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FATAL EXPOSURE:

The Destructive Force of Uranium Mining in Post-Communist Europe

The EU's member states focus on energy independence is putting at risk the environment and the health of its citizens, due to the bloc 's continued exploitation of European uranium resources.

An investigation spanning four countries - Romania, Slovakia, the Czech Republic and Germany - proves that national and local authorities show scant respect for health and environmental risks when overseeing uranium mining and the rehabilitation of closed uranium mines. There is no comprehensive and accurate data and monitoring on the quality of life of the population living close to current and former uranium mines, while wild animals live among and feed from ponds containing waste and from dump-heaps resulting from these mines. Meanwhile hundreds of millions of euros have been spent to close uranium mines with little effect.

The EU is dealing with a legacy of irresponsible and widespread uranium mining from the Soviet period, where the exploitation of vast tracts of land from East Germany through Slovakia and the Czech Republic to Romania have caused massive damage to human health and the environment. The union requires member states to decommission former uranium mines - a move not being honored by all EU countries. It also requires member states to build infrastructure for safe and responsible management of radioactive waste - which we show is also not being respected.

But there is a lack of consistent and thorough oversight by the EU. Radiation monitoring by the European Commission has slowed down from monitoring eight countries in 2012 to three in 2014. In the European Union there are only two countries that produce uranium in large proportions: Romania and the Czech Republic, which only cover two per cent. of the necessary uranium to power the EU's nuclear energy. But there are moves to open new mines in Slovakia and the Czech Republic. Small quantities from the reserves of mines are also produced in France, Germany and Hungary.

Uranium mine closures underfunded and abandoned

"We live here, with radon [radioactive gas] across the road and with chalk dust from down in the valley - God damn it - it will kill us all!" A former miner from Bihor, west Romania, is describing how his life is trapped between two pollution vectors - a former mine for uranium and another for

chalk. Baiţa Plai is a former Communist workers' colony built by the Soviets in the 1950s, and part of the nearby town of Nucet, on the edge of the Apuseni Natural Park in the Transylvanian countryside.

The Soviets exploited uranium at this site - one of the richest reserves in the world - as reparations for World War II, where Romanians fought against the USSR.The uranium was first extracted from two surface pits, before the mine moved underground.

"For us it was dangerous work," says 74-year-old former miner Florian Covaci. “We traveled an hour to the galleries with a bus, then by train underground for eight kilometers. We were working in the tallest mountains of the Apuseni range and working wet to the skin to make holes in the rock with water. It was like in a labor camp. ” Beginning in 2000, the mine slowly declined. The workers left, either voluntarily or were retired. Today most of the apartments in the four blocks in Baiţa Plai are empty, because people no longer want to stay near waste rock mountains and noxious mines. One hundred people live here - but only four are former miners. In Romanian dictator Nicolae Ceausescu's time, Nucet hosted a large camp of children who, on hot summer days, bathed in the river where radioactive waste was dumped.

The road to Baiţa Plai moves slowly up the river bank. There are no fish, because the river is thick with dust from the chalk mine. No life form can survive in the water. Instead, it is full of garbage. On the edge of the road are hundreds of blackberry bushes. The fruit can hardly be eaten because it is layered with dust. In this area, 4.6 million liters of radioactive waste has also been deposited. Next to the entrance of the dust-emitting mine, a recent placard tells a traveler that here they have the privilege to take part in the “Natura 2000 Network” - areas of ecological wonder, protected at the EU level, which offer a haven to Europe's most valuable and threatened species and habitats. Romania's track record of cleaning up its uranium legacy is a history of decay, abandonment and ignorance, where the effect of radiation on human health lacks analysis, environmental destruction is ignored and the uranium mines are left to rot without vital decommissioning.

Radiation-induced cancer: Thousands at risk

The casualties of cancer due to uranium mining and its legacy in Romania are unknown - but could be in the thousands. 53 year old Vasile Mocanu likes to be known as Doru. He worked in the uranium mine in Baiţa Plai for many years, then stayed on as a security guard for a private firm that oversees the mine and deposits of radioactive material. Doru says his body has become used to radioactivity and he hopes "with all his soul" that he will reach a retirement age, because many of his former colleagues died early. "Many died before they reached 50," says Doru. “A former colleague recently died at 57. If we reach 60, then we will have more years. These diseases put many young people on the ground. ”

Long-term irradiation even in small doses can produce leukopenia, congenital deformations, while radiation at high doses can produce accentuated leukopenia, erythema, hair loss, internal haemorrhaging, sterility and even death. Among the main sources of radioactive pollution is mining for uranium. Recent studies show that due to radioactive pollution, doses of radiation per head have grown in the last 60 years by five to 15 times. Zones of nuclear risk in Romania total 33,290 sq.km, 1,300 localities and 5.24 million residents, more than a quarter of the Romanian population.

