



DIRECTORATE-GENERAL FOR EXTERNAL POLICIES
POLICY DEPARTMENT



**POTENTIAL USE OF
RADIOACTIVELY
CONTAMINATED
MATERIALS IN THE
CONSTRUCTION OF
HOUSES FROM OPEN PIT
URANIUM MINES IN
GABON AND NIGER**

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DIRECTORATE-GENERAL FOR EXTERNAL POLICIES OF THE UNION

DIRECTORATE B

POLICY DEPARTMENT

STUDY

**POTENTIAL USE OF
RADIOACTIVELY CONTAMINATED MINING MATERIALS
IN THE CONSTRUCTION OF RESIDENTIAL HOMES
FROM OPEN PIT URANIUM MINES
IN GABON AND NIGER**

Abstract

Reports on the negative health and environmental effects of open pit uranium mining activities by European companies in Gabon and Niger have prompted a media and public critical reaction. This study looks at mining practices in two pits in these countries. Available secondary sources are thoroughly reviewed and complemented with a field visit to Gabon despite the technical and practical difficulty of reaching the areas where the activity takes place. The assessment indicates that substantial problems and negligence exist in both countries with respect to the operation of the uranium mines, the safety of mines and local citizens. It also criticises a lack of transparency regarding company's data on radioactive pollution and, in one case, claims that radioactive materials have been used for construction and that water sources and soil around the mining villages have been affected.

This study was requested by the European Parliament's Committee on Committee on Development.

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EXECUTIVE SUMMARY

Uranium is a weakly radioactive metal that is primarily mined for use in nuclear power generation.¹ Uranium mining has a relatively long history in Gabon and Niger starting in the 1960s, and it continues to be mined there mainly by foreign companies and their domestic subsidiaries.

The European Parliament commissioned the present study, entitled “Construction de logements d’habitation de résidus d’exploitation de l’uranium à ciel ouvert au Gabon et au Niger,” on practices in open pit uranium mining activities in Gabon and Niger with respect to the potential use of radioactively contaminated mining materials in the construction of residential homes.

The results presented in this study are based on available information regarding past and prevailing practices in Gabon and Niger, including statistics from the International Atomic Energy Agency (IAEA), studies undertaken and reported by independent non-governmental organisations, including Greenpeace and the French independent laboratory CRIIRAD², as well as industry groups and associations such as the International Council on Mining and Minerals (ICMM), and media reports. In addition, a field mission to Gabon, visiting the capital Libreville and the mining town Mounana, was carried out. The results of the mission include interviews with officials from the Gabonese Red Cross, local doctors, villagers, and others as well as photographic material.

In summary, the collective amount of information gathered and analysed indicate that substantial problems and negligence exist in both countries with respect to the operation of the uranium mines, the safety of miners and local citizens. There is also a general and persistent lack of (accessible) monitoring data on past and current levels of radioactivity in and near the mining sites, data on health and environmental effects associated with ionising radiation, and the safe management and disposal of mining material. Two uranium mines near the villages of Arlit and Akokan in Niger were the subject of a recent study undertaken by Greenpeace (2010).³ The present study relies on information from this report and other publicly available sources because in the end the contractor decided not to visit Niger due to the current volatile security situation following the military coup d’état in February of 2010.

In addition, the study identified the following problems and cases of negligence with respect to (1) the health of the local population, (2) the practices concerning the environmental and labour conditions in which the mining companies operate in Gabon and Niger, and (3) respective national and applicable international legislation pertaining to uranium mining.

Gabon:

- Uranium mining in Mounana was conducted by French state-owned energy conglomerate AREVA but ended in 1999.
- Interviewees did not identify any health-related problems that were directly attributable to ionising radiation from the mine, although several people exhibited respiratory illnesses. There is also anecdotal evidence of health problems of miners and local citizens.
- Contaminated construction material has never *officially* been utilised in Mounana for residential buildings.

¹ The isotope U-238 is by far the most commonly found in nature, making up more than 99% of uranium deposits.

² Commission de Recherche et d'Information Indépendantes sur la Radioactivité (CRIIRAD) is a French independent non-profit organisation whose mission is to defend the right for information about and protection from ionising radiation.

³ Greenpeace 2010. “Left in the Dust. AREVA’s Radioactive Legacy in the Desert Towns of Niger”. Greenpeace International. Amsterdam: Netherlands.

- The distance from the village to the mineshafts, processing factory and waste dumps is only 500-600 meters, and the village was essentially surrounded by mining facilities with corresponding risks of exposure for the population.
- Mining waste had been dumped into the lake and thereby posed and perhaps continues to pose a health risk due to radioactive contamination.
- New explorations by AREVA are underway, including on-site drilling with little or no change in safety measures.
- Radioactivity is measured daily by AREVA, but the data are not public.
- Gabon is a signatory candidate for the Extractives Industry Transparency Initiative for good financial governance of mining royalties. Gabon is not a ratifying party of the UN Convention 176 Safety and Health in Mines Convention from 1995.

Niger:

- AREVA also operates in Niger, through its subsidiaries in Arlit and Akokan. The open pit mine at Arlit and the deep shaft mine at Akakon, their waste dumps and related processing facilities are posing a severe environmental and health hazard to the local population of approximately 80,000.
- Contaminated construction materials have been sold on local markets and were found in dwellings and in the towns.
- There is evidence of radioactive contamination of local water supplies, and contaminated dust is accumulating throughout the two villages. Similar to Gabon, the distance between human habitations and the mines is too small, especially considering the hyper-arid environment and amount of dust in the air.
- Workers' protection and compensation for occupational illnesses is non-existent.
- A third uranium mine is expected to commence operation in 2013, but it is unknown what, if any, improvements in the working environment and safety of the surrounding environment and population will be made.

Niger is a signatory candidate for the EITI for good financial governance of mining royalties. Niger is not a ratifying party of the UN Convention 176 Safety and Health in Mines Convention (1995).

It is emphasised that the above findings should be used with some level of caution because of the severe lack of empirically measured data and the use of data from secondary sources for Niger. In addition, some of the interviews conducted in Gabon involved persons who had no scientific knowledge of the properties of ionising radiation and its adverse health and environmental effects.

