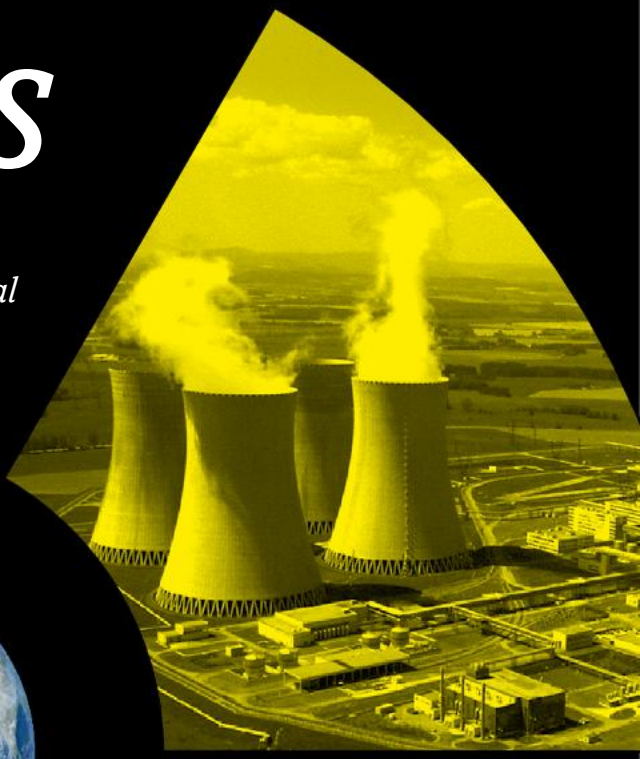
URANIUM *Atlas*

Facts and Data
about the Raw Material
of the Atomic Age
2026



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Atlas

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PREFACE

by Winona LaDuke

A creation story of the Diné, an Indigenous Nation in the Southwest of the United States, speaks of two kinds of yellow dust: the first humans were told that the yellow dust of corn pollen would secure their life. The other yellow powder, however, would endanger it. They were instructed to leave the other yellow powder — uranium — in the soil and never dig it up. If it were taken from the ground, they were told, a great evil would come.

And the evil came. Uranium, traded globally, even has a name reminiscent of this story from the beginning of time. It is called yellowcake. More than three thousand Diné, who are also called Navajo, worked in the uranium mines in the 1950s, without special work clothes or any radiation protection. Covered in radioactive dust, they walked home to their families — and without knowing it, contaminated their loved ones. People are still dying in Dinétah, the land of the Navajo. The danger is not contained, since almost a thousand abandoned mines still contaminate the region.

When we, the Indigenous people of Turtle Island — that's what we call North America in our tribal language — fight against uranium mining, we do this shoulder to shoulder with all Indigenous peoples everywhere in the world, fighting for the same goals. This is not only about our survival, but about the survival of all creatures. We are all one family. The industrial society wages war against the Earth. We see ourselves as children of this Earth, and therefore this war is a war against us. The first inhabitants of the Australian continent delivered a similar warning: He who disturbs the sleep of the rainbow serpent unleashes evil forces that humans cannot tame. The Aboriginals in the Northwest of the continent say that by tearing up the uranium veins, we awaken the sleeping snake. You do not need to be a rocket scientist to see that the nuclear path is one over the edge of a cliff.

Uranium is not just lying there, waiting for exploitation. That is the image the media and textbooks want to convey: raw materials are waiting, eager to uphold Western civilization and the modern world's infrastructure. It should be noted that uranium mining is not the only threat — oil extraction from tar sands also leaves behind dead and uninhabitable landscapes. But what we don't see is where the resources come from and what devastation is left behind after their exploitation. What kind of civilization prohibits its people from learning the truth? In our Indigenous cultures, we teach our kids that we humans are responsible for the consequences of our actions. However, we can only assume this responsibility when we know the consequences of our actions. The industrial society we live in is afraid of the truth.

The best minds in the nuclear establishment for decades have agonized over the question: where to dispose of the nuclear waste? In the United States, one solution appeared very attractive: dispose of the waste on Indian reservations — in a cloak-and-dagger operation! Thus we, the Indigenous people, are at the beginning and the end of the nuclear chain. Each nation committing to nuclear energy must understand that they are complicit. Uranium is killing us.

I refer to another prophecy, this time coming from my people, the Anishinabe, also called Ojibway. This prophecy talks of a time when we will be at a crossroads and have to choose between two paths: one path is worn and scorched, the other hardly traveled and green. We are now at this crossroads. The future is shown as green, also for us Indigenous people. To reduce their CO_2 emissions, the United States needs to build clean power plants with an output of 185,000 megawatts within the next ten years. We can contribute to this goal because where we live, the winds blow regularly and the sun shines as well. The reservations offer a potential of 200,000 megawatts. We, the Indigenous people, are in a position to implement alternatives in the most wasteful and destructive country on Earth. But we need to be alert, since the nuclear industry tries to sell its lies that it is working to save the environment. We must all work together and choose the green path — not the worn and scorched path. Let's meet on the green path. Let's leave uranium in the ground.

Winona LaDuke, born in 1959, activist, author and member of the Anishinabe Nation, lives on the White Earth Reservation in northern Minnesota, USA. In 1977, while just out of high school, she spoke at the United Nations in Geneva and for the first time revealed that most North American uranium was extracted on Indigenous lands.

THE URANIUM PATHWAY

In 10 Steps From out of the Ground to a Legacy of Waste

The Nuclear Age started in 1938 when nuclear fission was discovered. Uranium became the raw material for nuclear bombs and nuclear energy.

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1,000 t of uranium ore => **1 t of uranium in yellowcake** => **7.11 kg** fissile **uranium-235**

1 MINING

Uranium can be found in different uranium minerals. Uranium ore consists of these minerals and the surrounding rock. To extract the ore, varying amounts of material—the spoil—need to be removed, depending on the location. Uranium concentration in the ore varies significantly. For a "normal" uranium content of 0.1 percent for example, 1,000 tons of ore need to be extracted for one ton of uranium. For a long time, **URANIUM WAS EXTRACTED** exclusively using **UNDERGROUND OR OPEN-PIT** mining methods. Starting in the 1980s, **IN-SITU LEACHING** has been the preferred process.

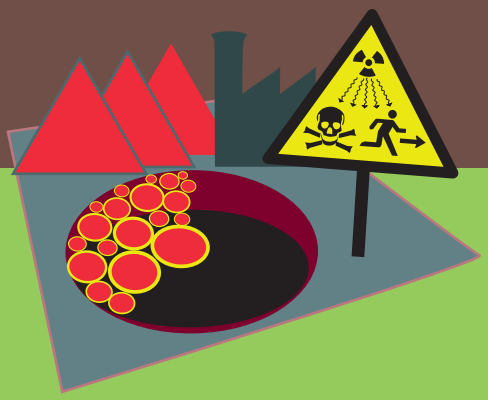
YELLOWCAKE
URANOXIDE-Concentrate
(U_3O_8)
contains
around
75%
URANIUM

2 PROCESSING

With conventional extraction, the ore is mechanically broken up, ground down and the **URANIUM IS THEN EXTRACTED BY CHEMICAL LEACHING**. This produces uranium oxide U_3O_8 with 99.284 weight percent non-fissile uranium-238 and only 0.711 weight percent fissile uranium-235. This uranium oxide, known as **"YELLOWCAKE," CONTAINS UP TO 75 PERCENT URANIUM. THE RESULTING TOXIC SLUDGE, THE SO-CALLED TAILINGS, IS PERMANENTLY STORED IN HUGE ABOVE-GROUND PONDS.**

3 MINING HERITAGE

As much as **99.9 PERCENT OF THE URANIUM ORE IS LEFT BEHIND** in the tailings ponds. Even after a mine closes, tailings are the reason that **MINING AREAS REMAIN RADIOACTIVELY CONTAMINATED.** In the US, **THESE REGIONS HAVE BEEN TERMED A "NATIONAL SACRIFICE AREA."** They are mostly located on the lands of Indigenous peoples.

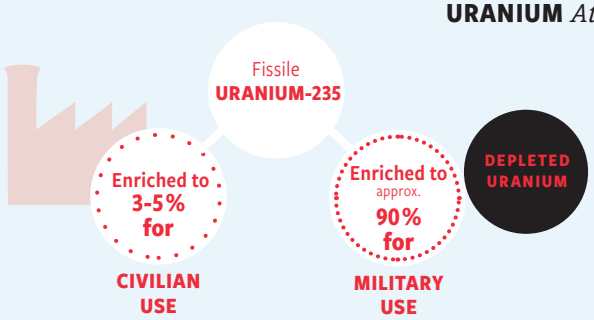


4 CONVERSION

In conversion plants, **YELLOWCAKE IS** first **CONVERTED** into uranium tetrafluoride (UF_4) and then uranium hexafluoride (UF_3) required **FOR URANIUM ENRICHMENT.**

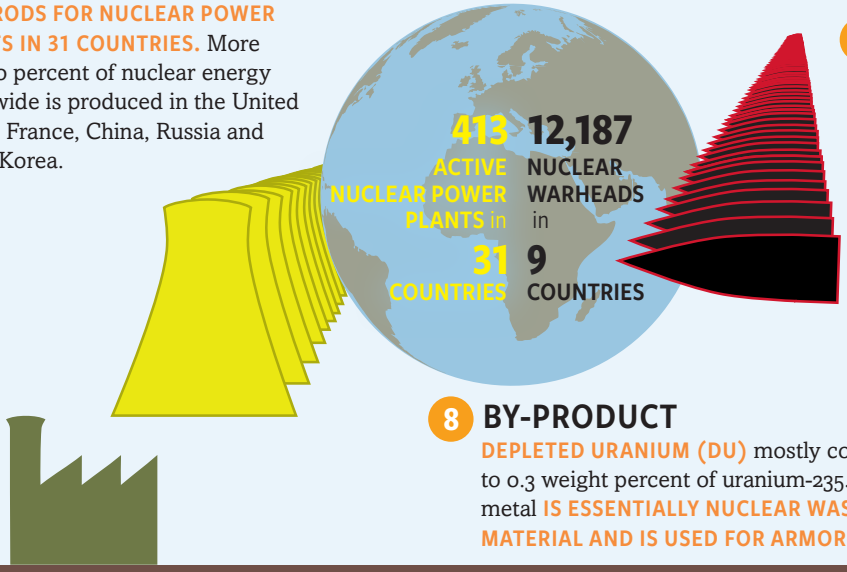
5 ENRICHMENT

There are **13 URANIUM ENRICHMENT PLANTS** operating **WORLDWIDE. GLOBALLY, 38 FUEL-ROD FACTORIES PRODUCE FUEL FOR THE WORLD'S NUCLEAR PLANTS.**



6 CIVILIAN USE

URANIUM-235 ENRICHED TO 3-5 PERCENT, IS USED TO PRODUCE FUEL RODS FOR NUCLEAR POWER PLANTS IN 31 COUNTRIES. More than 70 percent of nuclear energy worldwide is produced in the United States, France, China, Russia and South Korea.



7 MILITARY USE

URANIUM-235 ENRICHED TO MORE THAN 90 PERCENT IS USED FOR NUCLEAR WEAPONS. When a nuclear bomb is detonated, the fissile material (or plutonium) creates a critical mass. This results in a nuclear chain reaction and a nuclear explosion.

8 BY-PRODUCT

DEPLETED URANIUM (DU) mostly contains uranium-238 and only 0.2 to 0.3 weight percent of uranium-235. This extremely dense heavy metal **IS ESSENTIALLY NUCLEAR WASTE, BUT IS CATEGORIZED AS RAW MATERIAL AND IS USED FOR ARMOR-PIERCING AMMUNITION.**

9 REPROCESSING

In reprocessing plants in China, France, India, Pakistan and Russia, **PLUTONIUM IS EXTRACTED FROM SPENT FUEL RODS.** This multiplies the overall amount of nuclear waste by a factor of ten.

10 RADIOACTIVE WASTE

At every stage, from uranium mining to reprocessing, radioactive waste is produced. Worldwide there are approximately 420,000 tons of highly radioactive waste awaiting safe storage—excluding waste dumps at the uranium mines. **NO COUNTRY ON EARTH, WITH ONE EXCEPTION—FINLAND—HAS OPENED A FINAL REPOSITORY TO DATE** for these radioactive waste deposits.

CONTROLS?

The initial task of the International Atomic Energy Agency (IAEA) in Vienna, Austria, was to promote and establish the civilian use of nuclear energy in UN member states. **TODAY, THE IAEA IS STILL PROMOTING NUCLEAR POWER, BUT ALSO FOCUSES ON DETERRING THE SPREAD OF ENRICHED URANIUM AND PLUTONIUM.**

RESISTANCE

Many people living in nuclear states around the world are actively opposed to uranium mining. Resistance is even growing in the countries where uranium is mined. At least 70 percent of the uranium in circulation worldwide is mined on the land of Indigenous communities and tribal peoples. On every continent, Indigenous representatives are demanding: **LEAVE URANIUM IN THE GROUND!**

DEADLY ORE

The horrors of a nuclear war or a nuclear meltdown color public perception of uranium. However, even without such an outcome, the mining of uranium ore harms human life.

The nuclear chain always begins with the mining of uranium to produce fissile material. In most countries, little is known about this first phase. Mining companies and countries where uranium is extracted hide behind a mask of silence concerning the health risks. Operators of nuclear power plants talk about "clean" and low-CO_2 power generation. Fuel rod manufacturers and uranium enrichment plant operators refuse to provide information on where their raw material, uranium, comes from.

Uranium is a chemotoxic heavy metal while and radioactive since it is an unstable element

Uranium exists everywhere on Earth but mostly in very low concentrations. The Rössing mine in Namibia is at the lower end of the scale of mineable deposits with a uranium content of 0.03 weight percent. Yet, there are even plans to mine deposits with concentrations as low as 0.017 or even 0.01 weight percent. The mine with the highest uranium concentration in the world — 13 weight percent — is Cigar Lake in Canada. This means that to achieve a significant yield, large amounts of ore must be extracted in open-pit or deep mining operations: with a uranium concentration of 0.1 percent, 999.9 kilograms of waste remain per ton of ore mined. This waste then contaminates the environment for thousands of years.

Uranium is a heavy metal like lead and mercury, and is toxic to humans and animals. It is also an unstable element, radioactive even in its natural form and thus radiotoxic. It decays into other elements that emit alpha, beta and gamma radiation until, at the end of the decay chain, only stable lead-206 remains. Therefore, the fine and coarse dust released during uranium mining is full of radioactive particles, and the air is contaminated by radon gas — one of the main reasons for the high incidence of lung cancer in miners. Drinking water and the food chain are contaminated by uranium and its radioactive decay products. Even low doses of radiation can still damage an organism.

Miners perform strenuous physical labor and, as a result, can have difficulty breathing. In open-pit as well as underground mining, they are exposed to noise, dust, heavy metals, radon and ionizing radiation. Groundwater and pit waters are contaminated. Consequently, miners are most at risk from work-related and secondary diseases. But their families can also be contaminated via food, clothing, drinking water and toxic and radioactive dust particles.

As early as the end of the Middle Ages, the term "Schneeberger lung disease" was well known. Workers from mines in the German Ore Mountains (Erzgebirge) around Schneeberg suffered from this disease. At the time, nobody could explain the many mysterious deaths. Today we know that it was lung cancer — caused by radon and uranium dust. When uranium and its radioactive decay products disintegrate, they emit alpha, beta, and gamma radiation. Ionizing radiation can kill affected body cells. If the cells survive, their genetic material can be damaged. These diseased cells transmit the damaged genetic material to their "descendants," so that, even decades later, malignant tumors may occur. Since, in addition to ionizing

The Duration of Infinity

The uranium decay chain from uranium-238 to lead-206

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Attacks on Organs, Brain, Fetuses and Bones

The effect of uranium, thorium, radium, radon and polonium on the body

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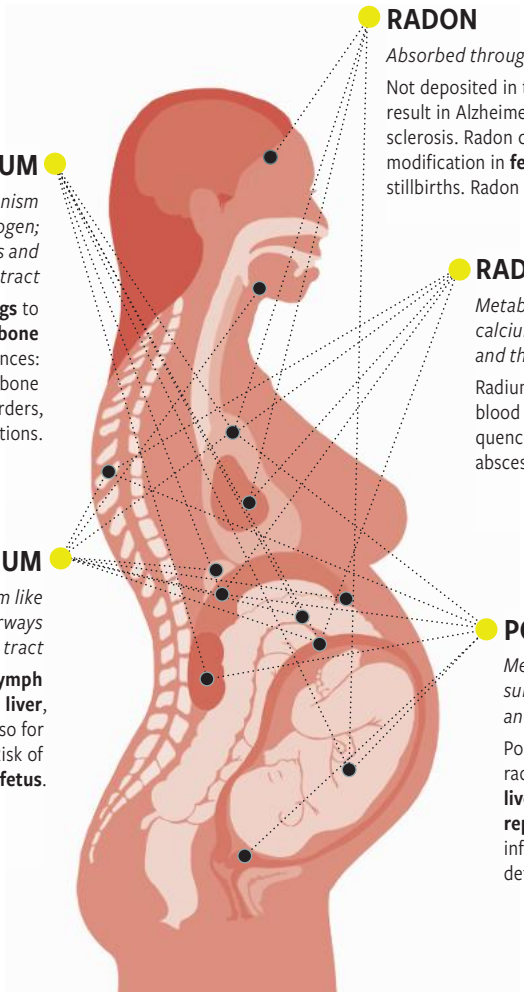


RADON

Absorbed through airways

Not deposited in the body; however, its decay products are. This may result in Alzheimer's and Parkinson's disease, maybe even multiple sclerosis. Radon can cross the placenta. Possible consequences: DNA modification in **fetuses**, enlargement of the **brain**, mental disabilities and stillbirths. Radon is considered the second leading cause of **lung** cancer.

URANIUM

Metabolized by the organism like calcium and estrogen; absorbed through airways and the digestive tract

Transported from **lungs** to **kidneys**, **liver** and into **bone marrow**. Consequences: damage to organs and bone marrow, hormonal disorders, infertility, **fetal** malformations.

RADIUM

Metabolized by the organism like calcium; absorbed through airways and the gastrointestinal tract

Radium is deposited in **bones**, reducing blood and leukocyte formation. Consequences: anemia, jaw necrosis, brain abscess, **bronchitis**, risk to fetus.

THORIUM

Metabolized by the organism like iron; absorbed through airways and the digestive tract

Cancer risk for **lungs**, **lymph nodes**, **bone marrow**, **liver**, **spleen**, probably also for **pancreas** and **colon**. Risk of malformations in **fetus**.

POLONIUM

Metabolized by the organism like sulfur; absorbed through airways and the digestive tract

Polonium is extremely toxic and highly radioactive. It is deposited in the **liver**, **kidneys**, **bone marrow** and **reproductive organs**. Risk to ovaries, infertility, miscarriages and risk of deformities in babies.

With each disintegration of an atomic nucleus, alpha, beta and gamma radiation is emitted. The range of beta radiation is several meters, the range of gamma radiation is much further, whereas the range of alpha radiation is only a few centimeters, in body tissue only up to fractions of millimeters. **Since alpha particles are relatively large, they are 20 times more potent than X-rays** and cause considerable damage to surrounding tissue. For this reason, it is extremely dangerous to absorb ionizing particles through the airways or food.

radiation, heavy metals also have toxic effects, the overall risk of contracting cancer is significantly higher for uranium miners and their families. A fetus is especially vulnerable, since its organism is still developing. Stillbirths occur, and women have fertility problems. Children in mining regions contract leukemia much more frequently than in other regions. For adults, the most typical diseases are lung and throat cancer, cardiovascular and immunodeficiency diseases and mental disorders. Indigenous people in mining regions also report cases of renal insufficiency and an increase in type 2 diabetes. Here, data is still patchy and cannot yet be scientifically proven. However, since the information from all continents is similar, there is a high probability that many diseases are a direct result of uranium mining.

The German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz BfS) in Berlin confirms the findings in a study, the only one of its kind in the world: in a cohort study, 59,000 miners who worked in uranium mines for the Wismut company were examined. The results of this study, published in the *British Journal of Cancer*, show an increase in the lung cancer rate of 50 to 70 percent, as well as 7,000 radiation-induced deaths among the 59,000 study participants (11.9 percent). A significant correlation between time worked in the mines and cancer risk (a 21 percent higher risk per month worked in the mines) was detected. Smokers and non-smokers among the miners had the same increased risk, so smoking was ruled out as a possible confounder.

Nuclear energy clearly violates human rights. For example, miners in Niger and Namibia are officially expected to tolerate a radiation exposure of 20 millisieverts per year — equivalent to 2,000 chest X-rays. In the United States, the Radiation Exposure Compensation Act (RECA) became law in 1990 and recognizes that uranium miners and some downwind communities are entitled to compensation and health care as a result of their exposure to radiation from atomic weapons testing or uranium mining and milling. RECA provides a single 100,000 US dollar payment to workers who may have developed cancer or other specified diseases after exposure. However, many workers died before receiving compensation, while many others have not been approved. After RECA expired in 2024, the law was reauthorized in June 2025. It is currently set to expire on December 31, 2028. ●

Further Information

Health Hazards for Uranium Mine and Mill Workers: wise-uranium.org/uhm.html
British Journal of Cancer: nature.com/articles/6603403; nature.com/articles/6604776

COLONIAL HERITAGE

Until the 1970s, military demand was used to justify uranium mining. It had negative health impacts on local populations from the start, but especially on Indigenous societies.

The US government sourced the raw materials for the Manhattan Project — the development of the first nuclear bomb during World War II — from the former Belgian Congo and from Canada. In the early 1920s, uranium was discovered in the Congolese Shinkolobwe mine and later systematically mined. The ore contained up to 65 percent uranium, higher than that found in any other mine in the world. In Canada, uranium was discovered in 1930 in the region around Great Bear Lake. While no US president has ever apologized for the nuclear devastation in Hiroshima and Nagasaki, the Canadian Dene — themselves victims of uranium mining — did just that, 53 years after the bombs were dropped. Since some of the uranium used for the first bombs came from mining in their territory, they felt they shared a responsibility for the devastation caused by these bombs.

Uranium mining cannot be separated from systemic colonialism. Even a superficial glance at the comparison between where raw materials are extracted and where nuclear energy is used points to the parallels with colonial and neo-colonial exploitation. From the 1940s until the 1980s, the majority of uranium used for US, British and French nuclear bombs and reactors came from existing, former or "internal" colonies. Canadian uranium also came from Indigenous Dene territories, land which they had never ceded. The Dene still suffer from the effects of uranium mining today. Canadian uranium also came from the Elliott Lake region — where the neighboring reservation is still radioactively contaminated. In 2015, the James Bay Cree of Quebec prevented the opening of new uranium mines. A moratorium on uranium mining remains in place in this region. Both the history and the current status of uranium mining are closely linked to the violation of Indigenous rights.

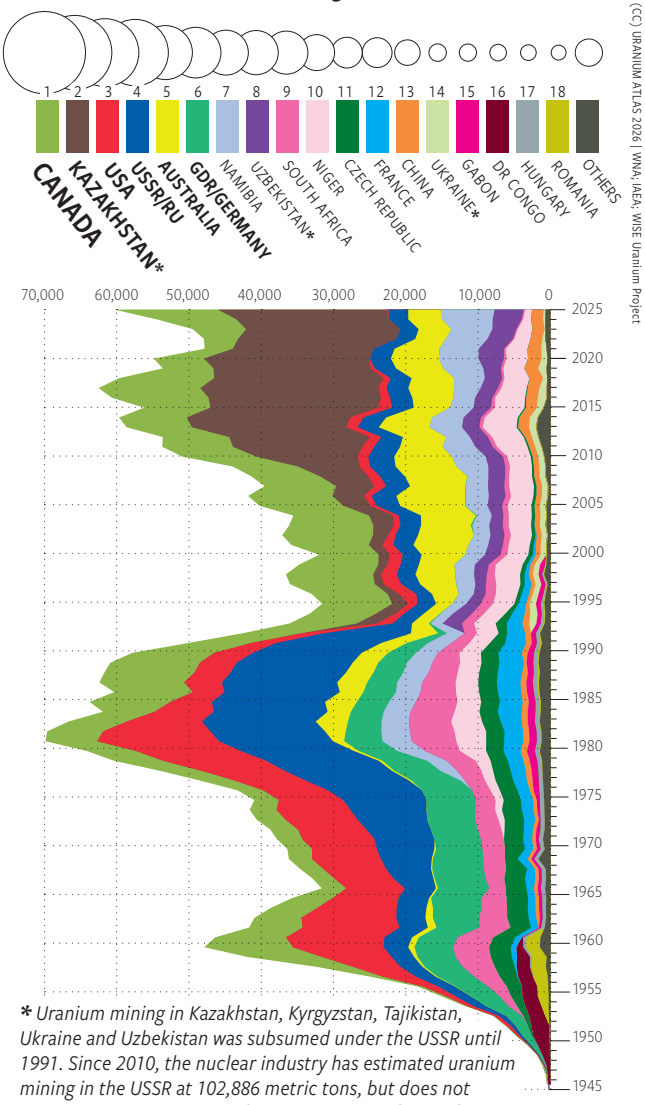
After World War II, the US government issued a buy-back guarantee for uranium mined at home, which attracted vast numbers of private companies; uranium mining in France and the Soviet Union was exclusively reserved for the state. The whole of Africa became of interest, while a huge mining industry developed in former East Germany and in former Czechoslovakia.

Uranium mining began in the then Belgian Congo and Canada. Today, Kazakhstan is by far the most important mining country

It was only in the 1970s, when the civil generation of nuclear energy began, that uranium became a commercial commodity and uranium mining a lucrative business for private companies. While in 1950 barely 4,800 tons of uranium were mined, by 1980 almost 70,000 tons were extracted, more than ever before or since. At the time, the spot market price was more than 40 US dollars per pound of uranium (454 grams). The less attention mining companies paid to the health of their

The Top 18 Uranium Mining Countries

Historical overview of mining from 1945 to 2024 *in tons*

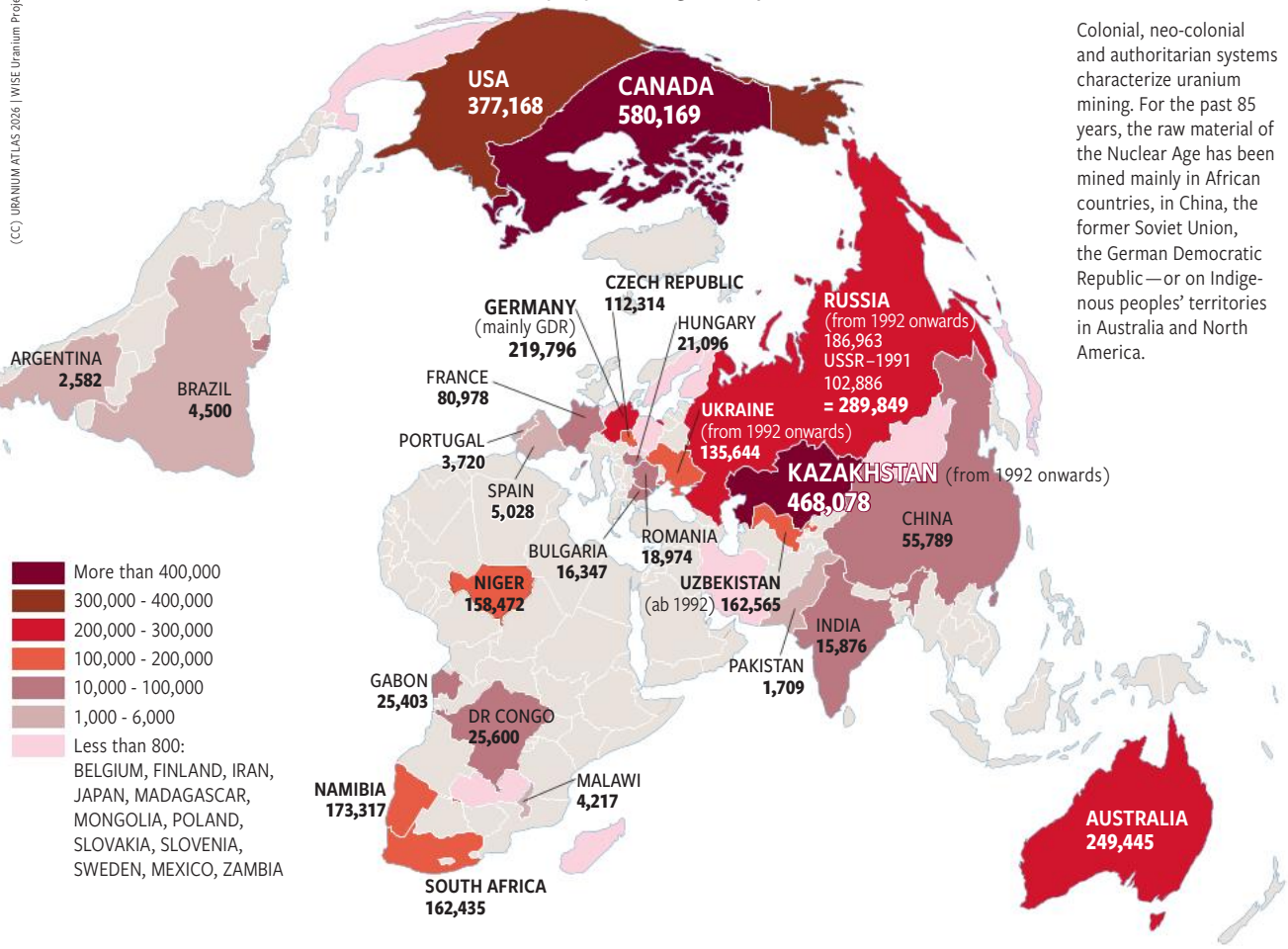


(CC) URANIUM ATLAS 2026 | WNA; IAEA; WISE Uranium Project

***** *Uranium mining in Kazakhstan, Kyrgyzstan, Tajikistan, Ukraine and Uzbekistan was subsumed under the USSR until 1991. Since 2010, the nuclear industry has estimated uranium mining in the USSR at 102,886 metric tons, but does not explain how it came to that figure. Production figures for the USSR and the former Soviet republics remain a mystery.*

Uranium for the World

Cumulative raw material output per mining country from 1940 to 2024 *in tons*

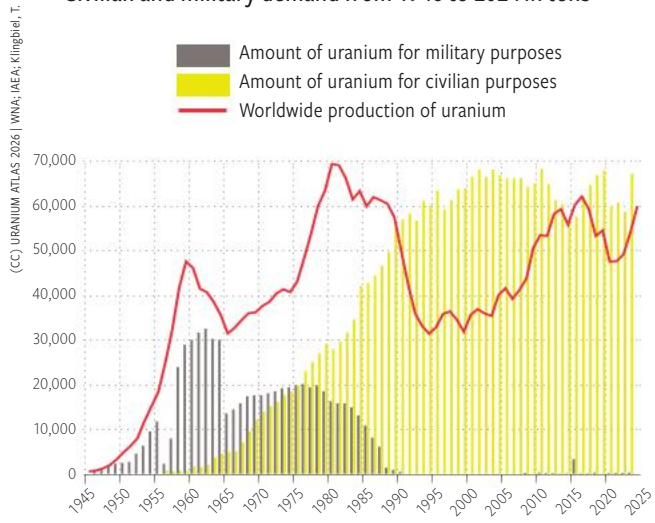


Colonial, neo-colonial and authoritarian systems characterize uranium mining. For the past 85 years, the raw material of the Nuclear Age has been mined mainly in African countries, in China, the former Soviet Union, the German Democratic Republic—or on Indigenous peoples' territories in Australia and North America.

workers and the security of mines and tailings, the higher their profits. And since uranium mining was then—and remains—a non-issue in the minds of the public, hardly anybody cared about essential safety measures, radiation protection and health standards.

Production and Use of Uranium

Civilian and military demand from 1946 to 2024 *in tons*



With the end of the Cold War, the military demand for uranium ended. As a consequence of the Chernobyl nuclear power plant disaster and, in large part, the one in Fukushima, along with the decommissioning of nuclear power plants in Japan, the civilian demand for uranium also fell significantly. Furthermore, after 1990, the nuclear powers began meeting their fuel needs to some extent by dismantling their nuclear missiles. In 2002, the spot market price for uranium plummeted to a historic low of eight US dollars. In 2007, it rose to more than 100, but has since dropped to 31.65 US dollars (as of October 7, 2020). In 2002, only 37,000 tons of uranium were mined worldwide. Because the price of uranium has risen again, 60,213 metric tons were produced in 2024. In early September 2026, the price stood at 89.50 US dollars.

Historically, Canada is the largest uranium producer worldwide: 580,169 tons between 1940 and 2024, contributing one-sixth of the world's uranium supply. Next are Kazakhstan, followed by the US, Russia (and before that, the former Soviet Union), Australia and the German Democratic Republic. As of 2009, Kazakhstan produces the most. However, its government discloses little information about uranium mining operations and certainly none regarding possible problems. ●

Further Information

World map of nuclear devastation: hibakusha-worldwide.org
Worldwide uranium mining: uranium-network.org; wise-uranium.org

SUPPLIER TO THE WEALTHY NORTH

The foundations of colonialism have shaped uranium mining in Africa from the very beginning. For many decades, South Africa was the main uranium supplier on the African continent. Today, Namibia and Niger have taken its place.

In Africa, uranium mining started in the 1930s in the Congo — then under Belgian colonial rule — at the Shinkolobwe mine, where working conditions were horrific. The miners supplied the raw material for the construction of the nuclear bomb, using only their hands and the simplest of tools. The Belgian mining company, Union Minière, had absolute control over all of the country's natural resources. Radiation protection and health and safety were completely neglected. Anyone who opposed this colonial plundering of the country's resources suffered draconian punishments.

Until 1950, one third of the uranium mined worldwide came from this mine and was mainly exported to the US. In 1960, Belgian colonial rule formally ended. However, that did not mean that the country avoided exploitation. The mining operations financed the civil war, with up to 20 billion US dollars of Congolese assets ending up in accounts abroad, according to the *Financial Times*. Golden Misabiko, president of ASADHO Katanga, opposed this government despotism and, in 2009, revealed a secret agreement between President Joseph Kabila (DR of Congo) and President Nicolas Sarkozy (France), which gave Areva, a French state company, exclusive access to the country's uranium resources. Consequently, Misabiko was arrested and tortured before he fled into exile.