"The first effect of radiation is cancer," explains Laszlo Toro, from the National Institute of Public Health, Department of Radiation Hygiene in Timişoara, western Romania. Romania's Ministry of

Health admits that the main route of exposure for miners who exploit uranium is through the inhalation of radioactive radon gas. This has been classified by the International Agency for Cancer Research as carcinogenic to humans and recent studies assess a possible relationship between radon and leukemia. The effects of radon in food or drinking water are unknown. After smoking, Radon represents the second major cause of respiratory cancer and recent studies show that ten percent of lung cancers have been due to Radon present in the body.

In Romania, between 1,000 and 3,000 deaths per year could be due to Radon, argues researchers from the Environmental Science and Engineering Faculty at the University of Babes-Bolyai, Cluj-Napoca and the University of Cantabria in Santander, which carried out a 1.12 million Euro project (financed by European Funds) in Baița - Nucet. These radiation levels are present in housing. In the 1960s and 1970s, Romania allowed materials from uranium mines to be used for buildings in Baița Plai, the Mayor tells us. Dozens of people in this area have built finds, walls, road kerbs and animal shelters with stones from the mine dumps. Such waste was also used to build roads in Slovakia and the Czech Republic and Czech officials say the homeless are also stealing contaminated metal from dumps and selling it as scrap. The researchers from Cluj and Spain measured the level of Radon in local housing with 20 dwellings being monitored over a three year period, and 580 locations were analyzed. The results show a high risk of lung cancer and 25 percent of deaths per year could be attributed to exposure to Radon inside houses in the mining area of Baița.

Backing this up is the low life expectancy in the area and the growing rates of lung cancer. It is tough for an occupational doctor to confirm a radiation-induced cancer, because it is hard to isolate the source of the cancer. To see whether radiation-induced cancer is due to a dose of radioactive material can only be determined through studies on a group of people exposed to radiation. The traceability of ex-miners is problematic, as they do not stay in the same place. But in the former Soviet-built workers' colony at Ciudanovița in Romania's southwest Banat region, the ex-miners have another theory about why they die early.

Leaving the mining village is "fatal"

In its day, Ciudanovița mining community boasted its own football team - and the stadium is still visible near the entrance to the mine, which is closed with concrete. Here around 300 still live. The school, once filled with children, now only has a few. Pensions for the former miners come to the broken-down post office to pick up their cash, because the town doesn't have any ATMs.

It is possible to reach Ciudanovița from Oravița by train, a mountain railway, similar to Switzerland's Semmering, this was the first mountain railroad in Romania. But this station is a few kilometers from the colony. The other options are with a car or a single bus which circulates through here. The locals have a name for the road from Oravița to Ciudanovița built by prisoners during Communism: 'Golgotha'.

In Ciudanovița, in the back of a housing block, a woman is sleeping next to a few crates of beer. We start talking to a man on a balcony about radiation. He believes poison from the mine is a fairy tale. “I worked in the mine and I have 11 kids. If there had been radiation, I wouldn't have been doing so many! ” I argue. There is a legend that people who leave the area become sick and die, while those who stay remain healthy. Two old men, also former miners, drinking beer on a bench say those who

left town died of lung diseases. Others, who could not accustom themselves to a life in another place, came back.

Residents from Baița Plai also back this theory that miners adjust to their environment. “Ex-miners who left, after three to four months, were found dead. In us uranium entered, but if a visitor comes here, he begins to have a headache, ”says 74-year-old Florian. "Those who visit us get tired very quickly," adds a 40-year-old resident of Nucet. “We who were born here, we lived in this drug, in this Radon. Men when they left this environment are finished. Their hair falls out, and when you see them, aged 48 or 50, they are as white as chalk. ”

Laszlo Toro from the National Institute of Public Health has worked a lot in the Ciudanovița - Lișava region and does not believe in this legend. He says it is difficult to make a nationwide study linked to the state of the population's health in this area and Romania has not done any such investigation for the last ten years. “Monitoring people is not done because it would cost a lot of money,” Toro asserts, “it's possible people who eat game are more exposed than others because radiation persists for a long time in the vegetation of forests, which the animals feed on ”. Toro underlines that in a mine near Ciudanovița - Lișava, the water entered the waste rock piles and it is not drinkable because the dump's rocks are radioactive.

