Federal Office
for the Safety of
Nuclear Waste Management

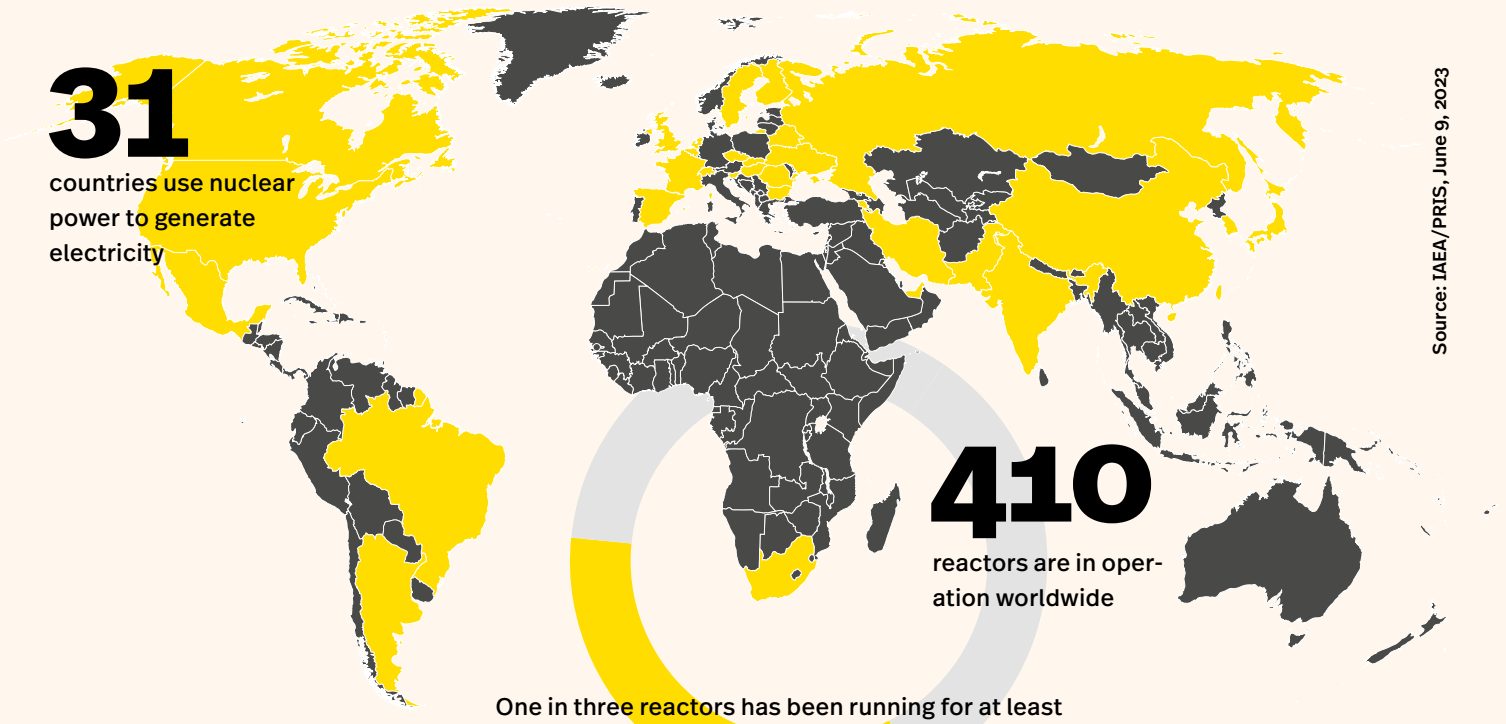
# search:x

**for a repository for high-level radioactive waste**

**Why the shutdown
of the last nuclear power plants
does not yet mark
the end of the nuclear chapter**

**The use of nuclear energy in Germany ended in April 2023. What remains are large quantities of radioactive waste. These will continue to emit radiation for hundreds of thousands of years, endangering humans and the environment. There is still no final repository in Germany for the particularly hazardous high-level radioactive waste.**

**31**
countries use nuclear power to generate electricity



Source: IAEA/PRIS, June 9, 2023

**410**
reactors are in operation worldwide



One in three reactors has been running for at least
**40 years**

# atomic numb

Source: Kenfo

**24,1 Mrd.**
Euros have been paid by the energy supply companies into the Fund for the Financing of Nuclear Waste Management (Kenfo). This money, in combination with investment profits, is to be used to pay for interim and final storage. The operators will still be responsible for dismantling the nuclear power plants and will have to pay for the associated costs.



**Up to 1,900**
special containers (e.g. Castor casks) are needed for the interim storage of the high-level radioactive waste produced in Germany

**16**
interim storage facilities in Germany

**2034–2047**
The licences for the existing interim storage facilities will expire during this period

Licences for interim storage facilities are valid for
**40 years**

**36**
reactors have been in operation in Germany since 1960, six of them in the GDR

ers

Nuclear power was commercially used in Germany for
**62 years**

The waste must be retrievable after closure of the repository for
**500 years**

At present, all high-level radioactive waste is stored at above-ground interim storage facilities.

# status quo

The casks are stored in specially designed halls made of reinforced concrete. Here is a view of the Grohnde interim storage facility in Lower Saxony.
*Photo © Bernhard Ludewig*
*Montage: quermedia*

At the interim storage facilities, high-level radioactive waste is stored in transport and storage casks (photo depicts Castor-type casks). Without the protective effect of the casks, the radiation would be fatal to human beings.

A Castor cask is about six metres high and weighs over 100 tonnes. A system of lids, thick cast-iron walls and moderator rods is in place to shield the radiation. The fuel rods inside have a temperature of up to 400 °C, while the temperature on the outside can reach 118 °C.

## Why is high-level radioactive waste stored at interim storage facilities?

The concept of interim storage dates back to the 1970s. At that time, those in charge planned to set up a so-called „nuclear fuel cycle“ in Germany. Nuclear fuel was to be recovered from irradiated fuel elements in a reprocessing plant.

The resulting waste was to be stored at the central interim storage facilities at Ahaus and Gorleben until the commissioning of a final repository. In political terms, however, the construction of such a reprocessing plant was not feasible in Germany. Due to massive protests, a project in Gorleben was discarded at the end of the 1970s, and the construction of a reprocessing plant in Wackersdorf was abandoned a few years later, too. The power plant operators used facilities in Great Britain and France instead.

This approach necessitated a large number of transports between the power plants, the reprocessing plants abroad and the central interim storage facilities. These transports were always accompanied by protests.

In Germany, the reprocessing of irradiated fuel elements has, therefore, been banned since 2005. Nuclear power plant operators are obliged to set up interim storage facilities in the immediate vicinity of the reactors. This is where the high-level radioactive waste is currently stored until a final repository becomes available.

Learn more:

There are many ideas on how to dispose of radioactive waste. At second glance, however, most of them are unrealistic.

# just get

Launch of a SpaceX rocket on 18 September 2022, carrying a Starlink satellite into Earth orbit. © *SpaceX*