With the growing development of nuclear energy in the 1960s, uranium companies started to prospect for uranium in several African countries

The development of nuclear energy shifted the focus to a growing number of other countries in Africa. Although Niger became independent in 1960, the French government and the nuclear company Areva continued their colonial exploitation. Uranium mining began in Arlit at the southern edge of the Sahara in 1971 and expanded to Akokan three years later. However, the uranium wealth brought no benefits to the people, even though 158,472 tons of uranium had left Niger, an amount with a market value of 31 billion US dollars (as of August 2026). The country remains one of the poorest in the world, but with an inheritance — nuclear waste. Twenty million tons of radioactive tailings lie exposed and unprotected around the mines. Background radiation levels are 200 times higher than normal.

Almoustapha Alhacen founded the local NGO *Aghir-in`man* — which in the Tuareg language means "Protection of the Soul" — and had scientists from the French CRIIRAD laboratory examine the Arlit terrain. "What happens there borders on negligent physical injury," reports CRIIRAD director Bruno Chareyron. "In drinking water, for example, the radioactivity is ten to one hundred times higher than the limits recommended by the WHO." A CRIIRAD study published in 2025 confirms that some of the water supplied to Agadez still contains excessive levels of uranium. Following a coup in 2025, the new rulers nationalized the mine in Arlit, revoked further licenses from Areva (now Orano), and invited the Russian state-owned company Rosatom to operate uranium mines.

Niger is not the only African country where Orano prospected for uranium: the company was also active in Gabon, but ended mining operations 20 years ago. Here too, tailings and waste dumps have not been cleaned up.

Rio Tinto, one of the world's three largest mining companies, opened Rössing in 1976, its first uranium mine in Namibia. Additional mines followed — with all the negative effects for the miners: although they continued to receive pay when they were sick, they had to pay their own medical costs. Namibia is currently the third-largest uranium producer and reached an agreement with Rosatom in 2025 to enrich uranium within the country — unlikely in the near future.

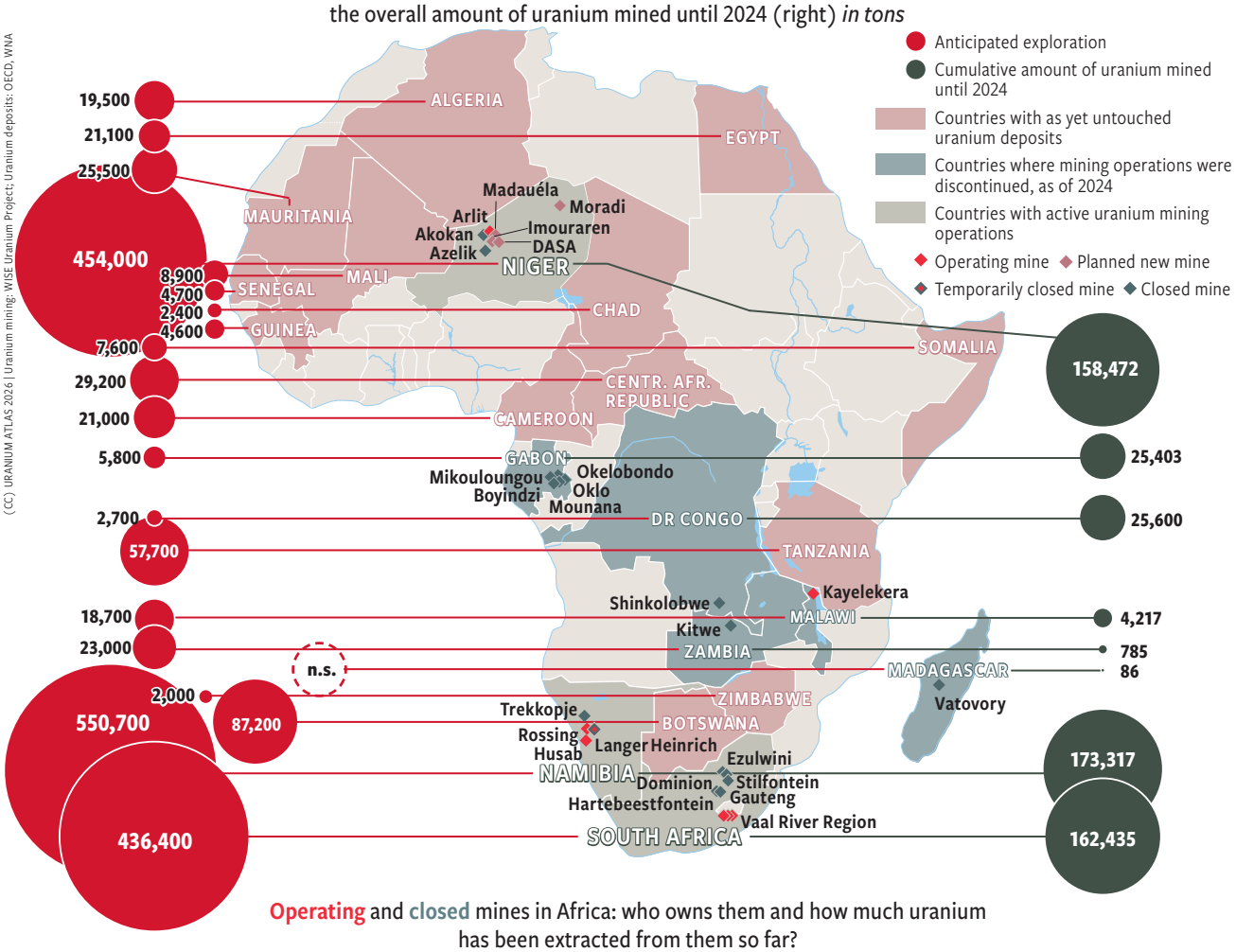
In South Africa, uranium was primarily a by-product of gold mining, yielding enough to make the country the most significant uranium producer on the African continent. With the South African gold rush already underway at the end of the 19th century, and with the mining companies at the time having no interest in uranium, the heavy metal was simply left on the rock piles as radioactive waste. The miners and their families lived right next to these dumps. Since the dumps contain more uranium than some new uranium mines, companies started to mine the waste rock deposits. Under the South African apartheid system, it was a decades-long standard procedure to pay workers who showed symptoms of a disease their last monthly wage and then dismiss them.

Many new uranium mining applications were made over the past several decades, for example, in Tanzania where the German Uranerzbergbau GmbH prospected for uranium from 1978 to 1982. Residents near the Mkuju River project in southern Tanzania expressed frustration, according to human rights activists. "For more than ten years now, they talk about research and exploration. What the people in the neighboring communities get is employment for just a few and for the rest the dust raised by cars and trucks," reports an activist from Songea, who wishes to remain anonymous.

However, because the price of uranium fell again (see p. 35) and no further price increases were expected following the Fukushima nuclear disaster, hardly any new mines were opened. Instead, companies suspended or scaled back their uranium production, or were forced to file for bankruptcy. Areva was bailed out with taxpayers' money to avoid

Uranium under African Soil

The mines of Africa, the amount of unmined uranium deposits (left) and the overall amount of uranium mined until 2024 (right) *in tons*



Operating and **closed** mines in Africa: who owns them and how much uranium has been extracted from them so far?

DR CONGO

◆ **Shinkolobwe**: 25,600 tons, first uranium mine worldwide. Open pit and underground mining since approx. 1938, closed in 1960. Ever since: illegal extraction

GABON

◆ **Mounana**: 5,760 tons, open pit and underground mining, 1960–1999

◆ **Oklo**: 14,649 tons, open pit and underground mining, 1970–1985

◆ **Okelobondo**: 3,144 tons, underground mining, closed in 1988

◆ **Boyindzi**: 2,471 tons, underground mining, 1980–1991

◆ **Mikouloungou**: 85 tons, open pit mining, 1997–1999
Owner of all mines in Gabon: Areva/state of Gabon

MADAGASCAR

◆ **Vatovory**: 785 tons, open pit mining until 1952, state of France

MALAWI

◆ **Kayelekera**: 4,217 tons, open pit mining, 2009-2014, reopened 2025. 85% Lotus Resources, 15% Malawi

NAMIBIA

◆ **Rössing**: 121,187 tons, open pit mining since 1976, 68% originally owned by Rio Tino, since 2018 owned by CNNC

◆ **Husab (Rössing Süd)**: 11,062 tons, open pit mining since2016, 90% Taurus Minerals Ltd (CNNC/chin.), 10% Epangelo Mining Ltd (nam.)

◆ **Langer Heinrich**: 16,416 tons, open pit mining since 2007, 75% Paladin, 25% CNNC

◆ **Trekkopje**: 437 tons, 2011–2013. Formerly 100% Areva, 49% sold to chin. CGNPC

NIGER

◆ **Arlit**: Open pit mining since 1971, up to 2,100 tons/year, originally 64% Orano, 36% Niger, 2024 state-owned

◆ **DASA**: planned; 90% Global Atomic/Canada, 10% Niger

◆ **Imouraren**: planned; originally 64% Orano, 36% Niger, since 2024 100% Niger

◆ **Madauéla**: planned; 80% GoviEx/Canada, 20% Niger

◆ **Moradi**:planned; originally Orano, now COMIREX (Niger), Expectation: 300 tons uranium/year

◆ **Akokan (Akouta)**: 75,000 tons, underground mining since 1974–2021, 34% Orano (frz.), 31% Niger, 25% OURD (jap.), 10% ENUSA (span.), closed in 2021

◆ **Azelik**: open pit and underground mining 2007–2015; 37% CNNC, 33% Niger, 25% Chin. investors, closed in 2015

SOUTH AFRICA

In charge of uranium mining since 1967: the Nuclear Fuels Corporation of South Africa, today an affiliate of Anglo Gold Ashanti.
Main mines:

◆ **Ezulwini** (formerly Randfontein): 217 tons, 2011–2017

◆ **Vaal River Region (Kopanang, Moab Khotsong)**: 4,459 tons, 2011–2022

◆ **Stilfontein** (n.s.)

◆ **Dominion** (n.s.)

◆ **Kompanang** (n.s.)

◆ **Hartebeestfontein** (n.s.)

◆ **Gauteng** (n.s.)

ZAMBIA

◆ **Kitwe**: 86 tons in the 1950s

bankruptcy; Paladin was on the brink of bankruptcy and had to shut down its operations in Kayelekera, Malawi, in 2024. Meanwhile, Chinese companies seized the opportunity: CNNC secured rights to uranium deposits, promoted the exploration of new deposits, quietly began operations at Husab in 2016, and purchased shares in the Langer-Heinrich uranium mine.

Since 2023, uranium has been above 70 US dollars per pound. The Canadian company Global Atomic therefore now plans to open the DASA Mine in Niger, and Rosatom is sticking to its plans to build a pilot processing plant on the Mkuju River in Tanzania. Projects like these also serve as a geopolitical tool for the Russian state-owned corporation. ●

Further Information

Greenpeace: Left in the dust. AREVA's radioactive legacy in the desert towns of Niger
Film: Uranium Mining—What are we talking about? Günter Wippel, 76 min.

(CC) URANIUM ATLAS 2026 | Uranium mining: WISE Uranium Project; Uranium deposits: OECD, WNA

RADIOACTIVE HUNTING GROUNDS

Canada is currently the world's second-largest uranium producer. The Indigenous people, on whose territories the mines are located, were never informed about the hazards and risks involved. The consequences of mining continue to pose a severe threat to their health.

The story goes that, long before Europeans arrived on their territory, a group of Indigenous hunters returned from hunting caribou and pitched camp for the night near the Great Bear Lake.

Among them was a Shaman, who sang and drummed until dawn. When the sun came up, he spoke to the hunters of his vision: men with white skin would arrive and tear up the earth in the very place they were camping. They would drill a hole and bring up something from the depths of the earth. They would make sticks from it, and these would be flown to the other side of the globe by an iron bird. On the ground where the iron bird dropped the sticks, all life would be destroyed. The victims in his vision looked like the people of the tribe, but they were not. In the future, the medicine man warned, people should stay away from the rock.

In the 1930s, when the Eldorado Gold Mine opened on lands belonging to the Sahtú Dene on the Eastern shore of Great Bear Lake in the Northwest Territories, nobody remembered this prophecy. When pitchblende (an uranium oxide) was found, the company abandoned gold and made their profit from extracting radium (a decay element of uranium) instead. Many hunters gave up hunting and took the new jobs offered to them at Port Radium, as the mining area was now called. Unaware of the risks, they carried bags full of ore on their shoulders to the ships waiting in the harbor. Now the hot item was uranium. The shipments were secretly transported to Port Hope in Ontario Province for further processing and, from there, the yellowcake made its way south to Los Alamos, New Mexico. Until 1971, the US government was the sole purchaser of Canadian uranium — mostly for military purposes.

Decades later, many Indigenous miners died from cancer; people began to remember the old warning. The village of Déline, formerly Fort Franklin, home to most of the miners, was soon called "Village of Widows." In 2005, the government issued a report, which acknowledged the poor information given to the people and made recommendations for community improvements; but no recommendations were issued for any kind of compensation. Douglas Chambers, a physician working for the Canadian government, stated in an interview with the Canadian state broadcaster CBC that "the potential risk of cancer associated with transporting the ore concentrate is extremely small, and in fact so small it would not be detectable."

In 1998, a delegation of women from Déline traveled to Japan and asked the Hibakusha, the survivors of Hiroshima and Nagasaki, for their forgiveness, since their husbands had mined the uranium that was eventually used in the atomic bombs "Little Boy" and "Fat Man." It was a pilgrimage: Indigenous people of North America believe.

The largest uranium deposits in Canada were found in 1949 in the Athabasca Basin and in 1954 near Elliot Lake, moving production to the provinces of Saskatchewan and Ontario, where it was mainly the Cree and Anishinabe (Ojibway) who were affected. The Beaverlodge Mining Area was established on the northern shore of Lake Athabasca, a conglomerate of the state-owned Eldorado Nuclear Ltd and the municipality of Uranium City, which became a boom town for three decades with almost 6,000 inhabitants. In 1982, the mines closed and, by 2016, had left behind a ghost town of no more than 73 inhabitants.

In Ontario, Denison Mines and Rio Algom operated a total of twelve mines, and the small town of Elliot Lake awarded itself the title "Uranium Capital of the World". By the end of the 1950s, 74 percent of Canadian uranium came from there. In the 1970s, the miners began to strike, alarmed by the high number of lung cancer cases. These protests were supported by the Anishinabe on the nearby Serpent River Reservation on the northern shore of Lake Huron. Five of the Elliot Lake mines were closed during this time; the other seven in the 1990s. Tailings were cleaned up by Denison and Rio Algom, but without any government approval.

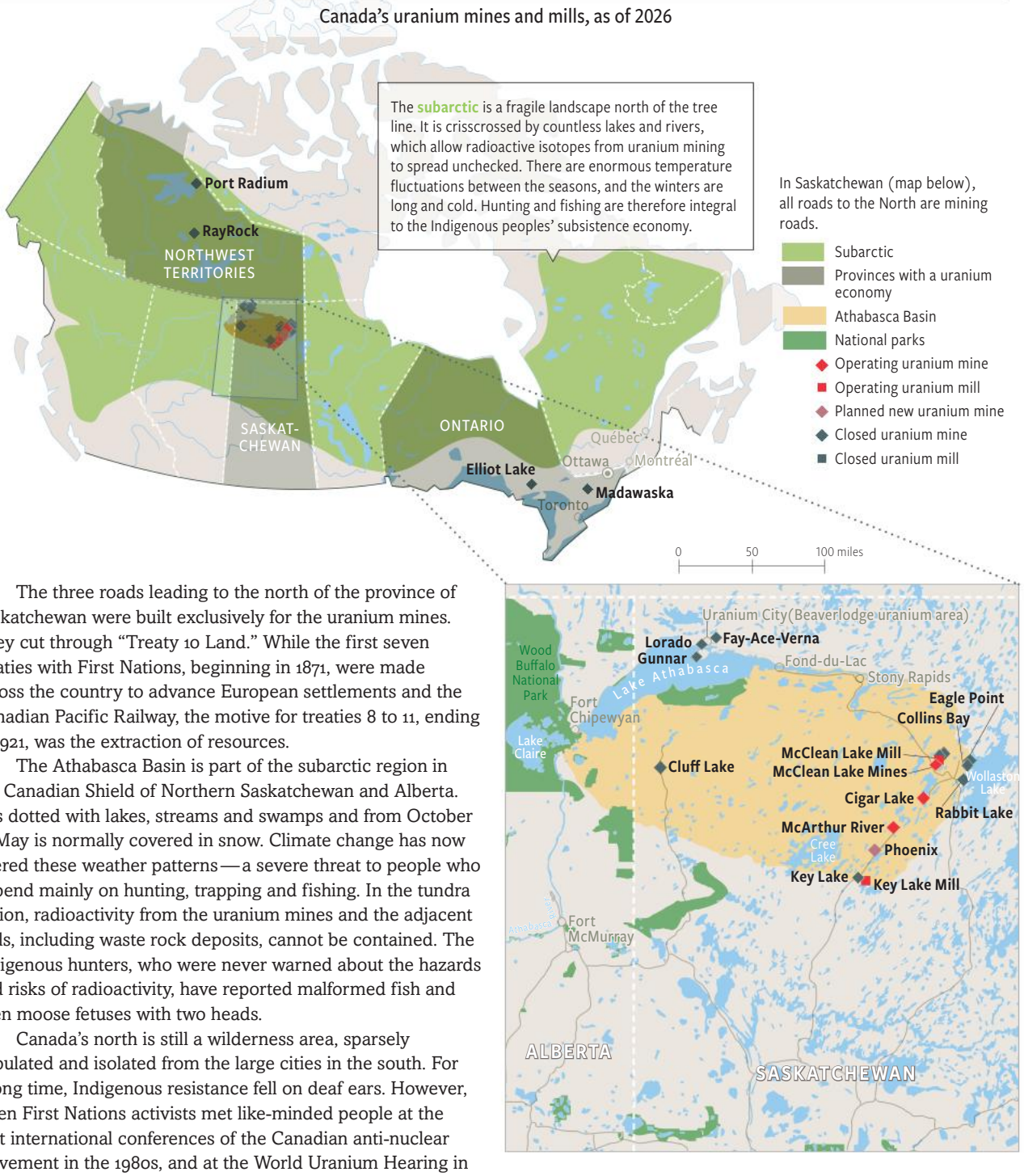
In Saskatchewan, the Gunnar Mine southwest of Uranium City was closed in 1964, leaving behind 4.4 million tons of tailings. The government did not begin cleanup operations until 50 years later, at an estimated cost of around 280 million Canadian dollars. The last working mines remained in Saskatchewan: McArthur River and Cigar Lake.

The subarctic is home to hunting societies: radioactive materials travel easily in the open tundra environment

From 2018 to 2023, the McArthur River mine was shut down by its operators, Cameco and Orano, due to the low price of uranium, while the Cigar Lake mine remained in continuous operation because the uranium content of the ore is exceptionally high — typically between 10 and 13 percent, and in some cases as high as 20 percent. In 2025, after a 17-year hiatus, the McClean Lake mine also resumed operations. Denison Mines Corp. signed an agreement with Indigenous communities in late 2025 to open new uranium mines on the Wheeler River and at Waterbury Lake: The Phoenix Uranium Mine, part of the Wheeler River Project, is scheduled to begin operations in mid-2028, marking the first major uranium project in Canada in over 20 years.

Canada's Uranium Interests Interfere with Indigenous Hunting Territories

(CC) URANIUM ATLAS 2026 | US Department of Energy: world-nuclear.org/information-library



The three roads leading to the north of the province of Saskatchewan were built exclusively for the uranium mines. They cut through "Treaty 10 Land." While the first seven treaties with First Nations, beginning in 1871, were made across the country to advance European settlements and the Canadian Pacific Railway, the motive for treaties 8 to 11, ending in 1921, was the extraction of resources.

The Athabasca Basin is part of the subarctic region in the Canadian Shield of Northern Saskatchewan and Alberta. It is dotted with lakes, streams and swamps and from October to May is normally covered in snow. Climate change has now altered these weather patterns — a severe threat to people who depend mainly on hunting, trapping and fishing. In the tundra region, radioactivity from the uranium mines and the adjacent mills, including waste rock deposits, cannot be contained. The Indigenous hunters, who were never warned about the hazards and risks of radioactivity, have reported malformed fish and even moose fetuses with two heads.

Canada's north is still a wilderness area, sparsely populated and isolated from the large cities in the south. For a long time, Indigenous resistance fell on deaf ears. However, when First Nations activists met like-minded people at the first international conferences of the Canadian anti-nuclear movement in the 1980s, and at the World Uranium Hearing in 1992 in Salzburg, a resistance network was established, which today has found a voice as a united force.

In 2024, the Canadian government, in consultation with the Wabigoon Lake Ojibway Nation and the municipality of Ignace in Ontario, selected a site for a final repository for high-level radioactive waste.

When uranium was discovered in northern Québec, Cree youth responded with a protest march in December 2014. This was followed by a uranium symposium in Québec City, after which the provincial government announced a moratorium until further notice. In 2024, Strateco Resources announced that it would now mine rare earth elements in the region. Up to 24,500 tons of uranium could remain in the open-pit mine tailings. The provincial government in Nova Scotia, meanwhile, lifted a moratorium on uranium exploration and mining in March 2025 that had been in place since 1982. Locals have been protesting ever since due to the looming health risks, most recently in September 2026 with a petition signed by over 10,000 people. ●

Further Information

Excellent overview: ccnr.org, miningwatch.ca
Jim Harding: Canada's Deadly Secret, Saskatchewan Uranium and the Global Nuclear System, Fernwood Publishing 2007

FIRST PEOPLES, LAST TO BE PROTECTED

The story of the Nuclear Age began on the homeland of North America's Indigenous peoples. From uranium mining to atomic bomb tests to the perpetual search for radioactive waste storage sites, the primary target remains Native lands.

On December 2, 1942, shortly after Enrico Fermi and his team achieved the first controlled nuclear chain reaction underneath a disused viewing stand at the "Stagg Field" football stadium in Chicago, the Italian physicist transmitted an encrypted message to his colleagues at Harvard University: "The Italian navigator has landed in the New World." When asked, "How did the natives react?" he answered, "Very friendly!" This coded language told the Harvard researchers that the experiment had been successful. The use of a historical metaphor — the landing of Christopher Columbus in the "New World," which proved disastrous for Indigenous people — was not just symbolic, but typical of the Nuclear Age: The first atomic bomb, Trinity, was developed in New Mexico at Los Alamos, adjacent to the Tewa pueblos of Santa Clara and San Ildefonso. It was then tested in the White Sands desert on Mescalero Apache territory. For its later nuclear tests, the US Department of Defense selected both the Western Shoshone's homeland in Nevada and the Polynesian islands in the South Pacific. When searching for suitable sites for uranium mining and nuclear waste storage, they also considered "Indian lands" the first option.

Starting in 1947, the US government studied the impact of ionizing radiation on uranium miners and their family members, from the Diné, as well as the Laguna and Acoma Pueblos

After World War II, an unprecedented mining boom began when the coveted ore was discovered on the Navajo Reservation (the Navajo also call themselves Diné). From the 1950s until 1971, the US government was the sole buyer, primarily for military purposes. The Diné, many of whom found work in the mines and mills, were neither informed about the dangers nor adequately protected. They worked underground, exposed to radon radiation, and inhaled alpha-emitting particles; after work, they carried uranium-containing dust into their hogans — the traditional earthen dwellings — on their clothing. There is hardly a Diné family that has not lost a member to lung cancer. The high number of cancer patients led to the passage of the Radiation Exposure Compensation Act in 1990. The process of securing compensation remains difficult to this day: those who smoke are ineligible. Most answered "yes" to the question about tobacco use, as they use tobacco in ceremonies, where it is considered a sacred plant.

According to a 2002 study by Doug Brugge of the Tufts University School of Medicine in Massachusetts, the US government knowingly failed to address the health risks faced by the Diné. He states, "scientists who drew attention to the plight early on were ignored by the responsible government agencies." Rafael Moure-Eraso, an occupational physician at the University of Massachusetts, concluded in 1999: "The period from 1947 to 1966 was an opportunity for the government to study the effects of radioactive radiation on Navajo miners." He speaks of "experiments on people without their knowledge." For the Colorado Plateau, where coal is also mined on a large scale, the US government coined the term "National Sacrifice Area" in the 1980s. To date, four million tons of uranium ore have been mined on the Navajo Reservation; in 2005, the Navajo Tribal Council passed a law prohibiting further mining; 521 abandoned mines on tribal lands await remediation.

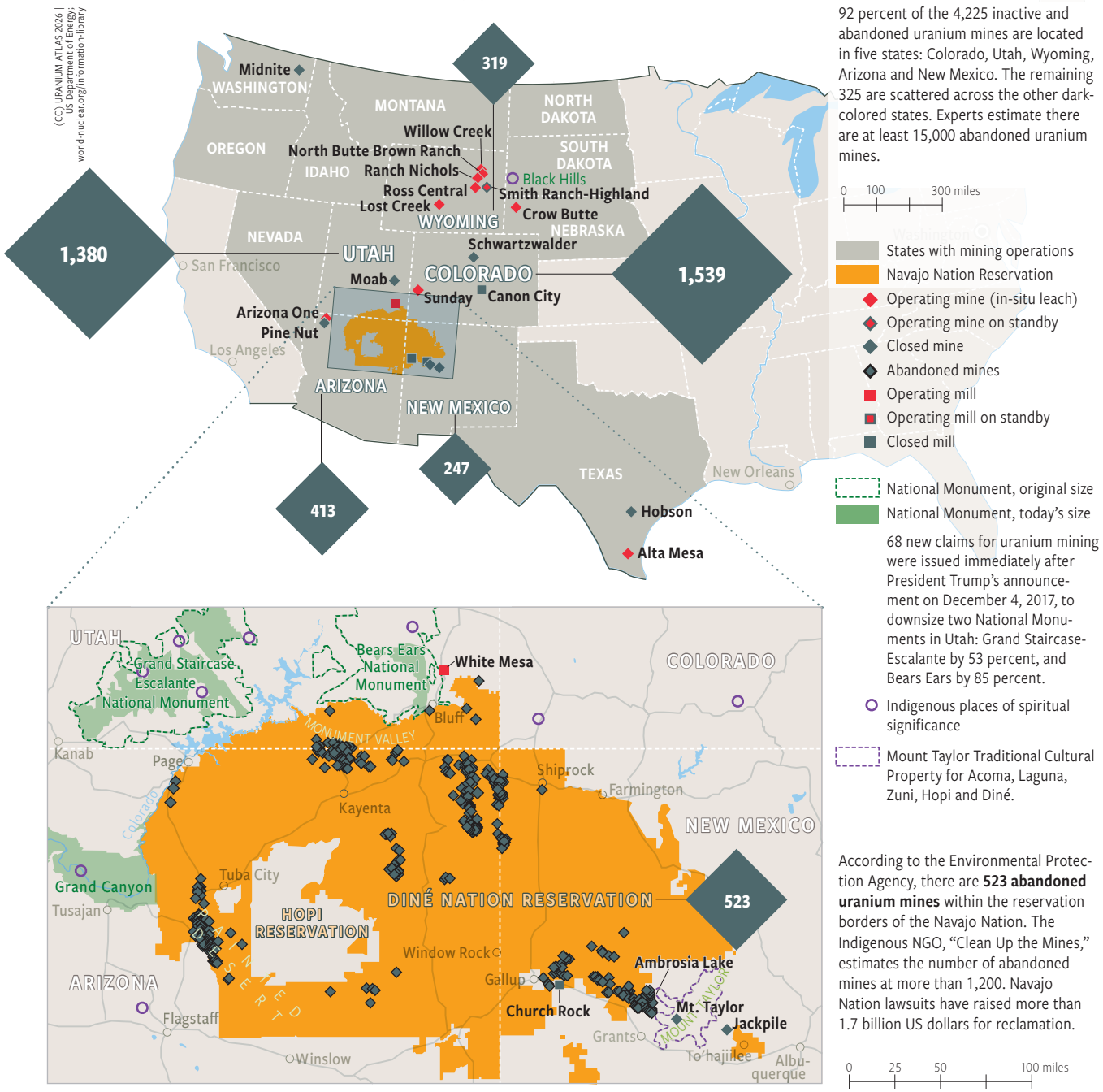
UNESCO designated the Grand Canyon a World Natural Heritage Site in 1979. In 2012, President Barack Obama issued an executive order protecting 4,073 square kilometers from uranium mining. During his first term, President Donald Trump significantly reduced the size of the protected area. Under President Joe Biden, the House of Representatives passed a law guaranteeing a permanent ban on uranium mining in the Grand Canyon and its surrounding area.

Now Donald Trump is president again, and he is once more attempting to boost uranium mining in the US: The federal government spends billions of taxpayer US dollars annually on loans, grants and partnerships with private industry. The US Geological Survey designated uranium as a "critical mineral," a special status that allows producers to avoid certain health and environmental regulations. The administration also announced plans to expand the national strategic uranium reserve, which amounts to a federal uranium purchasing program.

In Arizona, Energy Fuels began mining uranium in 2025 at its Pinyon Plain mine near the south rim of the iconic Grand Canyon. Since production began, arsenic, lead and uranium concentrations in groundwater have increased significantly, putting water for the Havasupai people at risk. Since 2025, federal government support has resulted in seven proposed uranium mines and exploration projects in New Mexico. The proposed underground La Jara Mesa and Roca Honda mines are located on the western flank of Mount Taylor, a sacred mountain to tribal people throughout the region.

The US American Uranium Boom: Where the Atomic Age began

Mining activities in the American West, as of 2025



92 percent of the 4,225 inactive and abandoned uranium mines are located in five states: Colorado, Utah, Wyoming, Arizona and New Mexico. The remaining 325 are scattered across the other dark-colored states. Experts estimate there are at least 15,000 abandoned uranium mines.

68 new claims for uranium mining were issued immediately after President Trump's announcement on December 4, 2017, to downsize two National Monuments in Utah: Grand Staircase-Escalante by 53 percent, and Bears Ears by 85 percent.

According to the Environmental Protection Agency, there are **523 abandoned uranium mines** within the reservation borders of the Navajo Nation. The Indigenous NGO, "Clean Up the Mines," estimates the number of abandoned mines at more than 1,200. Navajo Nation lawsuits have raised more than 1.7 billion US dollars for reclamation.

A law protecting Indigenous culture and religion—the Native American Religious Freedom Act of 1978—has been ignored in the past when granting permits for uranium mining. The Lakota in South Dakota fought in vain against mining in their sacred He Sapa Mountains—the Black Hills—while the Hopi, Diné, and Acoma Pueblo in Arizona and New Mexico fought unsuccessfully to protect their sacred Mount Taylor.

At the 2006 *Indigenous Uranium Summit* in Window Rock, the seat of government for the Navajo Nation, the thousands of open-pit uranium mines scattered across the Midwest—which threaten not only the Indigenous population—were brought to light. Since then, a battle cry has grown louder and louder in the Indigenous world of North America, finding an echo in Africa and Australia: "We have to ban uranium mining!"

As a result, the federal government's strong support for uranium mining has led to equally aggressive local, state and tribal opposition to uranium extraction. A New Mexico state senator is calling for a moratorium on uranium mining. ●

Further Information

Moratorium: sourcenm.com/2026/08/14/new-mexico-senator-calls-for-uranium-moratorium-amid-recent-spike-in-extraction-interest/
Protection of public land: sourcenm.com/2026/09/04/new-mexico-land-commissioner-announces-uranium-mining-ban-on-state-trust-lands/
Excellent resources: sric.org; swuraniumimpacts.org; defendblackhills.org; cleanupthemines.org; wise-uranium.org; uranium-network.org

SECRET ORE

Uranium has been mined in Asia since World War II. To date, most of the uranium-producing countries have made very little information public.

Ming-Kush, Mailuu-Suu, Kajy Sai, Shakavtar, Sumsar, Ak-Tüz and Orlovka — before the collapse of the Soviet Union in 1991, most of these cities in Kyrgyzstan were unheard of. But it was in these places that uranium was mined for the Soviet nuclear weapons program. Ming-Kush in the east and Mailuu-Suu in the south were among the most highly developed cities in Central Asia, but with one giant flaw: they were closed off from the outside world. Nobody was allowed to talk about the fact that these were the locations where uranium was extracted to manufacture nuclear weapons. Uranium mining was suspended even before the breakup of the Soviet Union.

The Kyrgyz Parliament rejected a proposal to resume operations following protests in May 2019, but passed a law in 2024 to develop uranium and thorium deposits.

Uranium mining in Asia began as early as World War II in Tabošar, now known as Istiqlol in northern Tajikistan, to supply the uranium needed to build the first Soviet atomic bomb. In Tajikistan, too, uranium mining and processing were treated as state secrets by the Soviet regime. The last mine closed in 1992; by then, 20,000 tons of uranium had been extracted.

In Kazakhstan, too, uranium was sought as early as World War II, and according to IAEA data, 30 commercially viable deposits containing more than 1,000 tons were discovered by the 1980s. In the mid-1950s, the Soviets began uranium mining, establishing four production centers and covertly extracting approximately 70,000 tons of uranium by 1990. While uranium had previously been mined almost exclusively underground or in open-pit mines, the state-owned company Kazatomprom, founded in 1997, now relies solely on the In-Situ Leaching (ISL) process. Two regions are suitable for this: Chu-Syrdarya in the south, home to the world's largest uranium deposits, and Kokshetau in the north. Because ISL mining leaves no radioactive tailings, the company classifies uranium mining as unproblematic. Scientists see it differently: "In most cases, this technique leads to extreme contamination of the groundwater. At some sites, this contamination has spread over long distances and compromised the drinking water supply," says Gavin Mudd of the Royal Melbourne Institute of Technology in Australia.