1 INTRODUCTION

This study is specifically concerned with the utilization and associated risks of using radioactively polluted construction materials that originate from uranium mines in Gabon and Niger. As specified in the study framework, a desk study and a fact-finding field mission to Gabon have collected information on the use of uranium-contaminated materials in the construction of residential homes in Gabon and Niger and general safety practices surrounding uranium mining which is presented in three parts:

Part 1: Identify reported health problems among the affected population. To accomplish this, the study analysed existing information and complemented it with interviews of experts, civil society organisations, medical staff, and government officials from the field trip to Gabon and other sources, e.g., EITI, Greenpeace, CRIIRAD, and others. Annex 1 lists the names and contact details of the persons consulted.

Part 2: Present the findings from the field mission to Gabon and further analyse the practices concerning the exploration of uranium in Gabon and Niger with a particular focus on the health of the people living near the mines and, as much as is possible, the environmental and labour conditions in which the mining companies operate. Special attention is given to the process of disposal, elimination, and/or storage of radioactively contaminated materials and the alleged cases of radioactively contaminated material being used for construction.

Part 3: Review the respective national and applicable international legislation and regulations relating to uranium mining in order to demonstrate the need for further actions.

The study concludes with a summary of the findings, their limitations, and a description of the remaining data and information gaps that would be needed to conduct an exhaustive analysis of the issue.

2 GLOBAL URANIUM PRODUCTION

Uranium is found and mined in several countries around the world. In Africa, the Republic of Niger has large reserves and, according to the World Nuclear Association (WNA), was the sixth largest producer in 2009 (cf. Table 1). Gabon's production of Uranium ceased in June of 1999 and is therefore not listed below, although there are talks between the government and mining companies, notably French energy conglomerate AREVA, to resume exploration.

Although uranium exports accounted for 62% of the value of Niger's exports and contributed 4.3% of government revenue in 2003, uranium-mining is a declining sector. Gabon's uranium reserves are much smaller, but it too was a producer since the early 1960s.

Table 1: The ten leading countries in uranium production in the period 2003-2009 (metric tons).

Rank	Country	2003	2004	2005	2006	2007	2008	2009
1	Kazakhstan	3300	3719	4357	5279	6637	8521	14020
2	Canada	10457	11597	11628	9862	9476	9000	10173
3	Australia	7572	8982	9516	7593	8611	8430	7982
4	Namibia	2036	3038	3147	3067	2879	4366	4626
5	Russia	3150	3200	3431	3262	3413	3521	3564
6	<i>Niger</i>	<i>3143</i>	<i>3282</i>	<i>3093</i>	<i>3434</i>	<i>3153</i>	<i>3032</i>	<i>3243</i>
7	Uzbekistan	1598	2016	2300	2260	2320	2338	2429
8	USA	779	878	1039	1672	1654	1430	1453
9	Ukraine*	800	800	800	800	846	800	840
10	China*	750	750	750	750	712	769	750
	Total World	35574	40178	41719	39444	41282	43853	50772

Note: Countries are ranked according to total production in 2009. Note: figures for countries marked with * are estimates.

Uranium mining is a profitable enterprise. Just ten companies worldwide control 89% of total uranium mining (cf. Table 2) and are led by the French conglomerate AREVA, one of the largest mining and energy companies, which holds a share of 17%. Canadian CAMECO, UK and Australian multi-national Rio Tinto and the Kazakh state-owned KazAtomProm follow closely. AREVA is almost completely state-owned with headquarters in Paris and operates through its subsidiaries in both Niger and Gabon. The authors, therefore, sometimes make direct references to AREVA as parent company even if the actual mining operator is working under a different name. The magnitude of AREVA's business is indicated by its total revenue for 2009 of €14 billion.⁴

Table 2: Leading companies in uranium production in 2009.

Company	Country of headquarter	Uranium production in 2009 (metric tons)	Percent of world production (%)
AREVA	France	8623	17
CAMECO	Canada	8000	16
RIO TINTO	UK, Australia	7963	16
KazAtomProm	Kazakhstan	7467	15
ARMZ	Russia	4624	9
BHP BILLITON	UK, Australia	2955	6
NAVOI	Uzbekistan	2429	5
URANIUM ONE	Canada	1368	3
PALADIN ENERGY	Australia	1210	2
GA/HEATHGATE	USA	583	1
Other	--	5550	11
Total		50772	100

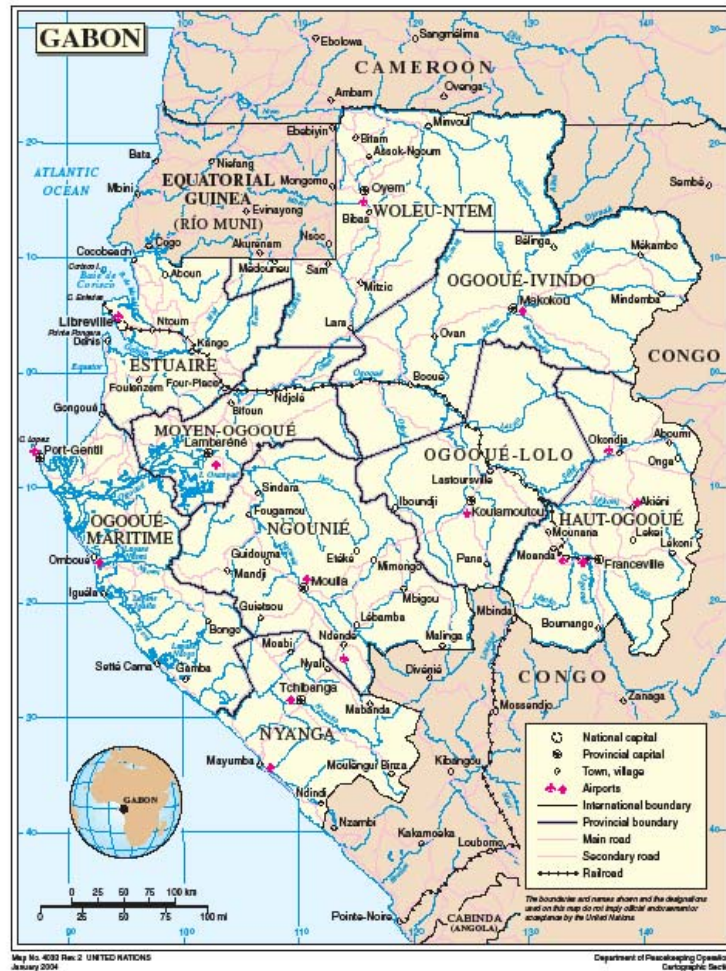
Exploration, mining, and processing of radioactive materials entails significant risks for the health of workers, people in the vicinity of the operations or within the range of dry and wet deposition of radioactive dust, people consuming radioactively contaminated water or coming in contact with contaminated materials. It can also have significant, negative consequences for the health of the environment. For these reasons, this report examines the current situation with respect to the use of radioactively contaminated materials in residential structures. Sections 3 and 4 summarise the findings for Gabon and Niger. International labor and safety practices are presented in Section 5, and the final conclusions and recommendations are summed up in Section 6.