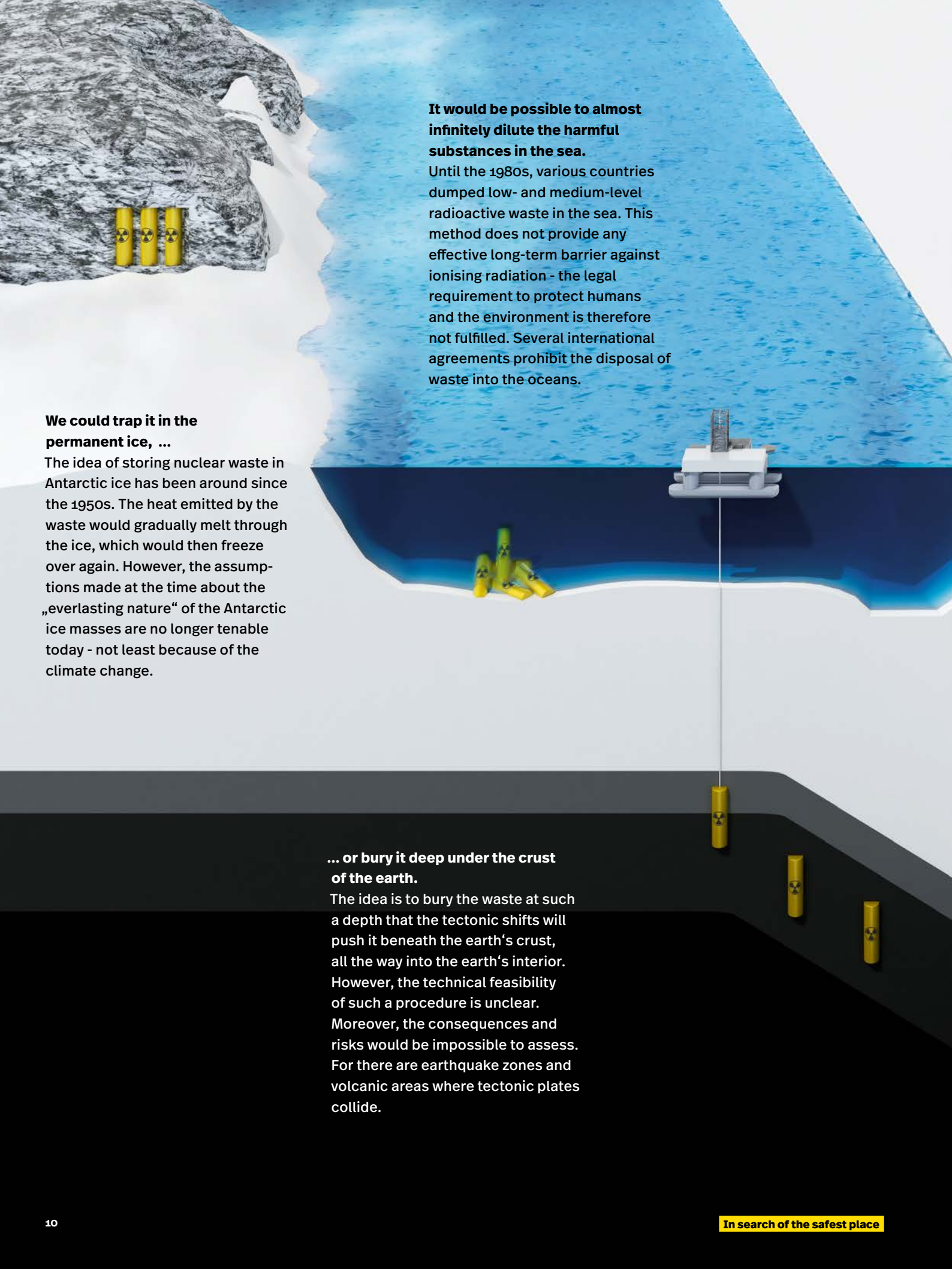
**Why not shoot the radioactive waste into space?**
For sure: that would remove the waste from the earth forever. But how many rocket launches would be necessary to transport the enormous amounts of waste consisting of the fuel elements used in Germany alone? Who would be able to pay for that? And what would happen if just one launch failed? Apart from that, Germany has signed the so-called Outer Space Treaty, which prohibits harmful contamination of outer space.

Ideas on how to deal with the highly hazardous waste have been around ever since the first nuclear power plants were built. The disposal methods receiving the most attention have been discussed by the so-called Final Repository Commission*.
The commission's main questions were: Will the method ensure a permanent removal of the waste? Would the risks be manageable, and would it be possible to rectify mistakes? Is the method compatible with applicable laws?

# rid of it

For Germany has made a legal commitment to protect humans and the environment from the harmful effects of ionising radiation - and to not impose unreasonable burdens on future generations. This alone rules out many of the alternatives to deep geological disposal.

*The Final Repository Commission was a body composed of representatives from science, business, politics and civil society organisations. Between 2014 and 2016, they discussed the issues of nuclear waste disposal in Germany. Their report forms the basis for the revision of the Site Selection Act in 2017.



**It would be possible to almost infinitely dilute the harmful substances in the sea.**
Until the 1980s, various countries dumped low- and medium-level radioactive waste in the sea. This method does not provide any effective long-term barrier against ionising radiation - the legal requirement to protect humans and the environment is therefore not fulfilled. Several international agreements prohibit the disposal of waste into the oceans.

**We could trap it in the permanent ice, ...**
The idea of storing nuclear waste in Antarctic ice has been around since the 1950s. The heat emitted by the waste would gradually melt through the ice, which would then freeze over again. However, the assumptions made at the time about the „everlasting nature“ of the Antarctic ice masses are no longer tenable today - not least because of the climate change.

**... or bury it deep under the crust of the earth.**
The idea is to bury the waste at such a depth that the tectonic shifts will push it beneath the earth‘s crust, all the way into the earth‘s interior. However, the technical feasibility of such a procedure is unclear. Moreover, the consequences and risks would be impossible to assess. For there are earthquake zones and volcanic areas where tectonic plates collide.

**Can we not send the nuclear waste abroad?**
There is a good chance that some other country would step in to dispose of the waste in return for a suitable payment. But is safety guaranteed to be the top priority in such a deal? Irrespective of this, the export abroad is inacceptable for ethical reasons, and it is prohibited by law. The final disposal of radioactive waste must be solved on a national level.

**Let's just leave the waste where it is.**
At present, the waste is safely stored at above-ground interim storage facilities. But these cannot be a permanent solution. No one can foresee whether future societies will have the same high safety requirements as we have today. In the long term, walls, barbed wire and guards will not offer the same protection as stable, maintenance-free rock formations deep below the earth's surface.

**And what about borehole storage?**
This would involve storing the waste at a depth comparable to that of final disposal in a mine at the very least. One advantage would be that drilling boreholes is much less costly than constructing a mine. The problem is that while research into deep geological disposal in a mine has been going on for decades, important questions about borehole disposal have yet to be answered. There is still a considerable need for research and development regarding requirements, feasibility and long-term safety. Therefore, even though borehole disposal is a potential option, it is not yet available.

Germany has decided by democratic vote to permanently store its nuclear waste deep underground.

**Deep into the rock**

On an international level, experts advocate the storage in layers of rock several hundred metres below the earth's surface. The Final Repository Commission also concluded that, according to the current state of science, no other disposal method guarantees the same degree of safety as a repository mine deep underground. For this purpose, a repository mine will be constructed and the waste will be stored there. It will then be permanently sealed.

# the safest

Geological and technical barriers enclosing the waste are intended to shield it safely for thousands of years. The high-level radioactive waste will thus be protected from natural forces and human intervention. Future generations no longer have to maintain or guard the final repository – simply because it does not pose any danger.


## Can technical processes like “P&T” render a repository superfluous?

The concept of “partitioning and transmutation” (P&T) covers various technologies and processes. Their aim is to separate long-lived components of high-level radioactive waste (partitioning) and to convert them into stable or short-lived components using special nuclear power plants (transmutation).

At the industrial level, P&T has so far only been applied to plutonium. For economic and security reasons, many countries have never pursued this practice or have since abandoned it. So far, the separation of other long-lived components has only been successful on a laboratory scale. Considerable further development of reprocessing technology would be needed before it could be used on an industrial scale. The development and construction of an industrial-scale transmutation plant - if technically possible at all - would still take many decades. This is the result of a scientific report commissioned by BASE. Relying on P&T would therefore mean postponing a solution to the disposal problem further into the future, and with an open outcome, too.

Future generations would be burdened with high risks because P&T would require building up an extensive nuclear industry. The operation of these plants would be associated with radioactive emissions. The separation of fissile material such as plutonium would create risks with regard to the non-proliferation of nuclear weapons. To convert the high-level radioactive material produced in Germany, the nuclear facilities would have to run for decades. But since, according to the current state of science and technology, not all waste can be converted, there would still be some high-level radioactive waste to dispose of.

A repository would still have to be found for this waste.

Learn more:

In Germany, there are three types of rock that would be suitable for siting a repository. All of them have advantages and disadvantages that must be considered when building the repository.

# the best

**Crystalline**
Crystalline rock (such as granite) is very hard, and will, thus, remain stable over long periods of time. However, it is prone to cracking. Special containers and sealing material are used to prevent hazardous substances from escaping.

**Rock salt**
Unlike crystalline, salt is rather soft and malleable. In fact, it is flexible enough to enclose the waste containers as if it were growing around them. However, salt is water-soluble and should not come into contact with fresh water. Care must be taken to ensure that no water can get to the waste.

# host

**Clay rock**
Clay rock is only very slightly permeable to water. However, it might be damaged by the heat emitted by the high-level radioactive waste, and it does not conduct heat as well as rock salt or crystalline rock. To avoid overly high temperatures in the repository, the containers must be placed at a greater distance from each other.