In Russia, 93,980 tons of uranium were mined by the end of the Soviet Union. After that, lack of profits forced one mine after another to shut. Today, Rosatom oversees Russia's civilian and military nuclear industries and, consequently, the uranium business (see p. 36). In 2004, the state-owned corporation first used ISL in Dalur; it is now standard practice in the three uranium mines still in operation. In its 2023 Sustainability Report, Rosatom states that all activities are "completely safe" for people. Uranium expert Paul Robinson comments: "In some homes near uranium mines in Krasnokamensk, radon concentrations of up to 28,000 becquerels per cubic meter have been measured; this level is 190 times higher than the threshold at which, for example, immediate measures are required by law in the US." However, no one investigates such cases.

There is also no program to remediate closed mines. Environmental organizations feel the weight of state power and must register as "foreign agents" if they receive financial support from abroad. In 2017, nuclear physicist Oleg Bodrov was forced to step down as head of the organization "Green World" because he advocated shutting down all nuclear power plants in Russia and ceasing uranium mining; Greenpeace Russia was classified as an "undesirable organization" in 2023 and shut down.

The situation is no better in China. In 1964, the country detonated its first atomic bomb and has been mining uranium for power generation ever since. Critics of uranium mining are considered enemies of the state, as demonstrated by the case of NFFA award winner Sun Xiaodi. The Gansu province has rich uranium deposits, and the No. 792 Uranium Mine opened there in 1967. Sun Xiaodi managed a warehouse and, in 1988, began asking questions about health risks and radiation exposure. He was fired in 1994. Because he continued to ask questions and gave an interview to a French journalist in 2005, he was placed under house arrest and sentenced in 2009 to two years in a labor camp for inciting public unrest, reports the medical organization IPPNW.

With a massive expansion of its civil nuclear program, China's domestic uranium production is no longer sufficient

Over 54,000 tons of uranium have been extracted from the ground to date — now by the state-owned CNNC. The country requires approximately 15,000 tons of uranium annually for its 64 nuclear reactors, making it the second-largest consumer after the US. Only 1,600 tons come from within the country; large quantities are sourced from mines in Kazakhstan and Africa in which Chinese mining companies have stakes.

Pakistan tested its first nuclear bomb in 1998 and currently operates six nuclear reactors. The country has produced just over 1,800 tons of uranium to date, with an additional 50 tons expected in 2024. To secure its uranium

Former Soviet Republics are Central Uranium Suppliers

supply, it has long-term contracts with China.

With a total of 535 tons, relatively little uranium has been mined in Mongolia. Although over 100,000 tons of uranium reserves have been proven, mining was halted before the turn of the millennium. However, the Mongolian government has issued 107 exploration licenses. In addition to the French company Orano, Indian, Chinese, Japanese, and Russian firms are interested in resuming mining. So far, nothing has happened.

Due to its nuclear weapons plans, Israel and the US bombed facilities in Iran in mid-June 2025 that, according to their statements, were linked to Iran's nuclear and missile programs. For years, the country has been under international scrutiny like no other: Iran had mined 243 tons of uranium on its own by 2024. It is unclear whether its ability to produce weapons-grade uranium was destroyed by the bombing — which violated international law. And that is the reason the US and Israel started the war with Iran in February 2026.

Alongside Pakistan, Israel, and Sudan, India is the fourth country that has not signed the Nuclear Non-Proliferation Treaty. However, India is the only Asian uranium-producing country with a democratic structure. With its rise to nuclear power status, uranium mining began in 1967 in Jadugoda at a depth of 640 meters. In 2007, according to IPPNW, Indian doctors committed to peace and development surveyed nearly 4,000 households in a large-scale case study. "They found that babies born in the affected area were nearly twice as likely to have congenital malformations as babies in uncontaminated control villages, and that 9 percent of the babies died from them — more than five times the reference mortality rate."

Today, India operates 23 nuclear reactors and has a correspondingly high demand for fuel. Even though the country has over 250,000 tons of uranium reserves, the state-owned Uranium Corporation of India mined only 15,876 tons of uranium by 2024 and has barely increased annual production. This is also due to the potential for democratic resistance, such as the large protest movement near Lambapur-Peddagattu that prevented the development of three underground and one open-pit mine. Similarly, plans for new uranium mines in the Meghalaya region have been put on hold. ●

Further Information

Jadugoda health study: ippnw.org (PDF)
China: savetibet.org/chinese-activist-receives-anti-nuclear-prize-for-campaign-against-uranium-mine-in-tibet

FOR THE BOMB AND BEYOND

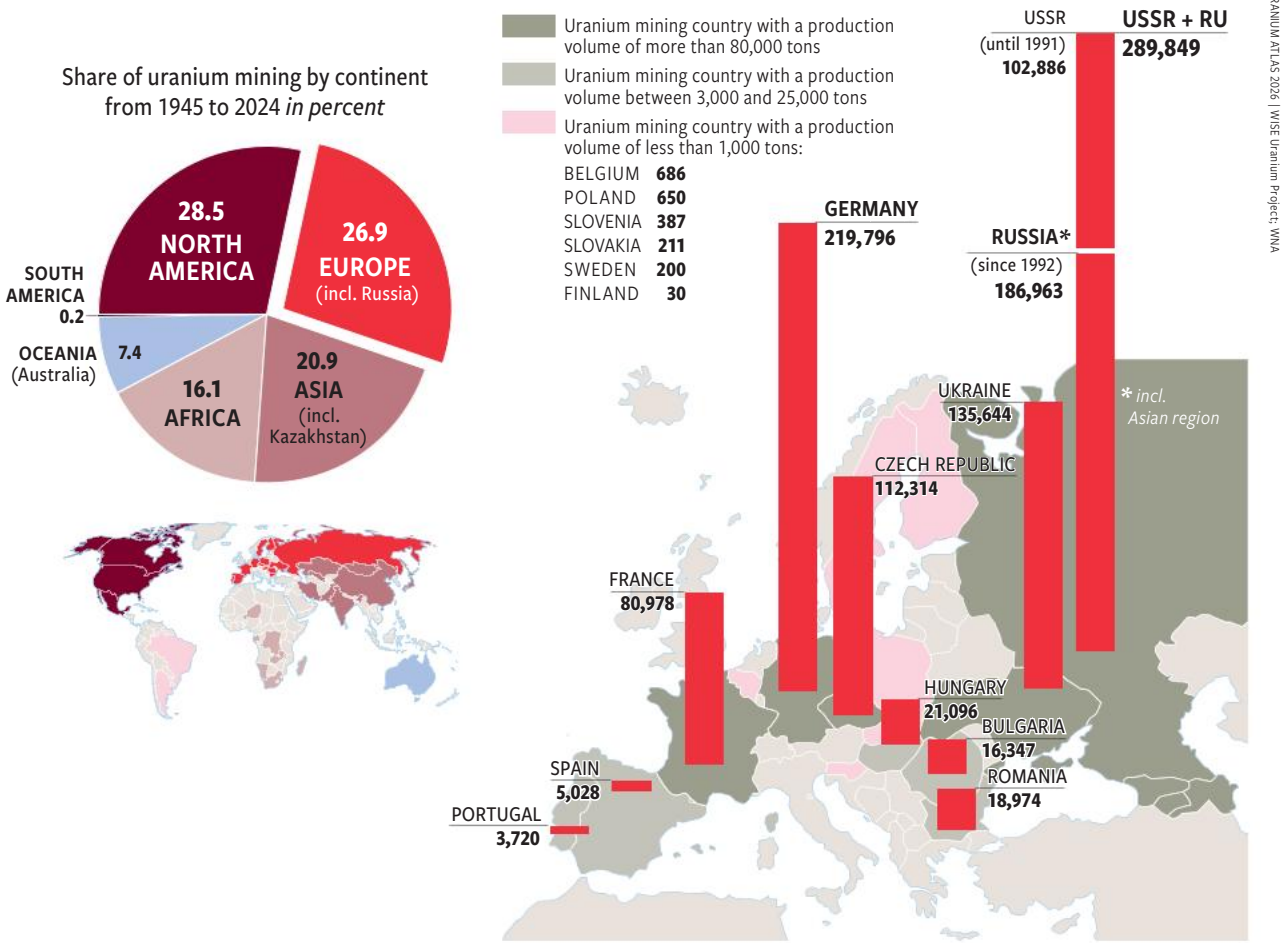
In mid-2026, 98 nuclear power plants were still operating in the EU, making it the world's largest consumer of uranium. The EU imports nuclear fuel, and there is strong opposition to any new uranium mining in Europe.

The last mine in Central Europe was closed in 2017 when the Rožná mine, southeast of Prague, terminated its operations. Rožná opened in the 1950s, employed 4,000 people in its heyday in the 1970s and produced a total of 4,000 tons of uranium. In November 2021, the Crucea mine in Romania — the last remaining operational uranium mine in the EU — was forced to shut down after the national uranium company operating the mine filed for bankruptcy. The company had stayed afloat, propped up by a multi-million-euro loan after Romania's Nuclearelectrica, its sole customer, decided in 2016 to purchase cheaper uranium from Canada. The Romanian government used domestic uranium to build up a sort of national uranium reserve.

Today, uranium mining in Europe is limited to Kazakhstan, Russia, and Ukraine. Yet its history here is also long and fateful. Even during World War II, in January 1945, Soviet geologists

Europe's Share of Global Uranium Production

Cumulative uranium mining in individual countries *in tons*



began searching for uranium in Bulgaria. The Soviets — just like the US with the Manhattan Project — were in a race with Nazi Germany to build the atomic bomb. At the time, much like the US government, they could not predict how quickly Hitler's war industry would produce the propaganda triumph known as the "wonder weapon." After all, Otto Hahn had conducted the first controlled nuclear fission in Berlin in 1938. After World War II, the Soviet Union's bomb project continued. Thus, by the end of May 1945, explorations began in Jáchymov, Czechia, and in the Ore Mountains. Driven by the arms race during the Cold War, people in Saxony and Thuringia extracted 217,000 tons of uranium by the time of German reunification, and over 100,000 tons in the Czech Republic.

Until the late 1950s, miners in the Czech Republic and the GDR extracted uranium ore under the worst conditions; in both countries, many were even conscripted. In total, over half a million people worked for Wismut, the operating company that organized uranium mining in the GDR. In the Soviet Union itself, "only" around 100,000 tons of uranium were mined until its collapse; Kazakhstan and Ukraine only became major uranium producers afterwards. In East Germany, uranium mining ceased after reunification, while in the Czech Republic it did not end until 2017. Over the past 25 years, German taxpayers spent around 7.4 billion euros on cleaning up the legacy of uranium mining in Saxony and Thuringia — more than any other country or company. In the Czech Republic, the government invested the equivalent of 540 million euros by 2020. It plans to spend three times that amount by 2040.

In West Germany, the nuclear industry has also been searching for uranium since the 1950s. Because there were no economically attractive deposits in West Germany, there was never any large-scale commercial mining there. Germany finally shut down its last three nuclear power plants in April 2023. As a result, the nuclear industry now consists solely of the fuel assembly plant in Lingen and the uranium enrichment facility in Gronau. The former is operated by the French company Framatome, which, through a joint venture there, aims to open up access to the European fuel assembly market for the Russian state-owned corporation Rosatom. The Lower Saxony Ministry of the Environment approved this partnership in July 2026.

France had 241 uranium mine sites. Closing the mines did not eliminate the hazards caused by the radon gas they released

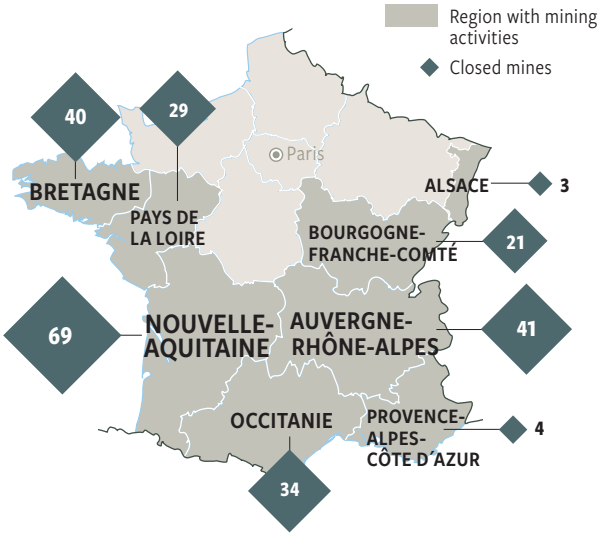
France's nuclear industry had access to larger deposits: 247 uranium mines extracted approximately 81,000 tons of uranium. These included many small mines with only a single shaft, to large mines such as Mas Lavayre or Margnac-Peny, from which 5,000 to 10,000 tons could be extracted. All deposits in France have been largely depleted; the last mine was closed in 2001, and virtually none were properly remediated.

In all of the mining areas in France that radiation protection specialist Bruno Chareyron has investigated with his laboratory CRIIRAD, radiation levels were far above normal background radiation. According to his findings, the radiological risks to residents persist and are by no means eliminated when mines close.

Fuzzy French Numbers

Former uranium mine sites in France

After World War II, the French state scoured the country for uranium in order to keep up with the arms race, resulting in **241 mine sites**. The last one was closed in 2001. However, the exact count is obscured by the presence of multiple small mines at one site, and by efforts of landowners to hide the existence of abandoned mines in order to maintain their property values.



(CC) URANIUM ATLAS 2026 | Inventaire national des sites miniers d'uranium / IRSN 2007

Portugal, on the other hand, which does not have a single nuclear power plant of its own, was also among Europe's uranium producers until 1991, with 91 uranium mines and a total of 3,720 tons. In neighboring Spain, where the last mine closed in 2001, the total was over 5,000 tons. As in most countries with uranium mining, the legacy of this activity has been inadequately remediated.

With nuclear power classified as "environmentally sustainable" under the so-called EU Taxonomy in 2022, the question of whether uranium mining should be revived within the EU has once again become a hot topic. This is particularly relevant because Europe is heavily dependent on uranium and nuclear fuel from Russia (see p. 37) and the EU has committed to "completely ending its dependence on Russian energy."

Nevertheless, there are no signs of new uranium mining projects. In Spain, the so-called Salamanca project has been on hold since the authorities revoked all permits in 2021 and denied a building permit for a uranium mill. Uranium mining has also halted in the Czech Republic, even though since 2022, the government has allowed mining to resume at the Brzkov uranium deposit. These examples show that the end of uranium mining in Europe will not happen on its own. Above all, ongoing protests have so far prevented new mining projects. ●

Further Information

Danish Institute for International Studies: Governing Uranium, Cindy Vestergaard, 2015, PDF
Bulletin of the Atomic Scientists: thebulletin.org
Commission de Recherche et d'Information Indépendantes sur la Radioactivité: criirad.org

BLINDED BY THE NATIONAL MYTH

For decades, France has relied on nuclear weapons and nuclear power. It has mined over 80,000 tons of uranium within its own borders. Niger was exploited for decades. At the same time, the government must keep the nuclear sector afloat with billions in subsidies.

In France, the myth that nuclear power is inextricably linked to the nation's fate is perpetuated at the highest levels. In late 2020, President Emmanuel Macron reminded the public that not only does "our energy and environmental future depend on nuclear power," but so do "our economic, industrial," and "strategic futures." In short: The nuclear sector determines the country's quality of life, independence, and stature.

This myth has a long history: As part of the global arms race, France also decided to launch its own nuclear program. President Charles de Gaulle established the "Commissariat à l'énergie atomique" (CEA) on October 18, 1945. In 1949, the nuclear weapons program was launched; in 1956, the Marcoule nuclear power plant went into operation, supplying exclusively weapons-grade plutonium; and in 1960, the first of four nuclear bomb tests was conducted in the Algerian Sahara (see pp. 46–47).

Uranium was a prerequisite for this development. Subsequently, the search began in 1949. The CEA and the "Compagnie générale des matières nucléaires" (Cogema, later Areva, today Orano)—founded specifically for this purpose in 1976—made discoveries at around 400 sites. Two hundred and forty-seven facilities went into operation: underground and open-pit mines, eight uranium processing plants, and 17 storage sites for uranium mining waste.

Between 1954 and 2001, the CEA, Cogema, and Areva extracted a total of 80,978 tons of uranium from French soil, leaving behind 200 million tons of ore rock, designated "sterile" due to its low uranium content. In 2001, the last domestic uranium mine was closed.

Areva typically filled the entrances to underground mines with sterile rock and replanted open-pit mining sites and tailings piles. By the turn of the millennium, the company had spent nearly 121 million euros on this. In 2006, the French government passed a law to remediate the contaminated sites left by uranium mining, after the radiation research institute CRIIRAD had consistently found radiation levels far above safe limits. However, Areva did not begin more extensive remediation work until after a 2009 TV report caused widespread outrage. Nevertheless, schoolyards, sports facilities, and industrial buildings remain heavily contaminated to this day: the so-called sterile gravel had been disposed of in these areas.

Due to its limited domestic reserves, France began searching for ore deposits in its former colonies early on; Madagascar in 1953 and Gabon in 1960 marked the beginning. Niger followed in 1971. The majority of the 158,472 tons mined through 2024 went to France.

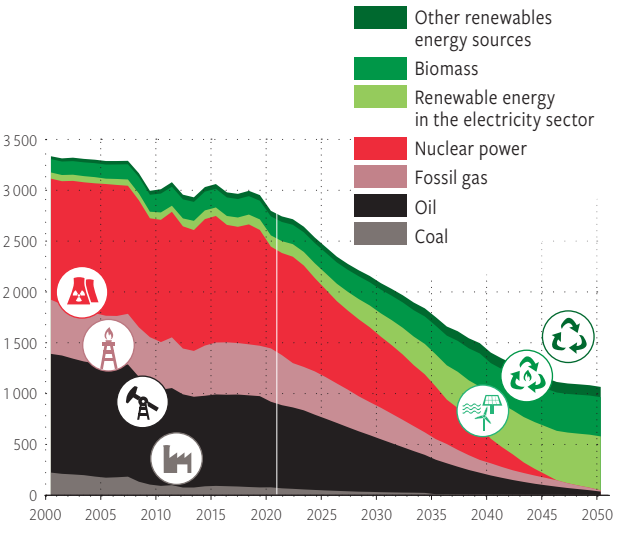
For Niger, the outcome after more than 50 years of exploitation is hardly encouraging. The country has received only about 12 percent of the value of the mined uranium and is one of the three poorest countries (see p. 14). Yet Niger's uranium has covered one-third of France's electricity generation, thereby contributing enormously to the country's prosperity.

Although Niger gained independence from France in 1960, the former colonial power continued to assert its interests: independence was granted only on condition that France retain control over the uranium deposits, and before that, the actual leaders of the independence movement be eliminated, either physically or politically. In Niger, the Francophile Hamani Diori took over the reins of government and established an authoritarian one-party regime overseen by French advisors. When the Société des mines de l'Aïr (Somaïr) and Cominak were founded in 1968 and 1970, respectively, Niger received only a 20 percent share.

France's Energy Transition Plan

Primary energy generation by energy source from 2000 to 2050
in terawatt-hours

In 2003, the négaWatt Institute developed the négaWatt scenario, which has been regularly updated since then, to demonstrate how France could meet its energy needs without nuclear power. The 2021 scenario shows how the country would need to transform its energy mix by 2050 to do without nuclear power or fossil fuels.



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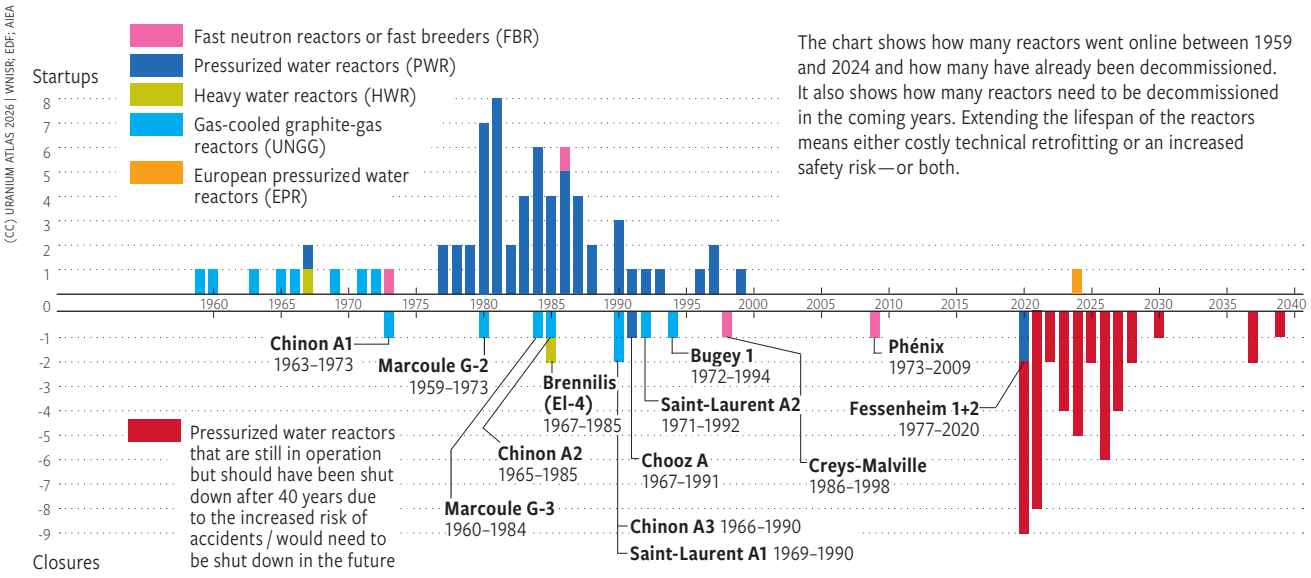
On, Off, or Perhaps On for Even Longer?

Commissioning and decommissioning of French nuclear reactors since 1959 and a projection through 2040



Encouraged by the rise in commodity prices in the early 1970s, President Diori demanded a higher uranium price. In 1974, he was ousted from power in a military coup. French diplomacy supported another military coup in 1996. Relations remained good with President Mamadou Tandja, elected in 1999, until he broke Areva's monopoly in 2006, allowed China to participate in uranium mining in Azelik, and doubled the price of uranium. Although Areva secured a new deposit at Imouraren, Tandja was overthrown in another coup.

Mahamadou Issoufou, elected in 2011, was once again an ally of France, particularly when France launched its "war on terrorism" in the Sahel region in 2013 and, through its military presence, also protected Areva's uranium mines in Niger, where hostage-taking had occurred in the surrounding area.

In 2023, the military government under Abdourahamane Tiani took power. Aware of the heavy metal's strategic importance, it nationalized the mine in Arlit and revoked Orano's mining license. In doing so, the new rulers ended France's role in Niger and set a new geopolitical course: Rosatom is to take over the uranium business in future.

For a long time, Areva described itself as the global market leader in civil nuclear power. However, the company would have gone bankrupt without government aid: The two pressurized water reactors (EPR) in Olkoliuto, Finland, and Flamanville, France, turned into a financial disaster, and in 2007, Areva paid an astronomical price for worthless uranium deposits in the Central African Republic, Namibia, and South Africa.

Construction of the EPR in Flamanville began in 2007, with operations scheduled to start in 2012. After an endless series of technical glitches, the reactor went online at the end of 2024. The French Court of Auditors estimates the costs to be 23.7 billion euros—eight times higher than originally calculated.

President Macron announced the construction of six new nuclear reactors in 2022. However, the financial implications of Électricité de France taking over Areva to save it from bankruptcy mean a three-year construction delay. To continue supplying nuclear power, the nuclear regulatory authority has approved extending the operating life of part of the current nuclear power plant fleet. To remain a nuclear power, France has committed itself to nuclear power for better or worse—and has thus manoeuvred itself into a costly nuclear dilemma. The 3.3 trillion euros in national debt is also attributable to the nuclear sector and results in 70 billion euros in annual interest payments. This is because, as a nuclear power, France has a strong interest in continuing to use nuclear energy so that its infrastructure can also be utilized for military purposes. The connection is evident in the example of the radioactive hydrogen isotope tritium, which must be constantly replenished in nuclear weapons: In the past, the Ministry of Defense operated military reactors to maintain the tritium supply. After shutting them down, it announced that it would use the civilian Civaux nuclear power plant to produce tritium for the national nuclear weapons program. Such connections are common practice in nuclear-armed states.

Construction of the EPR in Flamanville: After an endless series of technical and industrial setbacks, the French Court of Auditors estimates the cost of the venture at 23.7 billion euros

As France's role in the EU grows in light of renewed nuclear rearmament and deterrence, it is also up to Germany to advocate for disarmament—not least so that aging and dangerous nuclear power plants can be shut down. And the nuclear shield may well be extended to cover Germany and other EU states as well. ●

Further Information

Neocolonialism in Africa: Raphaël Granvaud, Areva en Afrique: Une face cachée du nucléaire français
Umbrella organization of French anti-nuclear groups: sortirdunucleaire.org
Film: "Cursed Uranium," Martin Boudot, France, 2021, 48 min.

UNITED KINGDOM

NUCLEAR POWER AND NUCLEAR DEPENDENCE

The construction of the new Hinkley Point nuclear power plant is turning into one of the biggest financial disasters in industrial history. This is hard to explain without considering the United Kingdom's status as a nuclear power. And Sizewell is making the situation worse.

As of mid-2026, nine nuclear reactors, with an average age of 38.1 years, were still online in the United Kingdom. In 2025, these reactors generated 35.9 TWh of electricity — 5 TWh less than the previous year — due to increased outages at the aging plants. Nuclear power thus covered 12.3 percent of the country's electricity demand. Notably, after the last coal-fired power plant — Ratcliffe-on-Soar in Nottinghamshire — closed at the end of September 2024, the UK became the first G7 nation to generate its electricity without coal. In 2016, coal-fired power accounted for 40 percent of electricity production.

Nuclear power played no part in this shift. The key factor was the expansion of renewables, which together covered 44.7 percent of electricity demand, with wind power alone accounting for nearly 30 percent. By comparison, nuclear power peaked in 1997, when it met 28 percent of electricity demand. Because Sizewell B was the last nuclear power plant to come online in the United Kingdom in 1995, and 26 reactors have been decommissioned since then, the importance of nuclear power has been steadily declining.

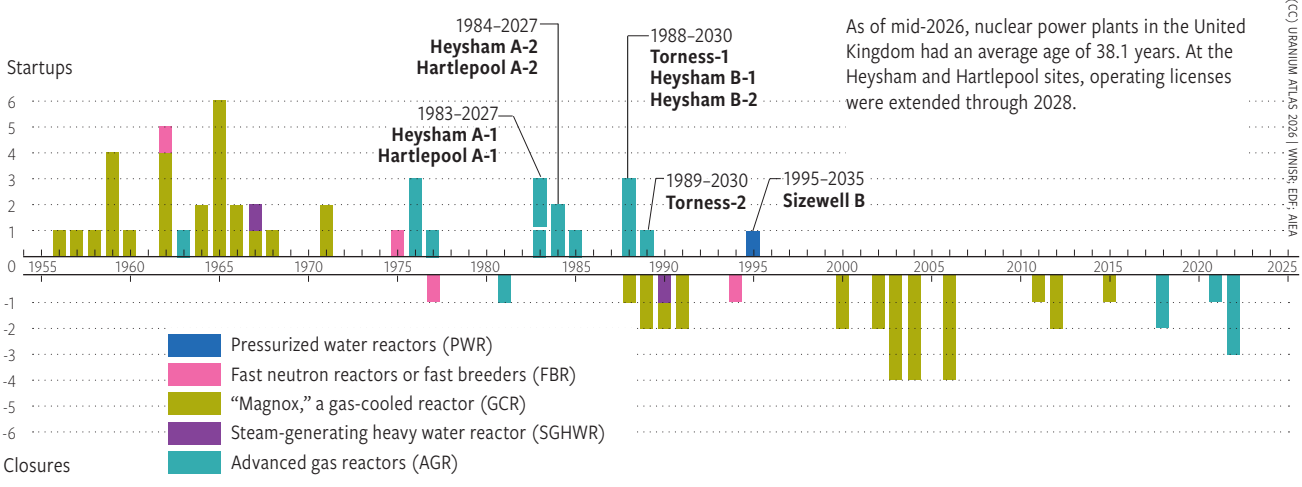
The situation remains unchanged despite the construction of the two European Pressurized Reactor units, Hinkley Point C1 and C2, with a combined capacity of 3.2 gigawatts. On the contrary, the project is turning into a disaster for England and the builder, French state-owned company Électricité de France (EdF), which acquired the nuclear power plant operator British Energy in 2009. In 2015, EdF estimated the construction costs for Hinkley Point C1 and C2 at 18 billion pounds (24.3 billion US dollars); the Chinese state-owned company CNNC contributed 6 billion pounds to the project and left any potential cost overruns to EdF. "We have the expertise, the supply chains, and the teams to build Hinkley Point C safely, on time, and within budget," stated Vincent de Rivaz, then-CEO of EdF. Eleven years have elapsed, and construction costs have risen to 48 billion pounds (35 billion at 2015 prices), equivalent to 64.8 billion US dollars. The originally planned commissioning date of 2025 was first postponed to 2027, then to 2029, and has since been pushed back to 2030. If there is a further delay, additional cost increases in the billions are likely. Hinkley Point C is already considered one of the most expensive projects in industrial history.

The nuclear power plant project is backed by a government-guaranteed feed-in tariff (Contract for Difference, CfD) subsidized by the government: The builders receive £127/MWh (as of January 17, 2026), which is about 17 US cents per KWh. This payment is guaranteed for 35 years and increases at the UK inflation rate. If electricity costs less on the power exchange, the government — that is, the taxpayer — covers the difference.

At the Sizewell nuclear power plant site in Suffolk, on the east coast of England, EdF plans to build two identical reactors. In July 2025, the British government cleared the

The Aging Nuclear Power Plant Fleet in the United Kingdom

UK reactors startups and closures *in units*, from 1956 to July 2025



way for construction and acquired a 44.9 percent stake in the project. The construction costs, estimated at 38 billion pounds, are comparably high to those at Hinkley Point — even though, according to the Research Services of the House of Lords, the upper house of the British Parliament, "a power system dominated by renewables is expected to reduce costs overall compared to the average wholesale electricity market price over the past year." The construction of Hinckley Point is baffling and can only be explained by effective lobbying by the nuclear industry and the country's status as a nuclear power. Environmental organizations and citizens' groups continue to use every legal means available to oppose the project. It would be better, more cost-effective, safer, and free of additional highly radioactive nuclear waste to expand the enormous potential of offshore wind power of the coast of Great Britain in combination with backup systems to mitigate power fluctuations: large-scale battery storage, pumped-storage power plants, facilities for converting excess wind and solar power into synthetic fuels, and reserve power plants where these fuels are then burned. Dogger Bank, the world's largest offshore wind farm with 9 gigawatts, could, for example, be expanded to 13.

As a deterrent, the United Kingdom uses Vanguard-class nuclear submarines carrying up to 16 Trident intercontinental ballistic missiles

The United Kingdom has no uranium deposits worth mining, so its nuclear power plants remain dependent on imports from uranium-producing countries. Currently, these are mainly Canada, Australia, and Kazakhstan. Because about five percent of the uranium came from Russia in the recent past, the British government decided — in response to Russia's invasion of Ukraine — to phase out these imports by 2030 at the latest, and has since shortened the deadline to 2028. "We have stood up to Putin on oil, gas, and financial markets," said Claire Coutinho, Secretary of State for Energy Security, "we will not allow him to hold us hostage over nuclear fuel." However, the United Kingdom has introduced several exemptions. Activities necessary to operate nuclear power plants commissioned before May 20, 2026, are permitted. The sanctions also do not apply to uranium purchased from and exported from Russia before that date.

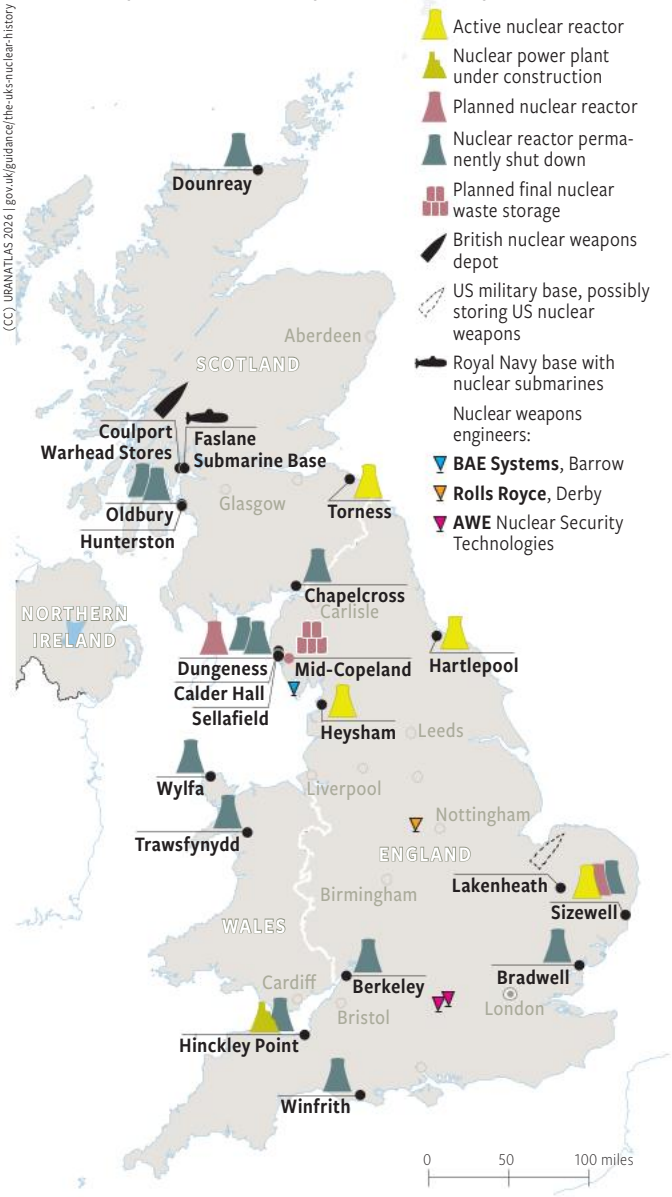
The United Kingdom has been one of the five officially recognized nuclear powers since 1952. The Windscale reactors Pile 1 and 2, used exclusively for military purposes starting in 1950, and Calder Hall — the first British nuclear power plant to also generate electricity, starting in 1956 — were essential to the British nuclear weapons arsenal and supplied the plutonium needed for the bombs.

