Rathenau Instituut

# A Matter of Time

## Decision making on radioactive waste management in the Netherlands 1945 - 2016


## Summary of the report

In January 2023, we published the report A Matter of Time (*Een kwestie van tijd*). This report shows how the Netherlands has dealt with radioactive waste since the Second World War. It provides ten key insights that are relevant for current and future policies.

We made A Matter Time in collaboration with *Stichting Historie der Techniek*. It is the first of a series of reports that we are publishing to advise the State Secretary for Infrastructure and Water Management on how the Netherlands can best decide on the long-term management of radioactive waste. This advice will be given in 2024.

We used a draft version of A Matter of Time for dialogue sessions with experts and stakeholders. The report of that dialogue was published simultaneously with this report. The full reports are both in Dutch only. *(photo on this page: one of the storage facilities at Nieuwdorp; Evelyne Jacq/ANP)*

## Introduction

Radioactive waste is generated from various processes, such as the production of nuclear energy and medical isotopes and the mining of raw materials. This waste must be managed so it does not pose a danger to humans and the environment. Parts of the waste can remain radioactive for hundreds of thousands of years. The Dutch policy for radioactive waste is described in the 2016 *National Programme for the Management of Radioactive Waste and Spent Fuel*. This is based on temporary long-term above-ground storage, followed by a geological final disposal, which is expected to be in use around the year 2130.

This study describes the development of the Dutch policy for radioactive waste management (RWM). By mapping this history, the current policy can be better understood. It also provides a better insight into the roles, positions, and interests of actors in the current debate and the options for future management.

In this report, we describe the history from the perspective of the so-called governance ecosystem framework (see figure 1). The Rathenau Instituut developed this framework a few years ago to make the handling of social and ethical aspects around science and technology more transparent. It focuses on what happens within four domains, and the interactions between them. These domains are: politics and governance, law and regulation, science and technology, and civil society.

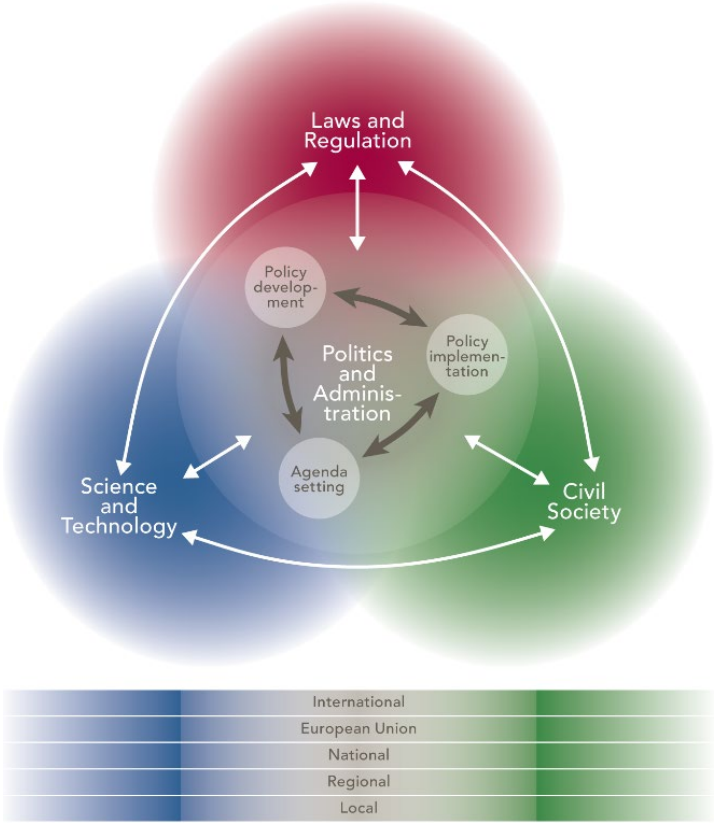


Figure 1 - Multilevel governance-ecosystem (adjust from Kool 2017)

This study is divided into five periods, each with a separate chapter. The division into periods is based on important shifts in the broader decision-making process on RWM. These are, for example, shifts in policy, legislation, technical RWM options, and societal involvement. Our study begins just after World War II, when radioactive waste was placed on the scientific and policy agenda both internationally and nationally.