Coverage of the radioactive material is crucial and residues from uranium mines must not be exposed to the air. "Radon outgassing can be a potential exposure, if residues are not adequately covered," says Dr. Eberhard Falck, Environmental Science Professor, Versailles Saint-Quentin-en-Yvelines University. "If the residues are not covered, or if the cover has been breached, contaminants may be leached and may reach surface and groundwaters, thus creating a potential exposure pathway." There is a lack of international oversight of radiation levels in EU member states. The International Atomic Energy Agency (IAEA) only centralizes data which members send through to them. It has some publications and safety guides on mine claim practice, "but these are just recommendations and not legally binding," as uranium expert Peter Diehl emphasizes. The European Commission is the only independent body that monitors radioactivity in air, water, soil and foodstuffs in EU countries. However, the number of countries monitored by the Commission's EURATOM agency has decreased from eight in 2012 to only five monitored in 2015.

The last verification in Romania was in 2012 and 2008, in Slovakia in 2014, 2008 and 2005, Czech Republic in 2010 and 2005. This includes not only uranium mines but processing factories and nuclear fuel factories. In all of these countries, verification visits took place over four days and it is hard to believe that inspectors really undertook a comprehensive analysis of all sites in the countries, which are in remote areas and at great distances from one another. One thing is for sure: they never talked to the former miners in Băița Plai.

Ex-uranium mines not rehabilitated

Former uranium mines need a stringent, professional and expensive regime of closure and decommissioning, followed by rehabilitation in which nature is allowed to reclaim the mining land. Throughout this period radioactivity must be monitored to ensure that waste and Radon is not entering the water supply or air. However, in Romania only two of 23 uranium mining sites have been shut down. Only a couple of million euros has been spent on this rehabilitation, compared to billions in the Czech Republic and Germany. Meanwhile many mines stand inactive or suffer delays and staggered works, leading many to believe that a slow-burning environmental disaster is taking place across the countryside.

An International Atomic Energy Agency (IAEA) report on post-World War II uranium mining states that many of these projects did not have an appropriate level of concern for environmental issues because production was the highest priority. These sites were frequently abandoned at the end of mine life with little or no remediation. "Waste rock containing sulphides (even at very low concentrations) can oxidize and release heavy metals and radioactive decay products," reads the report. “Unsuccessfully managed, they have the potential to adversely impact the environment for decades if not centuries to follow. Many of these sites have not been remedied and still present significant environmental hazards. ”

Along the regions of Baița Plai and Ciudanovița several places are still visible where mining exploration took place before 1989. The mine dumps and waste were not placed into any ecological rehabilitation program, and there have been no analyzes of these waste rock piles. The role of restoration has been abandoned by man and slowly taken over by nature. The dumps are subject to erosion due to rain, allowing toxic pollutants to reach groundwater or surface water and then enter the human body through drinking water, or through the consumption of local vegetation. Plants and wild animals like the deer we photographed feeding from a waste rock pile near Lișava mine help disperse the dump materials. In areas affected by uranium mining one can see the plants are much smaller and in time many species disappear.

On wet days even without a strong wind, Radon is more present. There have been no studies on the number of elements transported by animals, the wind or through water. Officials from the Romanian Ministry of the Environment and Climate Change agree that the main impact on the environment from the mining industry comes from the tailing ponds (pools of water containing liquid waste from mines) and mine dumps. Although rehabilitation of the contaminated sites should be designed to provide protection to the water resources, food security and human health, this does not happen.

23 uranium sites have been proposed for closure in Romania, yet only two have been fully shut down. There are also 23 uranium ore dumps in the country. Some material from these waste rock piles has entered farmland. Animals drink water from streams containing heavy metals and radionuclides, yet the authorities only analyze the drinking water. Romanian law does not set a limit for radionuclides in surface water. The National Environmental Guard officials say there are limits to radiation in the water only for humans, but there is "no limit" regarding the amounts in water for wild animals or plants.

A 40-year-old resident shows me a mining gallery in Nucet, Bihor county, shut down with iron bars, as though they were an underground prison, from which water emerges. "What this mine did was destroy the underground springs which no longer bring water to the surface," he says. “There is no place for animals to drink water. The water comes from the mine and then enters into the Criș river. ” He explained that a local entrepreneur made a pond with water from the mine, which he filled with trouts to sell in a market. This is not entirely successful. "Sometimes the fish die in the pond," he says. “In the river higher up in Baița Sat there are no fish.”

The closure of the mines is a difficult procedure involving many Romanian institutions. First, Conversmin is a firm belonging to the Ministry of Economy which has a main objective to supervise inactive mines until they begin a closure process; the National Uranium Company (CNU) is responsible for overseeing the uranium resources in Romania; the National Council for Nuclear Activity Control (CNCAN) is the institution that approves all licenses for supervising and closing the mines, and monitors the decommissioning. The state keeps hold of these and other institutions

in this field, unlike in the Czech Republic, where all the mining and processing of uranium is undertaken by a single entity. CNCAN officials state that they have followed the law regarding individual radiation monitoring of persons exposed to their radiation jobs and have centralized data on the doses, which were within the limits allowed by law.

