

Keywords

- > Uranium mining
- > Uranium milling
- > Environmental impact
- > Nuclear power
- > Uranium daughter products
- > Health impact

Using nuclear power requires the mining of uranium: one of the most polluting activities of the nuclear fuel cycle.

Yet the impacts of uranium mining on health and environment are often absent from calculations of social costs of nuclear power and neglected in the public debate about expanding nuclear power capacity. The [EJOLT report](#) reveals the **hidden environmental and health impacts of uranium mining**, while also giving scientific information to citizens and NGOs confronted with the risks.

The adverse impacts of uranium mining through the **increase of radiation in the biosphere** are omnipresent in the whole lifecycle. Impacts are seen from prospecting and extraction to processing and disposal, where the impact of waste rocks and tailings is severe. As is well known from other kinds of waste dumps, **residues regularly leach into underground and surface water sources**. Contaminated dust and radon gas from uncovered waste heaps frequently blow outside the mine. There are **no satisfying solutions** for the long-term control of the tailings dams, but at least a minimal confinement should be guaranteed. When such a dam breaks, the impacts are huge.

Zombie mines are everywhere

Uranium mining also has strong **adverse effects on human health**. Even at low doses (i.e. doses equivalent to natural background radiation), the **risk of cancer** and other pathologies increases with the accumulation of the dose. In the case of exposure to radon gas through inhalation, recent epidemiological studies confirmed that the risk of dying of cancer is increasing with dose even at very low levels. Furthermore, the studies found no safety threshold below which there is no risk.

Uranium miners are continuously exposed to radiation and are among the most exposed workers of the nuclear fuel cycle.



Tailings dumped into Bellezane pit (France)

Photo credit: CRIIRAD

The **population** living in the surroundings of uranium mines and mills is also subject to **ionizing radiation** both by external irradiation and internal contamination through the ingestion of contaminated food and water and the inhalation of radioactive dust and radon gas.

Impacts remain, even when the mines are long closed. At mines in Bulgaria, radiation levels have been shown to remain at elevated levels decades after closure. Eastern German experiences show that multi-billion euro costs occur before those levels are reduced. Also in France, the rehabilitation of uranium mines has been unsuccessful: radioactive contamination continues to be present in soil and water in the proximity of closed mines. Such “zombie mines” (dead but active) cause costs which must be considered as part of the operating costs of nuclear power plants.

Cleaning up our own mines in the EU

Although uranium mines in the EU have generally been closed for a long time, the EU still must work hard to further reduce the environmental and health risks that remain after the closure of the mines.

The **EU must strive to ensure** the following:

- **European legislation has to strengthen environmental standards** and the responsibility of the operators in the long term.



Sampling of contaminated sediments at Rössing mine (Namibia)

Photo credit: CRIIRAD



Contaminated pipes (Arlit, Niger)

Photo credit: AGHIRIN'MAN

Urgent improvements are needed

- **The rights of the communities to have access to detailed information** about mining projects and their impacts in all steps of the mine development, including prospection activities. The documentation must be freely available to the interested persons, be it local community or any other stakeholder; and should be reviewed by independent experts and available in a language that is directly accessible to the communities.
- **The right of the community to have free, prior and informed consent** to the mining project. This should include informative sessions by independent actors as well as the mining company.
- **The right of the community to actively participate in decisions regarding the mining project** that concerns them, such as radiological protection, health assessments, environmental monitoring and other labour related issues. This should be carried out through the organisation of regular meetings with the company, local and national authorities.
- **Improvements and revisions by independent actors must be applied to environmental monitoring programs** (air, soil, water, food chain, flora and fauna) and to the standards of treatment of liquid effluents from the mine, mill and waste disposal facilities, the discharge of radioactive dust and radon to the atmosphere and the decontamination of all potentially contaminated equipment used in the mine and mill before clearance.
- **Lowering of annual dose limit** to the impacted population and the impacted workers, as well as lowering the objectives of residual exposure of the public after reclamation of the mine.
- **Revising the design and maintenance of waste rock dumps and tailings dams** to guarantee the confinement of the radioactive material.
- **Money should be set aside by the mining company at the beginning of the extraction** in order to pay for the suggested improvements, as well as for the reclamation costs and the long-term expenses necessary for environmental monitoring and maintenance. This money should be put into a “remediation and rehabilitation fund” run by a public body with civil society participation in the supervisory board. The payment should be higher than the amount needed to cover long-term cost to establish an economic incentive to prevent the company from prematurely abandoning the site. Any money remaining after rehabilitation should be returned to the company.
- **Elaboration of baseline studies** which are necessary to properly evaluate the impact of uranium mining activities. When high levels of uranium or uranium daughter products are detected in the soil, air, water or the food chain, the mining companies can be inclined to claim that this is pre-existing natural radiation, as opposed to contamination. Baseline studies should be mandatory before the beginning of intense prospection (e.g. drilling and prospection trenches) and any extractive activities. A list of parameters to be monitored is given in the [EJOLT report](#). These baseline studies should be carefully supervised by local and national authorities and independent experts. Capacity building for local authorities could be supported by EU international cooperation programs.

