Spatial planning strategy for the subsurface

Summary

This summarised version of the Spatial planning strategy for the subsurface is a product of the Ministry of Infrastructure and Water Management, June 2018.
Why a Spatial planning strategy for the subsurface?

The subsurface of the Netherlands is important to the country's energy supply, because of our underground gas and oil reserves, for example. And most of the Netherlands' drinking water is produced from groundwater. It is easy to think of the ground beneath our feet as almost infinite. After all, we already make use of our subsurface for various purposes, and problems rarely arise. Nevertheless, we need to think about long-term underground management now, in order to prevent problems in the future. For instance, we are making increasing use of alternative energy sources, which imply further utilization of our subsurface. And, of course, we will always need drinking water.

Clean groundwater

The Netherlands have large reserves of groundwater, which are used to make high-quality drinking water. In order to ensure that we continue to have enough clean groundwater for drinking water production, we need to seek out and designate groundwater reserves. Designated reserves must then be protected against pollution.

New energy sources

Until now, most of our energy has been derived from natural gas and oil. However, as we seek to address climate change, such ‘fossil fuels’ are increasingly being replaced by energy sources whose use involves much lower CO2 emissions, such as geothermal energy (heat from deep in the earth’s crust) and soil energy. In addition, the underground storage of CO2 is now up for discussion. Both drinking water supply and mining activities (including the extraction of natural gas, oil, salt and geothermal energy, as well as the underground storage of CO2 and other substances) are important to the Netherlands as a whole. This Spatial planning strategy accordingly describes the government’s strategy for securing those national interests.

Key points

- Considerable emphasis on safety and early consideration of the environment in relation to new underground activities.
- Provinces take the lead in the designation of drinking water extraction zones.
- During the term of the current administration, no new onshore gas exploration permits will be granted. Natural gas production from small existing fields will remain necessary for some time.
- The potential of geothermal energy will be utilized wherever possible.
- No shale gas extraction will be permitted during the term of the current administration or thereafter.
- Offshore CO2 storage: No onshore CO2 storage yet, but the possibility will be investigated.

Publication of this Spatial planning strategy makes the Netherlands the first country in the world to produce a national spatial planning strategy for the subsurface.
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Purpose of the Spatial planning strategy for the subsurface

Use of our subsurface for new activities is acceptable, as long as care is exercised and safety is not compromised. The guiding principle is: ‘Sustainable, safe and efficient use of the ground and subsurface, with an appropriate balance between exploitation and protection.’

By publishing this Spatial planning strategy, the national government is seeking to ensure that:

- In the future, we still have scope for the extraction of sufficient groundwater to maintain the drinking water supply;
- Sufficient scope continues to exist for future mining activities, taking account of the transition to a sustainable energy supply and the attainment of climate change goals;
- Deliberation and decision-making are based on effective cooperation involving all tiers of government, market players and NGOs, and taking due account of the safety and interests of the public.
**Geographical coverage**

This Spatial planning strategy relates to the subsurface of the entire land mass of the Netherlands, including its major inland water bodies. The North Sea and the Wadden Sea are outside the paper’s scope. Policy on those regions is set out in the National Water Plan 2016-2021, the North Sea Policy Document 2016-2021 and the Third Wadden Sea Policy Document.
The geology of the Netherlands is complex. Much more complex than one might imagine of such a flat country. The piece of land nowadays known as the Netherlands has been shaped by dynamic processes within the earth’s crust, by millions of years of climatic and environmental change, and by human activity.

In the past, the area has experienced ice ages and periods of tropical climate. It has sometimes been land and sometimes lain beneath the sea. In warm, moist periods, it has been covered in dense vegetation, leading to the formation of thick deposits of dead plant material. In warm, dry periods, the shallow seas have evaporated to form salt deposits surrounded by desert. At other times, rivers have transported large quantities of sand and clay into the region from newly created mountains further inland. And when the Netherlands was covered by sea, thick layers of clay and chalk have built up.