⁴ Cf. AREVA's business reports available at <http://www.aveva.com/EN/operations-635/the-mining-business-group-exploration-extraction-and-processing-of-uranium.html> (21 October 2010).

3 GABON

Situated on the west coast of Africa and straddling the equator (cf., Map 1), Gabon occupies an area of 267667 square kilometres². It borders the Atlantic Ocean to the West, Equatorial Guinea and Cameroon to the North and the Republic of the Congo to the East and South.

Map 1: Political Map of Gabon.



Source: United Nations.

The country is rich in natural resources, which coupled with international aid make it one of the more prosperous African states. The World Bank estimates that per capita income in 2009 was \$12460, but income inequality is high.⁵

Gabon's main mining locations are at Mounana, Oklo, and Boyindzi, which produced a total of more than 6 million tons of minerals, of which 27800 tons were uranium⁶. Nonetheless, its uranium deposits are relatively small compared to countries such as Kazakhstan, Canada, and Australia.⁷ Gabon's uranium production has slumped by 60% to only 294 metric tons of uranium by June 1999, ceasing completely thereafter.

The country became an EITI Candidate on 27 September 2007 to adopt the standards of good financial governance which EITI had established. The validation report by the Ministry of Mining outlines how the Gabonese institutions will implement the EITI system. The report was submitted in June 2010 to the EITI board and is currently being reviewed⁸. Furthermore, according to EITI, the mining companies operating in Gabon include AREVA, Vale, Codelco (Chile), Comilog, Sinosteel, and SouthernEra Diamonds.

AREVA conducted uranium mining activities in Mounana, a small village situated 60 kilometres northwest of Franceville and roughly 600 kilometres southeast of the capital Libreville, between 1960 and 1999. In April 2010, AREVA revived discussions with the Gabonese government to continue explorations and possible extractions contingent on proven reserves of at least 30000 metric tons of Uranium. Exhibit 1, taken on August 18, 2010, shows new exploration at a site in Mounana. The interviewed security guard stated that the drilling is expected to reach a depth of 100m. The drilling cores will then be shipped to Europe for further laboratory analysis, according to the guard.

According to the World Information Service on Energy (WISE), a small Dutch anti-nuclear energy grassroots organization based in Amsterdam, AREVA asked the French firm Géotech to begin exploring Uranium deposits in Gabon, which started with prospecting flights on March 9, 2009 near Franceville, Moanda and Mounana.⁹ Expected deposits are estimated to be approximately 26000 tons of usable Uranium, which is below the amount needed to make extraction economically viable.¹⁰

Nonetheless, Gabon is considering entering into negotiations with India to supply the latter with uranium. India's engagement with Gabon is in return for civil and military matters. Essentially, India's interest is driven by its need to expand uranium transaction activities with non-Nuclear Supplier Group (NSG) countries. Traditional Suppliers, such as Australia, Canada, and Kazakhstan do not engage in uranium deliveries with non- Nuclear Proliferation Treaty (NPT) signatories, of which India is one.¹¹

⁵ World Bank World Development Indicators, online at <http://data.worldbank.org/data-catalog>.

⁶ <http://www.mbendi.com/indy/ming/urnm/af/ga/p0005.htm>; accessed September 10, 2010

⁷ According to the Extractive Industries Transparency Initiative (EITI), EITI is an NGO based in Berlin, Germany, that advocates financial transparency and good governance for extractive industries that operate in developing countries.

⁸ Personal communication with Tim Bittiger, EITI regional director.

⁹ <http://www.wise-Uranium.org/upafr.html#GA> (last accessed 6 August 2010).

¹⁰ According to AREVA executive board chairwoman Anne Lauvergeon and reported in APA on March 9, 2009.

Exhibit 1: Current and new exploration activities near the village Mounana.



The Compagnie des Mines d'Uranium de Franceville (COMUF), which is a 68% subsidiary of AREVA, France, announced that the Mounana uranium mine in the Haut Ogooue Province has ceased operations because reserves had been depleted.¹² COMILOG, which extracts anganese deposits¹³ between Mounana and Moanda as well as in a second location 12 kilometres from Moanda's train station and the town center, will probably take over the COMUF uranium mining installations.

3.1 Field Mission to Libreville

The objective of the field mission's to the capital was to get a first hand look at past mining activities, to see whether any awareness of radioactive contamination exists and to what extent actions are being taken to protect miners and citizens from exposure to radioactivity. Furthermore, information was needed on the accessibility of the actual mining village, Mounana, the existence and accessibility of health related data and possibly additional contacts to sources. The mission was conducted by Sebastian Veit (text and translations) and Hafida Najib (photographs) from August 15, 2010 to August 21, 2010. The following paragraphs summarise the results of the field mission.

¹¹ The Asian Age, February 5, 2008, available at <http://epaper.asianage.com/blog/2008/01/france-says-n-pact-when-india-ready.html> (October, 2010).

¹² Global Insight Country Intelligence, Wednesday February 17, 2010, available at <http://www.ihsglobalinsight.com/CountryIntelligence> (21October 2010).

¹³ The Manganese deposits at Mikouloungou are estimated at 1.1 million metric tons.