- **Financial liability estimates for uranium mine closure must be revised**, taking actual on-site assessments into consideration. The current practice of assessing the state of the mine and its installations merely on the basis of existing documentation must be abandoned, as it is misleading and often ignores actual risks.

- **Monitoring mine closure must include control of procedures on safety**, compliance with radiation protection laws, and monitoring of radiation levels in soils, air, waters and vegetation at all potentially affected sites.

- **Opportunity** must be ensured **to have additional rehabilitation of mines** if independent audits determine it to be necessary. This should be financed by the companies or through EU funds (when impossible to do otherwise) with the participation of a certified auditing authority ensuring the quality of the works.

- **Radon concentrations in private buildings have to be monitored in regions** where uranium was mined. Measures to reduce health risks from exposure to radon, where needed, must be obligatory.

- **Review of environmental impact assessments (EIA)** by the competent national and local authorities and by an independent group comprised of representatives of the affected communities, local NGOs and independent scientists. Particular attention should be given to various costs that are usually not properly assessed and taken into consideration, such as the long term environmental monitoring of the mining area; maintenance of water treatment facilities; maintenance of the waste rock dumps and tailings dams; adverse impacts of the mine on existing economical resources (natural parks, tourism, agriculture, etc.); water supply to the local communities, and the maintenance of hospitals and social welfare systems for affected workers and local communities. Such costs are decisive for the future quality of life and must not be eliminated by economic discounting procedures. EIA needs to evolve into SIA, Sustainability Impact Assessment.
- **Training workers and local communities:** It is extremely important to train workers, local communities, local authorities and national authorities about the short- and long-term adverse impacts of uranium mining activities on health and the environment. Special emphasis must be placed on radioactivity and the impact of ionizing radiation; the problem of water consumption and contamination; the difficulty of waste management in the long run and the associated costs. Independent institutions should develop these training programs, while also organising the exchange of information between affected communities of different countries.
- **Environmental monitoring:** The environmental monitoring programs developed by uranium mining companies usually do not carry out a complete and unbiased evaluation of the impact. In order to improve these programs, the specifications of the environmental monitoring program should be reviewed by independent scientists and by representatives of the affected communities. The communities should have trained representatives that should be associated to the sampling and monitoring activities of the companies and to the interpretation of the results. They should have dedicated resources in order to buy monitoring equipment and be in a position to submit some samples to independent analysis.
- **Monitoring of health impacts:** The methodologies developed to analyse the health impact of uranium mining activities on the workers and affected populations suffer from many weaknesses. The doses received are usually evaluated without taking into consideration all radioactive substances or chemicals, all pathways, all health states and all age groups. The methods of estimating exposure usually do not give a comprehensive view of the risks. Therefore, these methods should be reviewed by independent scientists in cooperation with workers and affected communities. The process should include independent monitoring activities that could comprise monitoring of uranium and uranium daughter products in samples of urine or hair. The workers should receive the data of the monitoring and the global non-nominative results of the dose evaluation of the workforce should be publically available. Epidemiological studies should be developed both on the health status of the workers and any other affected communities. These studies should concentrate not only on cancer mortality, but should also include global morbidity and all pathologies and health indicators including mental diseases, birth defects, etc. The studies should include follow up periods of several decades. Popular epidemiology studies should be promoted in parallel to classical studies. Measures should be taken to guarantee that the affected individuals receive treatment and appropriate compensation even decades after the closure of the mines.