Also in the agreed limits is environmental radioactivity outside the perimeters of uranium mining and processing, including decommissioning, as well as the discharge of radioactive liquid and gaseous effluents into the environment, resulting from mining and processing. CNCAN says that when the European Atomic Energy Committee (EURATOM) checked the radiological situation at the perimeter of closed uranium mines in 2012 and 2008 in Romania the results were "positive after the completion of both missions." The Romanian Government has promised to invest € 220 million in the closure of 23 uranium sitess, and so far only ten percent of this figure has been absorbed.

CNU has exploited uranium in only a few productive mines: Natra-Dobrei, Ciudanovița, Baița Plai, Avram Iancu and Crucea - Botușana. of Geology. Here 3,600 miners worked before 1989 and now only 130 are employed in only operating mine, in Crucea-Botușana. Initially, closure works and rehabilitation were meant to end in 2009, which was delayed to December 2015 due to the absence of funds. An exact date for closure is unknown. The best example of a failure to rehabilitate Romanian mines is in Ciudanovița and Lișava in Caraș - Severin county, south west Romania.

Clean-up contractors: dodgy political links

In Ciudanovița over a surface of 37,000 square meters, the size of five Olympic stadiums, were deposits of a large amount of uranium waste.The nearby mine of Lișava is one of the main sources of pollution in the county. The project to close and rehabilitate the mines does not have the aim to decontaminate areas outside of their perimeter. These mines were the first included in the closure plan since 1999, but due to an absence of financial resources, the works were not complete. CNCAN assessed and authorized the decommissioning of uranium mining facilities through CNU which was fined in 2001 with close to 2,000 Euro for not meeting the environmental criteria for exploitation, and in 2002 a further 4,500 Euro for not rehabilitating the dumps from mining exploitation.

Now the road between Oravița and Ciudanovița passes through the unloading station for uranium. The buildings have not been decommissioned, and their construction looks unfinished. Contamination can occur via water from reservoirs in the underground mine galleries and from the run-off from the mining waste dumps. The National Agency for Protecting the Environment (ANPM) sets up an annual program to monitor radioactivity of the environment in areas where uranium has been exploited. Although they take different analyzes of water, soil and vegetation, this program does not monitor the radiation emissions in the waste dumps.The National Environment Guard confirms that the mines from Ciudanovița and Lișava are pollution agents and the waste rock piles contaminate the soil with radioactive elements from the uranium mining.

Due to funding interruptions, ecological rehabilitation stopped periodically and a contractor cannot offer continuity of activity to complete the job. These ecological works have begun to degrade, and cannot be summarized, so works will have to start all over again. Delays are caused by insufficient funding to finish the works, and also by the Romanian legislation which must be harmonized with that of the International Atomic Energy Agency (IAEA) in Vienna.

Another reason is bureaucracy. When the Romanian Government in the mid 1990s decided to close these mines there were no standards for radiation protection in Romania, which changed after Romania joined the EU in 2007. Since rehabilitation works stopped, underground water radiation in Ciudanovița and Lișava has grown. by close to three to four times.

The firm that won the majority of contracts to close and clean up the uranium mines in Romania was Castrum Corporation. This was set up in 1992 and is owned by Gheorghe Moiș, who is also its manager. Only July 2002, the firm added a competence the ability to undertake closure works on underground mines. Castrum Corporation is a major shareholder in the firm along with a public institution and part of the Romanian Ministry of Economy, which operates in real estate. Moiș is the cousin of a former Romanian MP and had good relations with the former Ministry of Defense, Ioan Mircea Pașcu , now a member of the European Parliament, who has been on contracts between the Ministry and Castrum. Moiș also had good relations with Decebal Traian Remes, former Minister of both Finance and Agriculture, who has been convicted of corruption. Many sources have alleged that every contract for the closure of mines, companies must pay a kickback to Romanian officials.

Foreign exploiters looking for a uranium rush

Uranium exploitation is not in decline in the EU and entrepreneurs are looking to exploit the bloc's uranium deposits using the argument that this helps the EU fulfill its energy independence. Jahodna Chata is a beautiful ski resort about eight kilometers from the city of Košice, east Slovakia, which is part of the EU's Natura 2000 Network of “protected areas” for valuable and threatened species and habitats. In 2005, the Canadian company announced its intention to mine uranium next to the resort. The Vancouver and Frankfurt-listed Tournigan Energy had several targets in Slovakia for its gold and uranium reserves.