# back to the future

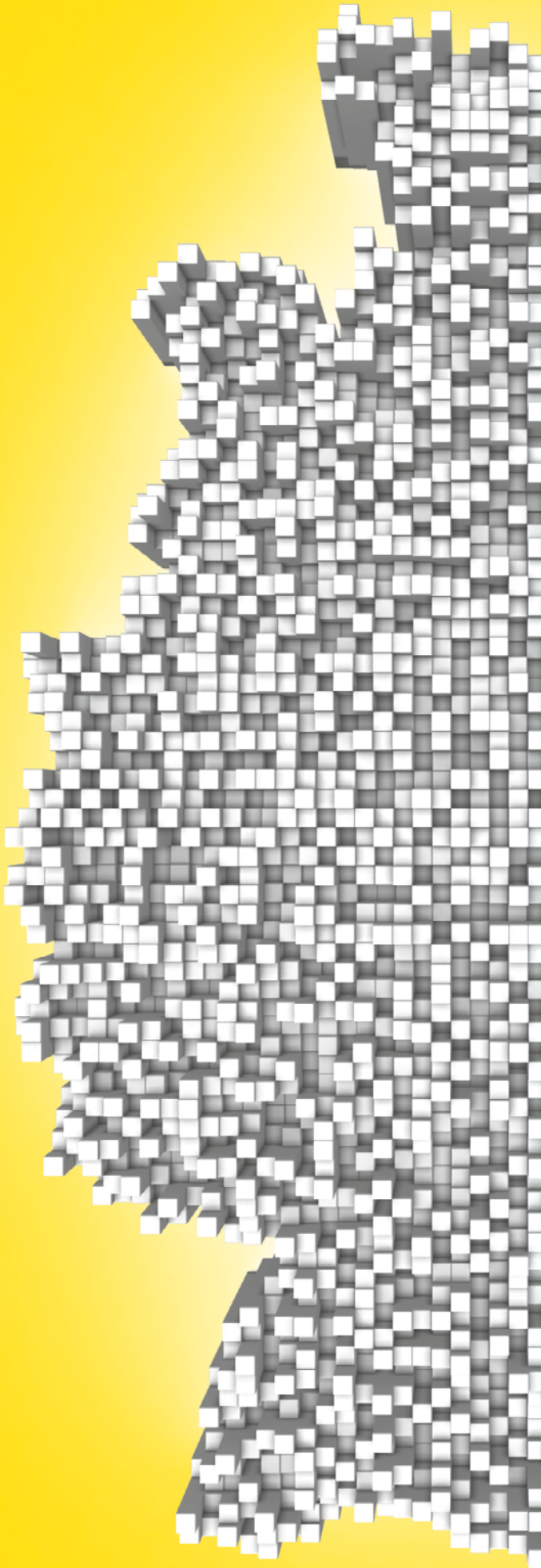
Changes in climate and rock formations can be better predicted than civilizational and cultural developments.

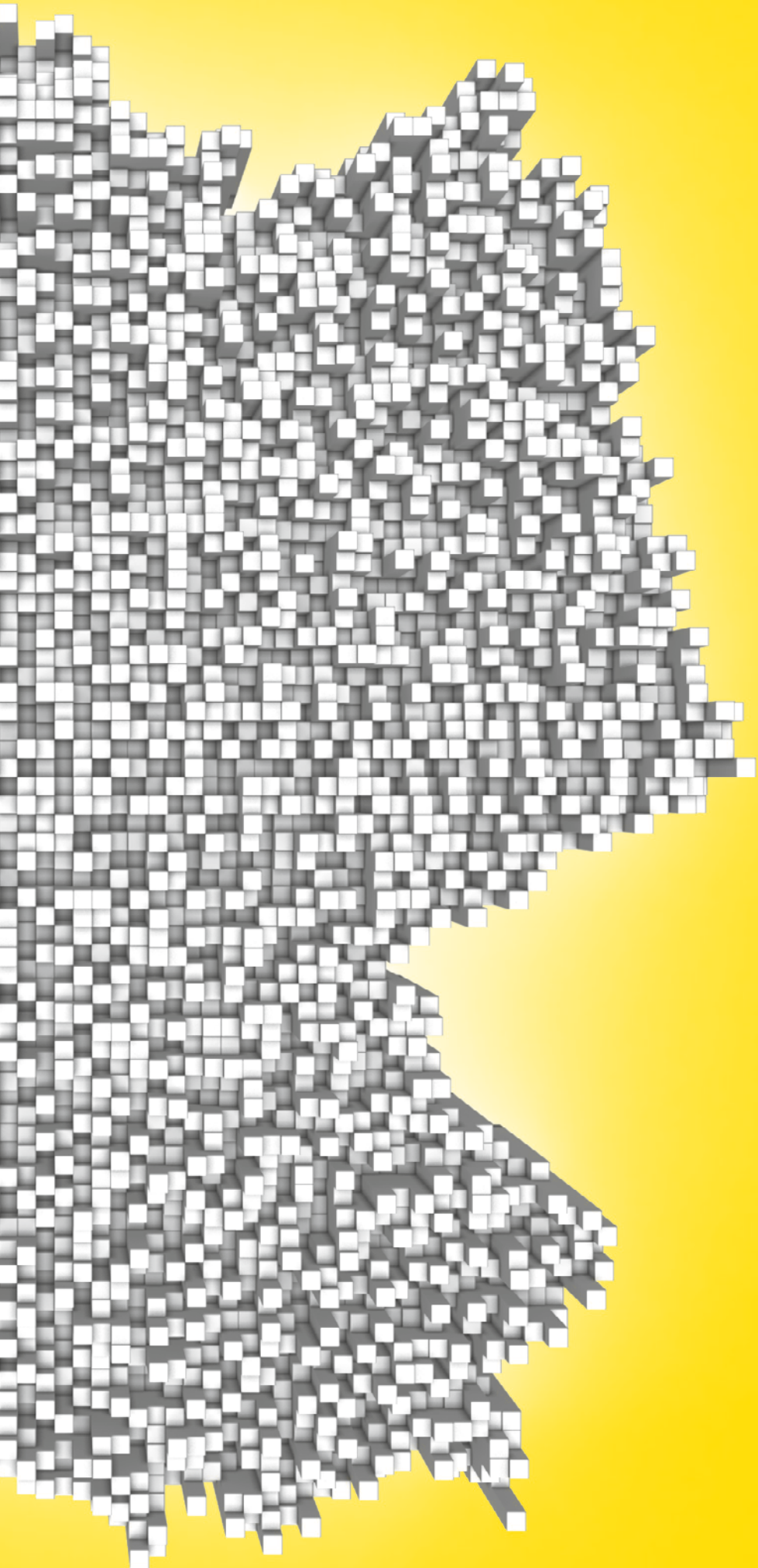
The next ice age, for example, is bound to come. Little by little, mighty glaciers will spread across northern Europe. They will scrape away the upper layers of rock. And when, at some point, the ice will then melt again, the meltwater might form deep gullies and depressions.

Even before the next ice age, however, there might be floods in the area above the repository.

The planners of a repository must consider all possible developments and events. These are incorporated into model calculations before a site is selected - the only way to look into the future.

# in or out?





Safety is the top priority when selecting a location. Hence, nothing is left to chance: Model calculations are used to determine potential changes in the underground in the future. Areas with poorer geological conditions are being ruled out. The best possible site is thus determined gradually on the basis of the criteria laid down in the law.

