

28. Preservation of RK&M for Long Term Storage Facilities: The Results of a French Study – T. Schneider

Due to the specific long lasting radioactivity of high level waste types, new issues may arise for radiation protection. In this perspective, technical, societal and organizational aspects have to be considered. For the two latter aspects, it is interesting to analyse the efficiency of protection systems available in other fields than nuclear waste management, in order either to protect society from specific risk or to preserve world heritage. Few years ago, CEPN together with MUTADIS have performed a specific study, commissioned by CEA (Commissariat à l'Energie Atomique), in order to analyse the characteristics of protection systems used to manage risks associated with the presence of past underground cavities and mines, as well as the mechanisms designed and implemented by UNESCO for the preservation of world heritage sites. This study has identified a set of performance criteria to deal with long-term protection. These results were notably discussed within the framework of the European project COWAM 2 in a working group involving experts, authorities, waste managers, locally elected representatives and NGOs.

This paper presents briefly the case studies performed on long-term protection as well as the key lessons related to the continuity and sustainability of the surveillance and control of radioactive waste facilities.

1. Introduction

The long-term persistence of the radioactivity of the waste gives a new dimension to protection and raises the question as to which technical means and organizational and societal aspects could contribute to an efficient protection throughout long periods of time. In this perspective, CEPN was involved in different research activities since more than 15 years in order to contribute to the debate among the radiation protection community concerning the way to establish a protection system to cope with the long-term dimensions. Notably, it is interesting to mention the reflections developed within the framework of the French research law, adopted in 1991, on radioactive waste and the National Public debate on this issues organised by the National Commission of Public Debate (CNDP) at the end of 2005. In this context, the French Atomic Energy Commission (CEA) asked to CEPN and Mutadis to perform a study to analyse the effectiveness of long-term protection systems implemented in other fields. The main result of this study was to identify performance criteria originating from arrangements existing in the risk management developed for abandoned quarries and mines, as well as arrangements used by UNESCO for the world heritage sites [1, 2]. It has also clearly shown that the question of preservation of memory and long-term considerations are not only a matter of centuries or several thousand years but could be of concern only a few years after the closure of the activities at the origin of the risk. In addition, within the framework of the Euratom Research Programme, CEPN led the reflections on long-term radioactive waste management with European stakeholders as part of the activities of the COWAM research project [3, 4].

This paper summarises the key findings from these researches pointing out the key features for the conservation of records and memory as well as the governance issues associated with the long-term management of radioactive waste.

2. Characteristics of some long-term protection systems

2.1. Management of ancient cavities under the City of Paris

There are many cavities under the City of Paris, some of which are many centuries old, and their presence raises a risk of subsidence (see Figure 1). In fact, more than 70 km² are concerned for the City of Paris and its suburb area.