In December 2011, Tournigan Energy announced that France's Areva, a key player in the nuclear power industry and uranium mining, became a significant shareholder of the company. On the same day Tournigan changed its name to European Uranium Resources Ltd. (EUU). Its President Dorian Nicol said in a press release that due to Europe's 186 nuclear power stations and 19 under construction and its high per capita uranium consumption "Europe has an urgent need to develop sustainable uranium production." Nicol stated that EUU would be "the key uranium exploration company focused in Europe".

In March 2012, the EUU announced that the technical report for the Kuriskova project (near the Jahodna Chata ski resort) shows the potential of the area to be among the lowest cost uranium mining in the world. A few months later, in July 2012, the Slovak prime minister stated that nuclear power would become a main energy source in Slovakia as the country's fifth nuclear power plant construction is expected to be completed and operational by 2020. At the end of 2012 , EUU signed a Memorandum of Understanding with the Slovak Ministry of Economy including details of cooperation in Kuriskova uranium deposit. Locals only found out about this sensitive Government-backed deal from a press release.

Martin Ondera is a leading member of the Slovenský Zväz Ochrancov Prírody a Krajiny (SZOPK) a local NGO fighting against the opening of uranium mines in the Košice area. He argues that extracting the ore would cost more than the uranium price on the market. When the company came to start operation at the ski resort. More than 200 protested in front of The White House, the headquarters of the local council and municipality, and asked councilors to adopt solutions against the memorandum. Ladislav Rovinsky is the founder and leader of SZOPK. He underlines that the

company is not being honest with the locals. "The uranium company is deceiving people that the mining operations will be completely underground," says Rovinsky. “But its waste dump will be one km long and very high. All the city's water supplies will be affected. ”

EUU operates in Slovakia as the shareholder of Ludovika Energy. Rovinsky explains that in 2013 this company had no financial reports and fired all its employees. Meanwhile the company sponsored local football teams, golf tournaments, amphitheaters for the World Championship hockey, pilgrimages to Lourdes, and supported the city of Košice when it was European Capital of Culture in 2013. The main attraction EUU offered was the creation of jobs. Initially the number of would-be workers was estimated to be between 60 and 800. "The numbers of jobs are exaggerated and will take between 10 and 15 years before the deposit will be exhausted," Rovinsky argues. "In Košice if you are pro-uranium you are not elected to the local council or as a major."

Because the uranium issue is a political matter, the CEO of the EUU's subsidiary operating in Slovakia refuses to meet the locals, activists or local journalists. Rovinsky adds that SZOPK has proof that the company tried to influence the Local Council. In its turn, the Council can influence public opinion. Reporters' attempts to make Košice's mayor explain his attitude toward the locals, anti-uranium activists or the EUU were in vain. Jozef Marko, the Mayor of Kosice's Assistant, told reporters: "Thank you very much for your questions, but we will not answer the questions."

The Kuriskova deposit is considered the flagship property for EUU. But according to a 12 million Canadian dollar study EUU has ordered, the project is very unlikely to be economically feasible. The EUU tried several times to sell its business and even entered into a joint venture with an Australian company focused on the exploration and development of uranium and associated bi-products in Africa. In March 2015, EUU changed its name into Reyes Resources Inc. The Prosecutor General of Slovakia listened to the locals and the anti-uranium activists and in 2013 challenged the renewal of the company's exploration license.

In addition, recently the Slovak Ministry of the Environment, which administers exploration licenses, issued a statement declaring it will deny the company's application for further extension. Now the company is not asking to explore uranium, but rare earth elements in the area. According to Ondera, rare earth elements are just a pretext for continuing with their uranium activities as they are radioactive too. The company replied in a public press release that after investing 25 million Euros in the region, it will protect its investments. At the same time, the EUU tried hard to sell its business in Slovakia. The EUU's main office address is in Canada in a small building hosting an Asian restaurant called Sidhart Grill.

Invasion of the poisonous sludge

All of the mineralized uranium rock from Slovakia's uranium mines - now closed - was transported to either the former Soviet Union or to a uranium processing plants in Mydlovary and Dolní Rožinka in former Czechoslovakia, now Czech Republic. The Czech Republic is spending billions on rehabilitating its contaminated environment on the site of Soviet-era uranium mines. However the same company that remedies the land and analyzes the levels of radiation is also running existing uranium mines and plans to open a new mine - leading many to believe this is a conflict of interest.

Mydlovary is a small village in South Bohemia 150 km south from Prague. A chemical treatment plant for uranium ore and a mill operated here have near-destroyed the landscape and ecology. The

plant was opened between 1962 and 1991, creating hectares of contaminated sludge. After the closure of the reprocessing uranium plant, the waste sludge was placed in lignite mine shafts. This radioactive sludge contained heavy metals such as mercury and lead, as well as arsenic, and spread into the surrounding landscape and villages, the air and groundwater. 150 million Euro has been earmarked to reform this site. For the environment, it is often not a uranium mine's residual radioactivity that poses a problem "but rather other heavy metals or constituents such as arsenic originating from the mineralogical matrix," according to Dr. Eberhard Falck, Environmental Science Professor, Versailles Saint-Quentin -in-Yvelines University.