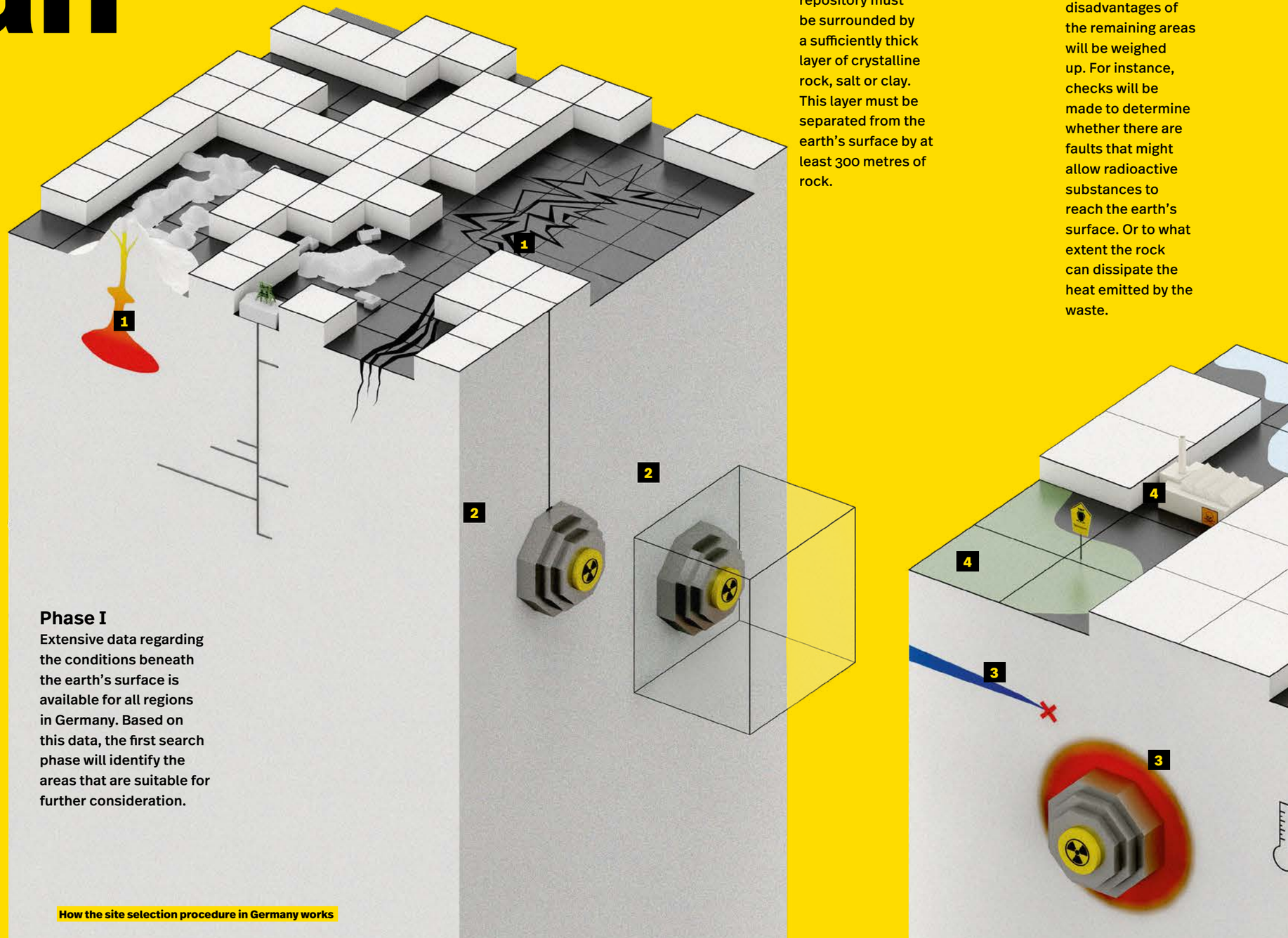
# the plan

All sites in Germany are examined, evaluated and compared according to a defined procedure. The best possible site will then be determined.

**1**
Areas with damaged or endangered bedrock will not be considered. This applies, for example, to areas with deep mines and regions where volcanoes have been active or where there is a risk of earthquakes.

**2**
Minimum requirements will be reviewed next. For example, the repository must be surrounded by a sufficiently thick layer of crystalline rock, salt or clay. This layer must be separated from the earth's surface by at least 300 metres of rock.

**3**
The advantages and disadvantages of the remaining areas will be weighed up. For instance, checks will be made to determine whether there are faults that might allow radioactive substances to reach the earth's surface. Or to what extent the rock can dissipate the heat emitted by the waste.




## Phase I

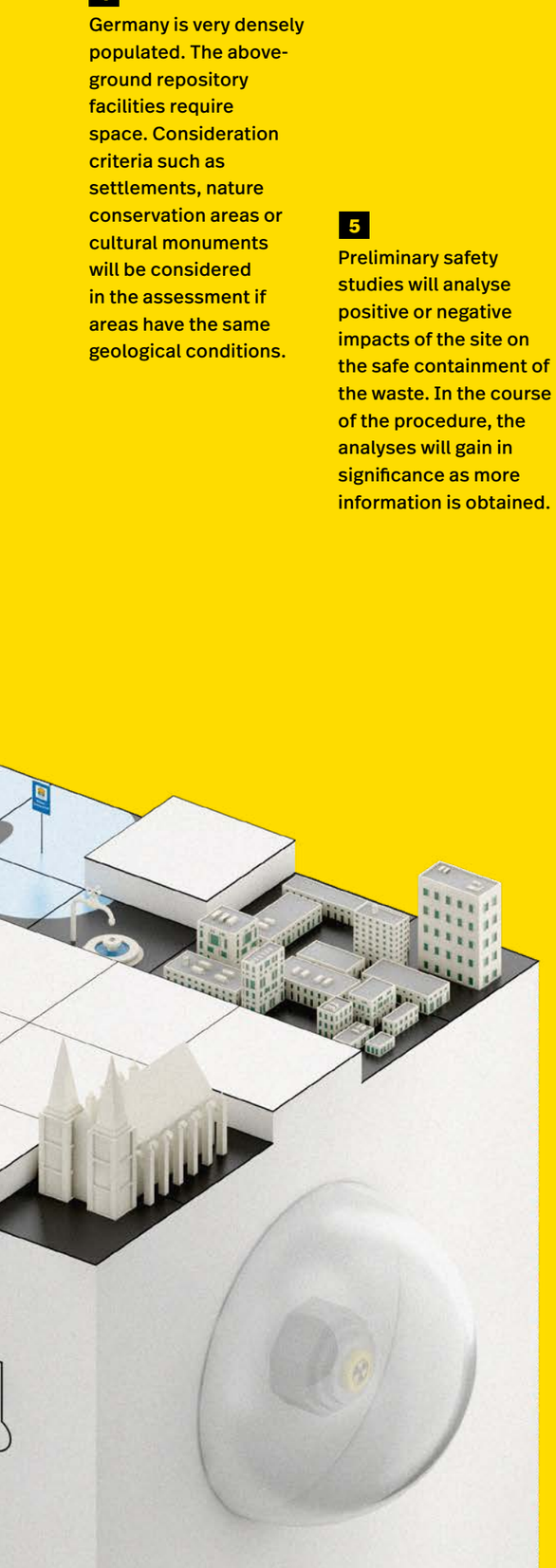
Extensive data regarding the conditions beneath the earth's surface is available for all regions in Germany. Based on this data, the first search phase will identify the areas that are suitable for further consideration.

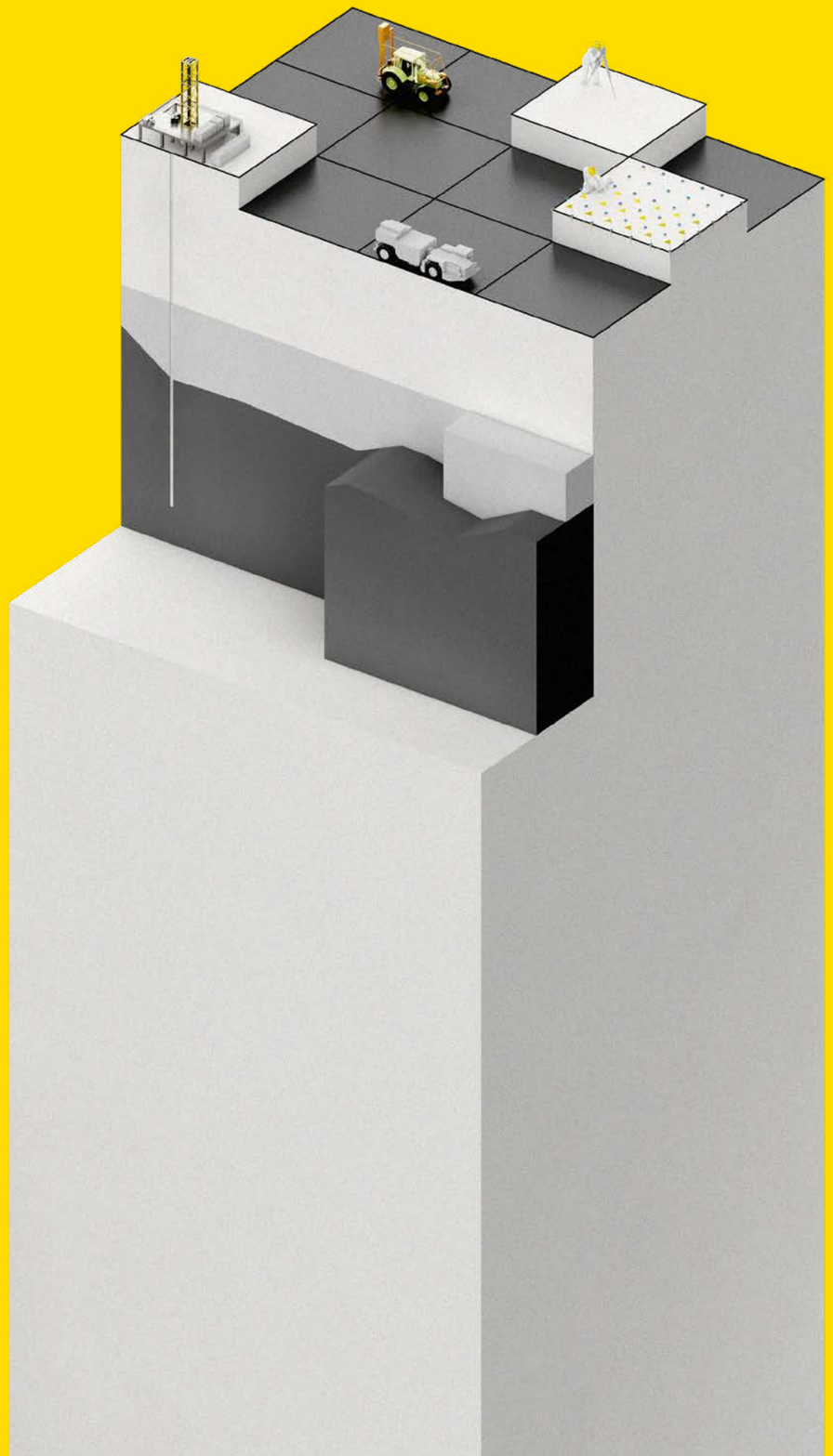
**4**

Germany is very densely populated. The above-ground repository facilities require space. Consideration criteria such as settlements, nature conservation areas or cultural monuments will be considered in the assessment if areas have the same geological conditions.