**1945-1958: Radioactive waste comes onto the scientific and political agenda**

The emergence of radioactive waste on the agenda has to do with the rise of nuclear technology. During the post-World War II reconstruction years, the Dutch government saw nuclear technology as a pillar for industrial development and prosperity. Inspired by the American *Atoms for Peace* program, nuclear technology was on the Dutch political agenda from 1953. During this period, there was no scientific consensus on how to handle radioactive waste and the risks of low doses of ionising radiation. International conferences on the peaceful applications of atomic energy in 1955 and 1958 helped put RWM on international and national scientific and policy agendas.


Figure 2 - Nuclear installations mentioned in the summary

### 1958-1972: Formation of the nuclear energy law and radioactive waste practices

In the early 1960s, the Netherlands put its first nuclear research reactors into operation. In 1969 and 1973, respectively, the nuclear power plants in Dodewaard and Borssele followed. There was not yet any explicit and integrated radioactive waste policy, but an RWM practice emerged that was characterised by a national collection service and temporary above-ground storage at the Reactor Centre Netherlands in Petten. Some of the low- and intermediate-level waste was dumped at sea, under international supervision starting in 1967. Spent fuel from the nuclear power plants went to the Eurochemic reprocessing factory in Belgium, in which the Dutch government was a co-owner. The high-level radioactive waste that remained after the reprocessing process stayed in Belgium.

In the course of the 1950s and 1960s, protection against the ionising radiation of radioactive substances came onto the policy agenda. New international organisations such as the International Atomic Energy Agency (1957), the European Nuclear Energy Agency (1958), and the European Atomic Energy Community (1957) established guidelines that were implemented by the Netherlands. The resulting laws and regulations culminated in the 1963 Nuclear Energy Law, which regulated the handling of radioactive substances. The responsibility for the Nuclear Energy Law rested with the Ministry of Economic Affairs, which shared the responsibility for radiation safety with the Ministry of Social Affairs and Health.

### 1972-1980: Protests against dumping at sea and salt layer test drilling

The Dutch handling of radioactive waste came under social and political pressure in this period. In 1972, the London Dumping Convention was concluded, an international treaty against sea pollution. Partly due to increasing social protest, the dumping of radioactive waste into the sea was limited and, from 1983, prohibited. In the Netherlands, groups of citizens and scientists spoke out against nuclear energy. This also affected the debate on radioactive waste. Against the government’s plans to build more nuclear power plants, there was resistance from social and scientific groups. The government made the expansion of nuclear energy subject to the condition in 1974 that there must be an acceptable solution for radioactive waste. In that same year, Eurochemic closed its doors. New reprocessing contracts with England and France, for the Dodewaard and Borssele power plants, respectively, provided for the reprocessing waste to be returned to the Netherlands from then on.

This started a search for alternative solutions for the final storage of radioactive waste. In the early 1970s, both the Scientific Council for Nuclear Energy (WRK) and the Netherlands Reactor Centre (RCN) advised exploring storage in underground salt domes, which was in line with international scientific insights. In 1976, the government announced its intention to investigate this option in the northeast of the Netherlands. After protests from citizens, social organisations, businesses, and government officials from the relevant regions, the planned test drills were cancelled. There has been no on-site research in the Netherlands since then.

### 1980-1993: Formation of radioactive waste policy and an integral research program

In 1981, the government established the Commission for Reconsideration of Removal of Radioactive Waste (CHVRA). In light of growing social resistance and the expected

ban on sea dumping, it looked at alternatives for managing low- and medium-level radioactive waste. In 1983, it expressed a preference for storage in salt layers.

Regarding energy policy, and particularly nuclear energy, the government organised the Broad Social Discussion (BMD) on Energy Policy from 1981 to 1984. The BMD, which also covered RWM, was innovative in both its setup and execution as a form of public consultation. However, many participants lacked confidence in the process and the government's intentions. The objectives were not achieved. It was not possible to achieve a greater understanding of each other's positions, bring parties closer together, or give decision-making processes on (nuclear) energy policy and radioactive waste a greater basis of support, through the provision of information and the exchange of thoughts and ideas.