Experts attack the "slow" progress of works on the massive estate of tailing ponds, which began almost 20 years ago and aim to be completed in 2024. Responsible for remediation is Diamo, a state-owned Czech company under the Ministry of Industry and Trade . This slack pace forced local mothers to create an NGO, South Bohemian Mothers (Sdružení Jihočeské Matky) calling for more responsible rehabilitation. "They [Let's] put material such as crushed tires and ash from heating plants to solidify the sludge, then they put soil on top of it," says Monika Machová Wittingerová, who works for this organization. Wittingerová underlines the waste needs to be isolated to prevent water with heavy metals and radioactive substances spreading into the groundwater and surface water. Mydlovary is just one of the locations to face environmental issues in a 150 km radius around Prague where uranium has been mined or processed .

Acid leaks

Stráž pod Ralskem is a town near Liberec, north of Prague, where uranium has been extracted using deep mining and a process of extracting uranium using an acid solution, called in-situ leaching (ISL) between 1967 and 1993. Using the ISL process, the miners dug over 7,000 wells over 5.7 square kilometers on the ground. Here they pumped more than four million metric tonnes of sulfuric and nitric acid and ammonium into the mine through metal tubes, to extract the uranium in a solution form. These chemicals leaked from the production area into the nearby river for more than a decade.The contamination consists of 100 hectares of tailing ponds, millions of tons of underground water with four million tons of chemicals over 27 sqk near drinking water reservoirs.

On the shore of an artificial lake on Revolution Street is the Hotel Uran (uranium in Czech language), part of a leisure zone for lovers of watersports. This lake is surrounded by pipes still in use for uranium extraction. On the lake shore are dozens of yellow trucks which transport waste from uranium processing to a new factory, owned by Diamo. The former factory has been demolished as part of the plan to remediate the environment. However, the dozens of hectares of tailing ponds are visible and unprotected. Only a small sign hidden behind some trees warns visitors this is an area exposed to radiation.

"Hundreds of miners died as a result of having worked in the uranium mines and the impact on the landscape is among the worst environmental disasters in the Czech Republic," reveals a spokesperson for Calla - Association for the Preservation of the Environment. The estimated cost for remediation is almost two billion Euros with a completion date of 2037. In many cases the European Union finances these remediation procedures with up to 85 percent. The ISL method also impacted 266 million cubic meters of groundwater. This water can be contaminated with aluminum at a rate of up to 30,000 times more than drinking water. Local official of Diamo in Stráž pod Ralskem said that until September 2015 almost one billion Euro has been invested in this region for remediation and liquidation of the former treatment plant. "All the scrap is being verified in terms of radioactive contamination," explained the official.

Contaminated material is disposed of in tailings ponds at a rate of 100 cubic meters daily, according to the deputy governor of the Regional Authority of Liberec, Josef Jadrný. "The contamination in this region is reaching as far as 300 meters in depth," he says. However, according to locals and activists there are no independent environmental and health surveys or reports, only analyzes undertaken by Diamo - the company that runs both uranium mining and remediation in the Czech Republic. The locals are not satisfied with the company's methods and explained that cleaning the area was not a priority for the Czech government until the country joined the EU in 2004. We give officials however says its procedure is in accordance with the legislation. The company claims health problems in the region are due to natural radiation from contamination taking place in the 1950s.

When asked, the Czech Ministry of Environment stated it could not answer any questions regarding uranium mining, the closure procedure or the effect on the environment as these are the attributes of Diamo. In the Czech Republic - similar to Romania - there is no national strategy for monitoring the health of former miners or locals. All the data about the former miners are kept secret in Diamo's files. Activists see a conflict of interest as the body controlling all the data on sick miners is the same body that would have to pay out compensation damages to these workers.

We questioned the company about such analyzes. "I remember just one case in 2007 when a former miner had been evaluated," says the Diamo official in Stráž. There is also a further conflict of interest, as the very company with a monopoly on information on uranium mining and its effects and the environmental rehabilitation of former mines, currently runs uranium mines and plans to re-open mines.

Rožná: the last soviet outpost

The entry to the Dolní Rožínka uranium mine shaft resembles the tracks and carriages of a rollercoaster. Close by is a waste dump resulting from uranium mining and a few hundred meters away a pond is fenced off with solar panels around the perimeter to keep out prying eyes. The whole area is full of ponds which are barely visible because the terrain has been overgrown with dense forests. A wooden sign reveals how in 1970 this area was declared a protected landscape area called Green Heart - one of the best protected areas in the Czech Republic. However, this sign say nothing about the ecological disaster that took place here.