The plates making up the earth’s crust are constantly moving and grinding against one another. That leads to stresses that have fundamentally changed the deposited materials. In some cases, cracks (or ‘faults’) have formed, and the layers of rocks on the two sides of the faults have then been displaced relative to one another. That is the case with the Roerdalslenk (Roer Valley Graben) in Brabant and Limburg, for example. The result is a complex landscape of hills and valleys, with discontinuities in the strata. Each geological layer has its own characteristics and potential applications.
Three-dimensional (3D) spatial planning

Use of the land surface and use of the subsurface are closely related. Mining activities involve the creation of surface infrastructure and the drilling of holes, often deep into the substrata. Pipelines are buried near the surface to transport the extracted resources to the places where they will be used. Consequently, new mining activities have to be integrated with other subsurface and surface activities. Similarly, if you use groundwater to produce drinking water, there are implications for what happens at surface level. Considerable areas of land must be devoted to the drinking water supply, as must extensive water-bearing strata beneath the ground. Use of such strata for other purposes is undesirable and possible only under strict conditions.

Changes caused at geological depths are not easily reversed. Where reversal is possible, high costs and long timescales are often involved. The choices we make today restrict the options open to future generations. It is therefore essential to look far ahead and consider what developments may take place and what those developments imply for the demands made of our geology. Time may therefore be regarded as the fourth dimension.
Water system approach

We want to make sustainable, safe and efficient use of our subsurface. The impact of new and existing underground activities on the soil ecosystem must therefore be carefully considered. In that context, water is often a dominant factor. Groundwater and surface water are closely related and, in fact, form a single system. Surface water bodies are fed by groundwater flows. Conversely, the management of surface waters has a degree of influence on groundwater levels and on groundwater quality.

The water system connects the land’s surface with the upper underground strata. The way that the land is used has a major impact on the functioning of the water system. Furthermore, the water system in the upper hundred metres connects regions of rural and urban usage, and is extremely sensitive to climate change. Adaptation to climate change is therefore primarily about making the water system more resilient. The best way to achieve that is to utilize the natural regulatory capabilities of the soil and water system, in particular the ability to retain water and to dampen temperature fluctuations.

In the Netherlands, responsibility for water management is shared by various authorities. It is therefore important that all parties engage in dialogue regarding the functioning of the water system.
Protection of existing groundwater extraction sites

The provinces are responsible for protection of groundwater in the vicinity of sites where water is extracted for the production of public drinking water. In that role, they designate three types of zones:

- Water extraction zones;
- Groundwater protection zones;
- Drilling prohibition zones.

Activities within such zones have to comply with relevant provincial regulations. Generally speaking, mining activities are not allowed within such zones. The government believes that drill shafts that start at surface sites outside such zones and extend beneath groundwater reserves are in principle acceptable, as long as they do not pose risks to groundwater quality. With a view to assuring drinking water supplies, the provinces evaluate the existing groundwater protection zones and adjust their policies where appropriate. The provinces discuss their evaluation findings with the central government.
Supplementary Strategic Reserves

We want future groundwater reserves to be sufficient to assure drinking water supplies. The Policy Plan on Drinking Water therefore highlights the need for ‘spatial ground water reservations’ and associated protection measures. We distinguish between Supplementary Strategic Reserves and National Groundwater Reserves.

Supplementary Strategic Reserves are intended as a buffer against serious shortages and emergencies in the medium term (ten to twenty-five years). The provinces and the national government have agreed how the provinces will designate and protect Supplementary Strategic Reserves in the coming two to three years. Account will be taken of the areas that offer significant potential for geothermal energy, gas extraction from small fields and CO2 storage.

The national government is in regular contact with the provinces regarding the progress of the project. The initiative is guided by the principle that the long-term security of the public drinking water supply must be assured. It is also vital that an appropriate balance is found between the protection of groundwater reserves and the facilitation of mining activities such as those mentioned above.
National Groundwater Reserves

National Groundwater Reserves are very old, clean groundwater reserves deep below the surface, which have remained intact for centuries. Such reserves are a valuable form of natural capital. They could also be used to assure drinking water supplies if unpredictable factors should make that necessary in the remote future.

