

# Considering the modalities of intergenerational transfer associated with radioactive waste management

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## 1. Introduction

Radioactive waste introduce a new time dimension in the field of risk management and lead to address the issue of intergenerational transfer of protection. This is why, for more than 10 years, there have been reflections on the societal and organisational mechanisms allowing a responsible management over the long term of the risk associated with radioactive waste. These reflections lead one to ask questions regarding interactions between what is at stake for societal and radiation protection criteria, demanding a multidisciplinary approach to the problem.

Within the framework of the European Commission research project COWAM 2, dedicated to the improvement of governance of radioactive waste management in Europe, a working group involving experts, authorities, waste managers, locally elected representatives and NGOs, discussed the stakes associated with the long term dimension by exploring the elements which can contribute to a better integration of the technical and societal time dimensions, taking into account technical, ethical, economic and organizational considerations.

After a discussion on the time dimensions to be taken into account from the technical and societal perspective, this paper presents, mainly based on the findings of the COWAM-2 project, a brief analysis of the ethical criteria to be considered when future generations are concerned as well as some performance criteria regarding the continuity and sustainability of surveillance and monitoring and the transfer of financing schemes.

## 2. Meaning and stakes of the "long term"

When we discuss subjects referring to the "long term", we raise the question of the actual time scale involved. In fact, there is no single definition of the "long term". It all depends on the context in which the issue is raised, the stakes and time perspectives of the actors studying this issue. As far as radioactive waste management is concerned, we can distinguish two main points of view: the technical point of view and the societal point of view.

### *The long term from a technical perspective*

From a technical point of view, operators of radioactive waste management facilities and radiation protection authorities usually want to assess the performance of protection systems over periods of time ranging from several thousand years, or more, to several million years. The criteria for assessing the safety of disposal sites are based on different considerations like: the evolution of the radioactivity and thermal characteristics of waste packages, the service life of facilities and waste packages, the geological evolutions and the assessment of the impact of disposal systems.

However, because of the numerous uncertainties associated with these timescales, there is no "absolute" guarantee of the very long-term safety of radioactive waste disposal. These uncertainties are notably highlighted in a report drawn up by the Nuclear Energy Agency (NEA) of OECD<sup>1</sup> that

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<sup>1</sup> AEN/OCDE - Agence pour l'Energie Nucléaire/Organisation de Coopération et de Développement Economiques (2004), Gestion des échelles de temps dans l'évaluation de la sûreté en phase post-fermeture Enseignements tirés de l'atelier d'avril 2002 à Paris, France, NEA n°5148

underlines the limits of predictability of various aspects of a geological disposal system. Faced with these uncertainties, the criteria and principles that authorities adopt to assess the safety of geological repositories are usually separated into two periods: a first period of about 10,000 years during which the predictability of the system's performance is considered accessible; a very long term period, beyond 10,000 years, where the assessment is generally used only as an indication of the efficiency of the system.

### ***The long term from a societal perspective***

The different elements presented above clearly show that the timescales used in technical evaluations of the safety of radioactive waste repositories are outside the range usually used in predictions on societal evolutions. However, the long-term governance of waste cannot be limited to technical considerations. Given the potential risks associated with radioactive waste, it is essential to acknowledge that the whole of society is concerned by this issue and not only the waste producers, the institutions in charge of managing waste or the authorities. Although it is the responsibility of these different actors to manage the waste, it is the whole of society that is undertaking a long-term waste management process, and this involves new responsibilities for future generations: continuing waste management, maintaining and organising surveillance and keeping the memory of waste management facilities.

The ethical matters considered initially in the framework of radioactive waste management were oriented towards the obligation of today's society to avoid placing "undue burdens" on future generations. Although the duty to protect future generations is of prime importance, the capacity of really fulfilling this obligation is greatly impacted by technical and scientific uncertainties, and also depends on how society evolves. In this context, it appears that future generations will always be faced with risks, even if these risks remain potential over time. Moreover, we can ask ourselves whether the current generation has the right to impose a behaviour on future generations even if this behaviour is motivated by a desire for protection. To address this concern, it appears that the current generation should adopt a reasonable approach consisting in creating governance processes that encourage the continuous transmission to the future generation(s) of a "safety heritage" (know-how, protection options, procedures, resources, etc.) in order to ensure continuity in waste management.

This approach involves assuming the past, present and future organisation of radioactive waste management and introducing an open process to allow future generations to intervene.

### ***Towards complementary approaches***

Whatever technical options are adopted, it is necessary to combine the two main concerns for the long term (i.e. technical and societal concerns). As far as safety and radiation protection is concerned, it is impossible to prove absolute efficiency over the timescales considered. Only by transferring responsibility from one generation to the next can a solution be found for waste management. Therefore, the present generation should examine the efficiency and feasibility of technical options but in association with a system of governance that addresses societal issues in terms of transferring a "safety heritage".