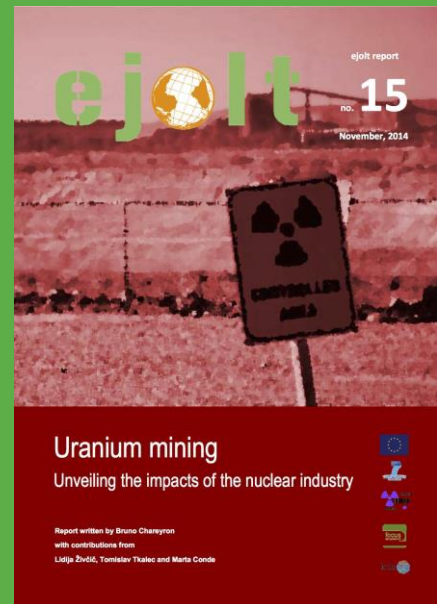
Acting outside the EU

Through the pro-nuclear **EURATOM treaty**, the **EU has a strong impact on the environment and health** in countries where uranium is mined. Therefore, **the decision-makers and citizens of EU** must be made **aware of the impacts of uranium mining and must understand the responsibility that we have when we import uranium**. This has to be part of Sustainable Impact Assessments.

The key step to this learning exercise is to **stop treating uranium as a ‘domestic source of energy’**, which is the case in almost all Member States of the EU. It is hard to understand why uranium is considered an indigenous energy source when nearly all of it is imported. Removing this distortion in the EU perception would be a key step towards admitting that the EU carries responsibility for what occurs in countries where its uranium is sourced.

Uranium mining and milling comprise the first phase of the nuclear fuel cycle, and is one of the most polluting ones. The aim of this report is to give workers and communities basic information about radioprotection. The document deals with the radiological characteristics of materials and waste from the mines, principles of radiation protection, and methods of dose evaluation.

The report draws from on-site studies performed in the course of the EJOLT project and from previous studies performed by CRIIRAD over the last twenty years. It gives examples of the various impacts of uranium mining and milling activities on the environment (air, soil, water) and provides recommendations for limiting these impacts.



Although, admittedly, the EU has a limited influence on restraining the adverse impacts of uranium mining in non-EU countries, it is not powerless.

The sustainability criteria applied for importing agrofuels (as weak as they are) clearly show the option to set criteria for the social and environmental quality of goods imported.

Furthermore, there are several **international agreements** that aim to **regulate uranium mining and its impacts**, such as the 11 principles of **“sustainable uranium” mining** of the World Nuclear Association (ranging from health and safety, to mine decommissioning and site rehabilitation); the **Extractive Industries Transparency Initiative**, and the general recommendations for “sustainable” uranium mining of the International Atomic Energy Agency.

Another relevant aspect is the **international agreements dealing with public participation** process (e.g. the Rio Declaration on Environment and Development and the Aarhus

convention) and rights to compensation of indigenous communities when they are affected by a mining project (e.g. the UN Declaration on the Rights of Indigenous Peoples).

Together they provide a platform from which the EU or its Member States can exercise influence, even beyond sustainability criteria for imported goods. For mining companies headquartered in Europe, further routes of influencing performance exist.

** In this context we would like to stress that the word “sustainable” is completely misleading in the case of uranium mining.*



The EJOLT project (2011-15) has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266642. The views and opinions expressed in the website and in all EJOLT publications and documentaries including the Atlas reflect the authors' view and the European Union is not liable for any use that may be made of the information contained therein.

For more information

Uranium mining: Unveiling the impacts of the nuclear industry

EJOLT Report No. 15, available at:
www.ejolt.org/reports

Or please contact the report coordinator:

Bruno Chareyron, CRIIRAD
bruno.chareyron@criirad.org