To this day, nuclear weapons production and the nuclear power industry remain closely intertwined. The United Kingdom currently possesses 225 nuclear bombs, 125 of which are operational (see p. 44-45). Since 1998, the country has relied exclusively on Trident-class submarine-launched ballistic missiles, deployed on four Vanguard-class submarines stationed at the Faslane naval base.

According to the *Campaign for Nuclear Disarmament*, US nuclear weapons have once again been deployed at the US Air Force Base Lakenheath as a result of the war in Ukraine. This has not yet been officially confirmed.

Nuclear Power Country United Kingdom

Power plants, nuclear weapons and final disposal sites



In 2017, researchers at the University of Sussex discovered that the government was using the construction of the Hinkley Point C nuclear power plant to subsidize the British Trident nuclear weapons system. During a parliamentary inquiry, it was revealed that Trident would not be "viable" without the billions earmarked for the construction of Hinkley Point C. From a military-strategic perspective, work on the new nuclear power plant is essential to maintaining the nuclear deterrent doctrine. In the United Kingdom, nuclear power is inextricably linked to the country's status as a nuclear weapons power. ●

Further Information

Citizens' initiatives against Sizewell C: stopsizewellc.org
World Nuclear Industry Status Report 2025/2026, Chapter on the UK: worldnuclearreport.org
United Kingdom Nuclear Weapons, 2024/Bulletin of the Atomic Scientists: tandfonline.com/doi/full/10.1080/00963402.2024.2420550

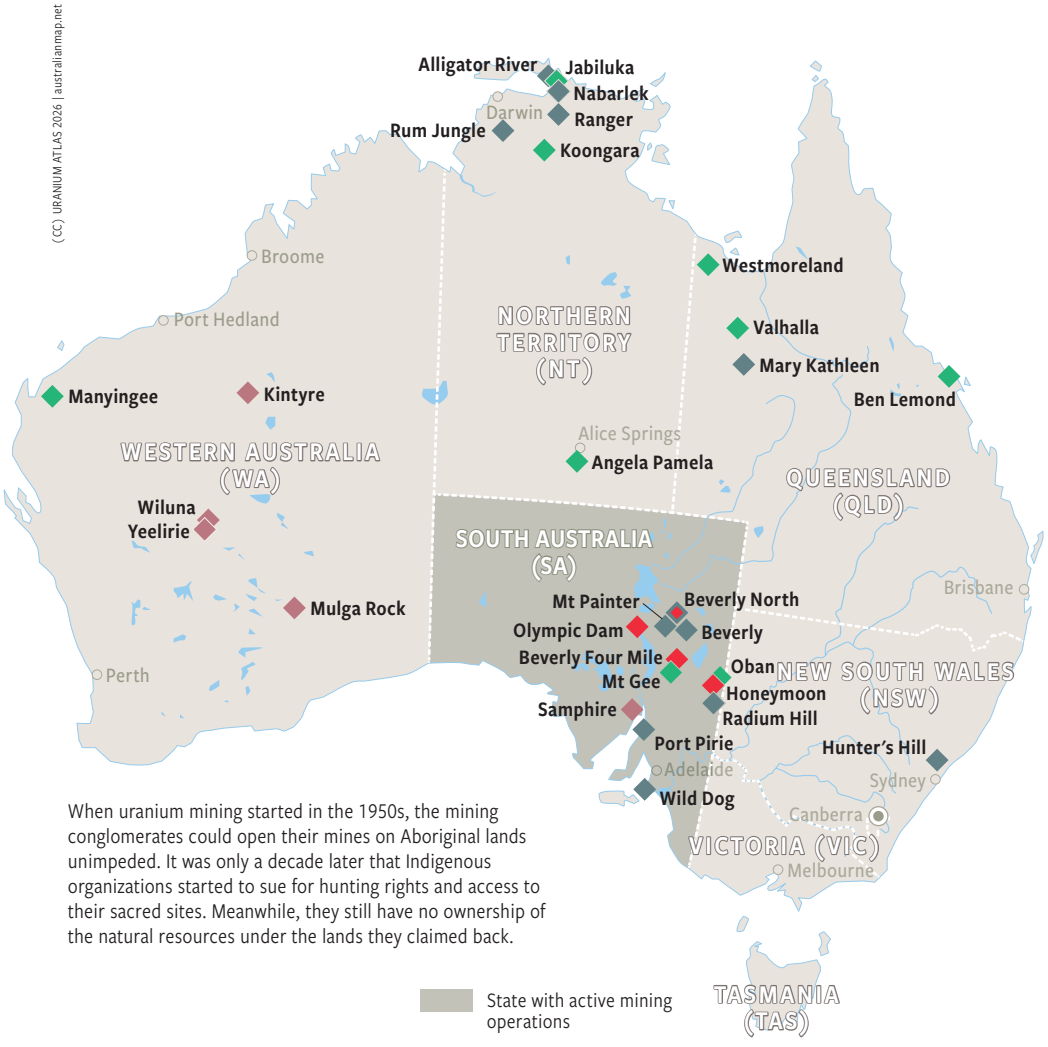
ANCIENT WARNINGS

The first peoples of the continent have a great sense of responsibility for the treasures buried in the earth, treasures that should never be brought to the surface. Their descendants continue to speak truth to power against the uranium mining companies.

In every landscape, the Indigenous people of Australia see a manifestation of the creative forces of ancient times, a power of the past that still resonates today. Thus, their bond with the environment is very deep: humans can never appropriate nature; they can only tend and care for it. The landmass was first settled 15,000 years ago; even today, Aboriginal people remember the names of places that have been underwater for 15,000 years, places named by their ancestors when New Guinea and Tasmania were still connected to the continent via land bridges. Songs and dances help preserve past knowledge in collective memory. This includes warnings not to hurt Earth's interior. The most well-known message is that of the rainbow serpent. The serpent created the mountains and lakes and sleeps under the earth. It is said that its sleep shall not be disturbed; otherwise, deadly forces will be unleashed that humans cannot control. According to today's First Nations people, the rainbow serpent is the guardian of the uranium veins. The late Joan Wingfield, an activist of the Kokotha

Yellowcake Country

Uranium mining operations in the five continental states, as of 2026



When uranium mining started in the 1950s, the mining conglomerates could open their mines on Aboriginal lands unimpeded. It was only a decade later that Indigenous organizations started to sue for hunting rights and access to their sacred sites. Meanwhile, they still have no ownership of the natural resources under the lands they claimed back.

The names of mines and the names of **Aboriginal nations and clans** *on whose lands the mines are located:*

Operating mines
Beverly Four Mile (SA), Adnyamathanha
Honeymoon (SA), Ngurunta, Wilyakali
Olympic Dam (SA), Kokatha

Temporarily closed mines / in preparation for cleanup
Beverley North (SA), Adnyamathanha

Closed mines
Alligator River (NT), Gagudju, Amarak, Iwaidja
Beverley (SA), Adnyamathanha
Hunters Hill (NSW), Wallumedegal
Mary Kathleen (QLD), Kalkatunga, Mitakoodi
Mt Painter (SA), Adnyamathanha
Narbalek (NT), Madjawrr
Port Pirie (SA), Nukunu
Radium Hill (SA), Wilyakali
Ranger (NT), Mirarr
Rum Jungle (NT), Kungarakan, Warai
Wild Dog (SA), Kaurna

Planned new mines
Kintyre (WA), Martu
Mulga Rock (WA), Ngadju
Samphire (SA), Barngarla
Wiluna (WA), Tarlpaa
Yeelirrie (WA), Tjiwarl, Koara

Successful prevention of planned mines
Angela Pamela (NT), Arrernte
Ben Lomond (QLD), Juru, Gia
Jabiluka (NT), Mirarr
Koongara (NT), Djok
Mt Gee, Adnyamathanha
Manyingee (WA), Baijungu
Oban (SA), Ngurunta, Wilyakali
Valhalla (QLD), Kalkadoon
Westmoreland (QLD), Gangalidda, Garawa

Nation in South Australia, gave an insight into the living earth at the 1992 World Uranium Hearing in Salzburg, when she talked about Galda, the stumpy-tailed lizard and the Olympic Dam uranium mine: "The first shaft dug goes right through the stomach of the lizard. At that shaft they mine uranium, the yellowcake, gold, silver, copper, lead, all the materials found in that area. When you open up a real lizard, you will find exactly the same colors you found deep down inside the earth."

Uranium mining started in Australia in 1954, although extractions for medical research began in 1906. By the late 1950s, Australia was the world's fifth-largest uranium producer with overall production of more than 249,000 tons; in 2024, the country ranked fourth on the list of worldwide producers after Kazakhstan, Canada and Namibia. At more than one million tons, the country has the largest mineable uranium resource in the world. Uranium mining has always taken place close to First Nations communities and far away from white cities. For decades, the traditional owners of the lands were not granted any land rights, so when mining operations started, there were neither negotiations nor compensation payments.

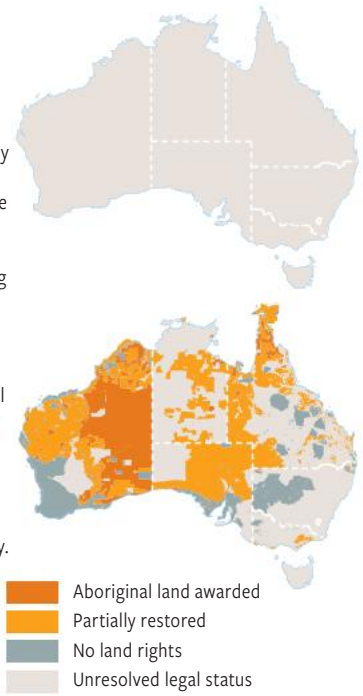
The first concession came in the Northern Territory in 1976: The "Aboriginal Land Rights Act" grants Aboriginal people there the right to prohibit exploratory drilling. Yet very few Indigenous communities knew that once exploration had been approved, it was virtually impossible to block mining operations. Before this law was passed, there were neither negotiations nor compensation governing mining in the Northern Territory. It wasn't until 1993 that the Parliament in Canberra passed the "Native Title Act"—a law intended to secure the traditional land rights of all Aboriginal peoples.

Once "Terra Nullius"

Changes in land ownership in parts of Australia from 1960 onward

1960
In the course of the colonialization of Australia by the United Kingdom and the takeover by white immigrants, Aboriginal peoples were initially completely dispossessed. Even in 1960, they did not own a single square kilometer of the land. The government gave the mining conglomerates unlimited mining rights on Aboriginal land.

2025
Since the mid-1960s, Aboriginal organizations have successfully pursued legal action, as the map shows. By 2025, they had regained control over a large portion of their homeland. The land claims continue to this day.



(cc) URANIUM ATLAS 2026 | Jon Altman/Australian National University

Australia does not operate its own nuclear power stations. Uranium is mined exclusively for export. New mines have been prevented due to resistance from Aboriginal communities

While the government proclaims it as groundbreaking recognition, those affected see it as a continuation of the old imbalance: If a company wishes to mine uranium, they must prove an unbroken connection to their land. A mockery in the eyes of those who have lived here since time immemorial.

Even if a court case is decided in favor of the Aboriginal people, they still have to negotiate with the mining companies. If they cannot reach an agreement, the company's project takes precedence over the recognition of the Indigenous land title. There is no legal recourse to veto this. Communities and groups that want to deny access are often not even involved in the negotiations, as the companies can choose their own negotiating partners and dangle financial incentives. Queensland, New South Wales, and Victoria currently do not allow mining; however, this stance can change again after any state election.

But despite all this, some successes have bolstered the hopes of the Aboriginal nations: Jeffrey Lee, the last descendant of the Djok, refused to sell Koongara, the land of his ancestors in the Northern Territory. The French company Areva outbid itself to extract the estimated 14,000 tons of uranium buried beneath his lands. Jeffrey refused every single offer and wanted to make Koongara part of the Kakadu National Park. He traveled to Paris with a delegation and was supported by UNESCO, which had already declared the park a World Heritage Site in 2003. At the same time in the same region, Yvonne Margarula (see photo on title page), the Mirrar senior Traditional Owner, and her community had fought against the opening of the Jabiluka mine—and even successfully stopped construction in 2005.

The resistance against the Ranger mine right next to the national park made an impact. Uranium had been mined there since 1980, mostly for Japan, Korea, Taiwan, Germany and the US. More than 200 incidents of environmental contamination have been documented. In 2019, production was finally stopped.

In the Northern Territory, on Arrernte land, the Angela Pamela mine was also successfully blocked. In South Australia, massive protests halted plans to develop uranium reserves in the Arkaroole Wilderness Reserve on Adnyamathanha land. In 2008, however, the state of Western Australia authorized uranium mining; in 2022, the operating company BHP applied for an extension of the deadline for the Yeelirrie mining project, which has faced protests from Aboriginal people since 2009.

The exploration projects Ben Lomond (QLD), Manyingee (WA), Oban (SA), Samphire (SA), Valhalla (QLD), and Westmoreland (QLD) have been suspended (see p. 35). ●

Further Information

Australian Conservation Foundation: Campaign "nuclear free"; acf.org.au
Don't Nuke the Climate Australia: dont-nuke-the-climate.org.au

ENTERING THE NUCLEAR AGE

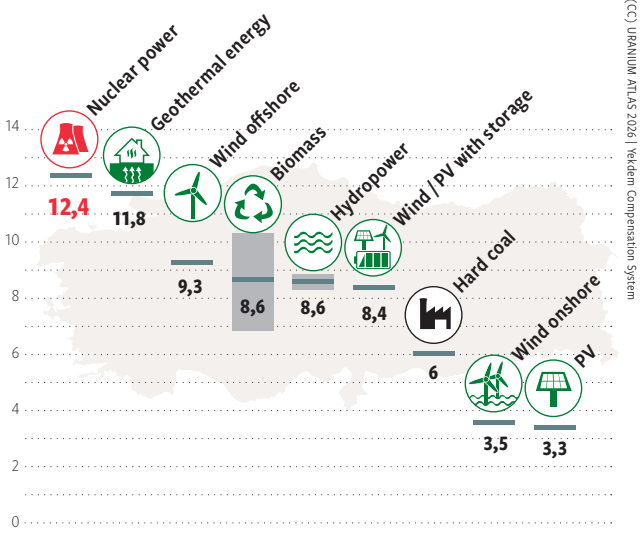
At the Akkuyu site, Turkey's first nuclear reactor is on the verge of coming online. The project raises serious environmental concerns and makes little economic sense. Is the country seeking to acquire nuclear weapons?

Turkey's nuclear ambitions date back to the 1950s. In line with the nuclear euphoria that prevailed at the time in all industrialized nations and much of the world, Turkey established an Atomic Energy Commission in 1956 to introduce nuclear power in the country. As early as 1962, the Çekmece TR-1 research and training reactor was commissioned just a few kilometers west of Istanbul. TR-2 followed in 1981 at the same site. In the interim, a Triga Mark-2 reactor was commissioned on the Ayazağa campus of Istanbul Technical University, the only research reactor still in operation in Turkey today. The first chain reaction was triggered here in 1979.

The *World Nuclear Industry Status Report* (WNISR) notes that between 1965 and 2000, there were four attempts to launch a commercial nuclear power project, but none reached the construction phase. The only remnant from this period is the Akkuyu site in the Mersin region, which received its first site license in 1976. In 2008, Turkey launched its latest nuclear tender and invited 13 companies to submit bids to construct a nuclear power plant. The tender ultimately failed due to exorbitant costs from the sole bidder, anti-competitive price reductions, objections, lawsuits, and the final cancellation of the process.

Turkey: The True Cost of Electricity

Feed-in tariffs for electricity from new power plants in Turkey in 2025, *in US cents per kilowatt-hour*



(CC) URANIUM ATLAS 2026 | Yekdem Compensation System

The first Turkish nuclear power plant only became a reality through the Turkish-Russian nuclear agreement, signed on May 12, 2010, during Russian President Dmitry Medvedev's visit to Ankara. It provided for the construction and operation of a nuclear power plant with four 1,200-megawatt reactors at the Akkuyu site. At the time, the four reactors were scheduled to go online between 2016 and 2019. Due to the Fukushima nuclear disaster and stricter earthquake safety requirements, the reactors were to be commissioned gradually starting in 2019.

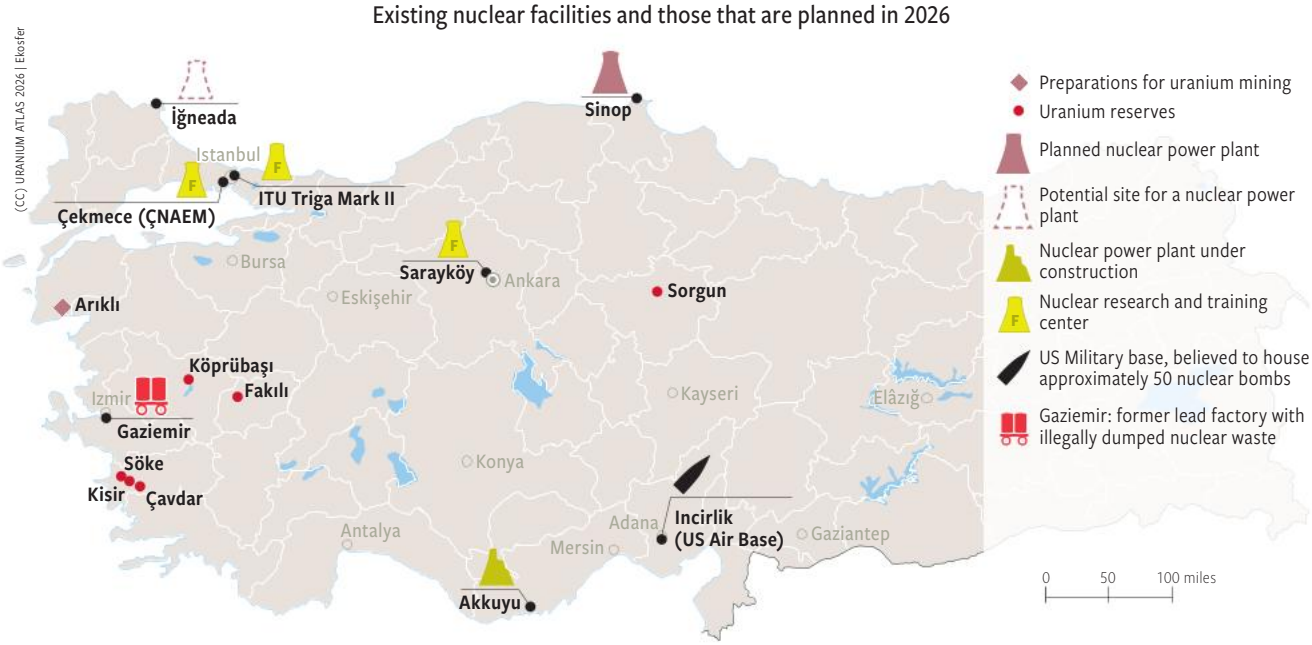
As with all current new nuclear power plant construction projects, the Russian VVER reactors could not be completed on schedule. President Recep Tayyip Erdoğan announced that the first reactor would go online in 2023 to mark the 100th anniversary of the founding of the Turkish Republic. But that was ultimately just PR. *Türkiye Today* reports that Unit 1 of the Akkuyu nuclear power plant is scheduled to come online in fall 2026. One reason for the delay: European sanctions against Rosatom because of the war in Ukraine. Siemens Energy withheld key switching components due to pending German export licenses, and Russian banks were hit with sanctions, which made it difficult to pay wages on site. Whether Unit 1 will actually go online and when the other three reactors will follow remains unclear.

What is certain, however, are the enormous costs the Akkuyu nuclear power plant is imposing on Turkey: The Russian state-owned company Rosatom receives a purchase guarantee of 12.35 US cents per kilowatt-hour for 70 percent of the nuclear power generated by the first two completed units. For the last two units, 30 percent will be purchased at this fixed price. The remaining nuclear power will be paid for at market price. The Turkish Chamber of Electrical Engineers estimated that Rosatom will receive 35.2 billion US dollars under the purchase guarantees within 15 years — three times the current market price.

This disparity is growing, as Turkey has significant potential for renewable energy — and these sources are becoming increasingly affordable. Following the "open" tenders in 2024, wind and solar power plants in Turkey will receive 3.25 and 3.5 US cents per kilowatt-hour, respectively. Suppliers who sell their electricity to the state through Turkey's Yekdem remuneration system receive about twice that amount, at 6.9 US cents. Biomass, geothermal energy, or wind and solar power plants equipped with battery storage are all cheaper than nuclear power.

Nuclear Facilities in Turkey

Existing nuclear facilities and those that are planned in 2026



Nuclear power is thus not only expensive but also inherently carries the risk of extreme disasters. "In Turkey, this risk is even greater, as Turkey is one of the earthquake-prone regions, as the recent disaster has made clear to us," criticizes Özgür Gürbüz, campaign director of the NGO *Ekosfer*. Over 60,000 people lost their lives in February 2023 in southeastern Turkey and northern Syria during a 7.8-magnitude earthquake. Eurasian, Arabian, and Anatolian tectonic plates collide beneath Turkey and have caused powerful earthquakes time and again for eons.

Nuclear power is compensated at 12.35 US cents per kilowatt-hour and is significantly more expensive than all other energy sources

But why does Turkey want nuclear power despite such dangers and despite the immense costs? The country has enormous solar energy potential and has already doubled its solar capacity to 19.6 GW in just two and a half years (as of the end of 2024). In addition, hydro and wind power, as well as biomass and geothermal energy, are available — the full spectrum of renewables. Is the country entering the nuclear power sector to eventually build its own nuclear bomb? After all, the construction of nuclear weapons is inextricably linked to the civilian use of nuclear power. Turkish engineers will acquire knowledge at the Akkuyu nuclear power plant that they could eventually apply in a nuclear weapons program.

Although Turkey signed the Nuclear Non-Proliferation Treaty in 1980, the *Frankfurter Allgemeine* and other newspapers quoted President Erdoğan in 2019 as saying it was "unacceptable" that some countries have nuclear missiles and Turkey does not. And in the same year, the president hinted in his speech to the UN General Assembly that Turkey might be seeking nuclear weapons when he said, "Nuclear weapons should either be banned for everyone or allowed for everyone." Several years have passed since then with no further statements emerging suggesting that Turkey is attempting to acquire nuclear weapons. However, this cannot be ruled out.

There are five regions in Turkey where uranium could be mined. According to the state-run Mineral Research Institute, Turkey has uranium reserves totaling 12,614 tons. The country has not yet begun uranium mining. For one thing, all uranium deposits are characterized by the fact that the uranium ore contains only between 0.04 and 0.1 percent uranium. On the other hand, Turkey has signed a contract with Rosatom under which the Russian state-owned corporation will supply the Akkuyu nuclear power plant with finished fuel assemblies and take back the spent ones. Currently, the Turkish regions where uranium has been discovered are protected from contamination caused by the mining and processing of the ore. Turkish NGOs are working to ensure that this remains the case.

Uranium mining in Turkey may therefore be prevented. It is uncertain whether this also applies to the construction of further nuclear power plant projects. The Turkish government has already announced plans to build eight additional reactors at two sites. Near Sinop on the Turkish Black Sea coast, South Korean and Chinese investors are reportedly showing interest in building new nuclear power plant units alongside Rosatom. In the Thrace region near the Bulgarian border, four reactors are under discussion. There is also speculation about small modular reactors, known as SMRs. However, financing issues may curtail these projects because nuclear power is not competitive without government subsidies. ●

Further Information

World Nuclear Industry Status Report 2025: worldnuclearreport.org
Non-governmental, anti-nuclear organization in Turkey: ekosfer.org

SUCCESSFUL RESISTANCE

For over 20 years, the nuclear industry has been touting a nuclear renaissance. Yet there are hardly any new uranium mines. This is partly because more and more groups are fighting back against the destruction of their livelihoods.

The reality of the nuclear renaissance is as follows: Mid-2026, 107 nuclear reactors will still be online in the European Union and the United Kingdom — 61 fewer than in 1989. One reactor is under construction in Slovakia and two in England (see p. 45). The same applies to North America: Between 1996 and 2026, Vogtle 3 and 4 were completed in the US state of Georgia. Not a single nuclear power plant is currently under construction in the US, and there is only one SMR in Canada. In Canada, however, four reactors were shut down over the past three years.

Japan shut down all 54 reactors following the Fukushima disaster. By mid-2026, 15 were back online, with new projects ruled out. Germany and Taiwan have completed their nuclear phase-outs, while Spain and Switzerland have also decided to do so. Italy phased out nuclear power in 1990 following the Chernobyl disaster, and Austria did so after a 1978 referendum. Although nuclear power plants are being built for the first time in Egypt, Bangladesh, and Turkey, only 31 of the 193 UN member states will be operating nuclear power plants by mid-2026. Nuclear power production and demand for uranium have risen again in recent years, but mainly due to new reactors in China. Only 12 countries will be building new nuclear power plants by mid-2026. Instead of a nuclear renaissance, there is only stagnation.

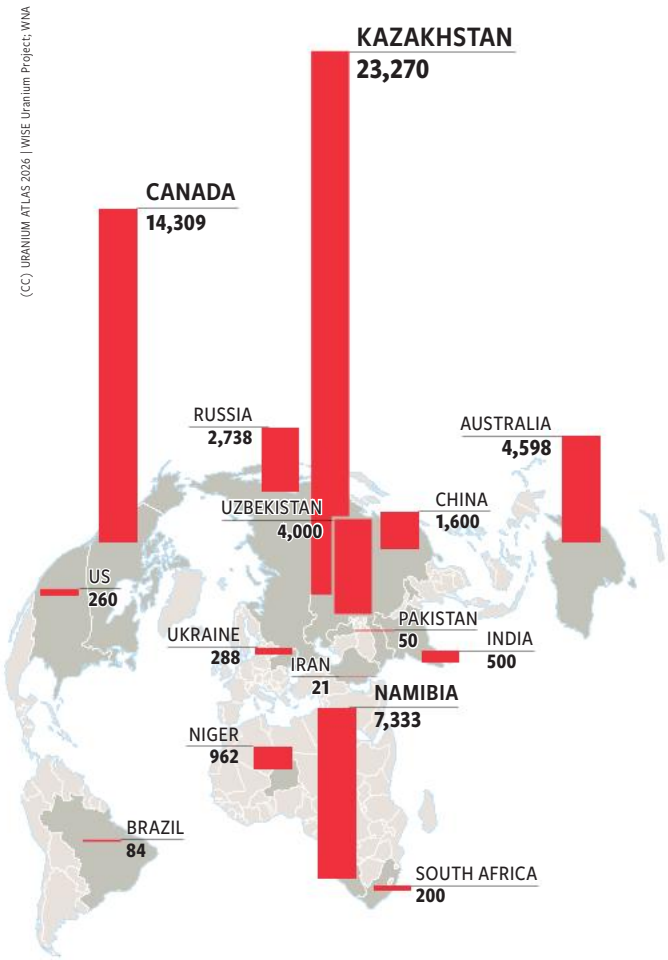
Kazakhstan is currently the leading uranium supplier, accounting for nearly 39 percent of global production. The country has held this top position since 2009. The state-owned Kazatomprom extracts the raw material exclusively using the in-situ leaching process. Because there are no tailings and the contamination remains invisible, government officials refer to it as "clean technology." Not a word about the consequences, such as the dramatic contamination of the groundwater (see p. 38). To prop up the price of uranium, the state-owned company cut production by five percent in 2017 and by 20 percent each in 2018 and 2020, and only slightly increased output again by mid-2025.

Following the 2011 Fukushima disaster, the uranium price remained below 50 US dollars until mid-2023, rendering most mines unprofitable; new ones are rarely being developed, while existing ones are being shut down or sold. In Malawi, Paladin closed Kayelekera in 2014. After a 10-year hiatus, the mine reopened under new ownership. In Niger, Areva (now Orano) invested 1.9 billion US dollars in Imouraren but never began mining; in Namibia, the company shut down Klein Trekkopje years ago because the mine was running at a loss. Langer Heinrich is also located in Namibia and contributed to the Australian company Paladin being on the brink of bankruptcy. In early 2018, the mine was "mothballed" and will not resume operations until 2024. In Mali, Falea lies idle; in South Africa — historically, after all, Africa's second-largest uranium producer — only 200 tons were mined in 2024. In Canada, McArthur River was shut down; in Australia, Ranger Deeps was developed but never brought online, and six exploration projects — already deemed uneconomical — were halted following public protests and a new government policy. In the US meanwhile, uranium production dropped to 6 tons in 2020, but by 2024 it had rebounded to 260 tons. The Trump administration aims to revive uranium mining on a large scale (see pp. 18–19).

At the same time, more and more people in Africa, Australia, North America, and Europe are resisting uranium

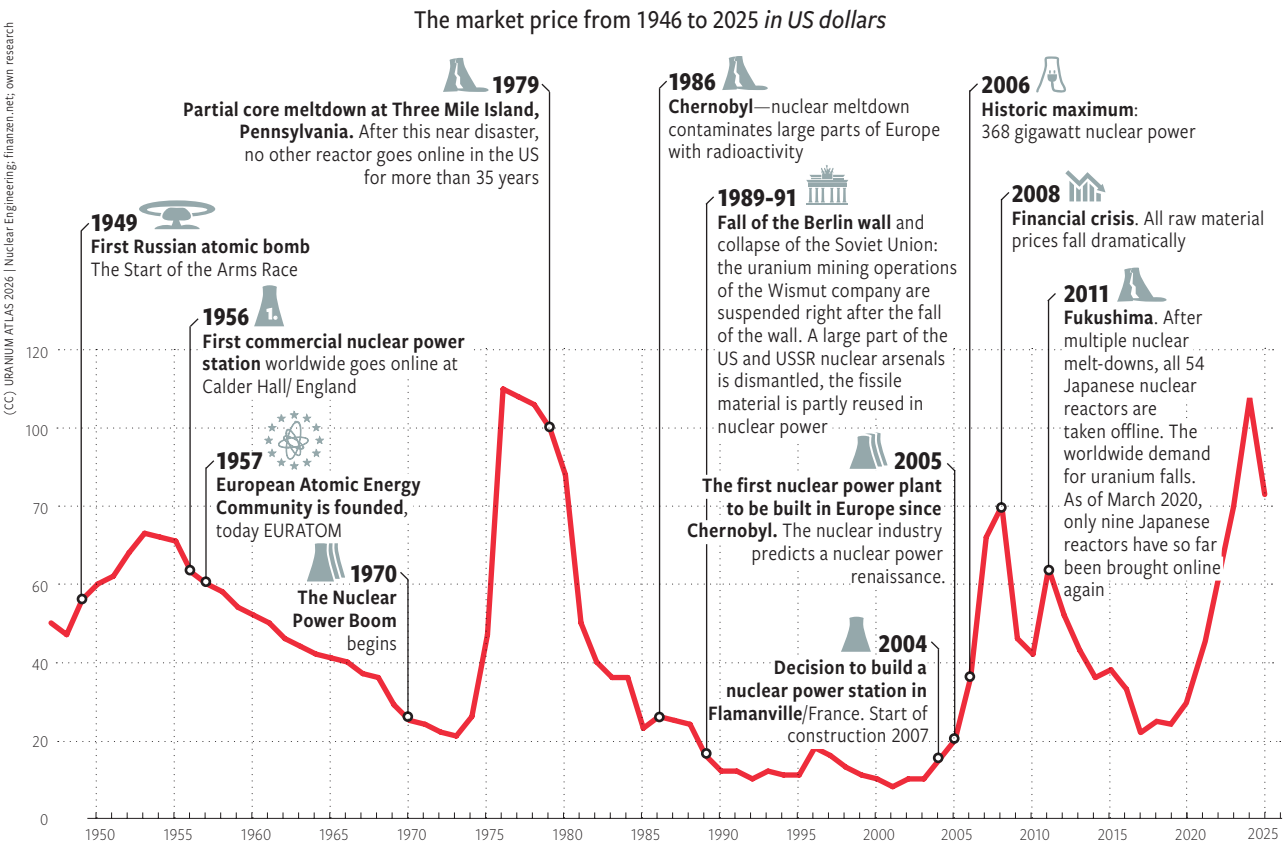
Leading Providers

Worldwide uranium production in 2024 *in tons*



(CC) URANIUM ATLAS 2026 | WISE Uranium Project; WNA

The Development of the Uranium Trade against the Background of Key Events



mining and the destruction of their livelihoods. In 2003, for example, Almoustapha Alhacen brought independent researchers from France to Niger and had them measure radiation levels around Arlit. The results showed dramatically elevated levels that explained the many cases of cancer. Uranium giant Areva cited its own measurements: everything was safe. Areva faced an unexpected opponent in Australia: UNESCO declared the Koongarra area in the Northern Territory a World Heritage Site. Because their protests were barely noticed outside Africa, activists from Niger, Tanzania, Malawi, and South Africa joined forces in 2009 to form the *African Uranium Alliance*. In addition to opposing new mining projects, the goal was to raise awareness among mine workers: protective clothing, dosimeters, and adequate safety regulations were often lacking. In Mali, West Africa, the government awarded a concession in 2007 to explore for uranium in the Falea region. The citizens' initiative *ASFA21* has been fighting against the mining ever since.

In nearly all uranium-producing regions, people are resisting uranium mining, the exploitation of their land, and the destruction of their livelihoods.

In Tanzania, young adults from various parts of Africa climbed Mount Kilimanjaro in 2015 and, from the summit of Africa's highest mountain, called for a "ban on uranium mining." The location was chosen because the government aims to make the country one of the leading uranium producers and plans to exploit uranium deposits discovered as early as the last century. When potential sites were being scouted in fields and pastures, exploration efforts occasionally required police protection due to resistance. The march to Kilimanjaro was, in a sense, a highly visible symbol of this. Nevertheless, the Russian state-owned corporation Rosatom intends to mine uranium on the Mkuju River, just as it plans to do in the Omaheke region of Namibia on the border with Botswana, where this would severely impact an underground water reservoir. A local movement has so far fought back successfully. State apparatuses do not simply take note of protests. In Malawi in 2017, eight activists from Tanzania were detained for over 100 days as "foreign agents." In Russia, anti-nuclear activists have fled into exile after the state also classified them as "foreign agents"; those who remain in the country are being intimidated. In dictatorial countries like Kazakhstan and China, protests do not even reach the public eye.