The national government has defined the approximate boundaries of the National Groundwater Reserves in the Spatial planning strategy for the subsurface. Mining activities are in principle permissible within the reserve boundaries, but would have to comply with strict conditions. The potential for drilling activities to compromise groundwater reserves can be gauged using a National Mining Inspectorate assessment tool.

The national government is in discussion with the provinces and municipalities regarding the definition of 3D National Groundwater Reserve boundaries. The development scope for harnessing soil energy within the reserve boundaries and the associated actual and potential limitations and parameters are also under discussion.
Geothermal energy production

The national government wants to achieve a low-carbon energy supply by 2050. Increasingly, therefore, society is making a transition to renewable energy sources. Geothermal energy is a low-carbon energy source. All tiers of government wish to utilize opportunities for geothermal energy wherever possible.

Geothermal sources can provide heat suitable for spatial heating, greenhouse horticulture and industrial processes. In combination with thermal energy storage and heat distribution network, geothermal energy is very efficient and has a wide variety of possible applications. In the short to medium term, geothermal energy is expected to develop mainly in places where there is concentrated ground-level demand for heat or an existing heat distribution network.

Experience gained in early geothermal energy projects indicates that the existing permit system is not ideally suited to the particular characteristics of this technology. A special regulatory framework and approach are required. The government therefore intends to amend the Mining Act and associated regulations.
**Gas production from small fields**

Wherever and as soon as possible, natural gas consumption is to be replaced by the use of low-carbon energy sources. Spatial heating is a particular focus, since sustainable alternatives are readily available. The requirement for residential districts to be connected to the gas network is therefore to be withdrawn. That will create scope for the growth of other energy sources. Increasingly, natural gas will be used only for purposes that do not currently lead themselves to alternatives.

Natural gas is, however, more efficient and associated with lower CO₂ emissions than any other fossil fuel. In the short term, therefore, it still has a role to play in the energy economy. Until the transition to a sustainable energy supply is complete, it is desirable that residual demand for natural gas is met using gas productions from Dutch fields, insofar as production can be achieved safely.

The production of gas from the Groningen field will end as soon as possible. During the term of the current administration, no new permits will be issued for onshore gas production. Nevertheless, existing permit-holders will be allowed to continue onshore gas prospecting and production, where and insofar as their permit conditions and the law allow. The policy on small gas fields is to be reviewed in 2018.
Use of empty gas fields for storage

Gas fields have clear horizontal and vertical boundaries. They have also proven to be suitable for retaining a substance for a very long period of time. Empty gas fields can therefore be used for various purposes. For example, they can be used to store CO2 or to buffer natural gas for use during energy demand peaks. Four gas fields are already in use for natural gas buffering: Norg, Grijpskerk, Bergermeer and Alkmaar.

In order to realize the climate targets in the Paris Agreement, rapid progress is required on energy sustainability and energy conservation. However, even with such progress, Carbon Capture and Storage (CCS) will be necessary if CO2 emissions are to be reduced to target levels. In the Climate and Energy Agreement, the government and the industrial community set out an agreed time line for the capture and storage of 18 megatonnes of CO2 by 2030. The government is talking to the Port of Rotterdam Authority and the companies active in the Rotterdam port area about utilizing the Rijnmond region’s great potential for CCS and residual heat storage. Similar discussions will be initiated regarding the Amsterdam port area and the Westland region.

In line with the existing policy on CO2 storage, the government’s preference is for offshore CCS. Onshore CCS will not be considered during the term of the current administration. The Minister of Economic Affairs and Climate Policy will commission research to identify empty onshore and offshore gas fields suitable for CO2 storage. The intention is to develop a CCS Road Map in partnership with the business community, knowledge centres, lower tiers of government and NGOs. The Road Map will cover issues of public support, safety and legislation, as well as the risks and barriers to the further development of CCS in the Netherlands.
Use of empty salt mines for storage

Rock salt is used as a raw material in the chemical and food industries and agriculture, and for road treatment. It is extracted by means of solution mining, which results in the creation of empty underground chambers. These empty salt mines are particularly suitable for buffering natural gas, nitrogen, hydrogen and compressed air, and for the storage of strategic diesel reserves.