The president of the Gabonese Red Cross was interviewed at the organisation's premises in Libreville¹⁴ to find out if cases of radioactive contamination had occurred in Libreville due to the transport of uranium ore, if the red cross has specific health data related to radioactivity and if the red cross has the capacity to act in case of accidental release of ionizing radiation. He confirmed that uranium from the Mounana mines had been transported via train to Libreville, handled, and then shipped to Europe. He further stated that he and most likely his specialists are not aware of any specific cases of cancer that were detected in Libreville due to the transport of uranium, and that "the information on this subject is very sensitive and politically charged. Centralized and aggregated statistics do not exist, maybe the Centre Recherche Medical de Franceville has some information regarding the magnitude of the contamination".¹⁵ He stated further, that the Red Cross has no dosimeters (Geiger counters) to measure radioactivity. "The problem is localised to the mining village and was an issue when the mines in Mounana were active", he said. He further recommended talking to professionals in Mounana, including the president of the former minors association in Mounana, which is an advocacy group for, among other issues, compensation of occupational diseases.

The impression that uranium contamination was a localized problem was further confirmed by a male nurse from the Backomba Hospital, which is roughly 25 kilometres from the Mounana mines. The hospital currently has a total of 33 employees and is undergoing renovations, including the construction of a new laboratory and operating theaters. The nurse reported that malaria is the most prevalently reported disease. He also stated that there have been several cases of cancers which could be attributed to the mining, but could under no circumstances provide any estimates of total incidences or prevalence. In particular, he stated that cases other than Malaria are usually treated in the Oretch's mining hospital at Backomba.¹⁶ Furthermore, he was not sure if the fresh water source of Mounana is radioactively contaminated, since a lake exists in the region. He therefore does not know where the villagers obtain their water or where the water intake for the village is. Finally, he stated that there had apparently been a secondary rail system planned to transport the uranium.¹⁷ According to him, the tracks are either not in place or no longer active.

The researchers also met with a journalist and chief editor of the journal *Gabon Economy* at the field office of the African Development Bank (ADB) in Libreville, who stated that manganese exploration and mining are very active in the Haut-Ogooué region, and that recent discoveries of iron and gold ore contribute to the relative prosperity of this province. However, he never mentioned uranium or current explorations. When asked about the status of governmental supervision of the mining sector, he said: "We have all the necessary legislation in place, ranging from mining to agriculture. However, Libreville is [a] long [way] from Moanda [the local prefecture] and no one is there to implement and supervise mining practices and standards". When the researchers pointed to the recent EITI signatory candidate status of Gabon, he repeated this point.

¹⁴ Gabonaise Red Cross Society, Bureau National Boîte Postale 2274, Place de l'Indépendance, Derrière le Mont de Cristal, Libreville, Gabon, Tel: (241)078 760 29/241 071 694 81, Fax: (241) 772004.

¹⁵ The mission team visited the centre in Franceville on August 19, 2010 but found it closed due to a national holiday on August 17, 2010.

¹⁶ The team did not visit this hospital, as the local pharmacist in Moanda (Pharmaci Centrale) rather suggested trying the Centre de Recherche Medical de Franceville instead.

¹⁷ This information was later verified by a local guide and driver in Mounana. The current small gauge railway system was constructed in the 1970s and inaugurated in 1986. Before the railway existed, the Uranium, and other metal ore was trucked 45 kilometres to nearby Congo. From there, the Uranium was sent by train to Point Noire in Congo and then shipped to Europe. As the mining operations in Mounana ceased, the plans for the secondary Gabonese rail systems were cancelled.

3.2 Field Mission to Mounana

This visit to Mounana (cf. Exhibit 2) had the objective of obtaining a first hand impression of uranium mining impacts on the ground. Mounana is situated in a picturesque valley roughly 12 kilometres west of Moanda (the regional prefecture and last train stop before Franceville). While uranium was still actively being mined, the village had a population of 5000-6000, which has now dropped to an estimated 800 to 1000 people, also caused by the loss of roughly 600 jobs at COMIF.¹⁸ As mentioned before, the mines have not been operational since June 1999. Mounana is well developed for its size as a central African village with several paved roads, continuous electricity supply¹⁹, potable water²⁰ school and churches as well as several housing structures made of cement. However, the decline of mining activities has left its mark on the village and can be seen in the deteriorating infrastructure.

Exhibit 2: The tropical mining village Mounana – site of nearly 40 years of uranium mining and potential new explorations by AREVA.



There are two mining shafts located in the centre of the village, with a distance to dwellings of at most 500 metres. Villagers reported that several accidents occurred both in the mines as well on the roads (specifics could not be obtained as events were more than 11 years in the past). The mining was also accompanied by a processing factory, the remains of which are shown in Exhibits 3 and 4. There is evidence of incomplete clean-up efforts following the termination of mining operations. Furthermore, the close distance to residential dwellings increases the likelihood that radioactive dust, ore crushing and processing may have been a health hazard.

¹⁸ Information taken on 18 August 2010 from the President of the Former Miners Association.

¹⁹ Transmission lines supply power from Franceville where a hydropower station is located. The high-quality infrastructure for Mounana was mostly put in place by AREVA or COMIF, respectively.

²⁰ We saw the pumping station, which pumps water from the nearby river. The system included filtering and water treatment.

The researchers' local guide stated that today there is no severe risk of exposure to radioactivity. As the researchers did not have any dosimeters (Geiger counters) or access to data, this claim could not be verified. There are, however, more than 20 dosimeters installed and operated by AREVA throughout the valley (cf. Exhibit 5).

Exhibit 3: Remains of the uranium processing facility in Mounana, Gabon.



Exhibit 4: Remains of the uranium processing facility in Mounana, Gabon.



However, the daily measurements are not accessible. The independent French research institute Commission de Recherché et d'Information Indépendantes sur la Radioactivité (CRIIRAD) already conducted research in Mounana in 2006 and attempted to obtain, through the Gabonese Ministry of Mining, the official radiological records in 2006 (listed below). CRIIRAD was referred to AREVA and in March 2007, AREVA declined the request to release the following reports:

- Rapports de surveillance radiologique du secteur de Mounana établis par la COMUF (radioactivité des vecteurs air et eau)
- Rapports de surveillance radiologique du secteur de Mounana établis par le CNPPRI;
- Rapports de l'AIEA édités de 2001 à 2006 et faisant état de contrôles radiologiques effectués à Mounana.

Exhibit 5: Dosimeter installation in Mounana, Gabon.