Anti-uranium activists have also been criminalized in Spain. However, massive protests there, as in the Czech Republic, have at least temporarily prevented new uranium mines from opening. Meanwhile, the motto of the Indigenous peoples of North America—"We are not protesters, we are protectors"—is spreading throughout the global movement. The protesters see themselves as protectors, pointing to renewable energies, which are becoming increasingly cost-effective. ●

Further Information

Banning uranium mining: uranium-network.org
Climbing of mount kilimanjaro: twitter.com/kproject2015?lang=en

A "WHO'S WHO" OF URANIUM MINING

Uranium mining around the world is a near monopoly. The ten largest corporations account for about 95 percent of uranium production. They dominate the market, wield immense power, and are responsible for the exploitation of Indigenous peoples.

A handful of players dominate uranium mining: the four state-owned companies Kazatomprom (Kazakhstan), Rosatom (Russia), CNNC (China), and Orano (France) — a spin-off from the de facto bankrupt Areva and bailed out with public funds — as well as the Canadian company Cameco. In 2024, these five produced nearly 80 percent of global uranium production. In line with their size, these major players have been and remain active wherever the raw material of the nuclear age is mined — largely on Indigenous land. The ten largest uranium corporations account for 95 percent of uranium mining and are all based in the Global North where the uranium — much of which originates from the Global South — is processed.

These corporations are not only making money but also shaping geopolitics, in which nuclear weapons are once again playing an increasingly important role. Rosatom for Putin's Russia (see pp. 36–37), the CNNC for China, and the Orano Group for France (see pp. 24–25). This also explains why the state bailed out Areva to the tune of 4.5 billion euros in taxpayers' money, defying all economic logic. Areva/Orano has been a key player for decades and is well-connected in the global uranium and nuclear business: The corporation holds 17 stakes in uranium deposits in Canada, three in Gabon, two in Mongolia, and three in Jordan.

Soon after World War II, France explored uranium deposits in Africa and began uranium mining in Madagascar (1953), Gabon (1960), and Niger (1971) (see p. 14). In Niger, Areva owned approximately 63 percent of the Arlit mine and 56 percent of the Imouraren deposit through various corporate holdings. When the military seized power in 2023, it nationalized these shares and revoked Orano's license. In Kazakhstan, the world's largest uranium producer since 2009, Orano holds a 51 percent stake in uranium production at the Tortkuduk and Muyunkum mines, which contribute significantly to the global uranium supply; in Canada, it holds a 40 percent stake in Cigar Lake and a 30 percent stake in McArthur River. In 2024, the two Canadian uranium mines accounted for nearly a quarter of global uranium production.

These investments focus not only on production but also on exploration, securing new deposits, and ensuring future profits. This is a state-backed business model where sometimes French special forces are deployed to secure uranium mines in Niger, as in the past. More recently, taxpayers bailed out Areva/Orano from bankruptcy. This allows Orano to continue driving the nuclear madness forward. *WISE Uranium Project* has inducted the corporate conglomerate Orano/Framatome/Areva/Cogéma into the "Hall of Infamy." Here, "infamy" can be translated as shame, villainy or audacity.

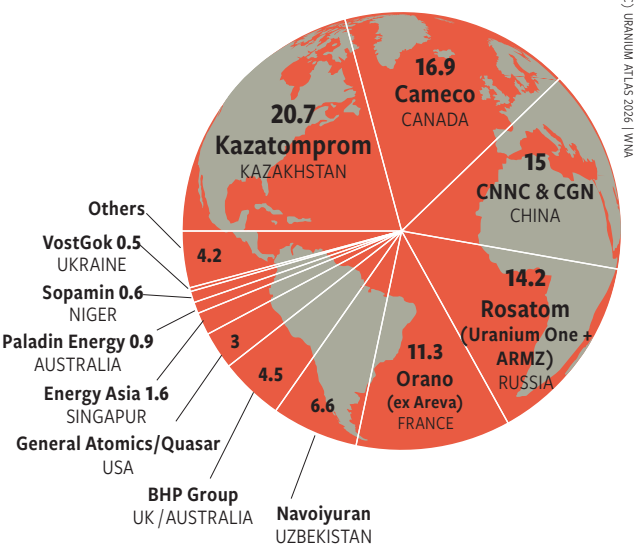
Other corporations act much the same way: The state-owned CNNC is not only China's leading operator of nuclear power plants but is also responsible for mines and uranium mills in China. In addition, the corporation secures nuclear fuel in other regions of the world: It owns 49 percent of each of the Semizbai and Irkol mines in Kazakhstan.

In Namibia, it holds a 25 percent stake in Langer Heinrich, a 68 percent stake in Rössing Uranium, and a 58 percent stake in the Zhonge exploration project. But the Chinese company is also active in Russia, Zimbabwe, and Australia.

In 2013, the Russian state-owned corporation Rosatom acquired the Canadian mining company Uranium One, instantly becoming one of the world's most powerful players. Since that acquisition, Rosatom has held stakes in five mines in the US, three mines in Canada, and projects in Mozambique

The Largest Uranium Mining Companies

World market shares in 2024 *in percent*



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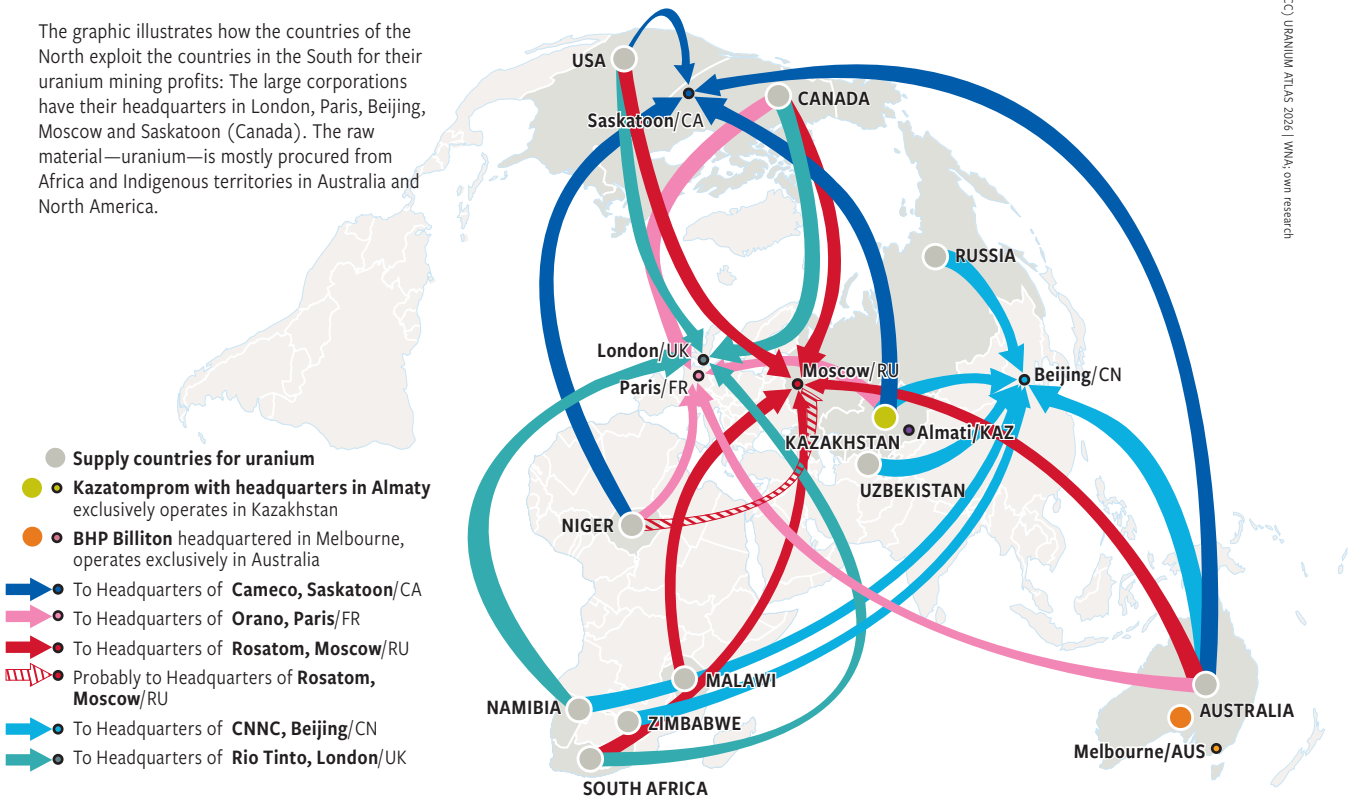
The Strings Are Pulled in the North

Uranium mining corporations and their supply countries

The graphic illustrates how the countries of the North exploit the countries in the South for their uranium mining profits: The large corporations have their headquarters in London, Paris, Beijing, Moscow and Saskatoon (Canada). The raw material—uranium—is mostly procured from Africa and Indigenous territories in Australia and North America.



(CC) URANIUM ATLAS 2026 | WNA; own research

and Tanzania. The company maintains offices in South Africa and Australia, is the fourth-largest uranium producer with an annual output of 8,567 tons, controls about one-third of the world's uranium enrichment capacity, and supplies approximately 40 percent of Europe's nuclear fuel elements. Because Rosatom is simultaneously building or planning to build new nuclear power plants in Egypt, China, India, Kazakhstan, and other countries, many threads converge at the corporate headquarters.

The Canadian uranium giant Cameco is also found wherever the material for atomic bombs and nuclear power plants is available. It has 20 holdings in its home country, 10 in the US, and others in Kazakhstan, Niger, and Australia. Cameco has also made it into the "Hall of Infamy." Kazatomprom, for its part, operates 17 uranium mines in Kazakhstan and was the world's largest uranium producer in 2024, with 12,463 tons of uranium. The company has no foreign holdings but grants other companies access to Kazakhstan's uranium deposits.

Mining conglomerates such as the Australian-British BHP Group—ranked seventh in the global uranium industry in 2024—make money from everything that can be extracted from the earth: iron, copper, gold, aluminum, diamonds, oil, coal, or bauxite, to name just a few. They mine uranium not only in Australia, but also in Namibia, South Africa, Canada, and, after a brief hiatus, once again in the US. A look at the ten largest uranium mines in the world highlights the neocolonial nature of the business model: McArthur River and Cigar Lake in Canada are located on Cree and Dene territory; Olympic Dam in Australia is on Kokatha land; Arlit in Niger is in Tuareg territory; and Rössing and Husab are in the Namibian desert. In 2024, these five mines accounted for 39 percent of global uranium production.

Uranium mining is a neo-colonial business model. Five of the world's ten largest uranium mines are located on the land of Indigenous peoples, and are generating profits for the financial centers of the North

In authoritarian states such as Russia, China, Kazakhstan, or Uzbekistan, resistance to uranium mining is not tolerated. The price for keeping nuclear power plants running in South Korea, China, Japan, Russia, the EU, and the US is paid by the people in the mining regions: their livelihoods are destroyed. The exact routes taken by the uranium are virtually impossible to trace: neither the mining companies disclose where they deliver the extracted uranium, nor do the nuclear power plant operators reveal where the uranium for their facilities comes from. This also applies to Germany: when asked where the Gronau fuel assembly plant obtains its uranium, the answer is: "Classified!" ●

Further Information

Uranium Mining Company News: wise-uranium.org
Cindy Vestergaard: Governing Uranium Globally, 2015, PDF on researchgate.net

PUTIN'S GEOPOLITICAL ARM

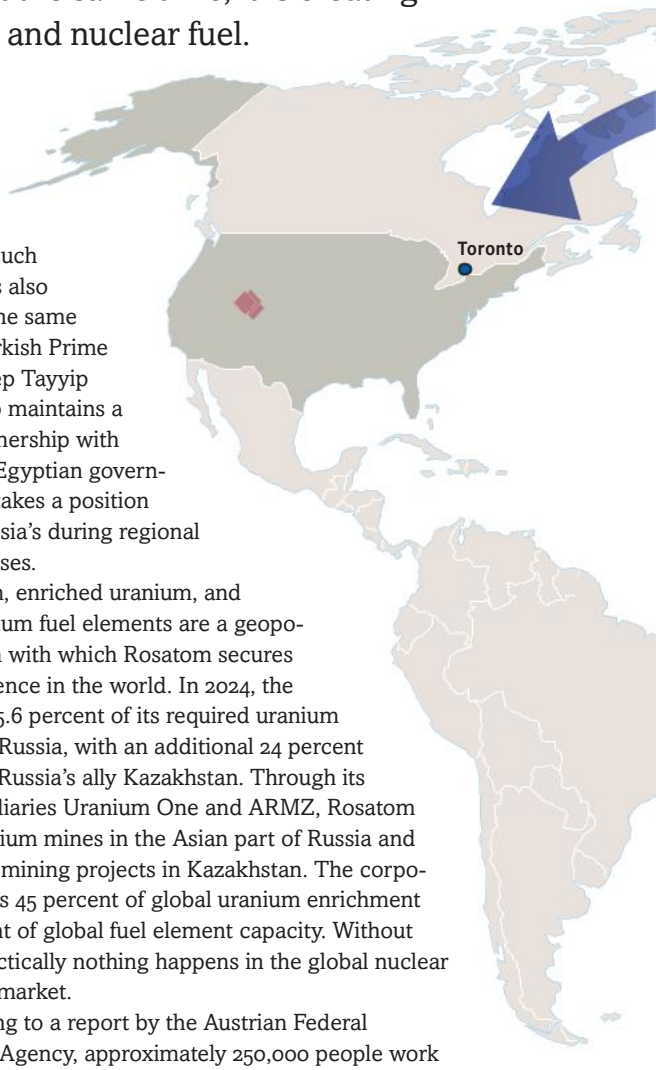
The Russian state-owned corporation Rosatom is driving the global expansion of nuclear power plants like no other company. At the same time, it is creating dependencies in the trade of uranium and nuclear fuel.

El Dabaa, Ruppur, and Akkuyu are the nuclear power plants through which Egypt, Bangladesh, and Turkey aim to enter the nuclear age. Rosatom is building a total of 10 reactors at these sites and selling the respective countries an all-inclusive package. This package includes construction, operation, staff training, fuel supply, and the removal of highly radioactive nuclear waste. All of these services are guaranteed by the Russian state-owned corporation.

And these are by no means all of Rosatom's new construction projects: 4 reactors at the Kudankulam site (India), 1 reactor in Bushehr (Iran), 1 reactor in Mochovce (Slovakia), 2 reactors each in Tianwan and Xudapu (China), and 6 reactors in its own country. On its website, the company describes itself as the number one player in the global nuclear market and points to 33 nuclear reactors in 10 countries that it has built or is currently building. And because Rosatom is financed through the Russian state budget, the nuclear company can offer favorable financing terms to prospective nuclear power plant customers. Only Iran is financing the construction of Bushehr with its own funds; all other customers are dependent on Moscow's financial support. Accordingly, of the 24 nuclear reactors currently under construction outside China and Russia, 17 are being built by Rosatom (as of December 2025). Notably, the company is building only 6 nuclear power plants in Russia, but nearly three times as many outside the country.

Rosatom's headquarters in Moscow. The company emerged from the Ministry of Atomic Energy and reports directly to President Putin

With every project, Rosatom creates new dependencies and secures political influence for Russia and President Vladimir Putin. Yet the new nuclear power plant construction projects are by no means the whole story. Sixteen nuclear reactors in the European Union were built during the Soviet era and completed after the fall of the Iron Curtain using Soviet/Russian technology. Only hexagonal fuel assemblies can operate these systems, a market where Rosatom long maintained a monopoly: Dukovany 1-4 (Czech Republic), Loviisa 1-2 (Finland), Paks 1-4 (Hungary), Mochovce 1-4 (Slovakia), and Kozloduy 5-6 (Bulgaria). Despite a general flight ban over EU territory for Russian aircraft since Russia's invasion of Ukraine, several special permits were granted, allowing fuel assemblies to be delivered by air to Prague and Budapest. When Hungary's President Viktor Orbán blocks EU sanctions against Russia and calls for peace talks — but really means Ukraine's surrender — such dependencies also play a role. The same applies to Turkish Prime Minister Recep Tayyip Erdoğan, who maintains a strategic partnership with Putin, or the Egyptian government, which takes a position similar to Russia's during regional and global crises.



Uranium, enriched uranium, and finished uranium fuel elements are a geopolitical weapon with which Rosatom secures Russia's influence in the world. In 2024, the EU sourced 15.6 percent of its required uranium directly from Russia, with an additional 24 percent coming from Russia's ally Kazakhstan. Through its mining subsidiaries Uranium One and ARMZ, Rosatom operates uranium mines in the Asian part of Russia and is involved in mining projects in Kazakhstan. The corporation controls 45 percent of global uranium enrichment and 22 percent of global fuel element capacity. Without Rosatom, practically nothing happens in the global nuclear and uranium market.

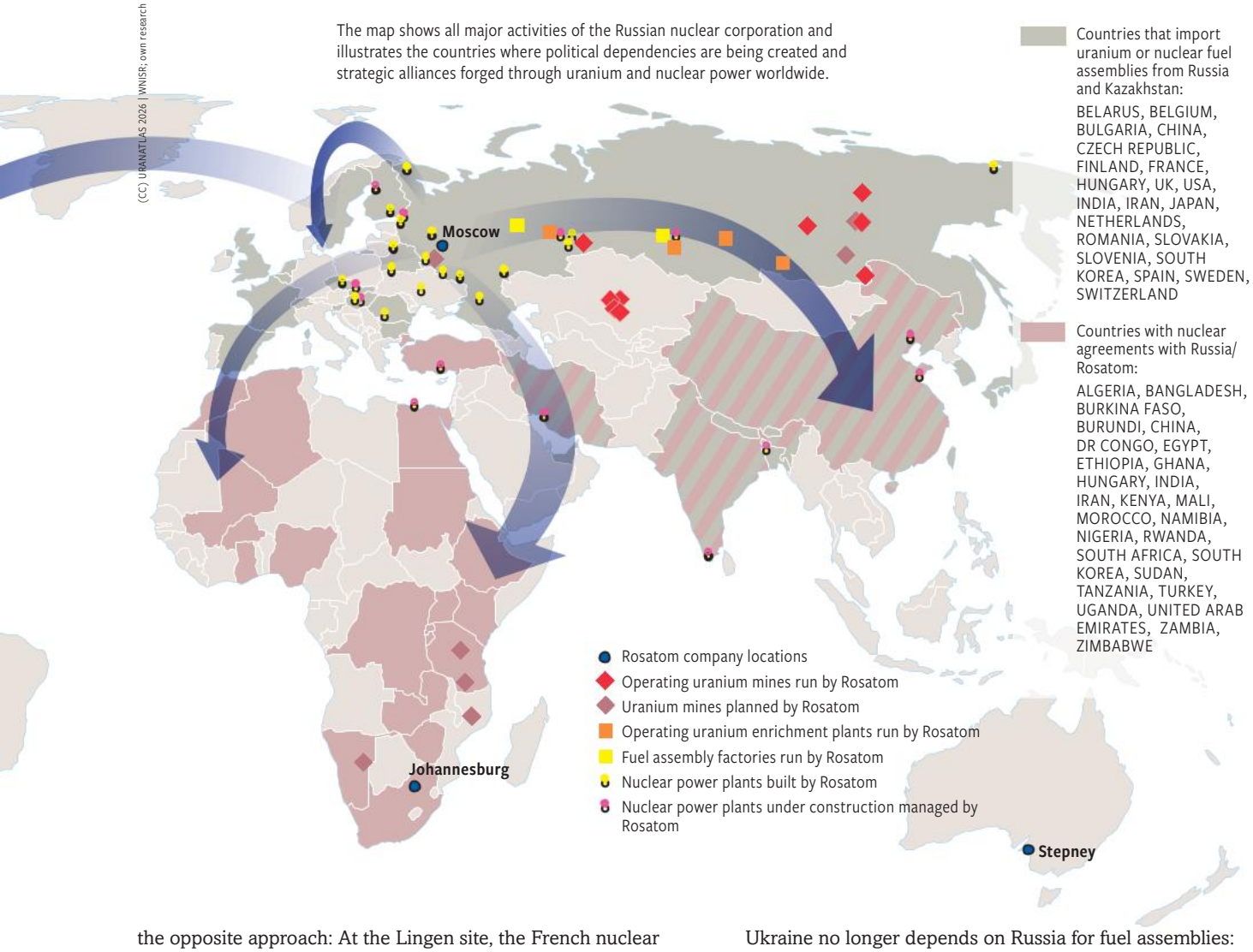
According to a report by the Austrian Federal Environment Agency, approximately 250,000 people work for Rosatom, 90,000 of whom are employed in the nuclear weapons complex. This is because the company is also responsible for Russia's nuclear arsenal and its modernization. The "Russian Federal Agency for Atomic Energy" brings together the military and peaceful uses of nuclear energy under one roof—interconnections that the West tends to keep hidden. One cannot be conceived without the other. Rosatom can enrich uranium to 3 to 5 percent for nuclear power plants and to 80 to 90 percent for nuclear bombs. And the company can — in reprocessing plants — extract plutonium from spent fuel assemblies and use it to manufacture plutonium bombs, the same type of bomb the US dropped on Nagasaki.

At the Zaporizhzhia nuclear power plant, the nuclear conglomerate is already openly involved in the war in Ukraine. Following the occupation of the region and amid the crossfire of the warring parties, it took over management of the nuclear power plant on the Kremlin's orders. Despite the war in Ukraine, the EU has so far not threatened Russia with sanctions regarding uranium and fuel assemblies. The reason: Europe's dependence is simply too great. France is even taking

Rosatom's Global Reach

Locations, investments, nuclear power plant construction and uranium mines operated by Rosatom, as of 2026

(CC) URANATLAS 2026 | WNISR; own research



the opposite approach: At the Lingen site, the French nuclear company Framatome and its subsidiary ANF got approval to manufacture hexagonal pressurized water reactor fuel elements of the VVER type, using licenses from and in cooperation with Rosatom, to supply Soviet-era nuclear power plants in Eastern Europe. This opens the door to Europe for the Russian state-owned company in the highly sensitive nuclear sector.

Ukraine no longer depends on Russia for fuel assemblies: Although all 15 of the country's reactors are also of Russian design, the US company Westinghouse can now manufacture fuel assemblies for them and currently supplies nuclear power plants in Ukraine as well as in Bulgaria and the Czech Republic. The fact that the EU treats Rosatom so favorably can only be explained by their nuclear dependence.

AFRICA IN FOCUS

Rosatom and Russia are pursuing a very aggressive nuclear power strategy on the African continent. So far, Rosatom has "only" built a 4-reactor nuclear power plant in Egypt. However, Russia/Rosatom has already signed formal nuclear agreements with 18 other countries so they can begin using nuclear power for peaceful purposes (see map). Military coups in the Sahel states of Mali (2020), Burkina Faso (2022), and Niger (2023) have increased Russia's influence and advanced the discussion on the construction of nuclear power plants, even though none of these countries has an energy infrastructure to which a nuclear power plant could be connected. So-called small modular reactors (SMRs) are under discussion. In Niger, Rosatom is attempting to leverage its contacts with the military junta to take over the uranium deposits. In Tanzania, the company holds the rights to the ore deposits at the Mkuju project and could begin uranium mining in 2029. The company is involved in uranium exploration in Mozambique and Namibia. ●

Further Information

Rosatom's ties to the EU: umweltbundesamt.at
Rosatom Annual Reports 2021–2024: PDF at report.rosatom.ru/en
Nuclear Power in Africa: Tristen Taylor, 2025, PDF at za.boell.org

A RESPONSIBILITY ABANDONED

Uranium mining is never a benign process. It leaves behind radioactive and toxic waste with decay products that are even more hazardous than the mined uranium. However, there is virtually no management of old mines.

Mining is the oldest method to extract riches from the earth. Once so-called mineral resources are depleted, a gaping hole is left behind with grave consequences, especially with uranium mining.

Whether uranium is mined below ground or through open-pit mining, both methods leave behind enormous amounts of residue. These residues include the decay products of the uranium chain, many of which have seemingly infinite half-lives (see p. 10). Problems are created from the start, beginning with the exploration process: Thousands of test drills are conducted in areas where uranium deposits are anticipated. The drilled shafts connect below ground where uranium seeps into groundwater and can then contaminate the drinking water, even in a region where there was never uranium mining. Wind and rain can carry radioactive particles over large regions, whether they emanate from drill holes, waste dumps, tailings dams or abandoned mines. This effectively contaminates the soil and the produce grown in those areas. This problem could be minimized by covering the waste with clay, but this is rarely done as it costs money.

Australia and most African countries have no laws requiring corporations to conduct mandatory cleanup after mining

In addition, rivers transport radioactivity downstream from uranium mines, even after the mining operations have ceased. Nuclear radiation does not know man-made borders. For example, radioactive dust originating in Australia has been detected in the Arctic, according to South Africa-based geologist Stefan Cramer. Since the 1990s, below-ground and open-pit mining has been supplemented by In-Situ Leaching (ISL). About half of today's uranium extraction is conducted using this method. In ISL, sulfuric acid or ammonium bicarbonate is injected into underground deposits to separate the uranium ore from other elements. The extracted uranium is mixed with water and pumped to the surface. When the chemicals used for ISL breach subterranean aquifers, long-term monitoring is required, but there is practically no way to fix the ISL-created problems.

While decommissioned mines have usually undergone at least some form of effective sealing procedure, such measures are not possible at "abandoned" mines. The operators of thousands of former mines that were worked during the "uranium rush" era of the 1950s and 1960s — mostly located in the southwest of the United States — simply disappeared and left the mines completely unattended. Today, that legacy is still marked by rusting structures in danger of collapse as well as abandoned open pits and shafts. Even when they appear in US Environmental Protection Agency (EPA) documents, these "abandoned mines" are not clearly marked.

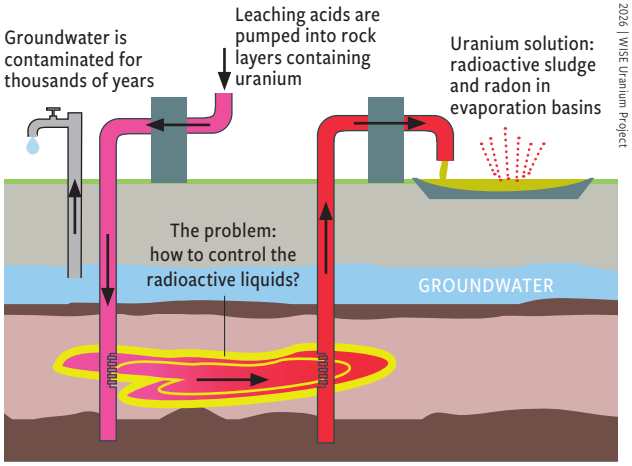
While requirements and guidelines exist for cleaning contaminated landscapes from mining operations in general, uranium does not have special status. As Paul Robinson, the mining expert at Southwest Research and Information Center (SRIC) in Albuquerque, New Mexico, describes, "The company gets the gold, the community gets the shaft." The *Surface Mining Control and Reclamation Act* of 1977 demands a minimum degree of cleanup by US companies. Currently, no such law exists in African states, and only to a limited extent in Australia, where cleanup commitments are entirely voluntary. Once a corporation declares bankruptcy, the population is stranded with the mess. That is why an increasing number of civil society groups are starting to fight for their rights.

For example, in Australia there are three active uranium mines and, according to Geoscience Australia, more than 340 active mines where iron, copper, gold, nickel, lead, or coal are mined. The resistance of the Indigenous population is not only directed at uranium mining and its legacy, but also at coal and bauxite pits.

Chemical Leaching Underground

In-situ leaching (ISL), also called in-situ recovery (ISR)

Using injection drills, diluted sulfuric acid, hydrogen peroxide or ammonium bicarbonate is injected into rock layers containing uranium and, using a second drill, the resulting uranium-rich solution is pumped to the surface.



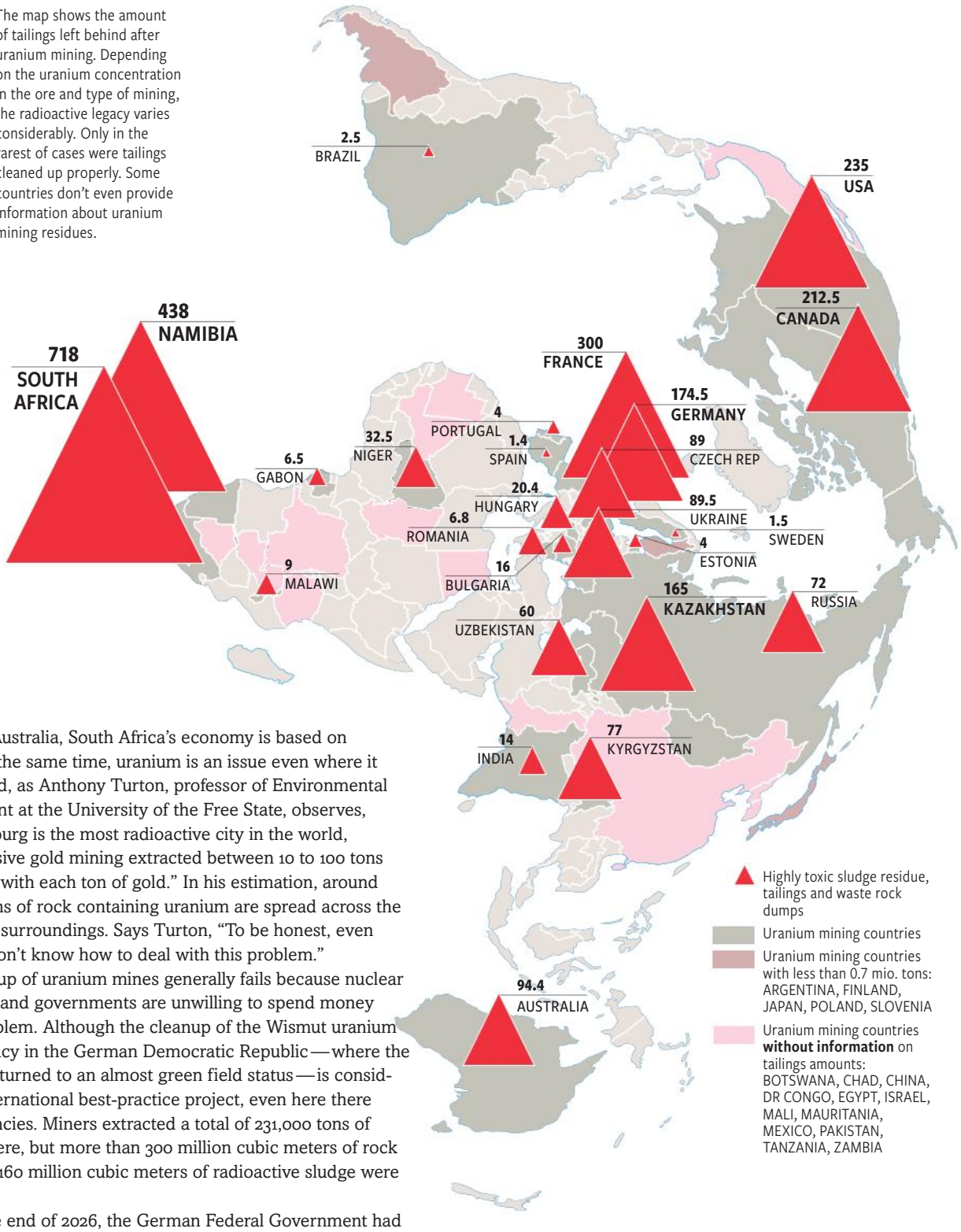
(cc) URANIUM ATLAS 2026 | WISE Uranium Project

The Legacy of Uranium Mining

Tailings per country from 1940 to 2017 *in million of tons*

(CC) URANIUM ATLAS 2026 | WISE Uranium Project; WNA; own calculations

The map shows the amount of tailings left behind after uranium mining. Depending on the uranium concentration in the ore and type of mining, the radioactive legacy varies considerably. Only in the rarest of cases were tailings cleaned up properly. Some countries don't even provide information about uranium mining residues.



Like Australia, South Africa's economy is based on mining. At the same time, uranium is an issue even where it is not mined, as Anthony Turton, professor of Environmental Management at the University of the Free State, observes, "Johannesburg is the most radioactive city in the world, since intensive gold mining extracted between 10 to 100 tons of uranium with each ton of gold." In his estimation, around 600,000 tons of rock containing uranium are spread across the city and its surroundings. Says Turton, "To be honest, even today we don't know how to deal with this problem."

Cleanup of uranium mines generally fails because nuclear companies and governments are unwilling to spend money on this problem. Although the cleanup of the Wismut uranium mining legacy in the German Democratic Republic — where the area was returned to an almost green field status — is considered an international best-practice project, even here there are deficiencies. Miners extracted a total of 231,000 tons of uranium there, but more than 300 million cubic meters of rock debris and 160 million cubic meters of radioactive sludge were left behind.

By the end of 2026, the German Federal Government had spent 7.4 billion euros of taxpayers' money on the cleanup. This sum is expected to grow to nine billion euros by 2045. Despite this immense effort, the radioactive contamination cannot be eliminated because leachate containing uranium leaks out in many places and pollutes small rivers.

In almost all other regions of the world where uranium is mined, this problem is not even addressed. Neither mining companies nor governments are willing to provide the billions of dollars needed. That is why people continue to demand: "Keep uranium in the ground!" ●

Further Information

Tailings: wise-uranium.org, key word: Uranium Mill Tailings Inventory
Documentary film: Buddha Weeps in Jadugoda by Shri Prakash, 1999

FROM MAYAK TO CHURCH ROCK TO FUKUSHIMA

Nuclear meltdowns and ruptured dams, reactor fires and explosions: disasters that should never have happened.

The story of nuclear energy is also the story of its catastrophes. Mayak, Windscale, Three Mile Island, Church Rock, Chernobyl and Fukushima are some of the best-known examples; six places where nuclear energy got out of control; six places that accelerated the decline of a technology that had once been launched euphorically. After 70 years of the so-called peaceful use of nuclear energy, we are instead left with melted reactor cores, uninhabitable regions, radioactive clouds and countless deaths.

