processing of uranium ore include sodium carbonate, sulfur compounds, magnesium oxide, various nitrates and pyralene. These products are sometimes stored in houses in the town of Arlit or other towns in Niger, e.g. in Tahoua and Zinder. They are also dumped in the streets of cities, on roads and on the outskirts of industrial installations. Animals in search of pasture around the factories are the major victims of this negative environmental impact. It is described in the minutes of a meeting: "The impact of this half a century of exploitation."

In conclusion, it is obvious that the exploitation of uranium in Niger during the last fifty years, mostly by AREVA, has had serious effects on the environment and on human health.

Environmental Impacts

- Exhaustion of fossil aquifers
- Vanishing of the vegetation cover
- Disruption of wildlife
- Deformation of the landscape due to the tailings formed by the extracted material
- Deposition of radioactive scrap and other radioactive material in the town of Arlit and in the rest of the country.

Human Health Impacts

- Onset of diseases in workers and some of the population, often only after 20 years of exposure to mining material
- Tumorous malformations and gynecological problems

- Severe diseases or suspicious deaths of several workers, including of those who worked in high-risk places exposed to ionizing radiation.

Evolution of the situation

During the early years, from 1969 to 1999, uranium mining in Niger was carried out by AREVA in a “very wild” (i.e. uncontrolled) manner. The workers were not aware of the risks of ionizing radiation, and the surrounding population was not informed. This changed with the mobilization of environmental protection organizations, in particular after the publication of reports after the visits to Niger by CRIIRAD, SHERPA and Greenpeace in 2003, 2005 and 2009, invited by the Nigerian NGO Aghirin'man.

In the meantime, the following measures have been taken:

- Implementation of timely awareness raising programs
 - Implementation of radioactivity control measures
 - Installation of a radioactivity surveillance system in Arlit
 - Establishment of a health test site in the region of Agadez
 - Establishment of a sustainable development fund for municipalities impacted by mining
 - Suspension of work in the Imouraren mine
- Yet in Arlit, another uranium mine was opened by a Canadian company.

Reclaiming sites

The reclaiming of the sites implies that it is necessary to backfill the countless pits that have been dug since 1969, about 100 million tons of radioactive waste must be eliminated and the environment restored, especially the wildlife and the flora.

No concrete measures have been taken so far to ensure reclaiming of the abandoned mines and used sites. However, according to some sources, since 2014 AREVA's subsidiary mining companies set aside funds of a percentage of their uranium sales for site restoration - corresponding to 100 tons per year only.

Reference

1. Winde F, Brugge D, Nidecker A, Ruegg U: Uranium from Africa - An overview on past and current mining activities: Re-appraising associated risks and chances in a global context. J. African Earth Sciences 128: 759-778 (2017).



BP: 149 ARLIT - NIGER

Tel: +227 96 87 24 98

E-Mail: aghirin_man@yahoo.fr

WEB: <http://uranium-niger.jimdo.com>

Agrément Nr. 11/MI/D/DGAPJ/DLP du 10/01/03