New research was also carried out in the period 1980-1993. Almost simultaneously with the BMD, the Integrated National Nuclear Waste Research (ILONA) started, in which various options for managing high-level radioactive waste were considered: temporary above-ground storage of spent fuel and nuclear waste, underground and above-ground storage on land, geological storage in salt domes under the North Sea, and storage in geological layers under the ocean. The latter two options were soon considered too expensive. The two options on land remained on the agenda.

In 1984, the Minister of Housing, Spatial Planning and Environment (VROM) for the first time, laid out an RWM policy in the Radioactive Waste Note. Part of this policy was the construction of surface storage for the temporary management of all categories of radioactive waste (low, medium, and high). The Central Organisation for Radioactive Waste (COVRA) was tasked with managing the waste. This was initially for a period of 50 to 100 years and was later extended to at least 100 years. This long-term interim solution provided time to further explore permanent storage options. The government was considering geological storage in the Netherlands or, in cooperation with other countries, elsewhere, referred to as the dual strategy.

Driven by growing political and societal attention to sustainability, in 1993, the government formulated an additional policy as part of the National Environmental Policy Plan. They introduced retrievability and reversibility as new principles that RWM must adhere to. Retrievability means that the waste must always be able to be retrieved from a storage and final disposal facility during the active management period, so that future reuse and intervention in case of problems is possible. Reversibility means that it must be possible to reverse decisions made in the gradual implementation of a management method if new political, societal, or scientific insights require it. This gives future generations more room to make their own choices.

**1993-2016: Towards a national radioactive waste program**

In addition to storage in salt, the Commission for Radioactive Waste Storage (1996-2001) investigated the option of storage in clay. The Commission also took into account the new requirement of retrievability of the waste during the use of the final disposal, as specified in the National Environmental Policy Plan of 1993. Because field trials in the Netherlands were not possible due to public opposition, the Commission used research facilities in Germany and Belgium. The Commission looked not only at technical-scientific research, but also at the ethical and social aspects of RWM. In 2011, the Research Program on Radioactive Waste Disposal (OPERA) was launched. In 2020, a new research program initiated by COVRA was launched, which runs until 2025.

This happened in a changing institutional context, which shifted policy responsibilities. In 1999, the ministry of VROM became responsible for granting permits under the Nuclear Energy Act. Two years later, it also took over the responsibility for research into geological storage from the Ministry of Economic Affairs. In 2015, the Authority for Nuclear Safety and Radiation Protection (ANVS) was established to bring together government tasks and knowledge in these fields into one organization. This was in order to meet the obligations of the International Atomic Energy Agency and the European Union to have an independent authority in the field of nuclear safety and radiation protection. In 2020, the policy responsibility for these tasks was transferred to the current Ministry of Infrastructure and Water Management, which also became responsible for policy on RWM.

International guidelines such as the Aarhus Convention and Euratom Directive 2011/70 state that citizens should have the opportunity to participate in the decision-making process regarding the management of radioactive waste. In addition, the government presented its *National Programme for the Management of Radioactive Waste and Spent Fuel* in 2016. This National Programme is based on four principles:

- minimising the generation of radioactive waste;
- the safe management of radioactive waste;
- no unreasonable burdens on future generations; and
- the producers of radioactive waste bear the costs of its management.

The National Programme assumes storage deep underground. It provides for a final decision on final storage around the year 2100. Final storage must be operational around the year 2130. Based on experiences abroad, the National Programme states that a broad social consensus is essential for the realization of final storage. In this context, the Rathenau Instituut was asked to advise on the decision-making process to be followed regarding the long-term management of radioactive waste in 2024.

## Insights and policy considerations

Based on our historical study, we come to ten insights, which we present below. Based on these insights, we formulate policy considerations for current and future policies.