**5**

Preliminary safety studies will analyse positive or negative impacts of the site on the safe containment of the waste. In the course of the procedure, the analyses will gain in significance as more information is obtained.

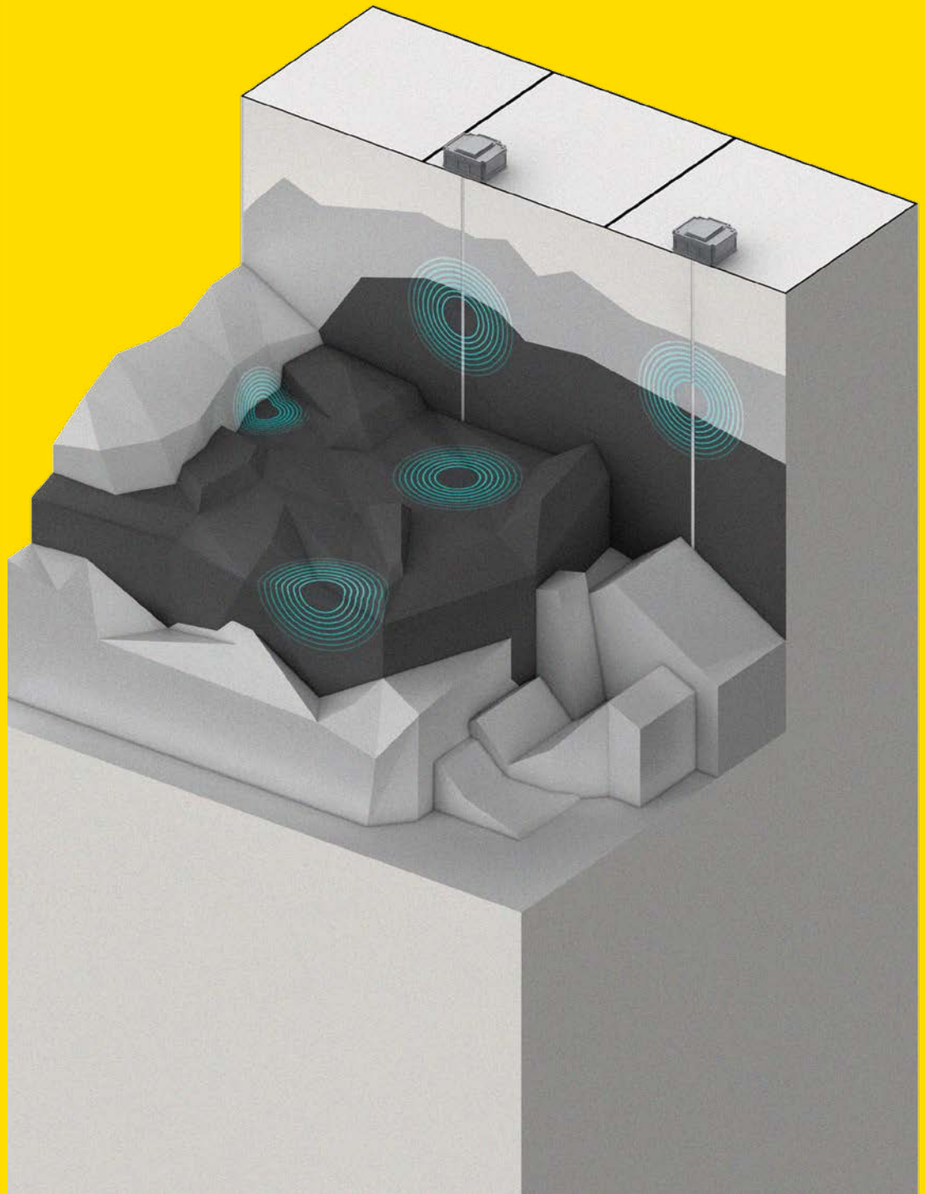




Learn more:

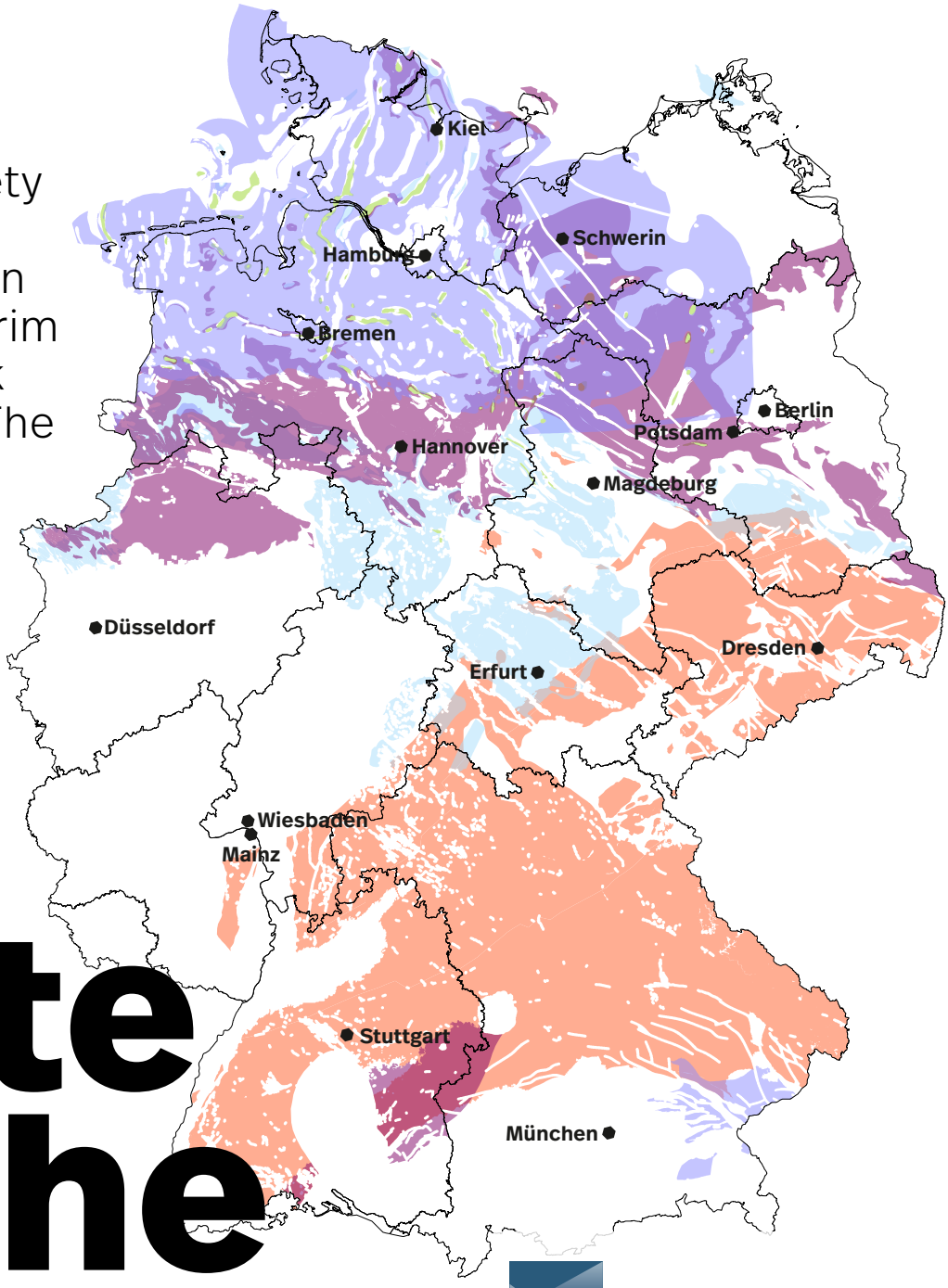
## Phase III – Below-ground exploration

In the third phase, at least two sites will be explored underground. Geologists will use boreholes and other methods to study the rock.