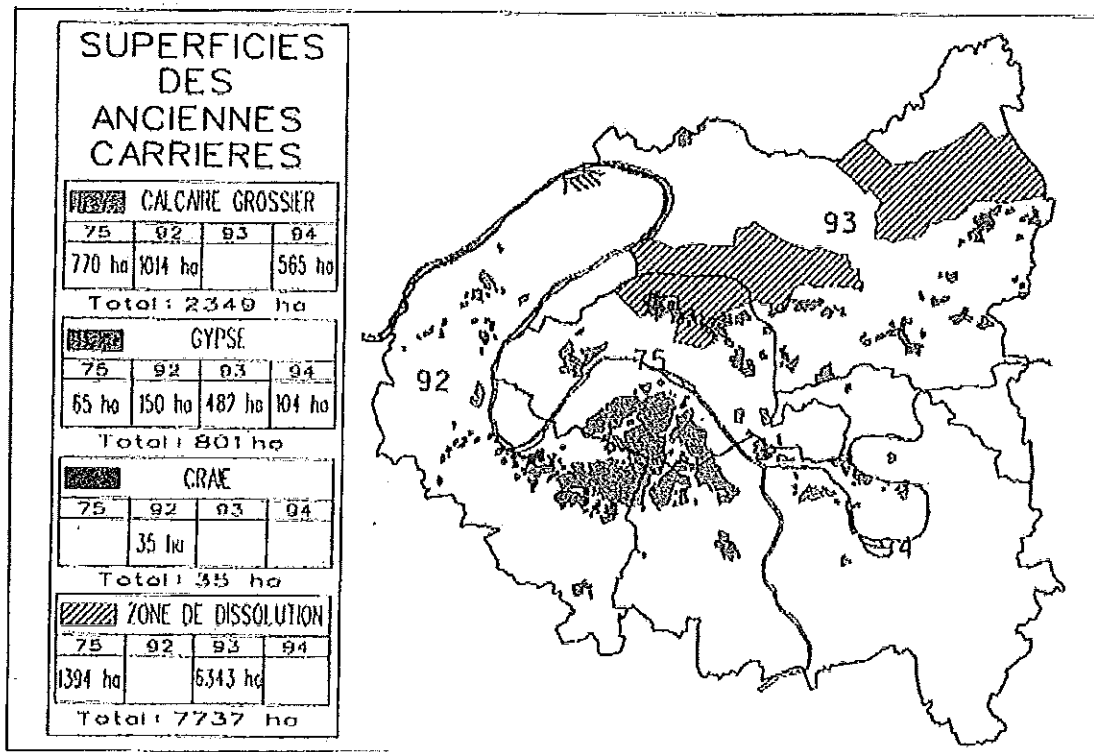


Figure 1. Old quarries in the City of Paris and its suburb

After an accident that occurred in the 18th century, a risk management system was set in place, and is still operating today. It is characterised by a judicious division of responsibilities between the quarry inspection service (Inspection Générale des Carrières - IGC), the land owners and the City of Paris:

- The IGC is in charge of acquiring, securing and maintaining relevant information. It also makes sure that problems associated with the existence of these cavities are kept on the agenda. It has built up a considerable expertise in the techniques of risk management and in making the land safe.
- The owners of buildings in high-risk areas, and the City of Paris as far as public property is concerned, address the risks as identified by the IGC, since they must finance the work to be carried out to ensure safety.

This arrangement has made it possible, despite the persistence of the risks, to ensure sustainable development of the city and long-term management of the risk by maintaining a dynamic action system. The durability of the system is essentially based on:

- Clear division of the responsibilities between private owners, the IGC and the municipal authorities;
- The market value of the land and buildings, which is continually increasing over time. The cost of remedial work is thus generally marginal compared to the current value of real estate, which is a powerful incentive for the owners to carry out the necessary work;
- A system which stimulates periodically risk awareness, when real estate transactions are being made and the surveillance of any of the ancient cavities results in the IGC issuing an alert, or should a ground collapse occur.

2.2. Management of the legacy of mining in the Lorraine Basin

Iron mines were operated in Lorraine during the 19th and 20th centuries. The last mines were closed in the early nineties, resulting in the transfer of the surveillance of the mined areas from mine operators to the French State. The ending of the regular maintenance resulted in subsidence of the land in a number of areas, which made it necessary to set in place a system for management of the long-term risks. This included the creation of:

- A centre of expertise on the risks of ground collapse, to support the government authorities (GEODERIS);
- A centre for scientific research into systems of detection and prevention of collapse (GISOS);
- A regional committee for evaluating the terms and conditions of the cessation of mining work and surveillance of the installations, combining civil servants, local politicians and non-governmental organizations.

The emergence of problems associated with subsidence in iron ore-mining areas is clearly linked with the cessation of mining throughout the region. The ending of this economic activity in the region has resulted in the absence of individuals or organizations with an incentive to conduct long-term surveillance. Unlike the case of the ancient cavities under the city of Paris, in the Lorraine Basin low land prices have resulted in difficulties concerning funding of protection and have necessitated the direct governmental intervention. With a view to long-term management of the situation, local politicians and populations have requested that consideration be given to the possible economic future of the region.