### Insight 1: Different policy areas contributed to the decision-making process regarding RWM.

Different policy areas were involved in the decision-making process regarding RWM, such as public health and environment, energy, climate, spatial planning, industry, science and technology. The developments within these policy areas were not necessarily about radioactive waste, but they did have an impact. In the future, different policy areas will also be involved in RWM. This requires a wide mix of knowledge and expertise. To avoid conflicts of interest, it is crucial to keep the different institutional responsibilities separated. In 2015, for example, the responsibilities of the Ministry of Economic Affairs for energy policy and the policy for nuclear safety and radiation protection were divided among different government agencies.

**Insight 2: Decision-making about RWM and nuclear energy strongly influenced each other.**

In the public debate about RWM, proponents and opponents of nuclear energy played an important role. Additionally, RWM was and is an important issue in the discussion about nuclear energy. For example, the government stated in 1974 that the expansion of nuclear energy was only possible if an acceptable solution for radioactive waste would come. In the future, it is expected that developments in the field of nuclear energy will influence decision-making about RWM. Firstly, because more or fewer nuclear reactors lead to more or less radioactive waste. This can have consequences for urgency and financial means to realise final disposal. Political and social parties can also make the adequate management of radioactive waste a condition for decision-making about nuclear energy. This happened in the 1970s, when opponents of nuclear energy opposed the expansion of the number of nuclear power plants because there was no solution yet for radioactive waste.

**Insight 3: International events had a great impact on Dutch decision-making.**

Geopolitical tensions, international protests, and accidents are difficult to predict, but they can have a major impact on how people look at nuclear energy, environmental policy, and nuclear facilities. This can lead to different considerations in decision-making regarding RWM.

**Insight 4: International cooperation stimulated the development of knowledge, policy, and legislation in the Netherlands.**

Dutch decision-making about RWM is bound by international agreements. The Netherlands contributes to the development of these agreements and European legislation. At the same time, changes in international guidelines and developments in international research programs can have consequences for the planning and conditions of Dutch decision-making.

**Insight 5: Regional and local support was important for decision-making.**

For future decision-making about radioactive waste, regional and local political and social support are of great importance, as well as at the national level. This support is not only needed to realize the final disposal of radioactive waste, but also to carry out research on location. Due to the lack of support, certain locations and management methods for final disposal can fall away.

**Insight 6: The Dutch government struggled with the design of social participation in decision-making.**

The Netherlands is obliged to involve citizens in decision-making on radioactive waste. The government also recognized the importance of participation in the National Programme for Radioactive Waste and Spent fuel (2016). Participation can take different forms, from informative to decision-making. Experts concluded from the Broad Social Discussion on Energy Policy that it is important to clearly define the topics to be discussed beforehand, to provide social groups with equal information and knowledge, and to embed public participation in the entire decision-making process.

**Insight 7: The Netherlands focuses on temporary above-ground storage and long-term geological storage.**

The Netherlands has successfully implemented temporary central above-ground storage, both technically and socially. In addition, the 2016 National Programme assumes an operational final storage around 2130. According to current policy, steps must still be taken before a decision can be made in 2100 with regard to concretising participation, defining the principle of retrievability, and ensuring knowledge.

**Insight 8: The technological concept of geological storage has developed strongly.**

Since the 1970s, the Netherlands has been exploring the option of storing radioactive waste deep underground. In the beginning, there was a focus on the role of natural barriers between the radioactive waste to be stored and the biosphere, especially salt stone. Later, technical barriers were added. The concept of geological storage has been further defined in recent decades. However, additional research is being done and more is needed, including into the meaning for the management option of policy principles such as retrievability and passive safety.

**Insight 9: No location-based research has taken place in the Netherlands.**

In order to make a decision on final storage, the Netherlands will eventually have to conduct research at one or more locations. This is an essential step that has not yet been taken. This research can only take place with sufficient regional and local support, both among residents and businesses, as well as among politicians and officials. The choice of one or more research locations is therefore, in addition to a technical, primarily a social consideration.

**Insight 10: The role of social scientific research was limited within the study of radioactive waste management.**

Long-term management of radioactive waste requires a stable, interdisciplinary long-term research program. The research must focus on technical aspects, but also on social scientific knowledge and societal participation. This can also lead to more interaction between research and public debate. This can help to further fill in the principle of retrievability and consider safety criteria.