## **3. Ethical issues**

Ethical, organisational and political issues have already been studied within the radioactive waste management community (International Atomic Energy Agency, OECD-NEA, KASAM – the Swedish National Council for Nuclear Waste, etc.). As mentioned earlier, one of the main conclusions of these experts is that the guiding principle for the elaboration of waste management options is to avoid placing "undue burdens" on future generations. In the COWAM2 project, the developments were oriented towards creating the best conditions to encourage the transfer to the next and following generations of the whole waste management system. This led to the identification of three main ethical

principles as key points for the long-term governance of radioactive waste: responsibility, justice and democracy. The analysis of these principles enabled the working group to draw up 20 ethical criteria that could be used to assess the modalities of radioactive waste management (see extracts in box).

### **Ethical criteria for taking the long term into account in radioactive waste management**

#### **Long term responsibility**

"Future generations should be provided with some appropriate sustainable means (processes, money, institutions, knowledge, know-how, etc.) for the implementation and assessment of radioactive waste management systems."

"A long term radioactive waste management policy should flexibly articulate the current decisions with the future capacity of actions."

"Appropriate organisation should be implemented to ensure the conservation of information, knowledge and know-how on radioactive waste management."

#### **Long term justice**

"A municipality that accepts to manage the country's radioactive waste should benefit from the nation's long-term solidarity."

"A municipality that accepts to host a radioactive waste management facility should be entitled to funding for the socio-economic development of its territory."

"This funding should be aimed at supporting sustainable development of the territory in order to ensure continuity in the vigilance and surveillance of the site by the local population".

#### **Long term democracy**

"A system of long-term democratic governance requires a flexible political procedure combining the people's representation, participation and deliberation."

"The institutions in charge of radioactive waste management should be subjected to democratic control and be counter-balanced by the empowerment of citizens through the generations."

## **4. Continuity and sustainability of surveillance and monitoring**

Whatever the type of waste management facility, (geological disposal, short-term or long-term storage), the generic term of "surveillance" can include different aspects of the protection systems, which may also vary over time, such as:

- surveillance of the site;
- monitoring the environment of the facility, maintaining the facility, managing all activities on the site, including the possible retrieval of waste packages;
- preserving and transmitting waste management know-how;
- training the generations who will take over;
- organising multi-level vigilance.

The continuity and sustainability of surveillance and monitoring over long-term periods cannot be guaranteed nor decreed. Nor is it possible for people living today to define how society should be run in the future to ensure waste management. Therefore, in a long term governance process, it is necessary to search how to create the conditions that will promote the preservation of vigilance (at local, national and international level) and its transmission from generation to generation.

In order to study the key issues associated with the continuity and sustainability of protection systems, two case studies were carried out: the systems implemented by UNESCO for the protection, preservation and transfer to future generations of world heritage sites and the management of the former iron mines in the Lorraine region of France. These case studies were complemented by studies on the integration of protection systems into sustainable socio-economic territorial development projects. This topic benefited from proposals put forward by stakeholders: i) those put forward by the group of local stakeholders - MONA – which was set up in the municipality of Mol (Belgium) to discuss the feasibility of a disposal site for low and intermediate level radioactive waste with ONDRAF/NIRAS (Belgian Agency for Radioactive Waste Management); ii) proposals formulated during the French National Public Debate on Radioactive Waste Management which was held in France from September 2005 to January 2006.

All these studies led to the identification of several areas of action that could be studied when designing surveillance systems around radioactive waste management facilities to promote the sustainability of these systems over long term periods. The main points to consider within these areas of action are presented below.

#### ***Organising surveillance and vigilance***

- The transfer of the surveillance system from one generation to the next should be studied in order to promote an active conservation of the memory of the facility. For this purpose, it is necessary to allow the waste management and facility surveillance systems to evolve over time.
- Local stakeholders should be involved in the site's surveillance system as they are key actors in the vigilance and the transfer between generations.
- The surveillance and monitoring programme has to be clearly organised (distribution of responsibilities, monitoring procedures, etc.). The sustainability of such a programme would be strengthened by the creation of regular meeting points between state regulatory authorities, the body in charge of surveillance and local stakeholders, to assess its efficiency and identify the needs for evolution.
- A dedicated and sustainable funding system should also be associated with the surveillance programme. If necessary, the possibility of mobilizing international resources should also be studied.