The Federal Society for Final Storage (BGE) published an initial status (interim report) of its work in autumn 2020. The map on this page shows areas that were considered suitable for siting a repository based on an initial review of the data.

# state of the search




BGE BUNDESGESELLSCHAFT FÜR ENDLAGERUNG

**Legende**

- Tertiary clay rock
- Pre-tertiary clay rock
- Rock salt in steep storage
- Rock salt in stratiform storage
- Crystalline host rock

Sub-areas in accordance with Section 13 of the Site Selection Act
Source: The Federal Company for Radioactive Waste Disposal (BGE mbH)
Coordinate system: ETRS 1989 UTM Zone 32N
Thematic map shareBGE mbH
Geobase data © GeoBasis-DE / BKG 2020
Editing: BASE

*Scan source code to go to the BGE's interactive sub-area map:*

Sub-areas are areas which, based on the available data, are expected to present a favourable overall geological situation regarding final disposal. The BGE has identified them according to technical criteria laid down in the Site Selection Act. The interim report represents an interim status; the supervisory review will only take place at a later stage.

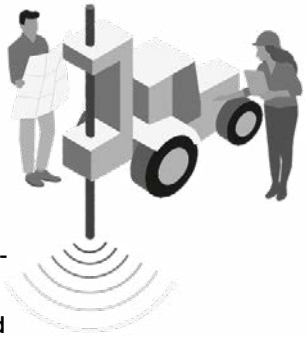
**The German Bundestag**
will determine after each phase which regions or sites are to be further explored for the final disposal of high-level radioactive waste. Parliament will also decide on the final site.

**The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)**
bears the overall political responsibility. It is responsible for the technical supervision of BASE, and is the owner of the federally owned company BGE mbH.

# who does what?

**The Federal Office for the Safety of Nuclear Waste Disposal (BASE)**
supervises the search for a repository for high-level radioactive waste. In so doing, it makes sure that the public is involved.
It also reviews applications for licences under nuclear and mining law for new repositories.

**The National Citizen's Oversight Committee (NBG)**
is made up of renowned members of the public and citizen representatives. This group is tasked with providing independent and mediatory support for the site selection procedure.



**The Federal Company for Radioactive Waste Disposal (BGE mbH)**
is a federally owned company. It collects all relevant data in the search for a repository site, evaluates it and carries out the specific exploration work from phase II onwards.

The search for a repository site to store high-level radioactive waste is a task that concerns society as a whole. Public participation plays a central role in this process.

At the end of the search process, the German Bundestag will determine the final repository site. To ensure that this decision is supported by a broad social consensus and can also be tolerated by the people in the affected region, it must be comprehensible. It is therefore important to make the procedural steps transparent from the very beginning. Everyone should have the opportunity to ask questions and have their say.

# get involved

The Site Selection Act provides for various committees and conferences in the course of the procedure. Their findings will be considered in the further course of the site selection process. To further strengthen the process, the institutions involved can also provide additional participation opportunities that go beyond the legally prescribed formats.

## Expert conference on sub-areas

The expert conference on sub-areas was the first legally stipulated participation opportunity in the site selection procedure. It was used to discuss the interim report on sub-areas published by the BGE in autumn 2020. It identifies areas in Germany which, from the company's point of view, should be considered for further examination. The BGE must consider the findings of the conference in its further work.

**When did the expert conference on sub-areas take place?**
It started with a BASE kick-off event in October 2020, followed by three consultation dates in February, June and August 2021.

**Who took part?**
Citizens, representatives of municipalities, social organisations and scientists were invited. The participants themselves were responsible for organising the consultations. Representatives of the BGE accompanied the events and were available to answer questions and discuss their interim report.

Learn more:

7 September 2021: Representatives of the expert conference on sub-areas hand over the results of their consultation to the BGE in Berlin.

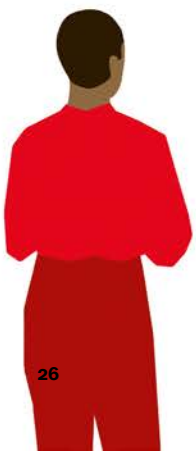

## Participation up to the start of the Regional Conferences

During this period, the public can discuss the progress of the BGE's work on the repository site search at the Repository Search Forum about once a year. The Repository Search Forum is prepared by a planning team made up of various groups from civil society and the municipalities, together with stakeholders in the process. In addition, BASE will offer a variety of participation opportunities on other topics related to the disposal of high-level radioactive waste. They are aimed specifically at particular groups, such as young people or representatives of the municipalities.

**When will the Repository Search Forum take place?**
The Repository Search Forum currently meets about once a year. The first meeting took place on 20 and 21 May 2022.

**Who can participate?**
The format is open to all interested parties.

Learn more:



## Regional Conferences

The Regional Conferences represent the interests of the local population, including neighbouring countries. They are open to all citizens of the region concerned. They can, for example, submit review requests to BASE if they see deficiencies in the proposals of the BGE. They can also seek scientific advice and develop concepts to promote regional development.

**When will the Regional Conferences take place?**
At the end of phase I, the BGE will propose so-called siting regions for surface exploration. BASE will establish a Regional Conference in each of the proposed siting regions. Once a region has been eliminated from the selection procedure, the associated Regional Conference will be dissolved.

**Who can participate?**
All citizens from the respective siting region and directly neighbouring areas aged 16 and over can take part. The conferences will consist of a plenary assembly and a representative group of up to 30 people, and will have their own office.

Learn more:

## Council of the Regions Expert Conference

The Council of the Regions Expert Conference is a supraregional participation format in the site selection procedure. Representatives of the Regional Conferences and the interim storage communities where high-level radioactive waste is currently stored will meet here to discuss supraregional issues relating to the search for a repository site.

**When does the Council of the Regions meet?**
Parallel to the work of the regional conferences, the Council of the Regions will convene as of the end of phase I of the site selection procedure. It will continue to exist until the siting decision has been made.

**Who can participate?**
The Council of the Regions is composed of representatives of the regional conferences and representatives of the municipalities of the interim storage sites.

Learn more:

## Comment procedure and hearing dates

Following intensive discussion, the legislator deliberately refrained from granting a right of co-decision in the form of a veto in potential siting regions. Under the terms of the site selection procedure, the German Bundestag will decide on a repository site on a scientific basis and in the overriding interest of the public good. The Site Selection Act allows citizens to voice concerns and opinions. BASE and BGE must address these concerns, and consider them for further decisions in the procedure.

**When will comments and objections be possible?**
Comments on BGE's proposals can be submitted at three points in the procedure, namely when the proposal for the siting regions to be explored above ground is submitted, when the proposal for the sites to be explored underground is submitted, and again when the siting proposal is submitted. The comments will be negotiated at discussion meetings in the siting regions or sites.

**Who can use this tool?**
Every citizen, the regional conferences, affected authorities and associations can submit comments.

... and what does that have to do with me? Three reasons for participating in the search for a repository site.

# looking for co

Atomkraftgegner demonstrieren 2010 in Dannenberg.
© dpa / Kay Nietfeld

## 1.
## Those who participate help shape the process.

Large infrastructure and construction projects often lead to conflicts. Especially when citizens are only confronted with the results when they can no longer take part in shaping the process; think, for example, of the protests against the “Stuttgart 21” railway station project. With regard to the search for a repository site - one of the largest environmental projects of our time - problems and conflicts must be identified and discussed as early as possible. Taking different perspectives into consideration helps to improve the planning and decision-making process, which should be supported by a wide range of stakeholders in a task that is relevant to society as a whole, such as the search for a repository site.

# -creators

## 2.
## By participating, stakeholders can monitor the quality of the process and challenge decisions.

BASE must ensure that the BGE’s search and result-finding process complies with the legal requirements. However, the affected regions in particular have a defined  say in the site selection process. This is because the outcome of the procedure can only truly gain acceptance if the process was designed to be comprehensible, transparent and fair - so that in the end there can be no justified objections to the decision. For example, the Regional Conferences (see p. 27) have the right to submit review requests before any decisions are made by the Bundestag. In addition, affected parties and recognised environmental associations can have the selection procedure reviewed by the Federal Administrative Court at the end of phase II and III of the search process.