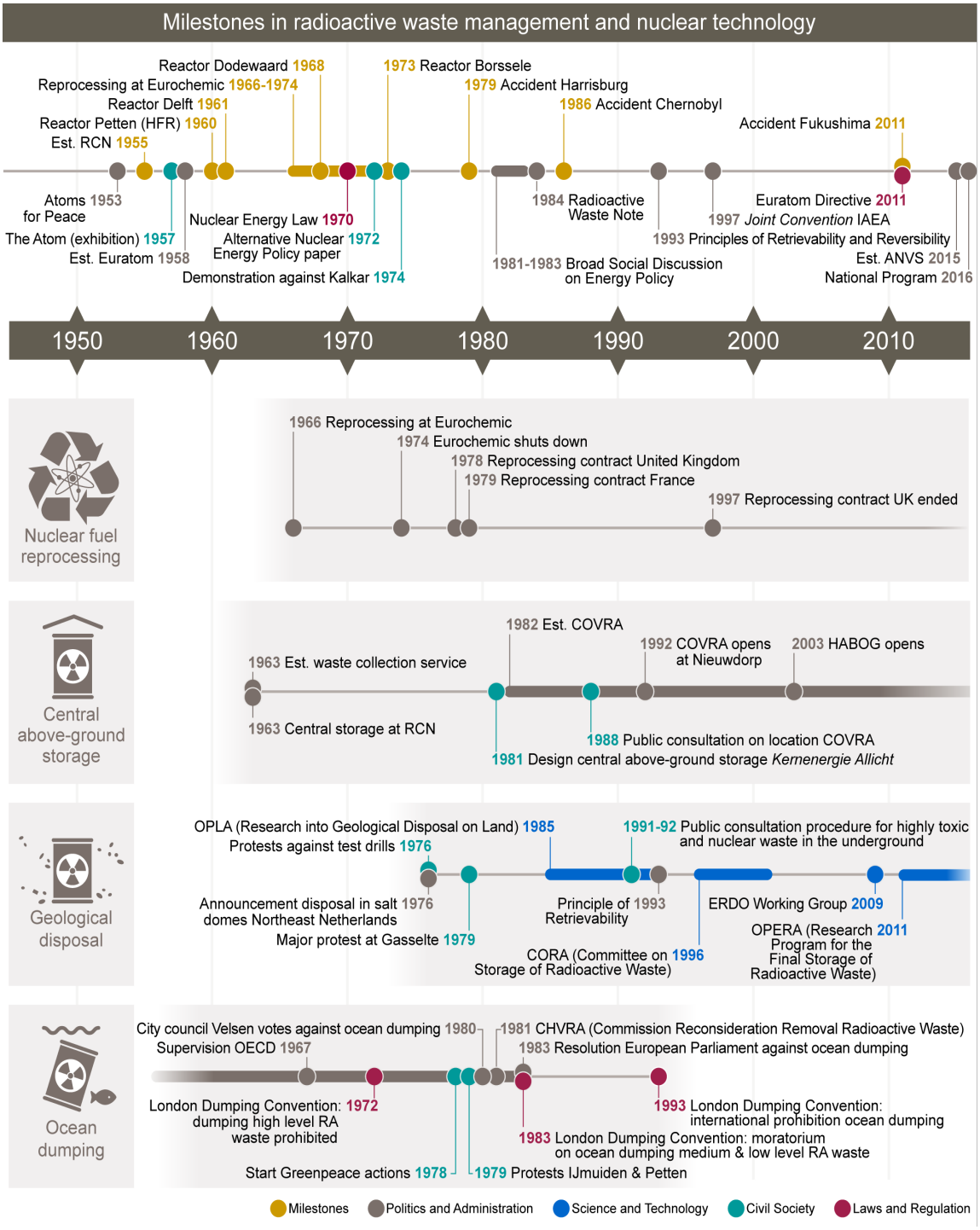


Illustration: René Rikkers