Part of the story of these disasters, however, is also the attempt to conceal or downplay them. Cover-ups are an integral part of the nuclear industry. Initially, the triple meltdown in Fukushima in March of 2011 was a significant exception. Pictures of the collapsing nuclear reactors could be seen online around the world in real time. But the consequences are still trivialized today, even in Japan. Health effects, the extent of the contamination, the helplessness of aid workers and the enormous costs are all downplayed.

But as early as its first decade, despite the growing enthusiasm for aeroplanes and cars with nuclear propulsion, and even for small reactors in each household, nuclear energy revealed its dark side: at Mayak and Windscale.

On October 10, 1957, in the northwest of England, on the coast of the Irish Sea, a fire erupts in the nuclear reactor Windscale I. Due to faulty temperature indicators and subsequent operating mistakes during maintenance work, the fuel channels overheat. Channel 20/53 glows as red as a cherry. All attempts to cool the reactor are unsuccessful: the core temperature rises to 1,300 degrees Celsius; Windscale is burning. While a fire blazes in the heart of the 2,000-ton graphite block, radioactive smoke is continuously emitted through the smokestack. The people in the region are asleep in their beds, unaware of what is happening. All attempts to extinguish the fires using carbon dioxide and water fail. Finally, on the third attempt, the fire is put out. The population is only warned after the fire is extinguished. The milk of neighboring farms is collected and dumped into the sea; millions of liters of radioactively contaminated water seep into the soil around the reactor.

By 1990, there are 70 investigative reports about the 1957 Windscale fire. Researchers try to convert the amount of released radiation into the number of cancer deaths. In the end, they agree on a number: 100 victims. In the 1980s, a surge in leukemia cases caused concern until memory slowly faded again. Windscale was even erased linguistically, with the complex renamed Sellafield in 1981.

Meanwhile, in September 1957, a tank with highly radioactive waste explodes in Mayak in Russia. Here, in the nuclear bomb factory of the Soviet Union, ten reactors produce plutonium for the Soviet nuclear weapons program. Even during normal operation, immense amounts of radioactivity are released into the environment. Nuclear particles and waste are disposed of either through the smokestacks or directly into the river Techa. In 1953, when the local population begins to show signs of radiation effects, the first village in the vicinity is evacuated; by 1956, another 18 villages follow.

A year later, the explosion occurs and can be seen hundreds of kilometers away, yet is officially declared a polar light event. At a height of 1,000 meters, the radioactive cloud travels northeasterly, leaving a radioactive trail 40 kilometers wide and 300 kilometers long. An area of 20,000 square kilometers with approximately 270,000 inhabitants is radioactively contaminated. More and more regions need to be evacuated.

The explosion is kept secret until Moscow finally admits to the disaster in 1989. According to assessments by the International Atomic Energy Agency, the Mayak explosion is the third-largest nuclear disaster in history after Chernobyl and Fukushima. Helmholtz Center experts in Munich put it at the same hazard level as Chernobyl. The radioactivity level released in Mayak may have been even higher.

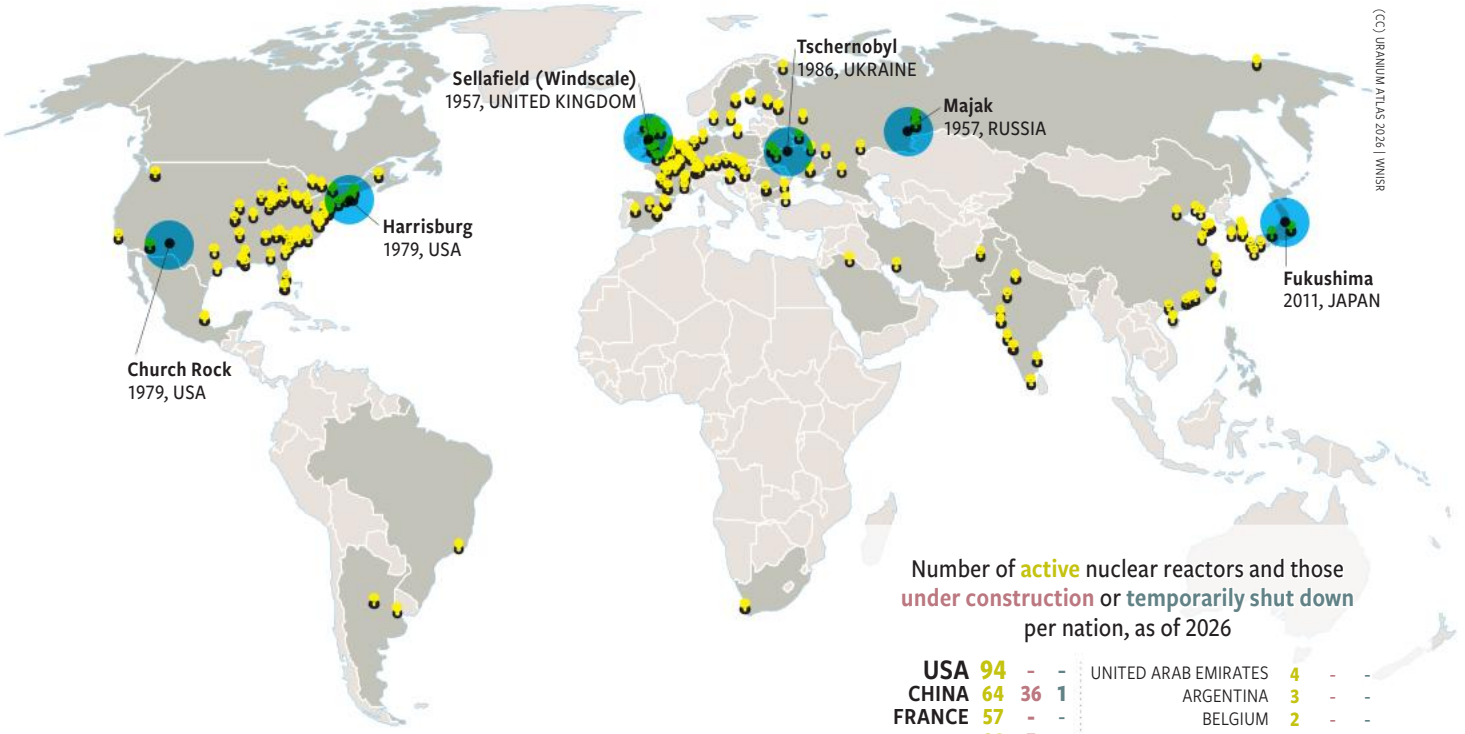
The United States experienced its own two nuclear disasters in 1979. In March, a growing number of experts are fighting to control reactor Unit 2 at Three Mile Island near Harrisburg. The glowing reactor core gushes to the floor of the reactor pressure vessel in a cascading torrent. It is a miracle that the pressure vessel holds. Three-fourths of the core, made up of 36,816 fuel rods, melts at temperatures of almost 2,800 degrees Celsius. Failed cooling water pumps, two incorrectly set valves on the backup pumps, a note on the control panel covering the valve indicators, and several operating errors lead to the disaster.

Chernobyl and Fukushima brought the world spectacular images and could not be kept secret — other disasters, however, were very well hidden from the public

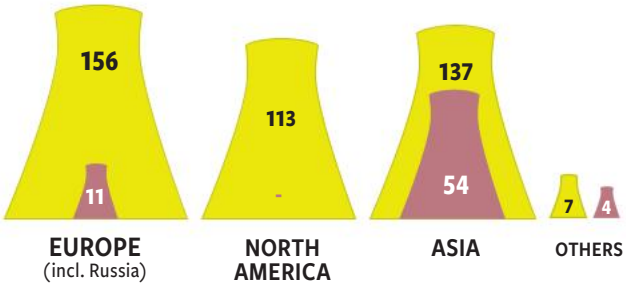
Children and pregnant women in an eight-kilometer radius are evacuated. At least 70,000 people flee the region. Nobody knows how much radioactivity was released into the environment. The statement of the lieutenant governor of the state of Pennsylvania, Bill Scranton, is unforgettable: “We have everything under control. There are no risks for the health and safety of the population.”

"Peaceful" Use of Nuclear Energy — a Summary

Sites of all active nuclear power plants and the great disasters of the nuclear age



Number of active nuclear reactors and those under construction on the different continents, as of 2026



Number of active nuclear reactors and those under construction or temporarily shut down per nation, as of 2026

USA	94	-	-
CHINA	64	36	1
FRANCE	57	-	-
RUSSIA	34	7	-
SOUTH KOREA	23	3	4
INDIA	23	7	1
CANADA	17	1	-
JAPAN	15	-	18
UKRAINE	9	-	6
UNITED KINGDOM	9	2	-
SPAIN	7	-	-
SWEDEN	6	1	-
PAKISTAN	6	1	-
CZECH REPUBLIC	6	-	-
SLOWAKIA	5	1	-
FINLAND	5	-	-
HUNGARY	4	1	-
SWITZERLAND	4	-	-
UNITED ARAB EMIRATES	4	-	-
ARGENTINA	3	-	-
BELGIUM	2	-	-
BRAZIL	2	-	-
BULGARIA	2	-	-
BELARUS	2	-	-
MEXICO	2	-	-
ROMANIA	2	-	-
SOUTH AFRICA	2	-	-
ARMENIA	1	-	-
IRAN	1	1	-
NETHERLANDS	1	-	-
SLOVENIA	1	-	-
TURKEY	-	4	-
EGYPT	-	4	-
BANGLADESH	-	2	-
WORLDWIDE	**413**	**70**	**30**

In July of the same year, a tailings dam bursts in Church Rock, sending shock waves through the US nuclear industry. Church Rock is a village in the territory of the Diné tribe in New Mexico. There are 20 uranium mines operating in the area. In the largest one alone, more than 1,000 tons of uranium oxide were produced each year throughout the 1970s. Hundreds of thousands of tons of radioactive waste are disposed of in huge tailings basins. On July 16, 1979, the walls of one of the basins burst. More than 1,000 tons of radioactive waste, and an estimated 90 million gallons of radioactive wastewater, end up in the Puerco River. This remains the biggest accidental release of radioactive waste in the history of the United States. Three years later, the uranium industry abandons this site.

The Church Rock and Mayak disasters remain largely unrecognized. On the other hand, Chernobyl and Fukushima, the two "classic" nuclear meltdowns, are household names. They produced spectacular images and could not be kept secret. Even in the US, Three Mile Island is well known, while almost no one has heard of Church Rock, which happened the same year. In addition, the global public was more sensitized to the risks of nuclear disasters in 1986 and even more so in 2011.

Millions were able to follow the track of the radioactive clouds from Chernobyl and Fukushima. In Japan, they even briefly considered evacuating metropolitan Tokyo with its 30 million inhabitants. In Chernobyl, Russian military planes drained the rain clouds with chemical agents before they could reach Moscow. While many details have emerged, the suffering and medical consequences for millions of people have been overshadowed by statistical data. From Windscale to Fukushima: these six names stand for accidents that, according to risk studies, should not have happened at all, or only once in one hundred thousand years. But they happened more often, and their legacy will live on for a very long time. ●

Further Information

Stephanie Cooke: In Mortal Hands—A cautionary history of the Nuclear Age. Bloomsbury, 2009
International Uranium Film Festival: uraniumfilmfestival.org

A QUESTION OF POWER

The WHO is supposed to pursue independent health policies. However, when it comes to nuclear issues, it is controlled by the IAEA. And under the EURATOM treaty, the European Union continues to promote nuclear energy.

On July 29, 1957, when the International Atomic Energy Agency (IAEA) was established under the auspices of the United Nations (UN), it seemed convenient to form an alliance with the UN World Health Organization (WHO), established nine years earlier. The experts wanted to profit from each other's experience. The industrialized nations had decided to use nuclear fission for civil purposes, a technology promising true wonders; the new organization was slated to promote worldwide dissemination of nuclear energy. At the same time, the effects of nuclear radiation on the human body were starting to be studied following the US nuclear tests in the South Pacific. On May 28, 1959, the two organizations concluded a cooperation agreement, referred to as WHA12-40.

It states: "The International Atomic Energy Agency and the World Health Organization agree that, with a view to facilitating the effective attainment of the objectives set forth in their respective constitutional instruments, within the general framework established by the Charter of the United Nations, they will act in close co-operation with each other and will consult each other regularly in regard to matters of common interest." It continues: "Whenever either organization proposes to initiate a program or activity on a subject in which the other organization has or may have a substantial interest, the first party shall consult the other with a view to adjusting the matter by mutual agreement."

Until the Chernobyl, Ukraine disaster in 1986, this agreement had never received much attention. However, it wasn't until the WHO announced the official number of deaths from the nuclear accident, that the real importance of the agreement became evident. The WHO figures only acknowledged 30 dead workers and firemen who lost their lives as a direct result of the disaster.

Today, in light of the many cancer deaths, it puts the death toll at 6,000. The organization International Physicians for the Prevention of Nuclear War (IPPNW, Nobel Peace Prize 1985) speaks of 125,000 deaths among the liquidators alone.

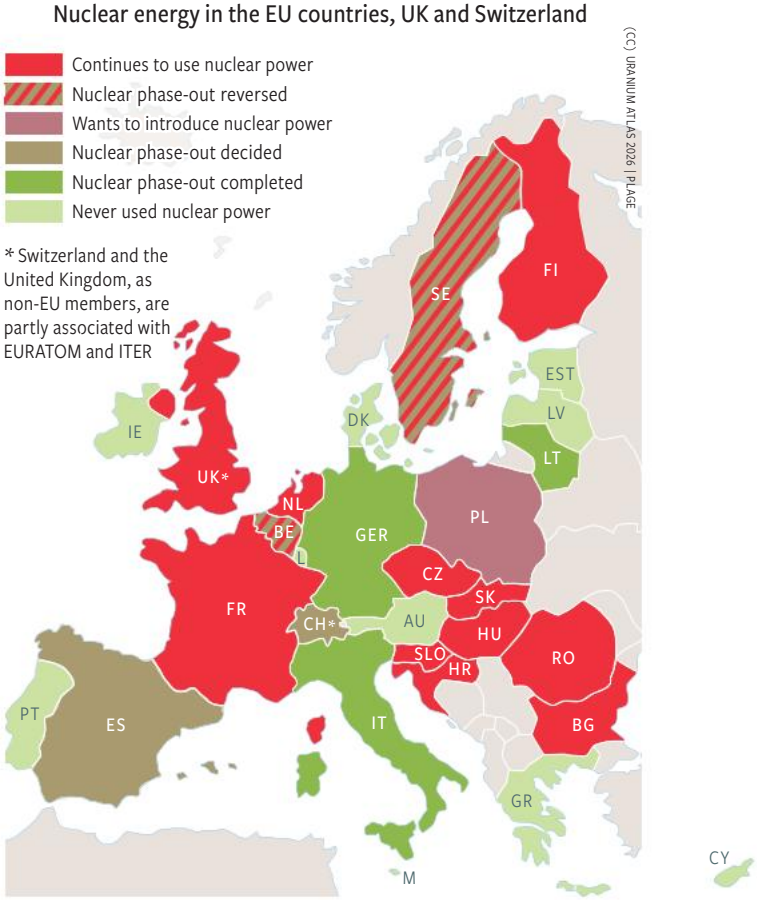
Then, in March of 2011, another nuclear catastrophe occurred in Fukushima, Japan. In April of 2014, three years after the triple nuclear meltdowns there, UNSCEAR, the UN Scientific Committee on the Effects of Atomic Radiation under the auspices of the IAEA, published its first report relating to the nuclear catastrophe. The authors claimed that "no significant change in future cancer rates is to be expected which could be linked to the radiation exposure from the accident."

Angelika Claussen, an expert on the health risks of low-level radiation and president of IPPNW Europe, criticizes this attempt to downplay the issue: "Fukushima led to high levels of radioactive contamination in the air and soil, especially in the first few months, which resulted in the contamination of food and drinking water. This low-level radiation, once absorbed by the human body, can still lead to cancer and other diseases even decades later." IPPNW cites computational models that estimate between 22,000 and 66,000 additional cancer cases in Japan as a result of the nuclear disaster.

Claussen's view is supported by Richard Horton, the editor-in-chief of the medical journal *The Lancet*; in volume 383 dated June 21, 2014, he wrote: "when it comes to Chernobyl and Fukushima and the threat of radioactive contamination, the truth may not have been fully told. And WHO has a responsibility to get to that truth, however uncomfortable it might be for member-states or related agencies."

EURATOM: Everyone Pays

Nuclear energy in the EU countries, UK and Switzerland



In the meantime, the IAEA has concluded cooperation agreements with the Japanese foreign ministry, the Fukushima Prefecture and Fukushima Medical University, which ensure that no party shall publish confidential information or classified material without the express consent of the other party.

The WHO denies it is subject to censorship. In a statement on its website since February 2001, it proclaims that its commitment to the IAEA: "... does not in any way imply a submission of one organization to the authority of the other so as to affect their independence and responsibilities under their respective constitutional mandates."

However, there is no cooperation on equal terms between the WHO and the IAEA because the WHA12-40 agreement ensures an imbalance, inherent in the differing interests of the two organizations: As a UN organization, the WHO represents the health interests of the public and not the interests of an industry; the IAEA is fully backed by the nuclear industry and the nuclear weapons establishment. De facto, the IAEA is no more than a lobby organization, affiliated with the United Nations by an agreement.

As a result, when things get complicated, the WHO chooses to remain silent. For example, it never issued warnings regarding the use of uranium ammunition (see p. 48), which releases toxic and radioactive dust, endangering soldiers on both sides of a conflict as well as the civilian population. When radiologist Keith Baverstock, employed by the WHO from 1991 to 2003, wanted to publish new findings from the Armed Forces Radiobiology Research Institute — a division of the US Department of Defense — he was censored and vilified, prompting him to leave the organization. In 2007, the "Independent WHO" initiative was established in Geneva. It demands an independent health policy, especially in the field of threats.

Another document from the early days guarantees that the interests of the nuclear industry will be served: the EURATOM treaty, which established the European Atomic

Sometimes, the World Health Organization is suspiciously quiet: It never issued warnings about uranium ammunition

Energy Community on March 25, 1957. Founding members were Belgium, Germany, France, Italy, Luxembourg and the Netherlands. This treaty was designed to disseminate and further develop nuclear energy in Europe. When the Treaty of Lisbon amended the Treaty on European Union and the Treaty establishing the European Community in 2007, the 50-year-old EURATOM treaty remained an integral part of the new alliance agreement. EURATOM provides the basis for financing European nuclear research. All member states pay into a joint fund, whether they operate nuclear power plants or not.

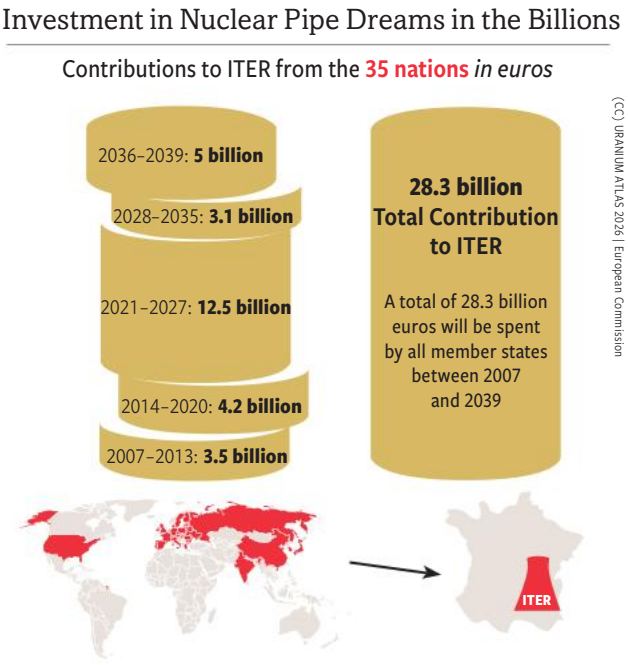
"The EURATOM treaty undermines free trade," says Heinz Stockinger, founder of the Austrian anti-nuclear initiative PLAGE. "Without this excessive funding, the nuclear industry would be in no position to survive in the free market." Currently, this is evident in the European Commission's approval of the exorbitant subsidies for the Hinkley Point C nuclear power project in the UK (see p. 26), which is based on the EURATOM treaty. "The treaty is undemocratic and obsolete," Stockinger says. "The European Parliament has no decision-making authority in EURATOM issues."

During the negotiations on an EU constitution in 2005, Germany, Austria, Hungary, Ireland, and Sweden demanded in a joint declaration annexed to the Treaty of Lisbon that a conference to revise the EURATOM Treaty be convened "as soon as possible." To date, this conference has not taken place. The countries that operate nuclear power plants are determined to maintain the Euratom privileges. Moreover, in 2022, the EU classified nuclear power as "sustainable" within the framework of its taxonomy.

ITER: THE 35-NATION NUCLEAR RESEARCH PROJECT

ITER is a research project aimed at generating infinite amounts of energy through nuclear fusion. Participants include all EU member states, the United Kingdom, and Switzerland via EURATOM, as well as the United States, China, South Korea, Japan, Russia, and India. The fusion reactor has been under construction since 2007 at the Cadarache nuclear research center in southern France.

Klaus Traube, the late chief designer of the Fast Breeder Reactor in Kalkar, criticized: In 1960, the nuclear industry said the fusion reactor would be a reality by 1970; in 1970, they spoke of 1990; and in 1990, finally, of 2020. Since the turn of the millennium, it has stopped making any predictions about completion. "The fusion reactor is a project of unrealistic nuclear pipe dreams," added the late solar pioneer Hermann Scheer in 2008, "we need to use the fusion reactor called the sun. It can deliver infinite energy." ●



Further Information

Alternative data on radiological hazards: independentwho.org

THE NEW ARMS RACE

A nuclear war would have no winners. Nevertheless, the nuclear weapon states continue to modernize their arsenals, withdraw from disarmament treaties, and develop new nuclear delivery systems.

The INF Treaty, signed in 1987 by US President Ronald Reagan and CPSU General Secretary Mikhail Gorbachev, was a milestone in bringing the Cold War to an end: Land-based nuclear missiles with a range of 500 to 5,500 kilometers, including launchers and infrastructure, were destroyed within three years. Further disarmament treaties followed: The United States and Russia, as the successor to the Soviet Union, have destroyed more than four-fifths of their nuclear arsenals.

The US and Russia are modernizing their nuclear weapons arsenals. At the same time, the United Nations wants to ban these weapons altogether

But the era of nuclear disarmament is over. The peace research institute SIPRI writes in its latest annual report: "Bilateral nuclear arms control between Russia and the US entered a crisis several years ago and has now almost completely collapsed." US President Donald Trump withdrew from the INF Treaty in 2019, and in 2024, Russian President Vladimir Putin announced the construction of new intermediate-range missiles. These have been deployed with nuclear warheads in Belarus — that is, close to the EU. In Germany, new US Tomahawk cruise missiles are scheduled to be deployed, but it is unclear when the US will be able to deliver them.

Since Russia invaded Ukraine in 2022, President Putin has repeatedly threatened to use nuclear weapons and has tightened his nuclear doctrine to allow the use of nuclear weapons against non-nuclear states and in defense of close allies (namely Belarus). The NATO nuclear powers have not responded comparably, at least not publicly. "This is the right step toward de-escalation," says peace researcher Sascha Hach. "In this situation, any threats only increase mutual mistrust and misinterpretations." However, the US also does not rule out a nuclear first strike, and Germany and other states insist on deterrence and nuclear sharing.

Current developments underscore that the nuclear threat is rising: As of early 2026, the nine nuclear powers possessed a total of 12,187 nuclear bombs, according to SIPRI. "A dangerous new nuclear arms race is emerging at a time when arms control regimes are severely weakened," states the SIPRI report. In other words: The world is closer to a nuclear war than it has been in decades.

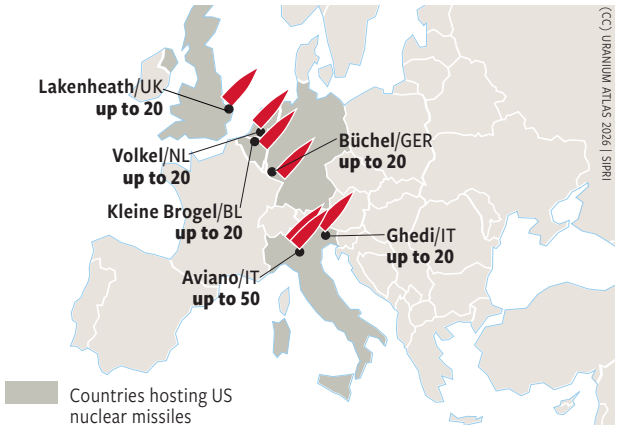
In 2009, US President Barack Obama spoke of the vision of a world free of nuclear weapons. But instead of disarming, the nuclear powers modernized their arsenals. The development of new, particularly smaller "tactical" nuclear weapons was already being prepared under Obama and then accelerated during Trump's first term. Yet most of these "small nuclear bombs" still possess the same destructive power as the Hiroshima bomb, which instantly killed 70,000 to 80,000 people on August 6, 1945. A study by the international medical organization IPPNW illustrates what a nuclear war would mean: A war involving 100 nuclear bombs would result in a global famine with up to two billion deaths.

Both the United States and Russia are strategically modernizing their entire arsenals: nuclear warheads as well as missile and aircraft systems. Russia has developed, tested, and deployed new delivery systems in the long- and medium-range sectors, which pose a particular threat to Europe. The same applies to the other nuclear-armed states, according to the SIPRI report. China is modernizing and expanding its nuclear arsenal, while India and Pakistan appear to be increasing their nuclear stockpiles. During a military conflict in April 2025, Pakistan openly threatened to use its nuclear weapons. North Korea's military nuclear program is a central component of its national security strategy. Particularly alarming: SIPRI sees signs "that additional states will join the 'nuclear club.'"

A look back offers hope. It is precisely after major nuclear

US-Nuclear Weapons in the EU and the UK

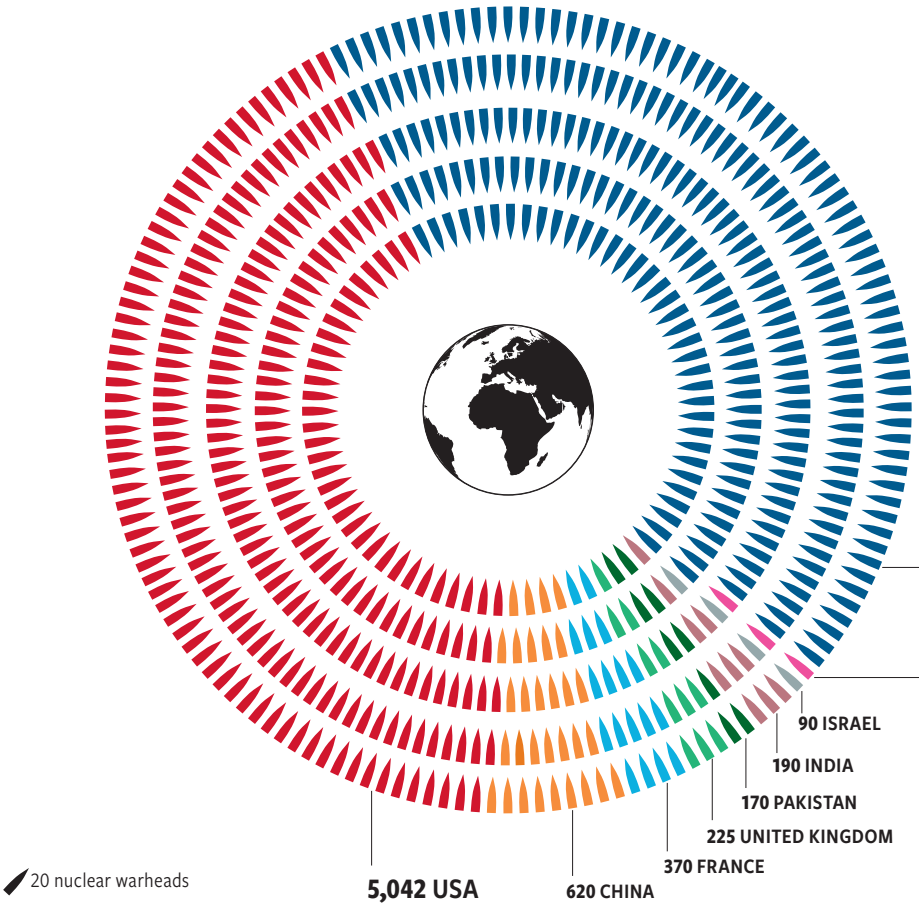
Number of nuclear weapons on US military bases in the UK, Belgium, Germany, Italy and the Netherlands



Permanent Threat to the World

Number of nuclear warheads per nation, as of 2026

(CC) URANIUM ATLAS 2026 | SIPRI



Anyone who wants to build nuclear bombs needs highly enriched uranium (HEU) or plutonium derived from fission. Any country with a civilian nuclear industry is capable of producing fissile material for this purpose.

In addition to the nuclear powers, the following countries have the technical capability to enrich uranium:
ARGENTINA, BRAZIL, GERMANY, IRAN, JAPAN and the NETHERLANDS.

crises that the nuclear powers have reached agreements and learned from the crisis that trust and disarmament are safer than mutual threats: The Cuban Missile Crisis in October 1962 was followed in 1963 by the Treaty Banning Nuclear Weapon Tests in the Atmosphere and, five years later, by the Nuclear Non-Proliferation Treaty. This was followed by SALT 1 (1972) and SALT 2 (1979), which limited strategic arms and nuclear delivery systems, and the 1987 INF Treaty. A new general understanding is needed that nuclear weapons do not guarantee security and that their existence requires political leaders to be cool-headed.

The alternatives to the nuclear threat are disarmament and a world free of nuclear weapons. Since 1982, the organization *Mayors for Peace*, founded in Japan, has been advocating for the abolition of all nuclear weapons. 8,608 cities from 166 countries and regions have since joined the organization. In July 2017, the *International Campaign to Abolish Nuclear Weapons* (ICAN) submitted a treaty to the United Nations banning nuclear weapons: 122 states voted in favor, 94 have since signed the treaty, and 74 have ratified it, most recently Indonesia, the largest country in Southeast Asia. The treaty entered into effect in January 2021.

NO MONEY FOR BOMBS

Since 2012, ICAN has been investigating financing for the construction of nuclear weapons through its "Don't Bank on the Bomb" campaign. In 2025, the NGO published a report on current developments: 24 companies remain heavily involved in the production, manufacture, and development of nuclear weapons. Worldwide, 260 financial institutions have invested or provided financing totaling 513 billion US dollars to one of these 24 companies. German banks and financial service providers are among them, including Allianz, the Deka Group, Deutsche Bank, Bayern LB, Commerzbank, DZ Bank, and KfW. Since current geopolitical power shifts are complicating nuclear disarmament, civil society must step up: Everyone can ask their bank whether it grants loans to corporations involved in nuclear weapons. "Destroy the bomb, not humanity," says report initiator, Susi Snyder. ●

Further Information

Physicians for Social Responsibility (PSR), Report 2013: Nuclear Famine. Two Billion People at Risk (PDF)
Links: mayorsforpeace.org; icanw.org; dontbankonthebomb.com; armscontrol.org
Graphic "Nukes Ready To Fly" by Andrew Barr and Richard Johnson, National Post, 2012

BANNED SINCE 1996

The first nuclear bomb was detonated on July 16, 1945, in Alamogordo, New Mexico. 2,057 additional tests followed, including those by North Korea in 2017. More than one quarter of all bombs were detonated above ground. Radiation victims are still fighting for compensation today.

"We are the most bombed nation in the world," say members of the Western Shoshone Nation when they talk about nuclear weapons testing. The US built the "Nevada Test Site" on their territory, about 100 km northwest of Las Vegas, in the Nevada desert.

The US military first conducted several dozen nuclear weapons tests after the conclusion of World War II, all of them in the South Pacific on the Enewetak and Bikini Atolls, which are part of the Marshall Islands. However, after the start of the Korean War in 1950, they instead chose to conduct most of their nuclear tests within the US "for reasons of national security." A 1,864-square-mile area in Nevada was declared a restricted military area. Between 1951 and 1992, the US Army detonated 928 nuclear bombs on this test site — one hundred of them above ground, until the Treaty Banning Nuclear Weapon Tests in the Atmosphere was passed in 1963.

"With the Ruby Valley Treaty, signed in 1863, the US formally recognized two-thirds of Nevada State as Western Shoshone sovereign territory," states the Society for Threatened Peoples. "In the 1930s, Western Shoshone territory illegally came within US authorities' jurisdiction." The Western Shoshone have never accepted this expropriation.

In the 1950s and 1960s, nobody was told about the radioactive clouds and the consequences of fallout — not the people living downwind in Las Vegas and elsewhere in the vicinity, nor the soldiers who were exposed to fallout only a few kilometers from the explosions and who were not given any protection. And least of all, the Western Shoshone. All the while, those in charge were well aware of the deadly risks, as recently declassified documents prove. By early 1953, a quarter of the sheep grazing on the test site land had perished. Seeing the carcasses of deformed lambs, even some with two heads, became a sort of strange normality.