Since the Communist period, uranium mining has been active at 66 sites in the Czech Republic with the largest uranium deposits found in Stráž pod Ralskem, Jáchymov, Příbram, and Rožná. In total, the Czech Republic has produced 6.33 million sqm of tailings ponds. Except Stráž pod Ralskem the only mining production continues at Rožná site, south-east of Prague, which produces 224 tonnes of uranium per year. Besides the mine itself and the waste rock piles, tailing ponds and the outflow of the contaminated mine water there is also a uranium processing plant. Public trains pass daily beneath the contaminated plant's conveyor belts.

This mine has been active since 1958 and, while workers received an excessive amount of radiation, it is criticized because uranium ore is low in quality and dealing with waste is expensive. Beyond a layer of trees many unprotected tailing ponds lie hidden. Nature has begun to take back the land. Agriculture is growing next to several dozen meters where for decades the contaminated materials ave been dumped. The flock of wild ducks is nesting in a tailing pond, connected to pipes from which yellow chemicals are pumped.

If the dumps and tailing ponds were not enough, the Czech authorities also want to build the largest deposit of radioactive waste a few kilometers from Dolní Rožínka. "No Repository at Kraví Hora" is an NGO whose representative Martin Schenk campaigns against the deposit for radioactive waste and spent fuel. His main concern is the passivity of the locals mainly due to the lack of information, which is monopolized by Diamo. "The main contamination is in people's minds," he says. "They see uranium as something that can never harm them."

There are no independent analyzes and Schenk says that if the Czech Republic wants to invest some money in a survey, “sooner or later we'll end up with experts somehow connected to Diamo and even the independent ones refuse to cooperate with us because of their links to this company. ” The best options Schenk said is to contact foreign experts which are expensive for his small organization. We have agreed to give some financial compensation to the municipality where the parcel for the radioactive waste is located.

Hundreds died in uranium forced labor camp

As the Dolní Rožínka mining is due to close in 2017, we intend to reopen an old mine in Brzkov about 50 km farther west. The town's mine was opened in 1981 and closed in 2004 and boasts good quality uranium. The 40-year-old Aleš Bořil was elected as the new mayor of Brzkov in 2014. He alleges there is political pressure to reopen the mine because a local manager of Diamo has a dream to reopen a mine where he once worked. We meet the mayor on the waste rock pile now covered by pine trees near the entrance of the former mine. The layer of uranium waste is here about two meters thick and the vegetation has slowly overwhelmed the waste rock. It was his playground. "Let's say it's the state spent millions of Czech Crowns to preserve it, why not reopen it?" says the mayor. He believes Diamo is putting pressure on mayors and politicians, who see the Czech Republic as an independent state in terms of its nuclear energy. "I'm interested in the future of this place and we want to protect the environment, not destroy it," says Bořil. “When I go to Dolní Rožínka [the site of the open mine] I see a sad place, I don't want here to be the same.”

Even though there are five municipalities that have signed a memorandum against reopening the mine, the Government has not given an answer. That is why all the localities hired a lawyer. "We financially support mayors, and municipalities, and offer seats in Parliament for those who work in the local public administration," the mayor alleges. Jobs are the main argument that politicians use to reopen the mines according to Josef Jadrný, the deputy governor of the Liberec Regional Authority. He believes they are working to preserve the know-how in the country and to allow a huge enterprise to survive. "It's a political reason why this company survives, not the interests of the people," adds Jadrný. "It's a Russian system: mine, mine and mine with no care about the environment and health."

On the Brzkov municipality building there is a large sign which reads 'we don't need mining'. Nearby is a small park where children play. About 50 meters away contaminated old mining trolleys and machinery from the uranium mine are rusting. "90 percent of the people who worked here in the mine are dead," the major claims. "Before when somebody died, the official statement was they died of old age - but actually they died of cancer."

Waste rock piles from uranium mining can be seen at sites along a 150 km circle around Prague. Six kilometers away from the Příbram city center near a small village and hidden behind a thick wood, is the former concentration camp of Vojna. This was built by the German war prisoners between 1947-49 who worked at the local uranium mine. This labor camp was not unique. Four others were

operating in the Czech Republic in uranium ore-rich regions, which was used by the USSR to become a nuclear superpower. In the early 1950s the Czech government filled this camp with political prisoners, who worked in the uranium mine without protection. In the mid 1950s nearly 1,500 prisoners were held here until 1961 when it was closed and used by the military. A total of 501 died here between 1947 and 1961.