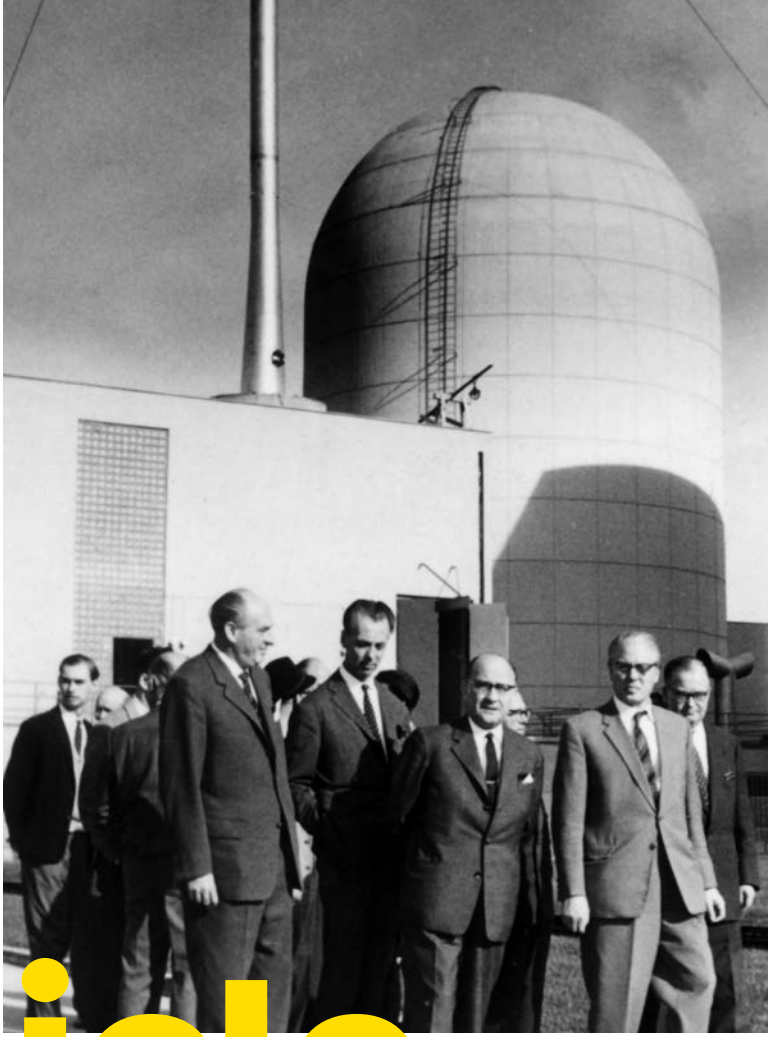
## 3.
## Those who participate can have a say in the future of their own region.

The region that will ultimately be selected will assume responsibility for the radioactive legacy of the nuclear age on behalf of the entire country. Regional development programmes are designed to support the siting region in this task. Within the framework of the regional conferences (see p. 27), the local population can help shape the development of these future prospects – for example by participating in regional development concepts. By incorporating local knowledge and ideas, the quality of planning and decision-making processes is improved.

**1960**
The first commercial nuclear power plant in the Federal Republic of Germany goes into operation in Kahl. Construction of the GDR's first nuclear power plant begins in Rheinsberg.

**1975**
For months, opponents of nuclear power occupy the construction site of the planned nuclear power plant in Wyhl am Kaiserstuhl. It is the first nuclear power plant project to be stopped by the anti-nuclear movement.

Learn More:



The first German nuclear power plant in Kahl a few weeks before the planned commissioning.
© *picture-alliance / Richard Koll*

# chronicle

The Prime Minister of Lower Saxony Ernst Albrecht announces that a „nuclear waste disposal centre" is to be built in Gorleben.
© *dpa / Wolfgang Weihs*

**1977**
On 22 February, the state government of Lower Saxony announces its intention to build a "nuclear waste disposal centre" in Gorleben – with a reprocessing plant and a permanent repository.

**1979**
The so-called Gorleben trek is formed on 25 March. Around 100,000 people take part in the final rally in Hanover on 31 March. The plan for a reprocessing plant is subsequently rejected.

**1980**

An initiative of the anti-nuclear movement proclaims the “Free Republic of Wendland” around drill site 1004 in the district of Lüchow-Dannenberg, Lower Saxony, which lasts for 33 days.

**1981**
100,000 people demonstrate against the construction of the Brokdorf nuclear power plant in February.

**1986**
The most serious accident in civilian use of nuclear energy to date occurs at the Chernobyl nuclear power plant (Ukraine) on 26 April. Radioactive substances are disseminated across all of Europe.

**2000**
First nuclear phase-out: The Federal Government and energy companies reach an agreement on an orderly end to the use of nuclear energy. Exploration of the Gorleben salt dome is interrupted for up to ten years.

**2010**
The nuclear phase-out is reversed, and a decision is taken to extend the operating lives of certain nuclear power plants.

**2011**

Evacuation of the village of the „Republic of Free Wendland“ on 04/06/1980
*© picture-alliance / Dieter Klar*

From the very beginning, the expansion of nuclear energy has been accompanied by protests. The issue of waste disposal is always part of the debate, too.

A nuclear disaster occurs in Fukushima on 11 March. The final phase-out of nuclear power is agreed upon by all political parties in Germany.

**2013**
The Bundestag passes a law on the search for a repository site for high-level radioactive waste (Site Selection Act) by a large majority.

**2017**
The amended Site Selection Act comes into force. The search for a repository site begins.

**2020**
The BGE publishes its interim report on sub-areas. The Gorleben site is eliminated from the search procedure.

**2023**
The last three German nuclear power plants are shut down on 15 April.

Any country that is using or has used nuclear energy must address the disposal of the resulting high-level radioactive waste.

# the others

Most countries in Europe are planning final disposal in a mine in deep geological formations. There is an international consensus that this is the safest long-term solution. The progress of these repository projects differs from country to country. The Finnish repository is scheduled to go into operation by the middle of the decade. Most other countries will still have to wait for a final repository for decades. In France, the project developer ANDRA has submitted a construction application in early 2023.

## France

**Host Rock**
Clay formation at a depth of 500 metres

**Site selection procedure**
In 2012, The French Government announced the repository site to be located near the small municipality of Bure in the Meuse and Haute-Marne departments.

**Status of the repository project**
ANDRA obtained amconstruction licence for the repository in January 2023.

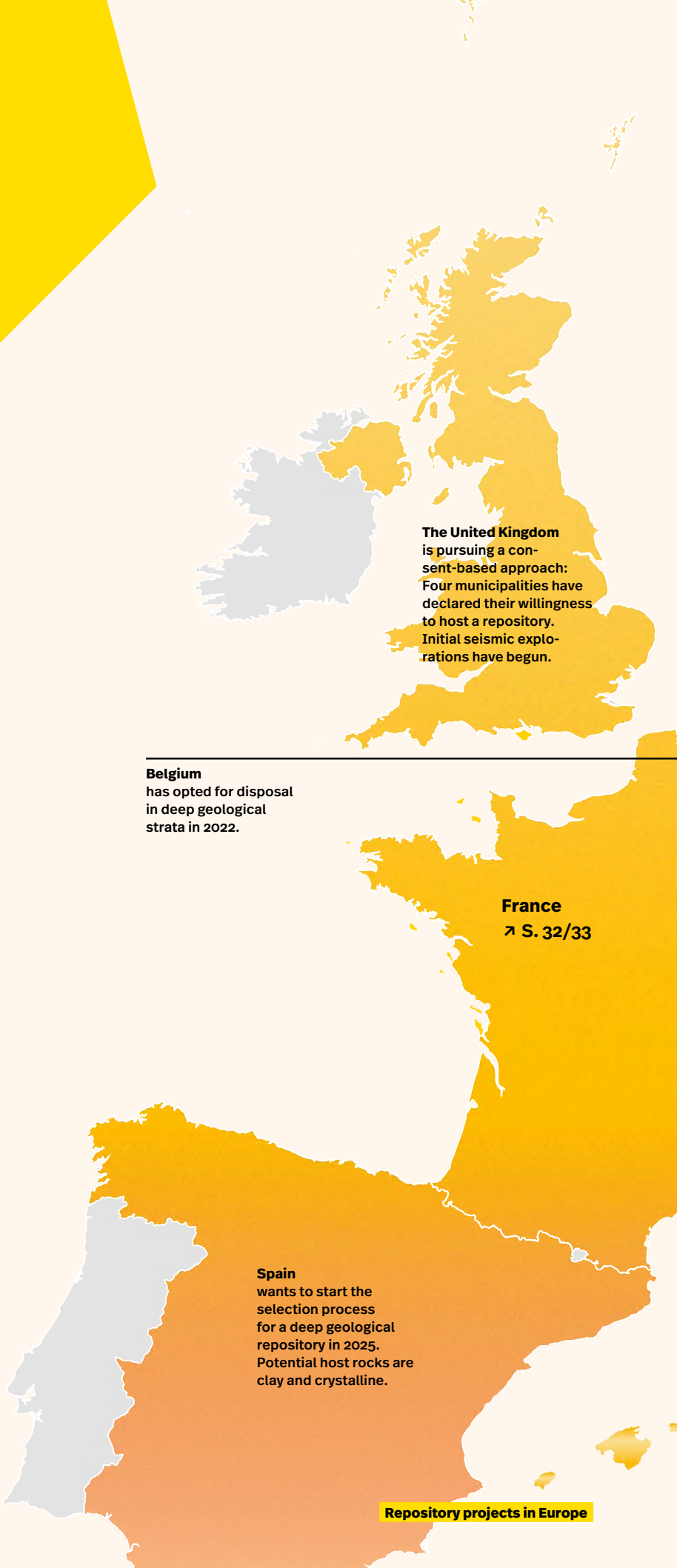
View into the underground laboratory Cigéo (Centre industriel de stockage géologique) in Bure.
© PHOTOPQR / LE PARISIEN / MAXPPP