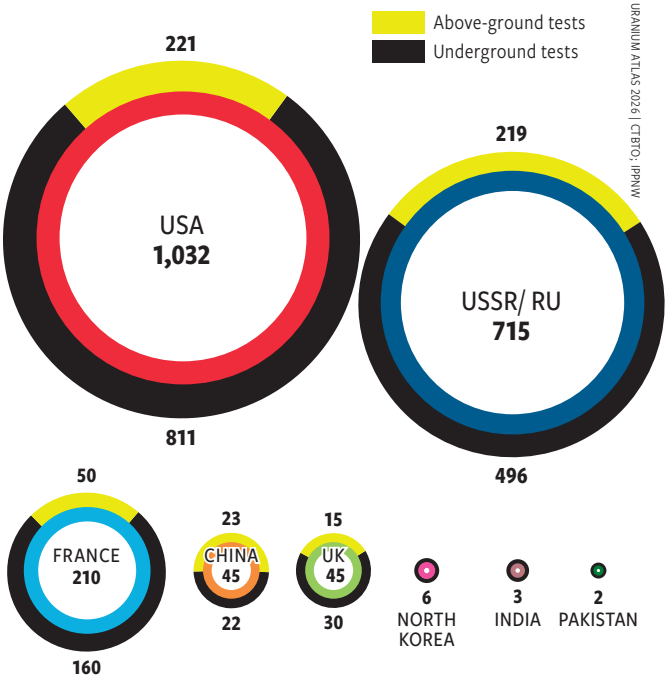
But the horrific effects of atomic testing did not end with malformed animals: "In the early '60s we began to experience all of the illnesses we are having now," says Lijon Eknilang, speaking about the Bikini tests in an article on the IPPNW website. She was just eight years old when, on March 1, 1954, the first US hydrogen bomb, "Bravo," was detonated on Bikini Atoll. "Many people suffer from thyroid tumors, stillbirths, eye problems, liver and stomach cancers and leukemia," said Lijon. "The most common birth defects on Rongelap and other atolls in the Marshall Islands have been 'jellyfish babies'. These babies are born with no bones in their bodies and with transparent skin. We can see their brains and their hearts beating. There are no legs, no arms, no head, no nothing. Some of these things we carry for eight months, nine months. The babies usually live for a day or two before they stop breathing."

Since 1990, radiation victims in the US have each received compensation of around 50,000 US dollars. A total of 2.6 billion US dollars has been paid out so far

It was not until 1990, with the passing of the Radiation Exposure Compensation Act, that the US government granted around 50,000 US dollars each in compensation to those suffering from cancer as a result of nuclear weapons tests and uranium mining. According to data released by the US Justice Department, 32,700 cases had been approved by July 2024, and more than 2.6 billion US-dollars had been paid out. That does not mean that all applications were approved. Those whose cancers could not clearly be linked to radioactive fallout or who "only" experienced stillbirths or suffered from mental disorders were denied.

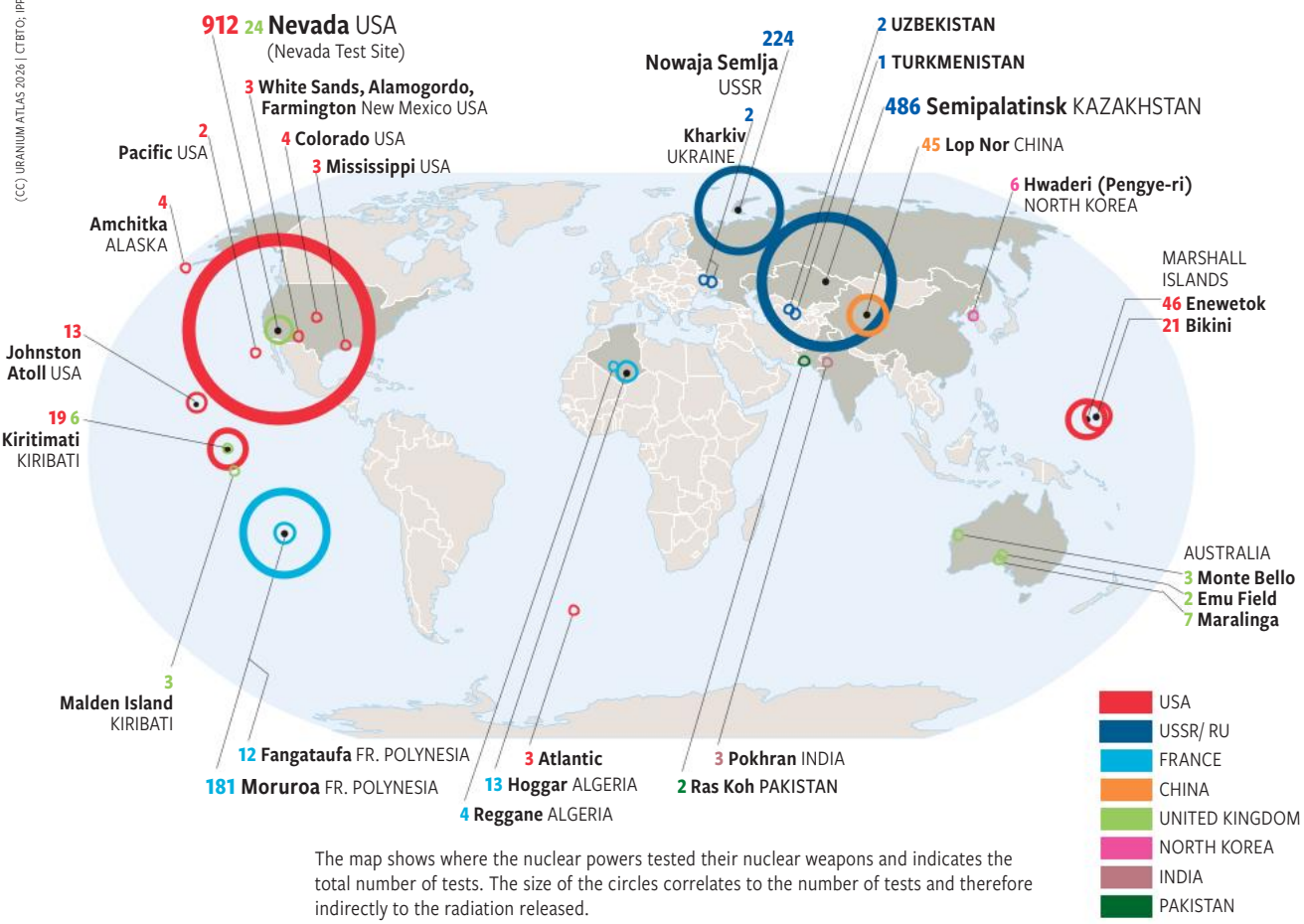
Global Testing Grounds

Number of nuclear tests per country from 1945 to 2017



Rehearsals for a Nuclear War

Where the nuclear powers tested their weapons



The map shows where the nuclear powers tested their nuclear weapons and indicates the total number of tests. The size of the circles correlates to the number of tests and therefore indirectly to the radiation released.

The Soviet Union had a similar test site to the one in Nevada in the US — in Semipalatinsk in today's Kazakhstan. From 1949 to 1989, the military carried out 486 nuclear weapons tests at this site. Before 1963, 160 of them were above ground. The explosive power of these tests was the equivalent of 2,500 Hiroshima bombs. The radioactive dust spread over an area the size of Germany; around 1.5 million people were exposed to radiation by the explosions. Karipbek Kuyukov knows the consequences. The man from Eastern Kazakhstan was born without arms and hands, a result of in utero exposure to the radioactive contamination. He dedicates his life and his art — painting moving and evocative images using his mouth and toes — to a single mission: that "no one else suffers the devastating effects of nuclear weapons testing." He is fighting for the abolition of all nuclear weapons, but not for an end to uranium mining - very much like the Kazakh government.

The Kazakhstan test site was closed down in 1991 — a success for which, among others, the Nevada-Semipalatinsk Movement can take credit. It was established in 1989 as one of the first anti-nuclear movements in the Soviet Union. The organization's name is an affirmation of solidarity with the radiation victims in Nevada.

In Australia, the UK tested its nuclear weapons in the desert at Maralinga and Emu Field and on the Montebello Islands. Between 1952 and 1963, twelve nuclear bombs were detonated in regions that the Aboriginal people claim as their homeland. France detonated its first bomb in February 1960 in the Algerian part of the Sahara Desert and some years later moved its testing site to the uninhabited Mururoa Atoll in the South Pacific. China, India, Pakistan and North Korea have all tested their weapons in their own countries.

Meanwhile, the international community has negotiated a complete halt to nuclear weapons testing via the Comprehensive Test Ban Treaty (CTBT). Negotiations began in 1994 under the US Clinton administration, with the US aiming for a ban on all nuclear tests, an effort supported by Russia. In 1996, the UN General Assembly adopted the treaty with UN resolution 50/245.

Germany, Australia, Finland, Canada, the Netherlands and Japan are part of the Group of Friends of the CTBT, which vehemently lobbied for the treaty to take effect. A total of 184 countries signed the CTBT, and 167 ratified it. For the treaty to take effect, it must be ratified by Iran, Israel, Egypt, China, the US, India, Pakistan and North Korea. The last three countries on this list have not signed it and have even conducted nuclear tests since 1996. ●

Further Information

Test Ban Treaty: ctbto.org
Global Peace Index: visionofhumanity.org
Treaty on the Prohibition of Nuclear Weapons: PDF at icanw.org/the_treaty

DU: SHORT FOR "WAR WITHOUT END"

Uranium-238, a waste product of uranium enrichment, has been diverted into tank-piercing projectiles. Depleted uranium, known as DU, has an extremely high penetrating force — and fatal consequences.

Due to its density, depleted uranium is used as a counterweight for aircraft wings and racing yachts. However, worldwide controversy has erupted over its military use: with three times the penetration force of a common grenade, a 30-millimeter depleted uranium projectile can cut into a tank like a hot knife through butter.

On impact, white-hot uranium dust reacts explosively with the oxygen inside the armored tank. A wall of flames, with temperatures up to 5,000 degrees Celsius, will silence the cries of panic from the crew in seconds. For two seconds, it is deathly silent. Then the fire reaches the ammunition stored in the tank. A huge explosion separates the tower from the rest of the tank. The blue and black pillar of fire and smoke soars straight up into the sky. It spreads radioactive and highly toxic nano dust particles over the battlefield and beyond — poisoning the soldiers on both sides as well as the civilian population, even long after the war is over. It seeps into the soil and contaminates the groundwater.

DU has a radioactive half-life of 4.5 billion years. This means that once released, its radioactive particles will emit alpha radiation virtually forever. According to the principles and criteria of international humanitarian law, the principle of distinction between civilians and combatants, and due diligence obligations regarding the environment and the precautionary and preventive action principles, the use of uranium weapons is prohibited. The consequences of using DU ammunition also violate the standards of the International Protection of Human Rights (e.g. the right to a healthy environment) as well as environmental protection standards (protection from toxic substances). Ramsey Clark, former head of the US Department of Justice, called uranium ammunition a "Metal of Dishonor," a pun on the term "Medal of Honor," the highest distinction awarded to a member of the military by the US government.

With three times the penetration force of a common grenade, a 30-millimeter depleted uranium projectile can cut into a tank like a hot knife through butter

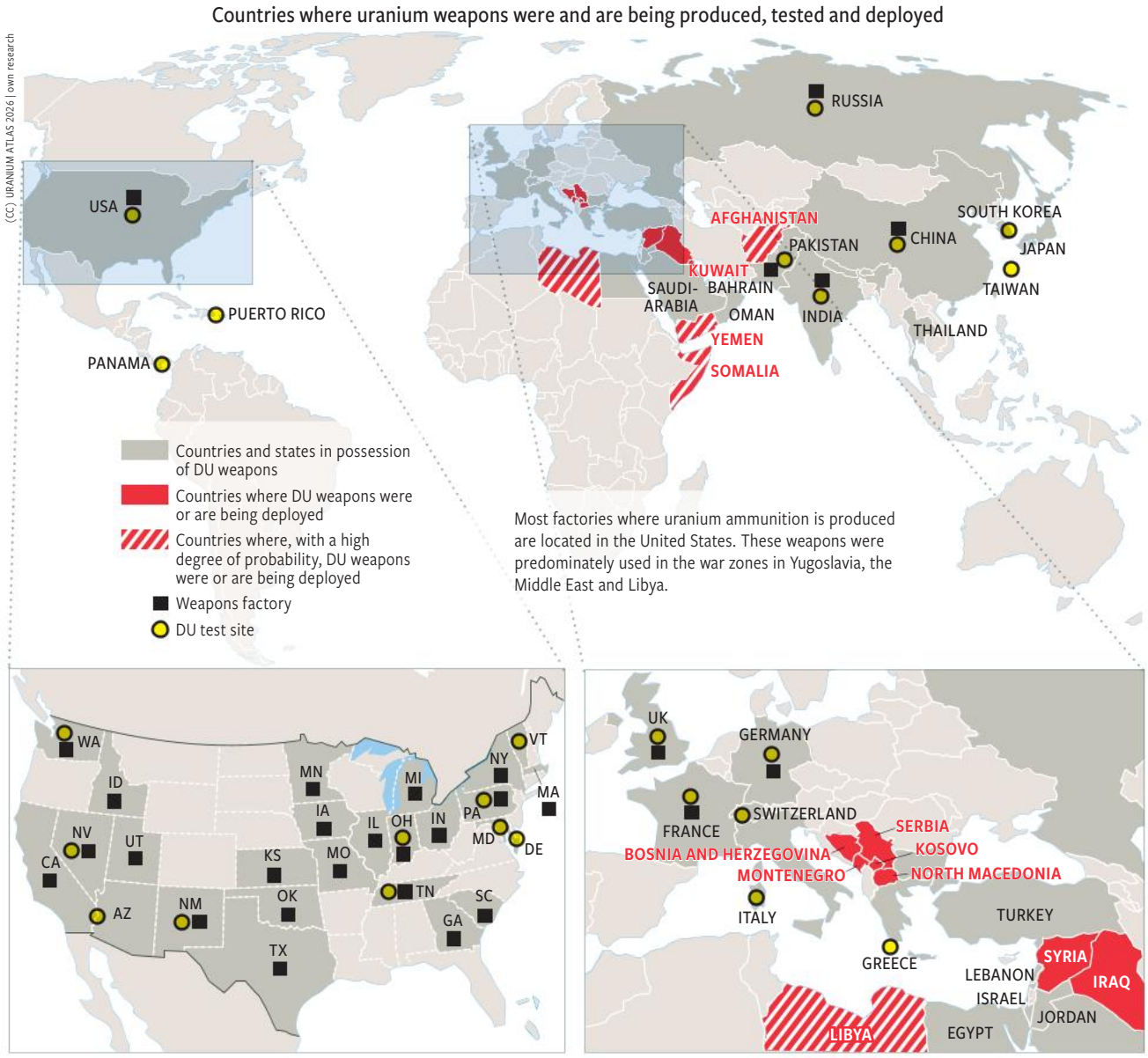
Uranium ammunition was first used in the Gulf War in 1991 in southern Iraq by the US and the UK — with at least 320 tons of DU being dropped on Iraqi cities and tanks. Since then, many US soldiers have fallen ill or have died, leading to the concept of Gulf War Syndrome. The sick veterans are still struggling to get recognition for their "service-related disease." The subsequent use of DU spans more than a decade: three tons of DU were used during the war in Bosnia and Herzegovina in 1995; 9.45 tons in Serbia, Kosovo and Montenegro in 1999; and 145 tons in Iraq in 2003. Between 2001 and 2006, it was used in missions in Afghanistan, Syria and Somalia. There is no reliable information on whether Russia and Ukraine are currently using uranium weapons, but it is likely.

Where does the DU come from? Natural uranium ore consists mostly of uranium-238 and is therefore not suited for nuclear reactor fuel. Uranium-235 is essential because it can sustain a nuclear fission chain reaction. Uranium-235 makes up only 0.7 percent of the uranium mined. Uranium enrichment increases this share to 3-5 percent to produce fuel rods for civilian reactors, or to 85 percent or higher for nuclear weapons. Depleted uranium is left behind as a waste product of this process, consisting mostly of uranium-238 and just 0.03 percent of uranium-235 (see pp. 8-9). Whether for military or civilian purposes, only about 5 percent of the total amount of depleted uranium is ever used at all. The vast majority of it is deposited in unmarked places, whereas it should be stored as nuclear waste in a safe, permanent repository.

When the US Air Force introduced its new A-10 Thunderbolt jet fighter 40 years ago, with an onboard gun capable of firing 4,200 rounds per minute of DU armor-piercing ammunition, these tests were conducted without any safety precautions or prior announcements; neither the US armed forces nor the population were informed of the health risks involved. A rise in morbidity among military personnel and civilians in the testing areas led to massive protests, so the tests were then relocated to places outside of the US mainland: to Vieques in Puerto Rico; Balboa West and Piñas in Panama; to Kumejima and Okinawa in Japan; Camp Doha in Kuwait; Koon Ni in South Korea; and to the military training area Grafenwöhr in Germany. The tests did not pass without incident: tanks loaded with DU ammunition caught fire and burnt out in Altenwalde, Gollhofen and Oberaltertheim in Germany.

In addition, several A-10 fighter jets crashed. In Kuwait, a US ammunition depot storing 3.5 tons of DU exploded. Other countries — among them the UK, France, Germany, Greece, the USSR and Switzerland — tested uranium ammunition within their own borders. The British military had a test site in Eskmeals in Northwest England and in Dundrennan in Scotland; France in the Polygone de tir near Bourges, 200 kilometers south of Paris. The German military tested on the premises of MBB, Rheinmetall and EADS in Unterlüss and in

Uranium Weapons — an Unacknowledged Hazard



the asparagus region of Schrobenhausen. The Swiss company Contraves had a site in Ochsenboden. Salto di Quirra in eastern Sardinia, Europe's largest military training site in Italy, was available to all NATO members. The rate of cancer incidence there is very high, and Greenpeace announced it had found sheep born with three legs and even two heads.

At least 18 countries have uranium weapons in their arsenals: the UK, the US, France, Russia, Greece, Turkey, Israel, Saudi Arabia, Bahrain, Egypt, Kuwait, Jordan, Pakistan, Oman, Thailand, China, India and Taiwan. The Honeywell subsidiary, Alliant Techsystems (ATK) in the US, is by far the biggest producer and exporter of uranium weapons worldwide. In September 2017, ATK was taken over by the world's largest weapons corporation, Northrop Grumman.

The UK, France, Russia, Pakistan and India also participate in the production of uranium ammunition. In Germany, physician Siegwart Horst Günther and the documentary filmmaker Frieder Wagner made this problematic issue public. In 1995, Günther smuggled casings of uranium ammunition from the Iraqi battlefields to Berlin and had them tested for radiation. He was subsequently charged with "dissemination of radioactive material" and jailed. At the same time, NATO declared this type of ammunition completely safe.

In 2003, the International Coalition to Ban Uranium Weapons (ICBUW) was established. It coordinates and brings together civil society efforts to ban uranium weapons and to help DU victims. The UN General Assembly discusses the issue of uranium ammunition every two years. The resolutions adopted there, with a large majority, emphasize the following priorities: transparency, the precautionary approach and support for affected regions. The European Parliament continues to support these precautionary principles. ●

Further information

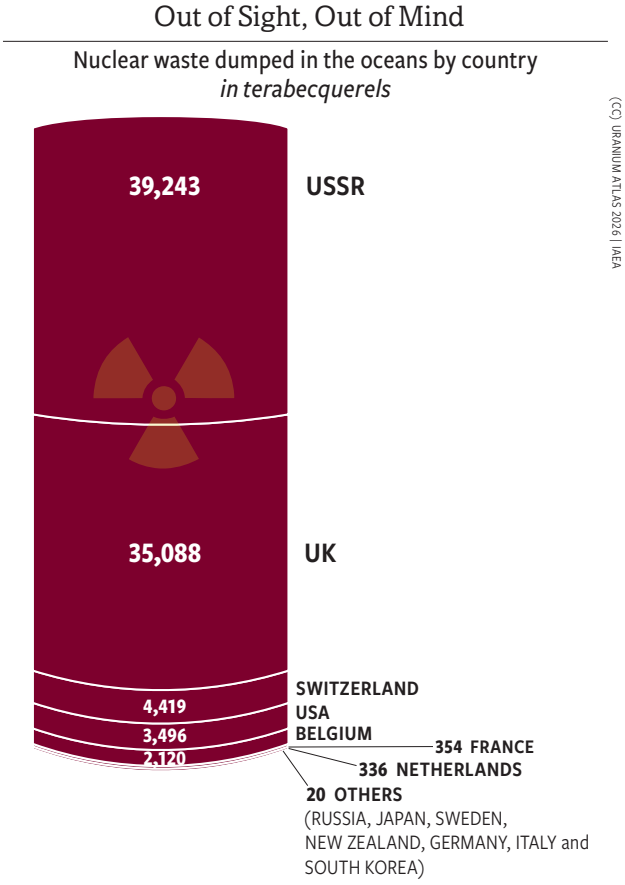
Film: Deadly Dust—Depleted Uranium, Frieder Wagner, 93 min, on Youtube
Links: icbuw.eu; uraniumweaponsconference.de

FINAL DISPOSAL SITE: THE OCEANS

Between 1946 and 1993, the seas were abused as a nuclear waste dump. Up until 1975, even high-level radioactive nuclear waste was disposed of in the world's oceans.

The US demonstrated very early on how to quickly and cost-effectively dispose of nuclear waste: In 1946, the US put radioactive waste in 200-liter barrels and dumped them into the Pacific Ocean near the Farallon Islands, about 50 kilometers off the coast of California. As a result, the ocean became a nuclear waste dump. Decades later, the US government admitted to the International Atomic Energy Agency (IAEA) that up until 1970, the country had disposed of 90,000 barrels at different locations in the Pacific and the North Atlantic.

A statistic, published by the IAEA in the 1990s, shows that several other countries followed the US example: Belgium, Switzerland, France, Sweden, the Netherlands, Italy, Germany and most notably the UK, abused the Atlantic Ocean as a final nuclear dumpsite and collectively disposed of more than



Protests by Greenpeace, in particular, finally forced an end to nuclear waste being dumped into the oceans, a practice that ended in 1994

100,000 tons of radioactive waste. Germany's part in this came in May of 1967, when 480 barrels of the country's radioactive waste were dumped into the Atlantic Ocean, 450 kilometers off the coast of Portugal.

After the fall of the Iron Curtain, the Russian Federation admitted to the IAEA that in Soviet times, around 1,900,000 cubic meters of nuclear waste disappeared into the Arctic Sea and almost 150,000 cubic meters went into the Pacific Ocean and the Baltic Sea — among them disused nuclear submarines and at least 16 nuclear reactors from submarines.

In addition, six nuclear submarines (three from the US and three from the USSR) sank, complete with nuclear missiles on board. The boats are still lying at the bottom of the ocean, at a depth of between 1,700 and 5,500 meters.

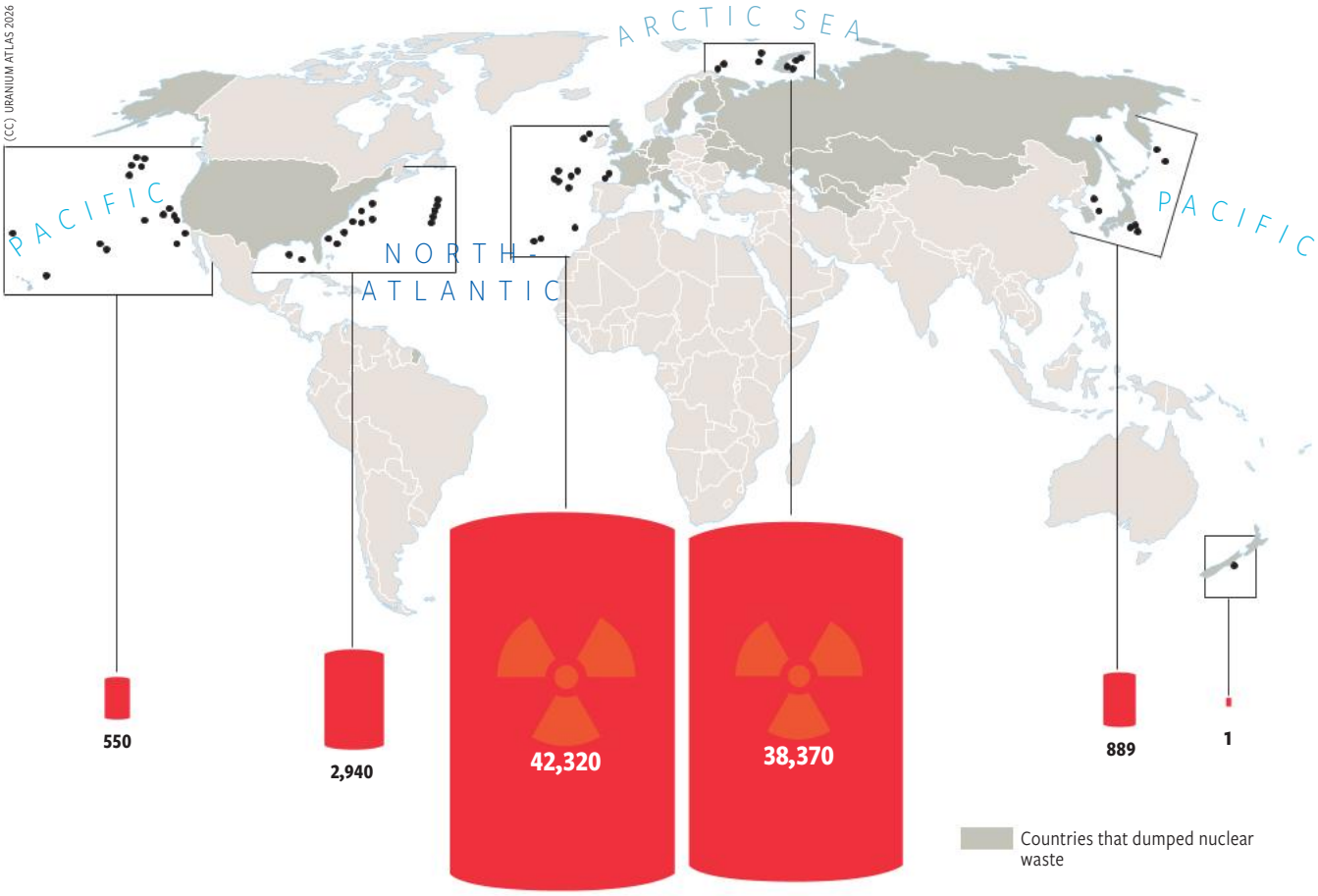
Today, nobody can provide exact numbers for the amount of high-level radioactive waste that was dumped into the oceans. The practice was not banned until 1975, when the London Convention on Marine Dumping came into force. However, even with the London Convention, low- and intermediate-level nuclear wastes were still allowed to be dumped. In 1985, the Nuclear Energy Agency, a subsidiary of the Organization for Economic Cooperation and Development (OECD), stated in a report that once the saltwater ate through the walls of the barrels, the radioactive contaminants in the ocean would be diluted and distributed over large areas. Consequently, the thresholds for radiation exposure were easy to adhere to.

However, highly publicized protests by *Greenpeace* finally changed the approach. In 1994, all countries that had previously used the oceans as a nuclear dumping ground signed a moratorium that still stands today. One can surmise just how much harm was done to the oceans from the nuclear waste dumped there decades ago, from the German government's response to an inquiry by the Green Party in 2012: "The barrels were not designed to ensure a permanent containment of the radionuclides at the bottom of the ocean. Therefore, it has to be assumed that they are partially no longer intact and the radionuclides have been released."

Greenpeace activists and journalists have documented and made public that this is the case: Their films show fish and other sea creatures swimming around burst metal barrels

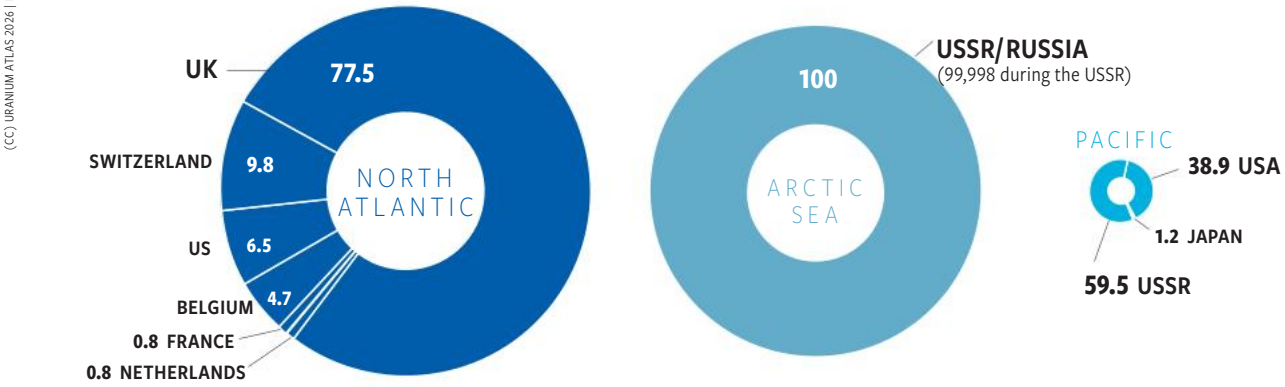
Dumped Under Water

Nuclear waste disposed of in the oceans *in terabecquerels*



The Polluters and Their Responsibility

Countries' share of nuclear waste dumped in the oceans in the respective region *in percent*



containing radioactive waste. The commission in charge of monitoring compliance with the treaty for the Protection of the marine environment of the North-East Atlantic (OSPAR), which consists of 15 governments, including members of the EU, stated in 2010: "The analysis showed elevated concentrations of 238Pu in water samples collected at the dumpsites indicating leakages from the packages. At some locations also the concentrations of 293+240Pu, 241Am and 14C in the water were enhanced." Although it is clear that the released nuclear waste has contaminated the oceans, so far no efforts have been initiated to recover it. Most probably, the expenditure would be prohibitive since most of the barrels lie at the bottom of the ocean at depths of several thousand meters. Besides, the nuclear industry does not feel the need to take responsibility. ●

Further Information

Sea disposal of radioactive waste: iaea.org
Nuclear submarine: bbc.com/news/world-europe-48949113

DESTINATION UNKNOWN

Worldwide, only one final repository is actually nearing completion—Onkalo in Finland. Yet there are now 420,000 tons of highly radioactive nuclear waste, with about 10,000 tons added annually.

(CC) URANIUM ATLAS 2026 | Endlagerkommission, Greenpeace

* *There is no standardized definition of highly radioactive nuclear waste. Some states use heat generation as an indicator, others the radiation potential. The boundary between medium and highly radioactive nuclear waste is also not clearly defined. Quantities sometimes are given in tons, sometimes in cubic meters or even container numbers. Accordingly, the data on highly radioactive nuclear waste in the various nuclear states are only comparable to a limited extent.*

Country	USA	CANADA	RUSSIA	FRANCE	CHINA
Background	In 1987, Congress mandated a focus on a final repository at Yucca Mountain in Nevada. The plan was to store 70,000 tons of highly radioactive waste on Western Shoshone land. The state of Nevada and the Western Shoshone vehemently opposed Yucca. Yucca Mountain was rejected in 2011. No alternative site has been identified to date.	A plan for final disposal in the crystalline rock of the Canadian Shield failed, so in 2002, Canada required nuclear power plant operators to establish the Nuclear Waste Management Corporation. In 2024, the region between Thunder Bay on Lake Superior and Winnipeg was selected; the Wabigoon Lake Ojibway Nation and the Township of Ignace (Ontario) were involved and gave their consent.	While Russia has a final repository for low- and intermediate-level waste, it is still in the exploratory phase for high-level radioactive waste. According to Rosatom, research is currently underway in the Nizhneanskiy massif in the Krasnoyarsk region of Siberia to determine whether the geological conditions are suitable. If the site proves unsuitable, Russia will be back to square one.	France plans to store its highly radioactive waste in a clay formation 500 meters underground near Bure in Lorraine. In 2023, the Constitutional Council ruled that the plans for Cigéo—as the project is known—were "constitutional." Construction could begin in 2027, with storage starting after 2035. The nuclear waste is to be retrievable for 100 years.	Due to the large number of new nuclear power plants, the amount of high-level nuclear waste is increasing. Near Xinchang in the Gobi Desert, the CNNC has established a research laboratory deep underground to investigate the site's suitability as a final repository. If the results are positive, construction of the final repository is scheduled to begin in 2041, with waste disposal starting in 2050.
Operating nuclear reactors **under construction** or **permanently shut down** (2026)	94 - 41	17 1 8	34 7 14	57 - 14	64 36 -
High-level radioactive nuclear waste*	**Over 90,000 tons of spent nuclear fuel** (as of late 2025)	**3.4 million used nuclear fuel bundles, each weighing 24 kilograms.** Approx. 90,000 more are added each year	**50,000 tons spent nuclear fuel** (by 2050)	**10,000 cubic meters of high-level, 73,000 cubic meters of medium-level radioactive waste** (by 2100)	**20,500 tons** (estimate as of late 2025)
Current interim storage facility	High-level radioactive waste is stored in more than 100 locations across 39 states, in various buildings and containers.	In Canada, spent fuel assemblies are stored in interim storage facilities at the various nuclear power plant sites.	Spent fuel is not considered waste and is stored at nuclear power plant sites, sometimes unprotected in the open air.	Spent fuel elements are reprocessed and not treated as nuclear waste. La Hague serves as an interim storage facility for the remaining waste.	In China, spent fuel assemblies have so far been stored in regional interim storage facilities. Operations are managed by the state-owned CNNC.
Location and status of the search for a final repository	**Rejected** Yucca Mountain was rejected in 2011	**Approval phase** Local residents were involved	**Under exploration** Krasnoyarsk is the only site being explored	**Advanced** Testing under real-world conditions starting in 2035	**In preparation** The Gobi Desert is favored as a site

The first nuclear chain reaction took place in Chicago on December 2, 1942, as part of the Manhattan Project. On that fateful day, the first cupful of high-level radioactive waste was produced — for eternity. No plan was made then to dispose of this new type of waste. It was a problem to be solved later. Now it is "later," and there remains no permanent, safe, long-term solution for its disposal. What we know: a final storage site or disposal site for high-level radioactive nuclear waste must be secure for at least a million years, the timeframe during which radioactive waste poses a deadly risk. What we also know: mankind has absolutely no experience in planning for periods of such long duration.

It is very difficult to research data relating to nuclear waste, since the IAEA and the WNA do not make information publicly available. Countries with reprocessing plants can significantly reduce the volume of high-level radioactive nuclear waste, but reprocessing also hugely increases the amount of intermediate-level radioactive waste. ●

A permanent disposal site for radioactive waste must be secure for at least a million years — the time that radioactive waste continues to pose deadly risks

JAPAN

Japan faces a fundamental problem: four tectonic plates converge beneath the country, meaning no rock layer can guarantee a million years of safety. Since nuclear power has been extremely unpopular since Fukushima, no region wants to take on the radioactive waste. Japan's nuclear industry has proposed a "national debate" to solve the problem.