It therefore appears that the AREVA radiological data seem to be the only concrete source of measurements at this point – but inaccessible to the public. At the local clinic of COMIF, a medical generalist at the Ministry of Public Health in Moanda confirmed to us that, every morning, measurements are taken at all stations. He did not disclose whether any further actions are associated with measuring the level of radio activity. Four months into his new position, he stated that, apparently, in the past, there was a problem of radioactivity which resulted in various cancers and birth defects. The latter information was also confirmed by a nurse, who reported that 0.5 percent of births have deformations. However, he informed us that the Mounana population in general is not aware of radioactivity.

Another indication that radioactive contamination may persist to this day is a rehabilitated dump, especially considering that, together with the waste disposals and processing facilities, the dump enveloped the village (cf. Exhibits 6 and 7).

Exhibit 6: Site of the former dump of the COMIF operated mine; the sign states that utilisation is forbidden.



Exhibit 7: Entrance to local dump site approximately 600m from Mounana village, where COMIF stored its waste.



Indeed, mine wastes were simply dumped into the village lake (cf. Exhibit 8).

Exhibit 8: Lake used by villagers (left top corner) and, between the trees, traces of the old transport line that transported the mining waste to be dumped into the lake.



However, with respect to the primary objective of the study, several interviewees stated that none of the materials utilised in the mines was ever used for construction in Mounana. All sources²¹ pointed to the fact, that construction materials were sold and bought in Moanda. This was confirmed by a visit to the local materials shop, SOTEX, in Moanda. However, the researcher's local guide acknowledged that once mining operations had ceased, some of the machinery was sold both in Mounana as well as Moanda. Whether they were radioactively contaminated, he could not tell. As those sales are now eleven years in the past, exact information was not possible to obtain.

With respect to uranium-attributable health problems, the team had only one personal contact. The local police officer had audible lung disease, but it could not be verified whether it was associated with uranium mining activities or exposure to ionising radiation. The same holds true for the president of the local Former Miners Association. He stated that several people had previously visited him, including journalists. He never heard back from them but did see the end product.²² He claimed that workers in the mines performed a lot of manual work and that relatively little protection was given to them.

3.3 Technical Conclusions for Gabon

The field mission to Gabon supports the finding that Mounana and the surrounding region have significantly benefited from mining activities in terms of infrastructure development and income generation for the local population. Despite these positive effects of the exploration and exploitation of uranium in Mounana and the region, the past mining activities continue to pose health risks to the local population and environment:

²¹ We did not ask all people for their names but a list of all contacts is included in the restricted Annex.

²² We were aware of the previous visit by the French journalist, Monsieur Dominique Hennequin, who had produced a documentary which was broadcasted in 2009. Furthermore, The French research institute CRIIRAD had visited Mounana in 2006 as well.

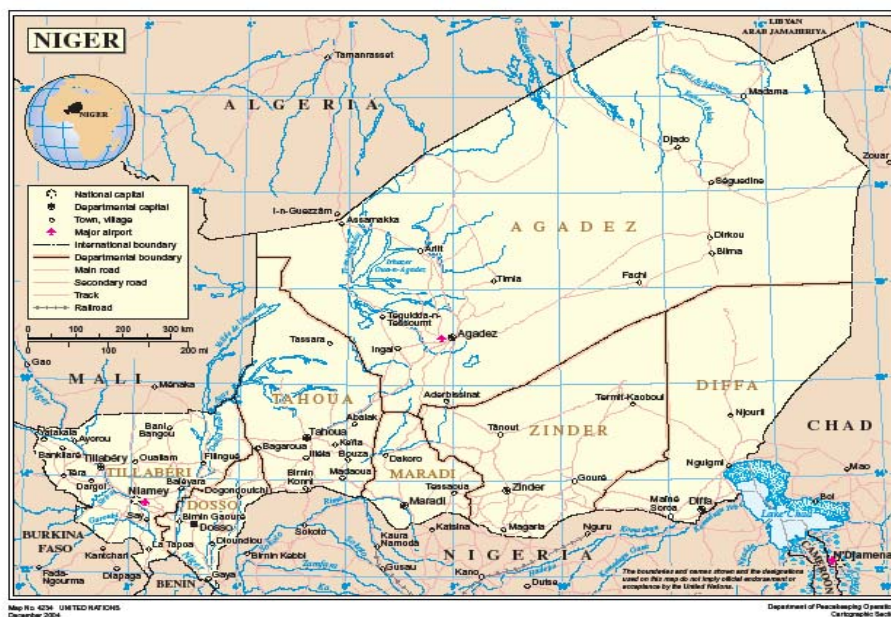
- The distance from the village to both the mines as well as the Uranium processing factory is marginal, as documented in the photographs. This significantly increases the risk that people are exposed to radioactive dust particles. It is also likely that local water supplies may be contaminated because their sources had been disturbed by the mining and they are now flowing freely out of the former mine shaft into the nearby lake. The waste disposal into the lake constitutes a clear negligence.
- Inadequate protection, including lack of or sub-standard, insufficient protective gear and safety instructions as well as inadequate education of workers and the people they come in contact with,
- To what extent the population overall is effected is as of yet unclear. The anecdotal evidence on cancer and lung disease is not sufficient to establish a robust, scientific link to Uranium mining. AREVA and COMUF also undertook steps to avert major incidences or risks. Nevertheless, despite environmental cleaning efforts by AREVA certain shortcomings are obvious, considering that radioactive contaminated soils had been moved and simply dumped in the lake or places close by. Additionally, the processing factory has not been properly dismantled and is likely contaminated due to ore crushing and processing for making yellow cake.

If AREVA were to revive exploration and mining again in the vicinity of Mounana, the village and population will greatly benefit from the influx of capital and employment opportunities. However, past mistakes made when locating the mines and conducting extraction as well as handling operations should be avoided. In addition, transparency in terms of radiation data collection and accessibility, adherence to sound environmental safeguards as well as social considerations should be enforced (cf. Section on ILO standards for mines). The latter also includes former workers compensation and if need be, further cleaning up of the Mounana environment.

4 NIGER

Located between the Sahel and the Sahara Desert, Niger is ranked as the 22nd largest country in the world with an area of 1267000 kilometres² and a population of approximately 12 million. It is bordered to the North by Algeria and Libya, to the East by Chad, to the South by Nigeria and Benin, and to the West by Burkina Faso and Mali. The Niger River, at the extreme west of the country, is the only permanent waterway in the country. Figure 2: shows a political map of Niger.