#### ***Developing a centre of competence***

- A centre of competence could be created for the operation, maintenance and surveillance of the radioactive waste management facility over the long term.
- This centre of competence should focus on developing, using and transferring to future generations the expertise and know-how required to ensure efficient surveillance and monitoring of the facility over time.
- The centre of competence should be able to benefit from local, national and international expertise. The possibility of using this centre's expertise in different places and in fields other than radioactive waste management should be promoted.
- Involving stakeholders in the definition and follow-up of activities at the centre of competence is also an important way of ensuring sustainability and vigilance over the long term.

#### ***Integrating the radioactive waste management facility and its surveillance into local/regional socio-economic development***

- It should be made possible to integrate the surveillance function into a global project for sustainable socio-economic territorial development. Such a project should be designed with a view to "maintaining life" around the radioactive waste management facility because the stability of the local and regional population is a key factor in ensuring sustainable surveillance.
- For example, economic activities linked to the surveillance and monitoring of the environment could be developed in interaction with scientific and technological competence at local/regional level.

- It is also essential to set up systems that guarantee that the presence of the radioactive waste management facility is compatible with long-term territorial development.

#### **Sharing out responsibilities fairly between territories and between generations**

- To ensure an efficient protection system, the distribution of responsibilities between local, national and international stakeholders has to be clearly defined.
- The notion of "safety heritage" should be developed in order to create a "safety link" between local, national and international players and between generations.
- Finally, the advantages of setting up an international convention on the protection of radioactive waste management facilities could be studied.

### **5. Efficient financing schemes**

The ability of future generations to implement radioactive waste management options and to continue the monitoring and surveillance depends on the financial resources that will be available in the future. In order to identify the main characteristics of financial schemes and to discuss their long-term sustainability, the schemes implemented in some European countries (Germany, Belgium, Spain, Finland, France, Sweden, Switzerland) have been analysed. These analyses, combined with a study of the financing schemes sustainability, have led to the identification of some issues that have to be addressed to assess the performance of such schemes over the long-term:

#### ***The distribution of responsibilities with regard radioactive waste management***

- These responsibilities include the ownership of the waste, the funding, the implementation of the waste management facility, the surveillance, etc. The transfer of these responsibilities over time should be planned in advance.

#### ***Transparency with regard cost estimates and the use of funds***

- The decision-making process to define levels of the funds or provisions and their use should be explained, as should the radioactive waste management scenarios used to determine future financial requirements.
- The cost of long-term surveillance and of financial support for sustainable territorial development should be taken into consideration in particular.
- Mechanisms that ensure the evolution of the funds over time should also be clarified. External audits of the funds and provisions should be carried out regularly by the Government in collaboration with local and national stakeholders, notably through the involvement of local information commissions in the monitoring of fund management.

#### ***Financial guarantees***

- The funding schemes should integrate financial guarantees for cases where the cost of radioactive waste management is higher than expected or in the event of a waste producer going bankrupt.
- They should also integrate specific systems to ensure (as far as possible) that the money provisions are available when necessary.

### **6. Conclusion**

During the COWAM 2 project, the work package studying the long-term governance of radioactive waste management shown that the stakes associated with the taking account of long term could not simply be reduced to technical considerations. It is essential to consider ethical, economic, political and organisational aspects to ensure society embarks upon a long-term protection system. Of course, the aim of such a system is not to specify how societies of the future should be organised to manage the waste but to implement measures that promote the transfer of the whole protection system to future generations.

Therefore, a radioactive waste management facility (storage or disposal) should not only be designed with its technical performance in view, but should be seen rather as an element belonging to a whole protection system integrating considerations like the transfer of knowledge and know-how, the organisation of surveillance and its evolution over time, the integration of the facility into a sustainable socio-economic territorial development project, etc.

To this end, options for radioactive waste management should not only be developed by scientific and technical experts but also involve other stakeholders in society who will be directly or indirectly concerned by the existence of the waste management facilities and their continued efficiency over time. Therefore, it is important to develop long-term governance for radioactive waste management, based on multi-level involvement (local, national and international) of different categories of actors (authorities, experts, citizens, associations, operators, etc.).

### ***Perspectives***

Based on the results of the COWAM 2 project, a new step is currently underdevelopment in 5 countries (France, Romania, Slovenia, Spain and UK) involving different stakeholders in order to discuss the conditions for the practical organisation of the intergenerational transfer. This new project called "COWAM in Practice" (<http://www.cowam.com>) addresses notably the following issues :

- the practical organisation of the surveillance and the long term monitoring,
- the contribution of local liaison committee in the intergenerational transfer of protection,
- the relationship between the local sustainable development and the sustainability of the surveillance,
- the practical implementation of retrievability (decision process, evaluation mechanisms,...),
- the stakeholders involvement in the elaboration of radiation protection criteria for assessing the long term performance of the waste management options.

The conclusions of the 5 national stakeholder groups will be analysed to draw recommendations at the European level for improving governance of radioactive waste.