# Countries in Europe have different types and quantities of radioactive waste - and very different disposal programmes.

Learn more:

## Repository projects in Europe

- Countries that currently use nuclear power
- Countries that will no longer use nuclear power in the future (phase-out decided)
- Countries that have used nuclear power
- Countries that have never used nuclear power




Repository projects in Europe


Finland
↗ S. 38/39
Sweden
chose the site of Forsmark in a voluntary search procedure. The high-level radioactive waste is to be stored in crystalline rock.
Russia
is building an underground laboratory near Krasnoyarsk, to test the suitability of the site for a deep geological repository.
Lithuania
has started a selection process in 2019. The repository is to be constructed by 2067.
Denmark
does not rely on nuclear energy, but must dispose of waste from research reactors. This is to be done in a deep geological repository by 2073.
Belarus
has started planning a deep geological repository.
Poland
intends to start using nuclear energy, and will also have to deal with the disposal of high-level radioactive waste in the future.
Netherlands
↗ S. 36
Ukraine
had designated three areas around Chernobyl as possible sites for a repository in crystalline rock before the beginning of the war in 2022. Interim storage is planned to last until 2100.
The Czech Republic
has identified four possible sites. Storage is planned to begin in 2065.
Austria
Fuel elements from the only research reactor will be returned to the USA after use.
Slovakia
Five locations for a deep geological repository are being examined. Storage is scheduled to begin in 2065.
Romania
is planning to build a deep geological repository by 2055. The host rock and the site have not yet been determined.
Switzerland
↗ S. 37
Slovenia and Croatia
are planning a joint deep geological disposal in crystalline rock. Storage is planned to commence in 2065.
Hungary
wants to dispose of its high-level radioactive waste in clay rock at a depth of 500 to 800 metres. Storage is scheduled to begin in 2064.
Bulgaria
is aiming for deep geological disposal. Five areas are potentially suitable.
Italy
is planning to store high-level radioactive waste in a deep geological disposal facility. A timetable has not yet been set.

## Netherlands

**Location**
Spent fuel elements are to be stored at the HABOG interim storage facility near Borssele for at least 100 years.

**Status of the repository project**
HABOG went into operation in 2003. Final disposal is to be made possible by 2130, presumably by disposal in a deep geological clay formation or in salt rock.

The Netherlands are relying on long-term above-ground interim storage of their high-level radioactive waste.


Initially, the HABOG had bright orange outer walls. Just as the heat of the waste will decrease over time, the interim storage facility is to be painted a lighter colour once every 20 years.
*© COVRA (CC BY-ND 2.0)*

The Swiss process is currently focused on a site near the border with Germany.

## Switzerland

**Host rock**
A combined repository is to be built in opalinus clay at a depth of about 800 metres to accommodate both high-level radioactive waste and low- and intermediate-level radioactive waste.

**Site selection procedure**
Potential sites and rock strata were considered throughout Switzerland. Less suitable areas were gradually excluded. Citizens had the opportunity to express their interests through various participation formats and committees. Representatives of German politics and civil society are also involved.

**Status of the repository project**
Swiss project developer Nagra announced in autumn 2022 that it considered the Nördlich Lägern site to be most suitable for the construction of a repository. It is now preparing a so-called general licence application for this site, with a decision expected in 2031. A repository could be available from about 2060.

**The Bülach deep borehole was the first in the Nördlich Lägern siting area in the current stage of the repository site search. The subsurface was explored to a depth of 1,370 metres.**
*© Nagra*

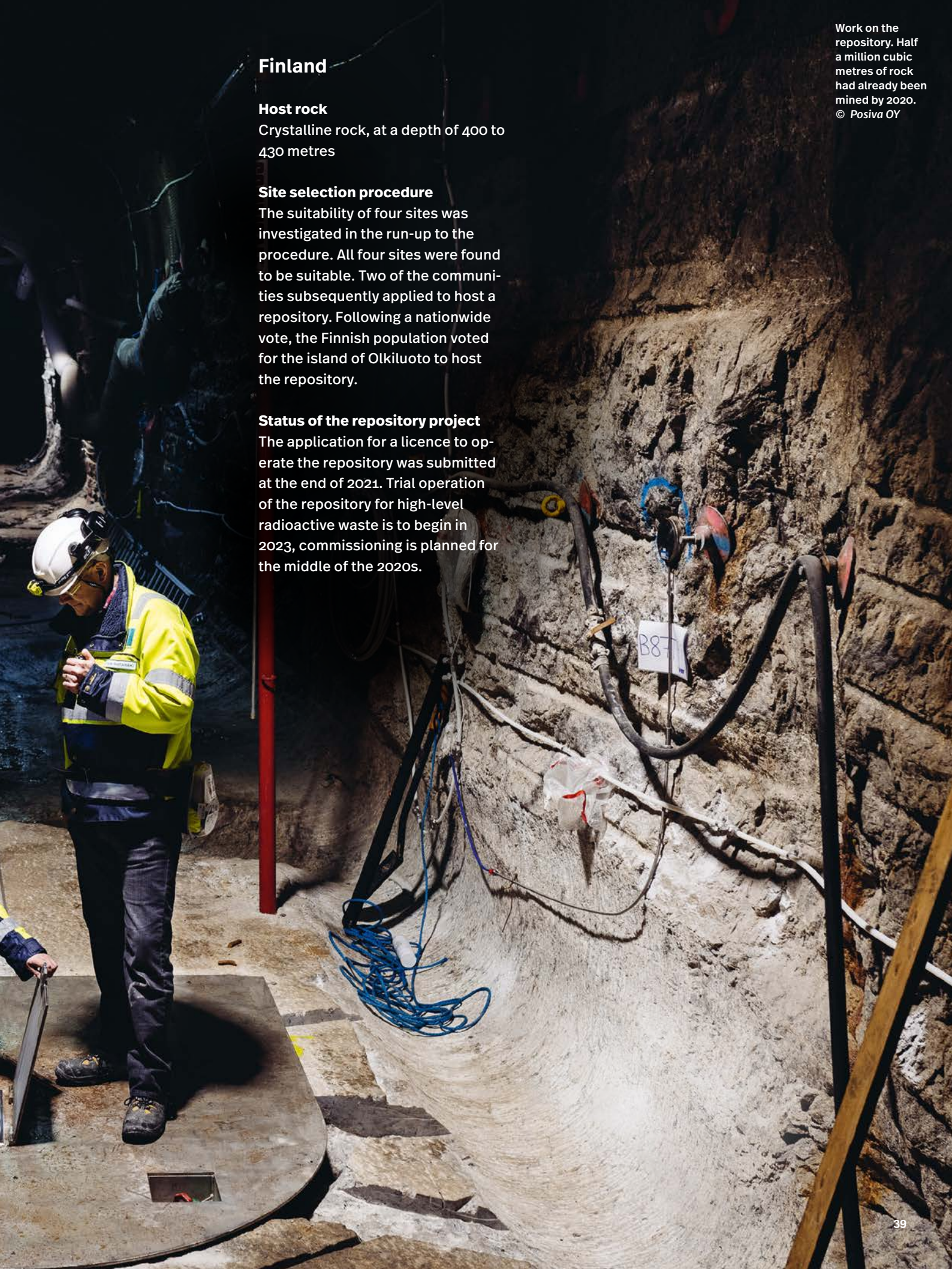
Finland is building the world's first licensed repository for high-level radioactive waste under the island of Olkiluoto. It is called "Onkalo": *cave*.

# Finland

**Host rock**
Crystalline rock, at a depth of 400 to 430 metres

**Site selection procedure**
The suitability of four sites was investigated in the run-up to the procedure. All four sites were found to be suitable. Two of the communities subsequently applied to host a repository. Following a nationwide vote, the Finnish population voted for the island of Olkiluoto to host the repository.

**Status of the repository project**
The application for a licence to operate the repository was submitted at the end of 2021. Trial operation of the repository for high-level radioactive waste is to begin in 2023, commissioning is planned for the middle of the 2020s.



Work on the repository. Half a million cubic metres of rock had already been mined by 2020.
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