Map 2: Political Map of Niger.



Source: United Nations.

Niger gained independence from France in 1960 and is one of the poorest countries in the world. Government services and infrastructure are almost nonexistent and the people depend heavily on an agricultural subsistence economy that is hampered by recurrent droughts.²³ and disastrous flash flooding, such as in August 2010 when almost 90 % of life stock herds were eradicated. Despite its poverty, the country is rich in natural resources, including uranium, coal, iron ore, tin, phosphates, gold, molybdenum, gypsum, salt, and petroleum.²⁴ However, lack of financial resources and infrastructure hamper their exploitation.²⁵

Since interest in nuclear power has increased over recent years and driven up world prices of uranium, Niger's rich deposits have generated considerable interest. Civil society and media outlets have repeatedly called for a review of mining licenses. Additionally, non-governmental organizations such as

²³ CIA World Fact Book online at <https://www.cia.gov/library/publications/the-world-factbook/geos/ng.html> (last accessed 6 August 2010).

²⁴ Niger is a divided country, with the Tuareq living in the north and the dominant Hausa ethnic group living in the South. Several media reports, including the German news magazine "Der Spiegel" assert that the mines have also contributed to the violent uprisings, in which Tuareq rebels try to claim their share of uranium revenues (cf. <http://www.spiegel.de/international/world/0,1518,686774,00.html> from 10 April 2010).

²⁵ Ibid.

Greenpeace have accused AREVA of abusing the local environment near the SOMAIR and COMINAK mines at Arlit and Akokan.

AREVA holds a 66.65 percent (with an indirect 10 percent share belonging to Korean Hydro and Nuclear Power, KHNP, since 4 February 2010) share in the Imouraren mine, the remainder belongs to the government.²⁶ AREVA's status has not been affected by the political changes following the military coup that took place in February 2010.²⁷

4.1 Uranium Mining in Niger

Due to the prevailing security risks, seclusion of the mines (access is restricted and only military convoys are allowed) a field mission was not feasible. Hence, the analysis presented is based on secondary sources.

The first mining company in Niger was of French origin was established eight years after Niger's independence in 1960. Since 1968, excavating machines have dug more than 55 million tons of ore out of the ground beneath the Sahara, resulting in 100000 tons of yellow cake.²⁸

The two AREVA owned operators in Niger are called: Société des Mines de l'Air (SOMAIR) and Compagnie Minière d'Akouta (COMINAK) — both operate in the north of the country, roughly 800 kilometres from the capital Niamey. There are two uranium mines in the area, which employ about 2,200 people. Excavation began at SOMAIR, seven kilometers northwest of the mining town Arlit, in 1971 as an open-pit mine and varies from 50 to 70 meters deep..

The second AREVA holding company and mine, COMINAK, was created in 1974. Production at COMINAK, located roughly four kilometers from the town of Akokan, commenced in 1978. Unlike SOMAIR, COMINAK is an underground mine with a depth of 250m. and over 250 kilometers of galleries, which makes it the largest uranium underground mine in the world. According to AREVA the mines produce an average of 3,000 tons of uranium and generate net €200 million in sales per year.²⁹

Furthermore, Global Insight reports that according to AREVA mining director Sebastien de Montessus, production at a third location, the Imouraren mine, will begin by end-2013. Imouraren has an expected capacity of 5000 tons of uranium per year and could lift Niger from being the fourth largest to the second largest producer globally. Construction of the Imouraren mine began in May 2009 at a ceremony attended by AREVA director Anne Lauvergnon and the French Minister for Cooperation and Francophony Alain Joyandet.³⁰

It is estimated that 80000 people live in the two towns, Arlit and Akokan, which AREVA created in the desert to service the mines. There are no paved roads. According to Greenpeace findings, well water is radioactively contaminated, and precious fossil groundwater is used in the uranium ore processing plant (Greenpeace – left in the dust, april 2010). The Spiegel reports in April 2010: "The conditions in

²⁶ Cf. World Nuclear News article from 5 February 2010 available on http://www.world-nuclear-news.org/ENF-Areva_and_Kepco_sign_Imouraren_agreement-0502104.html

²⁷ Global Insight Country Intelligence, Wednesday, July 21, 2010

²⁸ The yellow cake is a pre-stage to nuclear fuel. It is produced on site, canned, and trucked 2500kilometres to the port in Benin from where it is shipped to France.

²⁹ Cf. the figures reported in "AREVA in Niger" for 2007. In addition, SOMAIR generated €161.7 million of revenue by producing 1743 metric tons of uranium. COMINAK earned sales of €100.6 million for its supply of 1289 metric tons of uranium concentrate during this period.

³⁰ Global Inside Country Intelligence, Wednesday, July 21, 2010

Niger show the dirty side of supposedly clean nuclear energy. The activities are well hidden from the outside world: The uranium mining takes place in the middle of nowhere."³¹

Further, the founder of the NGO Aghirin Man (2001), which means "protection of the soul" in the Tuareg dialect, stated that he witnessed a dramatic increase in death rates and illnesses of former uranium miners. Apparently, AREVA claims that everyone in Arlit and Akokan receives free medical treatment, even former workers. The company also attests that not a single worker has died of occupational cancer; something that Aghirin Man disputes. Both Greenpeace and Spiegel report several affected people.³²

In addition, the founder of the French Former Arlit and Akokan Miners Association, reported that lung cancer is not recognized as an occupational illness. Her father was a former mine worker and died of lung cancer on July 31, 2009. She conducted a survey amongst former workers which revealed that no dosimeters or gloves were given to the workers. Apparently, the standard work clothing was shirts and shorts. Finally, it is also reported that AREVA doctors repeatedly claim malaria as a cause of death. This is despite the fact that, according to an environmental impact study commissioned in 2000 by COMINAK itself, death due to respiratory infection in the town of Arlit makes up 16.19 percent of all causes, which is twice the national average of 8.54 percent.³³ Reported illnesses which have increased over the years include: typhoid, cancer, cough, weakness of the joints, kidney diseases, foot pains, sexual impotence, etc.