Most salt extraction in the Netherlands involves salt pillows and salt columns less than 1,500 metres below ground level. At such depths, the salt behaves in a relatively stable manner and permanent chambers can be created. However, the salt extraction techniques used in the past did not match today’s high standards. Consequently, between 1963 and 1980, unstable chambers were created at various locations. Some of the chambers in question have collapsed, resulting in ground subsidence. Nowadays, much more is known about extracting salt safely, so that the resulting chambers are stable. If a salt mine is being considered for reuse as a storage facility once it is empty, the possibility needs to be investigated at an early stage, so that proper account of the planned reuse can be taken during the extraction phase.
Shale gas

Early this year, the Minister of Economic Affairs and Climate Policy told parliament that the exploitation of shale gas is no longer being considered for the Netherlands. This Spatial planning strategy assumes that no shale gas prospecting or extraction will take place anywhere within the area to which the strategy relates. Legal provisions to exclude the possibility of shale gas prospecting and extraction are being prepared.

Shale gas is a fossil energy source which may be present underground in the Netherlands. It is not yet clear whether it could be used as a fuel in the future. However, there is considerable public opposition to the possible extraction of shale gas. No drilling for shale gas has yet been done in the Netherlands.

Shale gas is trapped in layers of petrified clay, or shale, deep below the surface. Shale is present beneath a significant part of the Netherlands, particularly the Posidonia Shale Formation and the Geverik Strata. The strata that might contain extractable shale gas are between 1,000 and 5,000 metres below ground level. Closer to the surface, no extractable shale gas is present, while extraction is uneconomical below 5,000 metres.
Wadden Sea Islands and the coast

The Mining Act prohibits the issue of so-called ‘all-in-one environmental permits’ for mineral prospecting or extraction activities in the following regions:

- On the Wadden Sea Islands;
- In the parts of the Wadden Sea designated as Natura2000 zones;
- In the part of the North Sea coastal area designated as a Natura2000 zone.

North of the North Sea coastal region, an all-in-one environmental permit may be issued only if:

- Shared use of an existing mining platform is not possible;
- Visual impact is minimized.

The exclusion zone created under the Mining Act partially overlaps with the area covered by the North Sea Policy Plan and the Third Wadden Sea Policy Plan. The Wadden Sea Islands are the only part of the exclusion zone that is covered by the Spatial planning strategy for the subsurface. The Spatial planning strategy accordingly takes account of the fact that mining on the Wadden Sea Islands is prohibited by law.
Public support and participation

The national government has sought to maximise the quality of the Spatial planning strategy through participation. Numerous stakeholders have been involved in the development process, including the umbrella organizations that represent the provinces, water authorities and municipalities (which regulate underground activities to a significant extent). Multiple regional consultations have also been undertaken. In addition, various provincial and municipal authority members sat on the Steering Committee in a personal capacity and provided critical feedback on draft proposals. Input was also provided by a Public Panel, made up of fifty community members from around the Netherlands. The Panel served as a thermometer of public opinion.

Each interim product was prepared by an (informal) Consultation Group that included stakeholders from the business community, environmental and ecological organizations and action groups. The Consultation Group played an important role in the identification and clarification of social issues. It also put forward solutions, provided commentary on interim products, and suggested follow-up activities.

Finally, three opportunities for public input were provided by the publication of documents for comment. Comment was invited not only from the Dutch public, but also from neighbouring countries. The input led to various amendments to the Spatial planning strategy's texts and maps.

Benefits of a consultative approach

Active stakeholder involvement provided insight into the interests and concerns associated with exploitation of the country’s subsurface. It also enabled support for various subsurface activities to be gauged. The input of the Public Panel is literally incorporated into the Spatial planning strategy in the form of quotations from contributors.

Quotation from the Public Panel:

“The STRONG Public Panel discussed underground activities at length. We explored the dilemmas and reflected on all issues. We were glad we had the opportunity to broaden the discussion and to add those issues we considered relevant.”