When walking inside this camp one can feel the departed soul still asking for help. The waste rock pile near the camp is covered by a young wood the two other heaps in the quiet village rise up like medieval castle towers. At the baseof the piles people disregard the danger. Agriculture is flourishing here even though the mine was well known for problems due to mine tremors. It suffered from seepage, drainage, overflow from the tailings impoundment and precipitation water from the dump released into the site.

Clean-up: massive, expensive, unprecedented

Eastern Germany is viewed as the best example of how to remedy the environment following intensive Communist uranium mining. Land from a vast network of Soviet-era mines has been transformed into a spa, golf-course and horticultural exhibition. However the cost to the German state has been over seven billion Euros - and there are still problems. Following the Second World War, the Soviets took over the mining companies in East Germany's Saxony and Thuringia to cover war reparations. From 1947 to 1953, they exploited German uranium deposits for their nuclear program. At the beginning, many miners were drafted from East Germany, Poland and the USSR.

The institution running the mines was called Wismut. This is based on the German word for metal 'bismuth' which the Communists used to conceal the true nature of mine operations. Wismut mined across the Erzebirge mountains and the Vogtland mountains, close to homes. The total uranium production was 230,400 tonnes - making East Germany the fourth largest uranium producer in history after the USSR, the USA and Canada. In 1990, Uranium production bean to close, and in 1991 the USSR renounced its share of Wismut, which became a 100 percent German-owned state company. In the 1990s, Wismut changed its role from a mining company to a business dealing with decommissioning, cleaning up, and rehabilitating uranium mining and processing sites. Uranium production continues at Koenigstein mine southeast of Dresden, about 150 km away from Prague, Czech republic. During the process of cleaning the mine water, a uranium solution is created and sold on to the USA.

However the mining legacy included 48 mine dumps, 311 million cubic meters of waste rock, and 160 million cubic meters of radioactive sludge (tailings) and 1,520 hectares of waste dumps. Many of these were in or close to densely populated areas. The expected cost for cleaning up the mines is estimated at 7.1 billion Euro, of which around six billion Euro has been spent - this compares to the 20 million Euro so far spent on rehabilitation in Romania. In more than one thousand projects, Wismut flooded underground mines, treated the water, dismantled and demolished contaminated buildings and structures, encapsulated the tailings ponds, and rehabilitated mine dumps. The town of Schlema, once the site of a dump, is now restored as a spa town with a golf course over 57 hectares of a waste dump, and former mining town Ronneburg hosts a national horticultural exhibition. Wismut prided itself on having the largest mining rehabilitation project in the world. However, its officials refuse to meet us.

However, there are still some issues. "In Germany, where a lot of money has been spent to claim the former uranium mining sites, there are still some persisting problems," says uranium expert Peter

Diehl. The company still needs to pump out and treat groundwater from flooded mines over the long-term. Large tailings deposits pose a threat to seepage and from dam failure. "In spite of all the planning and expertise applied, there have been odd failures, such as slumping slope covers and excessive radon releases from drying waste pile covers," says Diehl. In 2008 burrowing mice were suspected of contributing to the slippage of a soil cover for a waste rock pile in Aue, Saxony, which collapsed after heavy rain. This was repaired. Radon levels have also caused some concern. "In Schlema's waste rock pile covers," Diehl says, "there have been rising radon emissions from Wismut's reclaimed waste rock piles leading to public doses above 1 mSv / a target value."

There are concerns that Wismut is not doing anything about the violation of the 1 mSv dose limit, because a new EU directive that will soon become national law in 2018 will not penalize them for doing so. The International Commission on Radiological Protection recommends for the public an average of 1 mSv (0.001 Sv) of effective dose per year, not including medical and occupational exposures. The sievert is a measure of the health effect of low levels of ionizing radiation on the human body. The EC Directive (2013, to be transposed in 2018) states: "Member States shall set the limit on the effective dose for public exposure at 1 mSv in a year."

Wismut officials rejected the opportunity to be interviewed for this article. Miners in the 1940s risked exposure to dangerous quart dust. At this stage narrow galleries and a lack of ventilation in the mines meant there were high concentrations from radon. This led to silicosis and lung disease. Hundreds also died in accidents between 1947 and 1964. "The biggest problem is the death toll among those who worked at the mines in the early years, when protective measures were not taken," says Peter Diehl.

After Wismut stopped operations, 3,700 cases of lung cancer among miners were recognized as occupationally caused since 1991, 100 workers contracted cancer of the larynx, and 2,800 workers quartz pneumoconiosis, according to a report by Central German Broadcasting (MDR) in 2012. This indicates that a connection can be made between uranium mining and occupational diseases - a link that has not been elaborated on in depth in the Czech Republic, Slovakia or Romania.

(Cristian Iohan Ștefănescu also contributed to this story)