According to the German news magazine "Der Spiegel", a massive hill made up of 35 million tons of waste material from the mine is visible from the northwestern edge of Arlit. Although the uranium has already been extracted from the material it retains 85 percent of its radiation, stemming from substances like radium and thorium, which have half-lives of thousands of years. The waste dump is a major source of radioactive dust particles, likely to contaminate vegetables which residents grow between the waste dump and the city.

Greenpeace conducted a nine-day research mission in November 2009. The researchers found elevated levels of radiation in several locations (Exhibits 9 and 10, credit to Greenpeace International). A sand sample taken near the mine in Akokan contained 100 times more radioactive material than normal sand.

³¹ <http://www.spiegel.de/international/world/0,1518,686774,00.html>, accessed July 24, 2010

³² For further information see the "article in the German news magazine "Der Spiegel", available at <http://www.spiegel.de/international/world/0,1518,686774,00.html> and Greenpeace "left in the Dust", April 2010.

³³ Chareyron B, 30 January 2008. Note CRIIRAD N°08-02 'AREVA : Du discours à la réalité. L'exemple des mines d'uranium au Niger'.

Exhibit 9: Greenpeace scientist Rianne Teule measures radiation on a piece of scrap metal in Arlit (© Greenpeace / Philip Reynaers).



In the streets of Akokan, the Greenpeace team apparently measured radiation levels that were 500 times normal levels. In the past, the radioactive waste from the mine was used as construction material for roads and buildings.

Of five water samples taken by the Greenpeace team, four exceeded guidelines for uranium set by the World Health Organization (WHO). In an interview dated August 04, 2010, Rianne Teule (Greenpeace lead scientist on the study "left in the Dust" stated the following: "To first answer your question on scrap metal on the markets: indeed the mining companies do sell (or at least used to sell) equipment/tools that were clearly contaminated. AREVA was made aware of this problem years ago, and says they increased the control of materials exiting the mines. But clearly, that problem was not solved when we visited Arlit in November last year. The contaminated ore loader we found on the market had been bought directly from the mining company less than a year before." She further stated, that the most severe problems facing the two towns are their proximity to the mines, the resulting dust contamination and the increased radioactivity of the water. Dust levels could be mitigated by better operations, e.g. spraying more water vapour in the processing plant and actual mine. The water intake for the towns could be moved to a distant aquifer, which is not connected to the mines and hence, less likely to bare radioactive water. Finally, according to Mrs. Teule, the sale of radioactive construction material on local markets could be mitigated by better mining safeguards.

Exhibit 10: Greenpeace scientist Rianne Teule measures radiation in a house in Arlit (© Greenpeace / Philip Reynaers).



4.2 Technical conclusions for Niger

The Greenpeace report provides empirical evidence that radioactively contaminated material was used for construction purposes. Based on the aforementioned evidence, the authors conclude that the impacts on both the mining towns of Akokan and Arlit are severe and difficult to mitigate. This is, in particular, due to their location in the northern part of Niger. This tip of the Sahara is very arid and sand storms are common, which exacerbates the spread of radioactive dust particles. Nevertheless, the studies which were analysed indicated grave mistakes in planning and operating the mines.

Recommended short term mitigation actions would include:

- Increased water vapour levels in both mines and ore processing facilities to reduce aerosol dust particles and their consequent spreading, including increased coverage of the dumps with uncontaminated soil;
- The immediate relocation of the town's water intake to another unpolluted water source;
- Issuing of protective gear for the workers. Safeguards, which implement an obligation to leave gear behind at the work place so that the potential spread of contamination to workers' households by dusty clothing is reduced. Furthermore, workers need to shower and get measured with dosimeters for treatment if need be. This also includes compensation for workers who suffer from work related disease;
- Increased frequency of measurements throughout the two towns and consequent removal of radioactive material, soils, or dust.

Nevertheless, as a long-term solution the authors recommend that the villages be completely relocated³⁴, as the proximity to highly radioactive waste dumps, processing facilities etc. is intolerable and in the long run, difficult to mitigate. This is due in part to the climatic conditions of low precipitation and high frequency of dust storms, as well as the unavailability of fresh water sources.

5 INTERNATIONAL STANDARDS AND SAFEGUARDS FOR MINING PRACTISES

The initial analysis of the collected information and the field mission indicates that relatively few standards for workers' protection, environmental and emergency management plans and, to some extent, financial governance instruments have been applied in both Niger and Gabon. International financial institutions such as the Multilateral Development Banks (MDB's) are prohibited by their policies to finance uranium mining activities. This aspect is relevant as the MDB's have strict and sound safeguard standards in place and the capacity to reinforce good corporate governance.

The following paragraphs summarise the most relevant internationally utilised practices. However, the assessment of the extent to which they were applied, implemented and reinforced was not core to this study and thus should be elaborated to a full extent in a separate document.

- Extractive Industries Transparency Initiative (EITI): Based in Berlin, Germany. Essentially this initiative is concerned with financial governance to fight high and medium level corruption in developing countries in relation to extractive industries. The current status of the signatory process for both Niger and Gabon is that the two countries have applied for full membership and the consequent establishment of a national EITI secretariat. According to EITI regional Director Tim Bittiger, Gabon submitted its validation report in June 2010. Niger missed the deadline of 9 September 2010 and will submit its report by mid-October 2010. The EITI Board will then assess the reports for further action.
- International Labor Organization (ILO): A UN organisation based in Geneva, Switzerland. It developed the Labor Standards and Guidelines for Safety of Mining Workers: Convention 176 Safety and Health in Mines Convention, 1995. Only four African countries, Botswana, South Africa, Zambia and Zimbabwe are signatory to this convention. Gabon and Niger are not.³⁵
- International Council on Mining and Minerals (ICMM): Based in London, UK, ICMM is a voluntary membership based organisation founded in 2001 by 19 mining corporations and 30 national national/regional mining associations.³⁶ Through the ICMM Sustainable Development Framework, ICMM member companies have committed to the following three principles: 1. Seeking continual improvement of health & safety performance; 2. Assessing and managing the risks and hazards to human safety and health, which is the cornerstone of the ICMM Health & Safety work program; 3. Committing to the open and transparent sharing of information and collective actions on health and safety issues that will assist member companies in their drive to

³⁴ An example of relocation costs from the proposed Niger KANDADJI dam, where 35000 people are affected by the project, indicates that the associated costs could be manageable. The Relocation Plan's budget amounts to CFAF 71.8 billion or US\$ 138.8 million (African Development Bank KANDADJI dam project document, 2008). Thus, it is believed by the authors that the relocation costs of roughly \$ 150 million to conduct a project for Arlit and Akokan would be sufficient. Relocation seems not only on a first glance the least costly option, but also offers the potential for enhanced productivity and, consequently, poverty reduction within the region.