27,000 containers of vitrified high-level radioactive waste
(March 2024)

High-level radioactive waste is stored in above-ground interim storage facilities. After Fukushima, all of them underwent a stress test.

No idea

Too seismically active to be safe

GERMANY

After the failure of Gorleben, Germany established a commission. The Federal Company for Final Storage, founded in 2017, identified 90 sub-areas as suitable in principle in 2020, covering 54 percent of the country's land area. By the end of 2027, this must be reduced to fewer than 10 potential site regions, which will then be examined in greater detail. Citizens are involved in the search.

27,000 cubic meters
(until the nuclear phase-out in 2023)

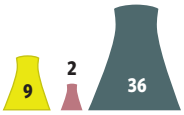
Until a final repository is ready, the highly radioactive nuclear waste is stored at the sites of the nuclear power plants and in Gorleben, Ahaus and Lubmin.

Open search

The decision could take decades

UK

Mid Copeland and South Copeland in Cumbria, as well as an area near Luth in Lincolnshire, have been designated as "focus areas" where the potential for a final repository is now being assessed. Local events are intended to convince people in the region of the idea. It will likely be some time before a decision is made.



1,470 cubic meters or 3,500 tons of vitrified waste from the reprocessing of spent fuel elements
(2022)

High- and low-level nuclear waste is currently stored above ground at several locations, most of it at the Sellafield reprocessing plant.

Still uncertain

Local residents need to be convinced

SWITZERLAND

In Switzerland, the last nuclear power plant is scheduled to be shut down in 2034. By then, the country will likely have 1,500 tons of high-level and an additional 72,000 cubic meters of low- and intermediate-level radioactive waste. In 1995 and 2002, the Swiss rejected two proposed sites for final disposal. North of Lägern has been proposed as the most suitable location for storing the waste.

1,500 tons
(by 2034)

Final storage will begin in 2050 at the earliest. Until then, nuclear waste is stored in an interim storage site and at the nuclear plant sites.

Site proposed

It is to be located north of Lägern

SWEDEN

The search for a site began in 1977. The Swedish Nuclear Fuel and Waste Management Company, tasked with this, has since selected Forsmark, 120 kilometers north of Stockholm, and a crystalline rock formation 500 meters underground. There is already a nuclear power plant there with three reactors. There is virtually no opposition from the local population.

12,000 tons
(total expected volume)

For the time being, the nuclear waste is stored near the Oskarshamn nuclear power plant.

Resolved

The construction permit for Forsmark has been granted

FINLAND

Onkalo means "cavity" and is the name of Finland's final repository. It is located on the Olkiluoto nuclear peninsula, where two nuclear reactors are already in operation. In 2015, the Finnish government granted a license to build a final repository in deep rock layers. Space for 6,500 tons of nuclear waste has been created. Storage is scheduled to begin in 2026.

6,000 tons
(total expected volume)

Until the final repository becomes operational, all nuclear waste will be temporarily stored at the Olkiluoto site.

Largely complete

Olkiluoto is the world's first final repository

GAME OVER FOR NUCLEAR POWER

For decades, the nuclear industry boasted of a "nuclear renaissance." But the reality turned out to be very different: losses running into billions, delays, and competition from renewable energy sources, which have become less expensive over time.

In the 1950s, it was predicted that nuclear power would be "too cheap to meter," but today it has proven to be "too expensive to matter." By mid-2026, 413 nuclear reactors were in operation worldwide—about 25 fewer than at the beginning of 2002, when the nuclear industry reached its peak. While 70 new reactors were under construction globally, more than half—36, to be precise—were located in China. Furthermore, of the 31 nations utilizing nuclear power, only eight were building new nuclear power plants; three-quarters had no reactor construction programs underway. Notably, 95 percent of all new nuclear plant construction projects (64 out of 70) are being undertaken either within nuclear-armed states or by nuclear-armed states in other countries. The state-owned corporations Rosatom (Russia; see p. 36) and CNNC (China) account for 44 of the 45 new reactor construction projects initiated between early 2020 and mid-2025.

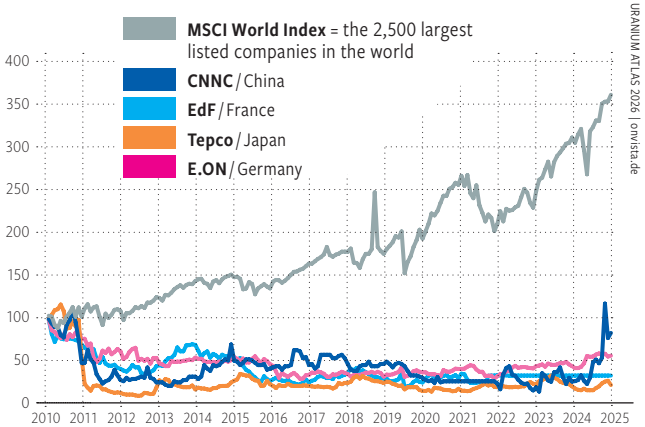
In the United States—the world's largest consumer of nuclear power—not a single reactor is currently under construction. By the end of 2026, the average age of the 94 US reactors will be 45 years. This means that in the coming years, many of these reactors will need to be decommissioned solely because of their age. Although the Trump administration aims to jumpstart and accelerate reactor construction once again, such effort takes time. It has already granted a 1 billion US dollar loan to the energy provider Constellation Energy Generation to bring the Three Mile Island nuclear plant—shut down for economic reasons in 2019—back online by 2028. Microsoft intends to purchase the electricity generated by the facility.

In contrast, Taiwan completed its nuclear phase-out in 2025, following in the footsteps of Germany, Italy, Kazakhstan, and Lithuania, which had abandoned their nuclear programs between 1987 and 2023. Meanwhile, nuclear power currently accounts for nine percent of global electricity production. In 2002—with 438 reactors in operation—the nuclear industry reached a historic peak of 17.5 percent. Since then, its contribution has steadily declined. When accounting for mobility and heating requirements, nuclear power plants contributed a mere 4 percent to global primary energy demand in 2024. For comparison: in 1984 and 1985, 33 reactors came online each year; in 2025, only two—despite 13 having been announced at the beginning of the year. In 1979, there were 234 reactors under construction, an all-time peak. Since then, the number of new construction projects has declined each year. Reflecting this trend, the significance of nuclear power continues to wane, while that of solar, wind, and hydropower grows ceaselessly. Between 2014 and 2024, annual electricity generation from renewable sources rose by over 4,500 terawatt-hours (TWh), whereas nuclear power generation increased by a mere 197 TWh (see figure on the right).

The reasons are simple: Regardless of all risks and hazards, nuclear energy—despite heavy state subsidies and bailout programs—is no longer financially competitive.

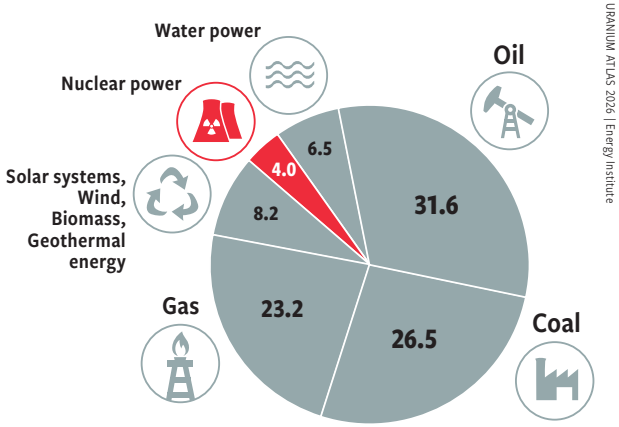
Nuclear Energy Cos. on a Downward Course

Share prices development of four large nuclear power companies according to the MSCI World Index *in percent*



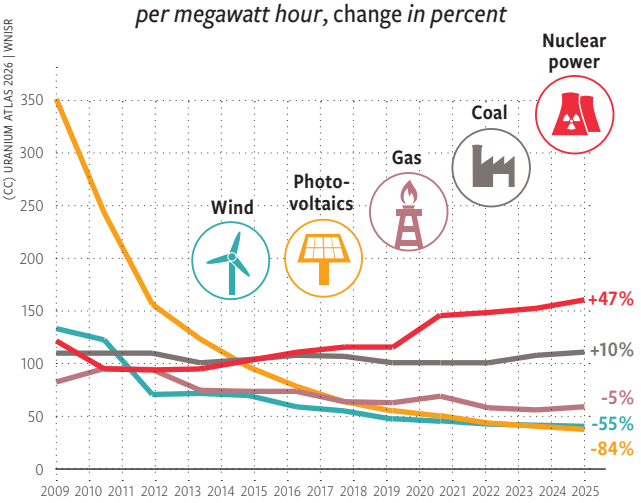
Nuclear Energy: Overestimated Importance

Worldwide market shares of primary energy sources as of 2023 *in percent*



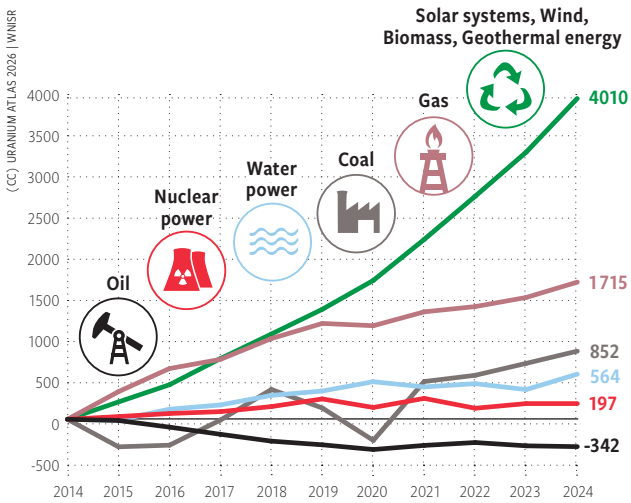
Nuclear Power: No Longer Competitive

Electricity generation costs of new power plants *in US dollars per megawatt hour*, change *in percent*



Renewables Outpacing Nuclear Energy

Annual new global electricity production *in terawatt hours*



Building nuclear reactors is becoming increasingly expensive and has turned into an economic gamble. Historically, one in eight new nuclear construction projects has been abandoned before commissioning. In 2017, following the bankruptcy of the manufacturer Toshiba-Westinghouse, construction on two reactors at the Virgil C. Summer site in the US state of South Carolina was halted, even though the project developers had already invested approximately 10 billion US dollars. In 2012, through its acquisition of the British firm Horizon Nuclear Power Ltd, Hitachi obtained the license to build two boiling water reactors at Wylfa on the Welsh coast. With few private investors, the corporation initially put the project on hold in 2018 and ultimately wrote it off in 2020, incurring a loss of 2.4 billion euros. The Japanese company Toshiba — which had lost around 6 billion US dollars during the insolvency of its former subsidiary, Westinghouse — pulled the plug on all its overseas nuclear projects, including Moorside in the UK.

Primarily for economic reasons, entire national nuclear power plant construction programs were abandoned or "suspended" — for example, in Chile, Indonesia, Jordan, Lithuania, South Africa, Thailand, and Vietnam. The failure of the "nuclear renaissance" had dramatic financial repercussions for nuclear energy corporations. Both Westinghouse — historically the most significant builder of nuclear power plants — and the French company Areva, which had styled itself the "global market leader in nuclear energy," went bankrupt.

These financial difficulties were largely caused by construction project delays and dramatically spiraling costs. The first European Pressurized Reactor (EPR) was built in Olkiluoto, Finland. Construction began in 2005, with completion scheduled for 2009 and a projected cost of 3 billion euros. Power generation finally commenced in 2023, by which time construction costs had reached 11 billion euros. The construction of a reactor in Flamanville, France, followed a similar trajectory. Construction began in 2007, with completion planned for 2012 at a projected cost of 3.3 billion euros. Following an endless series of technical and industrial debacles, the reactor went into operation at the end of 2024. The French Court of Auditors estimates the cost of this undertaking at 23.7 billion euros — six times higher than the original projection.

In December 2013, the French state-owned utility EdF was awarded the contract to construct two reactor units — Hinkley Point C1 and C2 — in the UK. The initial estimate stood at 16 billion British pounds. By now, however, costs have ballooned to between 43 and 47 billion pounds. The world's first EPR reactor to generate electricity was Taishan-1, built in China between October 2009 and June 2018 — a project that also fell significantly behind schedule and faced substantial cost overruns. Taishan-2 followed in 2019.

In several countries, the construction of new nuclear power plants was aborted for economic reasons

Current nuclear power plants face increasing economic challenges, and many struggle to remain viable in liberalized energy markets. Six US reactors have already been shut down ahead of schedule. In September 2020, Exelon Generation announced the closure of four nuclear units in Illinois because they were no longer competitive. After the Illinois Senate approved 694 million US dollars in funding for the struggling nuclear division in 2021, Exelon halted the removal of fuel rods. For years, the costs associated with nuclear power have been rising sharply. In contrast, wind and solar installations have become increasingly cost-effective and can now compete with both existing nuclear power plants and fossil fuels. It is therefore nothing short of absurd that the World Bank seeks to assist so-called developing countries in constructing small-scale nuclear power plants.

From an economic standpoint, nuclear power has no future and cannot survive without state subsidies. Operators are pinning their hopes on extending reactor lifespans — a strategy that significantly heightens the risk of catastrophic accidents. Moreover, new nuclear power plants are often built solely for military and strategic purposes. ●

Further Information

World Nuclear Industry Status Report, 2025 and 2026 (PDF), by Mycle Schneider et al.: worldnuclearreport.org

THE MYTH OF CLIMATE-FRIENDLY ENERGY

The nuclear industry extols so-called Small Modular Reactors in the highest terms, is working on the fourth generation of nuclear power plants, and invokes climate change in its arguments. Yet the hype is without substance.

One kilogram of uranium-235 contains enough energy to generate 24 million kilowatt-hours of heat; one kilogram of coal can generate only eight. As a result, nuclear power has always been promoted as a better alternative to fossil fuels, and the climate crisis is used to justify its continued and expanded use. Any mention of the health risks of uranium mining, the possibility of a nuclear meltdown, and the still unsolved issue of the "permanent disposal" of highly radioactive nuclear waste is studiously avoided.

"All technologies with low CO_2 emissions are needed to achieve the goals of the Paris Agreement—including nuclear power," states the IAEA publication *Nuclear Power and the Paris Agreement*. Climate protection currently serves as the central argument for restoring the acceptability of nuclear power.

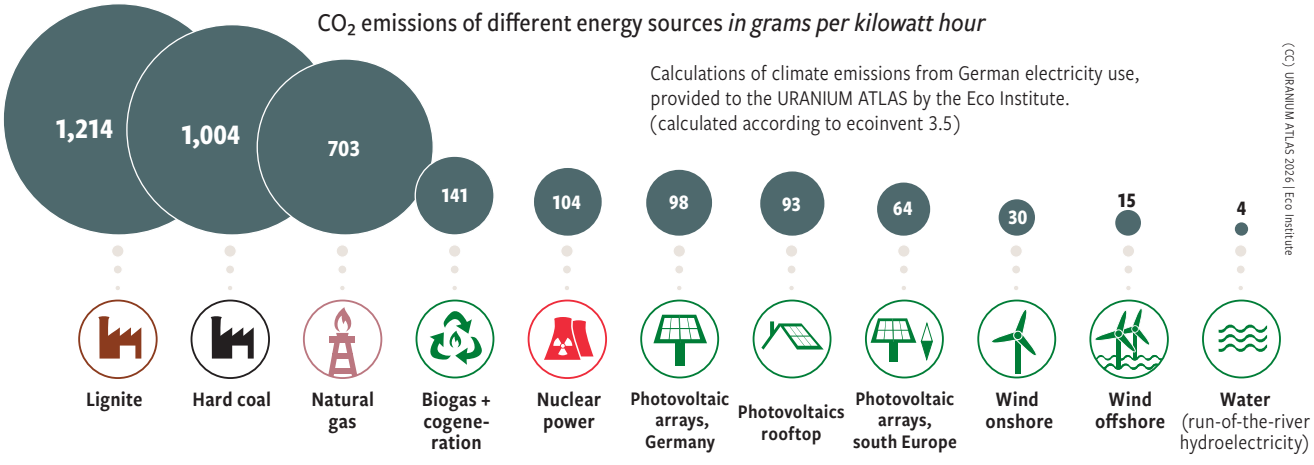
According to the IAEA, saving the climate would require 900 gigawatts of new nuclear power capacity by 2050. This would amount to 600 to 700 new nuclear reactors—far more than are currently in operation (see p. 41). Yet not a single new plant can be built today without massive government subsidies. In 2025, the International Energy Agency (IEA) concluded that "global nuclear energy capacity will increase by more than 50 percent by 2050." In doing so, the IEA assumes that Small Modular Reactors (SMRs) will become market-ready the next ten years and that new nuclear plant construction projects will face neither time delays nor cost overruns.

There is no evidence to support these assumptions. The nuclear industry has been heavily subsidized for decades and, from a purely economic standpoint, is not viable. From remediating the environmental damage caused by uranium mining and covering the costs of routine operations, to the notoriously difficult-to-quantify costs of decommissioning and final waste disposal, the industry has neither calculated the true cost of its operations nor accurately assessed its own economic standing. Due to its intrinsic links to the construction of nuclear weapons and the maintenance of nuclear-powered submarine fleets, state subsidies have been provided time and again.

Onshore and offshore wind energy is one of the preferable alternatives to fourth generation nuclear reactors

Recently SMRs have been touted as a solution. The Paris-based Nuclear Energy Agency has listed over 100 start-up designs, including Bill Gates' TerraPower, NuScale, and Rolls-Royce. However, their small size—300 megawatts or less—makes them even more economically unfeasible than large-scale reactors. According to German business magazine *Wirtschaftswoche*, NuScale intended to build the first mini-nuclear power plant in Idaho, US, and had already received 1.4 billion US-dollars in subsidies for this project. In November 2023, NuScale abandoned this flagship US project after significantly increasing its cost estimates. In Argentina, an SMR design that had been "under construction" since 2014 was officially scrapped in 2024. And the SMR project slated to

The Example of Germany: The Climate Burden of Electricity



be the first of its kind realized in Canada was "buried" after its parent company filed for bankruptcy in 2024. In 2020, after 13 years of construction, Russia completed a floating reactor. Yet none of these is suitable for solving the climate crisis. "Despite the considerable hype, SMRs are failing to live up to expectations," concludes the *World Nuclear Industry Status Report 2025*. The German Federal Office for the Safety of Nuclear Waste Management (BASE) agrees: "Their market launch is currently not foreseeable."

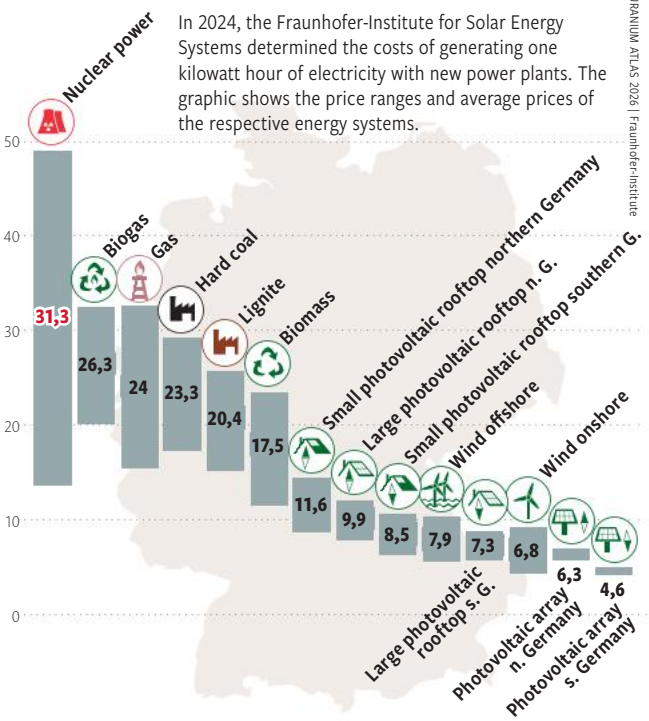
Third-generation reactors have been — and continue to be — built in France, Finland, and China since 2005, and in the United Kingdom since 2018, amidst mounting difficulties. The fact remains: their construction takes too long and is far too expensive to make any meaningful contribution toward solving the climate crisis (see p. 55). The same is true for fourth-generation nuclear reactors, despite being hailed as the solution by the nuclear lobby: "Despite intensive promotion, no development can currently be identified that makes their large-scale construction likely in the coming years," according to BASE.

These molten salt reactors are fueled by thorium. The claim that this type of reactor is inherently safe by virtue of its design applies solely to technical plant safety. The threat posed by natural disasters, terrorist attacks, aircraft crashes, human error, and the like remains. Added to this is the significant risk of the proliferation of weapons-grade uranium. In the case of the thorium molten salt reactor, feeding and extraction of materials — facilitated by an integrated reprocessing unit — are integral to the reactor system. Fourth-generation reactors significantly simplify building nuclear weapons, as they obviate the need for complex uranium enrichment. Furthermore, regarding the climate crisis: according to an assessment by the Scientific Services of the German Bundestag, "a commercial reactor is not to be expected before 2060." For this reason alone, this technology is currently ineffective to mitigate the greenhouse effect.

Germany: The Real Price of Electricity

Electricity generation costs in Germany
in Euro cents per kilowatt hour

In 2024, the Fraunhofer-Institute for Solar Energy Systems determined the costs of generating one kilowatt hour of electricity with new power plants. The graphic shows the price ranges and average prices of the respective energy systems.



(CC) URANIUM ATLAS 2026 | Fraunhofer-Institute

Nevertheless, Germany continues research into fourth-generation nuclear power plants. The Karlsruhe Institute of Technology is participating in its further development under a mandate from EURATOM. Such research contributions hinder the nuclear phase-out, as a true exit from nuclear power surely must also include terminating nuclear research.

THE GLOBAL POTENTIAL OF RENEWABLE ENERGY

Globally, electricity from renewable energy sources is substantially cheaper than new nuclear energy and currently even competitive with existing coal, gas and nuclear power. Depending on location and region, renewable energy comes from onshore or offshore wind turbines, hydropower plants or utility-scale solar plants delivering the cheapest electricity, according to the International Renewable Energy Agency (IRENA).

In 2024, onshore wind turbines primarily provided the cheapest electricity — at an average of 3.4 US cents per kilowatt-hour — according to findings by the IRENA, followed by solar power at 4.3 US cents. A 600-megawatt solar project in Saudi Arabia is now supplying electricity at 1.04 US cents per kilowatt-hour — a world record. And even in Germany, a kilowatt-hour costs 4.6 euro cents. Countries such as Norway and Austria, meanwhile, leverage their enormous hydropower potential, which supplies electricity at a far lower cost compared to coal and nuclear power. Economically, nuclear power cannot compete. ●

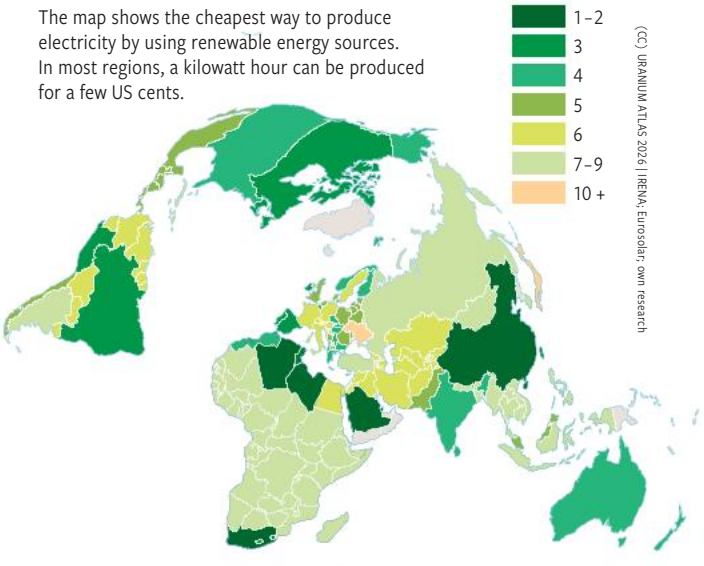
Further Information

IRENA: Renewable Power Generation Costs in 2024, PDF at irena.org

Renewable and Cost-effective

Electricity from new wind and photovoltaic installations
in US cents per kilowatt hour

The map shows the cheapest way to produce electricity by using renewable energy sources. In most regions, a kilowatt hour can be produced for a few US cents.



(CC) URANIUM ATLAS 2026 | IRENA; Eurosolar; own research

GLOSSARY

A

Aghirin'man: Human rights organization in Niger

ASADHO: African Association for the Defense of Human Rights, DR of Congo

B

Becquerel: Unit of radioactivity; one Becquerel signifies one radioactive disintegration per second

C

CRIIRAD: Commission for Independent Research and Information about RADiation, France

D

Depleted Uranium (DU): Waste product generated during uranium enrichment. Contains 0.2–0.3 weight percent of fissile uranium; half-life 4.46 billion years

Dosimeter: Measuring instrument to determine the dose of nuclear radiation

E

EPR: European Pressurized Water Reactor, third-generation nuclear reactor

EURATOM: European Atomic Energy Community of which all EU countries are members

F

Fallout: Radioactive emissions as a consequence of above ground nuclear weapon tests and reactor accidents

Fusion reactor: Nuclear installation designed to generate energy by fusion of atomic nuclei

I

IAEA: International Atomic Energy Agency; its task: to promote the civil use of nuclear energy and to prevent dissemination of nuclear weapons

ICAN: International Campaign to Abolish Nuclear Weapons

ICBUW: International Coalition to Ban Uranium Weapons

INF Treaty: Intermediate Range Nuclear Forces Treaty between the Soviet Union/Russia and the US to ban land-based ballistic missiles, cruise missiles, and missile launchers with ranges of 500–1,000 kilometers (310–620 miles/short medium-range) and 1,000–5,500 km (620–3,420 miles/intermediate-range)

In-situ leaching (ISL): A process with which chemicals are injected into porous uraniferous strata to extract uranium

IPPNW: International Physicians for the Prevention of Nuclear War

ITER: International Thermonuclear Experimental Reactor Project aimed at achieving nuclear fusion

M

Manhattan Project: US military research project, 1939-1946, to develop atomic weapons

Maximum credible accident: Accidents such as Chernobyl and Fukushima that go beyond the category of "maximum credible accident" (MCA)

N

Nuclear chain reaction: Process of splitting an atomic nucleus which repeats itself automatically once started

Nuclear fission: Splitting of an atomic nucleus into several parts

Nuclear fuel rods: Produced in special factories for use in nuclear power plants

Nuclear meltdown: Accidents such as Chernobyl and Fukushima that go beyond the largest accident anticipated. According to the nuclear industry, these types of accidents are too improbable to be worth adequately preparing for

Nuclear Non-Proliferation Treaty: Treaty on the Non-Proliferation of Nuclear Weapons. Prohibits the spread of nuclear weapons and furthers the goal of nuclear disarmament

Nuclear power plant: Consists of one or more nuclear reactors

Nuclear waste: Consists of low-, intermediate- and high-level radioactive waste. Irradiated nuclear fuel is very radioactive, and the categories can be misleading, as "low-level" does not mean harmless

Nuclear reactor: A single reactor unit that may constitute one or more at a nuclear power plant site. In the reactor core, fission of uranium generates heat and steam, which then drives a turbine

Nuclear Test Ban Treaty: Comprehensive Nuclear-Test-Ban Treaty (CTBT); prohibits the testing of nuclear weapons

Nuclear Prohibition Treaty: Treaty on the Prohibition of Nuclear Weapons (TPNW); Agreement to prohibit the development, production, testing, purchase, storage, deployment and use of nuclear weapons

P

PLAGE: Platform Against Nuclear Risks; Austrian NGO

R

Radioactivity: Process of spontaneous decay and transformation of unstable atomic nuclei of certain chemical elements emitting energy in the form of radiation

Rainbow Serpent: Mythological figure of Aboriginal creation stories

T

Tailings in uranium mining: Radioactive and highly toxic sludge residues generated when extracting uranium from the ore

Ton: Metric ton or tonne—1,000 kg (2,204.6226 lb)

Thorium: Chemical element and a decay product of uranium. There is interest in it as a raw material for Generation IV reactors currently still in the design phase

S

Small modular reactors (SMRs): Reactors with an electrical output of up to 300 MW. No new designs have been developed yet

U

U-Ban: Campaign for a Worldwide Ban on Uranium Mining

Uranium: In its natural isotopic state, it contains 0.711 weight percent of U-235 and 99.284 weight percent of U-238 as well as a very small amount of U-234. Present in different uranium minerals

Uranium-235: Fissile portion of uranium

Uranium-238: Non-fissile content of uranium

Uranium enrichment: The process of increasing fissile uranium content

Uranium exploration: Investigation of uranium deposits

Uranium mining: Early on, uranium was mined in open pits or below ground. Today, half of all uranium mining uses the in-situ leaching process

Uranium ore: Mixture of different uranium minerals within the rock; uranium concentration in the ore varies considerably: ore in Rössing, Namibia, has 0.03 percent, ore in Cigar Lake, Canada, 13 percent

Uranium ore processing: In conventional mining processes, the ore is first broken up, then milled. In the next step, uranium is chemically separated

Uranium oxide U_3O_8: First intermediate product after mining of uranium ore

W

Waste rock heap: Soil on top of uraniferous rock, removed in open pit mining and piled up in dumps

World Nuclear Association (WNA): International nuclear lobby organization with headquarters in London, UK

Y

Yellowcake: Yellow uranium concentrate powder obtained from leach solutions, contains approximately 70 to 90 weight percent of U_3O_8. Uranium is traded in this specific form

NUCLEAR FREE FUTURE FOUNDATION

Ganghoferstr. 52, 80339 Munich, Germany | nuclear-free.com

The Nuclear Free Future Foundation was inspired by the 1992 World Uranium Hearing in Salzburg, Austria, and was founded in 1999. At that time, people from uranium-mining regions around the world reported on the environmental damage and health consequences caused by uranium mining. Against this backdrop, the foundation aims to strengthen environmental responsibility, provide arguments for phasing out nuclear energy, encourage climate protection and energy conservation, and contribute to the ban on uranium munitions and nuclear bombs. The Uranium Atlas provides key arguments to support these goals. The Atlas is now available in German, English, French, Italian, Turkish, and Czech. And it demonstrates with facts and figures that nuclear power has no future.

ROSA-LUXEMBURG-STIFTUNG

Straße der Pariser Kommune 8A, 10243 Berlin, Germany | rosalux.de/en

The Rosa Luxemburg Foundation (RLS) is a political foundation affiliated with the party DIE LINKE, the German Left Party. It maintains offices in more than twenty countries worldwide. Founded in 1990, the Foundation's work is guided by the ideas of Rosa Luxemburg; through its analyses and educational programs, it aims to strengthen emancipatory developments and alternatives for democratic-socialist societies. In cooperation with its partner organizations, the Foundation develops alternative concepts and approaches for a comprehensive process of socio-ecological transformation, seeking to create a society based on solidarity and justice. To achieve this goal, the RLS organizes political education activities, provides spaces for critical analysis and dialogue, and awards scholarships.

IPPNW

German Affiliate of IPPNW, Frankfurter Allee 3, 10247 Berlin, Germany | ippnw.de

International Physicians for the Prevention of Nuclear War (IPPNW) is a non-partisan federation of national medical organizations in 62 countries. It was founded in 1980 by physicians from the United States and the Soviet Union who shared a common commitment to advocate for the elimination of nuclear weapons from the world's arsenals. IPPNW received the Nobel Peace Prize in 1985. Even long after the end of the so-called Cold War, the very existence of nuclear weapons and efforts to modernize them and expand nuclear arsenals continue to pose an enormous threat to life on the planet. Proliferation and the threat of nuclear terrorism have added to the nuclear danger. In 2006, IPPNW started the International Campaign to Abolish Nuclear Weapons (ICAN), which was awarded the Nobel Peace Prize in 2017 after facilitating the Treaty on the Prohibition of Nuclear Weapons.

BEYOND NUCLEAR

7304 Carroll Avenue #182, Takoma Park, MD 20912, USA | beyondnuclear.org

Beyond Nuclear is a US-based international watchdog and activist organization working for a safe and democratic world free from the threats of nuclear power and nuclear weapons. The central aim of Beyond Nuclear is to shut down nuclear power and end the harmful practices of uranium mining, nuclear powered electricity generation and the endless production of deadly radioactive waste. Beyond Nuclear also draws attention to the inextricable link between nuclear power and nuclear weapons, and advocates for sustainable and peaceful solutions to global problems such as climate change and the threat of nuclear war. Founded in 2007, Beyond Nuclear assists a broad alliance of activist groups, providing educational materials and events, expertise, reports, and news updates on the intersection between the nuclear sector, human rights, democracy, nature and the environment.

UMWELTSTIFTUNG GREENPEACE

Hongkongstraße 10, 20457 Hamburg, Germany | umweltstiftung-greenpeace.de

As a part of the international Greenpeace network, the Greenpeace Environmental Foundation is committed to the goals and values of Greenpeace. Our foundation is dedicated to the protection of the environment and nature and promotes international understanding by means of peace work and research. We want to preserve the unique natural wealth of our planet and are committed to safeguarding natural resources. We work internationally because the destruction of nature knows no borders. In a globalised economy, ethical, social and ecological standards form the basis of our investments. The Greenpeace Environmental Foundation is non-partisan and politically and financially independent.

COLONIAL HERITAGE, page 12

From the very beginning, uranium mining
harmed local populations, especially Indigenous peoples.
Nothing much has changed since.

ANCIENT WARNINGS, page 28

The history of uranium mining in Australia is the history
of Aboriginal peoples' resistance. They see the destruction of their sacred sites
as the beginning of the destruction of the world.

NUCLEAR WEAPONS: A NEW ARMS RACE, page 44

The Stockholm International Peace Research Institute (SIPRI) warns:
Not only are countries increasing their arsenals, but more nations
could join the "nuclear club."

GLOBAL WARMING, page 56

The nuclear industry is praising so-called Small Modular Reactors
as saviors of the climate. This is just hype.
There is no evidence that this will ever become reality.