Regarding the reinforcement of surveillance of the mines after closure, a system of expert appraisals has been set in place, on the one hand to mobilise local and regional skills (expert appraisal organizations present in the region, creation of collaboration with the university), and, on the other hand, to make use of such special knowledge in other regions.

2.3. Protection of UNESCO world heritage sites

The UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, signed in Paris in 1972, set in place a system which established, for more than 900 specific locations, considered specifically significant for humanity, the terms and conditions of management combining concerted action by the international community, the government involved and the local population. Currently, 188 countries are involved in this Convention.

The effectiveness of this system of protection is primarily based on the recognition of the existence of one heritage that is common to local, national and international players, and the division of responsibilities between them over time. Everyday management of such a site is handled by a local organization in contact with local inhabitants. The national level sets up a regulatory framework, provides legal guarantees and makes technical and financial contributions to protection-related actions. At the international level, the UNESCO monitors the permanence and durability of the local and national protection actions and initiates procedures in the event of any shortcomings, mobilising technical and financial resources as necessary. Effectiveness also depends on the procedures for listing and monitoring the sites to be protected, encouraging the governments involved to 'identify, protect, conserve, enhance and transmit to future generations their natural and cultural heritage'.

Apart from recognition that responsibility for heritage sites is more the affair of the government involved than UNESCO, among the projects that have arisen in the context of the 1972 convention, all recognise the need to link site conservation to the sustainable development of the concerned area to encourage the local population to play a positive role in taking care of the site. This integration is fostered by the creation of centres of activity handling both safeguard issues and those relating to development (tourism, and the fostering of intellectual and technical skills for instance).

It is finally to be noted that the 1972 convention provides for the keeping of long-term records concerning the protected sites, featuring the compilation of archives and inventories, and the circulation of copies to museums and libraries throughout the world.

3. Addressing the issue of continuity and sustainability of surveillance and monitoring with stakeholders involved in radioactive waste management

These lessons have been further investigated within the COWAM-2 European Commission Research Project with a group of European stakeholders, in order to derive, when possible, performance criteria regarding long term management processes. It was recognised that 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 levels) and its transmission from generation to generation.

Based on these different studies presented above, the stakeholder group of COWAM-2 identified 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.

4. Lessons that can be learnt for the management of radioactive waste

To summarise the reflections, the following properties of a system enabling management of risks in the long-term could be mentioned:

- The sharing of roles and responsibilities between the different parties involved;
- The existence of durable and available expert knowledge;
- The presence of multiple centres of expertise;
- The recognition of a common goal by the different parties involved;
- The promotion of a sustainable local development;
- The legal, institutional and financial structures;
- The existence of a sequential decision-making process;
- The redundancy of the records.

References

- [1] Hériard Dubreuil G., Gadbois S., Schieber C., Schneider T., Réflexion sur les critères de performance d'un entreposage de longue durée (ELD) vis-à-vis des situations de délaissement temporaire, Rapport CEA - DEN/DDIN/DPRGD/2003/3, 2003.
- [2] Marvy A. et al., A look at new key performance criteria that could affect the most the safety of a long term storage for nuclear waste - A case study commissioned by CEA, International Conference on Issues and Trends in Radioactive Waste Management, IAEA, Vienna, Austria, 9-13 december 2002.
- [3] Schneider T., Schieber C., Lavelle S., Long-term governance for radioactive waste management - Final report of COWAM 2. CEPN-R-301 / Report COWAM2 - D4-12.
- [4] Schneider T., Schieber C., Gadbois S., Hériard Dubreuil G., Considering the modalities of intergenerational transfer associated with radioactive waste management. In: Proceedings of the 12th International Congress of the International Radiation Protection Association-IRPA 12, Buenos Aires, Argentina, 19-24 October 2008.