³⁵ For list of countries that have ratified C176 to date visit <http://www.ilo.org/ilolex/cgi-lex/convde.pl?C176> (21 October 2010).

³⁶ For member companies see <http://www.icmm.com/members/member-companies> (21 October 2010).

'zero harm'. AREVA is not a member of this association. The ICMM's 10 principles for sustainable development are listed in Annex 1.

6 RECOMMENDATIONS AND CONCLUSIONS

The authors conclude that whilst first steps on paper towards sound international practices in mining operations are being instigated by both countries' EITI signatory application, the future outlook for health and environmental safeguards is not clear. This is mainly due to the fact that neither the governments nor AREVA have signed existing safeguard charters (such as the ILO convention 176 for mining labour standards or the ICMM's 10 principles for sustainable development), monitoring and enforcement is weak, and a lack of financial and human resources further exacerbates the problem. The specific conclusions for Gabon and Niger are summarized below:

Gabon:

- The issue of radioactive contamination seems to be concentrated within Mounana on certain locations, such as the remains of the processing plant, mine shafts and waste dumps. At the time of operations the village itself had a population of roughly 5000, of which 600 workers were actively employed. Mounana served two underground mines and housed one processing factory to produce yellow cake. The infrastructure in the village is outstanding for its size. Furthermore, the region as a whole has benefited from the overall mining activities in terms of its development progress.
- Although apparently no radioactive material had been used for construction, during the mission it became evident that severe environmental problems exist, mainly attributable to the negligent disposal of mine wastes into the nearby lake, the remains of the processing factory and the very short distance of mines to the village. Although no measurements of ionizing radiation could be taken, it was possible that citizens are suffering from impacts in terms of birth defects and respiratory disease. The only radiological data that exist are from the daily measurements done by AREVA, but this is not available to the public. Hence, it could not be determined if and where further environmental clean-up is needed.
- The roughly 600 miners at the time had relatively little protective gear. The information retrieved by the mission team strongly indicates that no radioactive contaminated material had been used for construction of residences etc. Nevertheless, the authors conclude that relatively few of the above mentioned international mining guidelines and safeguards have been applied during operations – which should be a pre-requisite for new licenses.
- Adherence to ILO, ICM EITI and IFC standards is difficult to ensure in part because of the remoteness of the mines and the non-ratification of ILO and other standards by Gabon and Niger.

Niger:

Although Niger could not be visited due to security and travel restrictions, the desk study revealed strong indications of need for urgent actions, in particular as the two mines are still operational. The two mining towns of Arlit and Akokan are situated in the Sahara 800 kilometres north of the capital, Niamey. The close distance of the towns to the mines (approximately 4 to 7 kilometres), the fact that one of the mines is an open-pit mine and the other is the largest underground uranium mine in the world, coupled with the hyper-arid climatic conditions, poses some unique problems:

- The ground water aquifer, which serves as water source for the two towns, is shared and disturbed by the mines. Hence, radioactive drinking water is a likely consequence.

- Radioactive dust from the processing factory, mines and related waste dumps is accumulating in the towns. Furthermore, radioactive sand, construction material and scrap were sold on local markets. This material is presumably still used today by inhabitants.
- Workers' protection was virtually non-existent. No compensation for any work related disease is being paid.

This leads to the following conclusions:

- Actions in the short-term may include the immediate change of the water source to a clean level; higher frequency of measurements throughout the towns and consequent removal of radioactive contamination; immediate adoption of sound safeguards for workers protection and compensation.
- The long-term recommendation is the relocation of the two towns. The rationale is grounded in the fact that, due to the proximity of the mines and the enormous waste dump, the area will likely never be free of all mining-related radioactivity (i.e., above natural background levels). Hence, planning at this stage for a relocation project will be the least costly option, as discussed in the Niger conclusions. The benefits are manifold and costs could be shared between the Government of Niger and AREVA.

6.1 Recommendations for Further Actions by the European Parliament

Based on our findings, we recommend these follow-up actions:

- Exert political, diplomatic, and economic pressure to call upon the private sector for adherence to Corporate Social Responsibility – beyond the 28 EU member states as well. Governments should, through their stake in large energy corporations, require sound implementation of international standards, ranging from financial governance to the adoption and implementation of environmental and social management plans. The issuance of advocacy letters or parliamentary information requests to relevant EU authorities, National legislators and corporations serves the purpose of raising public awareness.
- Mounting further pressure through formalising a complaint/inquiry directly to AREVA's top management on why the state owned corporation has not yet signed the ICMM membership with the obligation to implement and adopt their sound safeguards. This request should also involve the appropriate French Ministries.
- Launch a formal request to the French Government and AREVA to release the monitoring data on ionizing radiation at all of its mining operations and seek agreement that future data be made available in a timely manner to local authorities, as well as the national governments of Gabon and Niger.
- Commission requests to development partners (local governments) for the identification of additional need in capacity building to implement, adopt and ratify on sound international mining standards ILO, EITI, and environmental safeguards. Both Niger and Gabon are signatory candidates to EITI. However, no binding instrument in the two countries currently exists for social and environmental safeguards application and monitoring.
- Further assess the actual implementation and adoption of current initiatives, ILO, ICMM etc. Whilst signatory commitment to sound international practices is a useful first step, it is the implementation, application and reinforcement on the ground (often a long way from the capitals) that makes a difference for the local population. Hence, further study of the issue by the EP to inform the aforementioned progress and commitments for both countries is recommended.

- In regards to actual contamination of houses, infrastructure and water sources in Gabon, the authors recommend to further assess and measure actual radioactivity levels by an independent technical research institute. However, measurements should only be conducted if funding or commitment for possible follow-up actions by any of the parties, AREVA, Gabon Government or donor agency is provided if need be. Generating knowledge by itself without any consequences is therefore not sufficient. For Niger, the assessment of a potential relocation project in collaboration with development partners, the government of Niger and AREVA is highly recommended, due to the severity of the contamination and the local climatic conditions.

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