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NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

Expert Group on Preservation of Records, Knowledge and Memory across Generations

Phase-II Vision Document

The present Phase-II Vision Document is the revised version following refining of work priorities of the initiative after the International Conference and Debate "Constructing Memory", which took place 15-17 September 2014 in Verdun, France.

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**PRESERVATION OF RECORDS, KNOWLEDGE AND MEMORY ACROSS GENERATIONS
(RK&M)
PHASE-II VISION DOCUMENT**

Introduction

Preservation of Records, Knowledge and Memory across Generations (RK&M) is an initiative under the NEA Radioactive Waste Management Committee (RWMC) in the area of knowledge consolidation and transfer. Launched following approval by the 44th RWMC in March 2011, Phase-I of the initiative ended in March 2014. The modus operandi and goals for Phase-I are documented in NEA/RWM(2011)6/REV2. The initiative's many products can be consulted on its web page (www.oecd-nea.org/rwm/rkm). Annex A of this document provides an overview of topics addressed in Phase-I of the initiative.

Five main observations from Phase-I of the initiative are:

- The context has changed greatly since the 1980s, when RK&M was thought to serve the sole function of deterring intrusion into a repository. Today, the goal is to preserve information to be used by future generations while maintaining technical and societal oversight of the repository for as long as practicable.
- There are a number of mechanisms for international cooperation that can foster RK&M preservation. They constitute a potential resource for waste management organisations and governments.
- The period of time of a few centuries that will follow repository closure, which is defined in the RK&M glossary as the medium term, is rarely specifically addressed in the literature. However, this is an important period for RK&M preservation and for preparing the future.
- The regulatory aspects of long term RK&M preservation are much in need of formulation and systematisation.
- Terminology is important when discussing long-term issues.

“Constructing Memory - An International Conference and Debate” took place on 15-17 September 2014 in Verdun. This event provided an international venue to present and discuss the findings that emerged from Phase-I, to receive suggestions for further work topics and to enlarge the initiative's network of interested experts and communities.

Modus operandi

The modus operandi should continue as for Phase-I, with the aim for the initiative to become the reference community in OECD/NEA member countries for ideas, aspirations and practices in the area of RK&M preservation.

- Integration of local communities, academics and additional regulators in the initiative will continue to take place via regular RK&M meetings and workshops.
- The internal menu-driven document based on wiki-technology will continue to be a communication platform for members of the initiative.

Membership

Members currently represent 19 organisations from 13 countries:

- **Belgium**
 - Belgian National Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS)
 - Belgian Nuclear Research Centre (SCK)
- **Canada:** National Waste Management Organization (NWMO)
- **Czech Republic:** Radioactive Waste Repository Authority (SÚRAO)
- **Finland:** Radiation and Nuclear Safety Authority (STUK)
- **France:** French National Radioactive Waste Management Agency (Andra)
- **Germany**
 - Federal Office for Radiation Protection (BfS)
 - Gesellschaft für Anlagen- und Reaktorsicherheit (GRS)
- **Hungary:** Public Limited Company for Radioactive Waste Management (PURAM)
- **Japan**
 - Japan Atomic Energy Agency (JAEA)
 - Radioactive Waste Management Funding and Research Center (RWMC)
- **Spain:** Empresa Nacional de Residuos Radiactivos (Enresa)
- **Sweden:**
 - Swedish Radiation Safety Authority (SSM)
 - Swedish Nuclear Fuel and Waste Management Company (SKB)
 - National Archives of Sweden (Riksarkivet)

- **Switzerland:**
 - National Cooperative for the Disposal of Radioactive Waste (NAGRA)
 - Swiss Federal Office of Energy (SFOE)
- **United Kingdom:** Radioactive Waste Management Limited (RWM)
- **United States:** Sandia National Laboratories

The International Atomic Energy Agency (IAEA) is participating in the initiative as an observer.

Duration

Three years (April 2014–April 2017)

Programme of Work

The RK&M initiative will continue to upkeep basic tools such as:

- the RK&M glossary
- the catalogue of national and international laws and regulations
- the bibliography of works related to the preservation of RK&M
- the internal menu-driven document based on wiki-technology.

Additional work will be performed in areas identified in Phase-I as being relevant to RK&M preservation such as:

- archives
- international mechanisms
- regulation
- markers
- cultural heritage.

For each of these areas, preliminary examinations have been conducted in Phase-I. Avenues for further inquiry were also identified in Phase-I and are reported in Annex A. In Phase-II, participants will define work priorities among and within the areas listed above.

A significant effort will be dedicated to a new topic: the Key Information File (KIF) to be associated with geological repositories. The KIF consists of a summary of documents that actors involved in radioactive waste management are required to transfer to the national archives. It is designed to include basic technical and contextual information at a facility scale and to be accessible to non-specialists. It would be prepared during operations, and updated and re-issued regularly during the period of institutional oversight.

Also, the initiative will continue to highlight and elaborate the value of a systemic approach, defined within the context of the RK&M initiative as a communication approach under which information is conveyed through a variety of components. These components are linked, act as indices to one another, and reinforce each other's information content. This approach thus incorporates a variety of means of RK&M preservation. It is envisaged to identify and provide an overview of inter-action between these components and to make more detailed recommendations about the development of a strategic approach at the end of Phase-II.

There will be coordination and cross-fertilisation with the NEA RepMet¹ initiative, which addresses the management of metadata during repository pre-closure operation.

Please see Annex A for a more detailed description of these areas of work.

Resources

The initiative will continue to need (a) a full-time research assistant to work within the secretariat, supporting the Administrator in the organisation of the initiative and in particular in the upkeep of the internal menu-driven document based on wiki-technology; and (b) experts and consultants for performing specialist studies and for participating in meetings, workshops and conferences organised within the programme of work. As in Phase-I, these will be funded through voluntary contributions from participating

¹ Radioactive Waste Repository Metadata Management. Please see here for more information about the initiative: <http://www.oecd-nea.org/rwm/igsc/repmet/>.

organisations from member countries. The amount of the voluntary contribution is 5,000 € per year (plus 6.3% OECD overhead) per participating organisation. In-kind contributions can be accepted when voluntary contributions are not possible. In-kind contributions include, but are not necessarily limited to, organisations making available staff time to the RK&M initiative.

ANNEX A: MAIN ELEMENTS OF THE PHASE-II PROGRAMME OF WORK

Upkeep of basic tools developed in Phase-I

RK&M glossary

- The existing definitions will continue to be refined.
- New definitions will be added as needed.

Catalogue of national and international laws and regulations

- The catalogue of regulatory requirements will continue to be updated and extended in Phase-II.
- The RWMC Regulators' Forum will be asked to participate in the upkeep of the catalogue.

Bibliography

- Documents developed during Phase-II of the RK&M initiative, either within the initiative itself or in parallel to it, may be added to the bibliography.
- Indexing of documents for the RK&M internal menu-driven document based on wiki-technology will be extended to documents both within and outside the current core group of key documents in the bibliography.
- The entire bibliography will be reviewed in order to identify existing documents that are important enough to be included in the core group.
- Abstracts in the standard format and style will be prepared for newly-identified core documents and added to the bibliography.

Internal menu-driven document

- The internal menu-driven document based on wiki-technology will be further developed during Phase-II.
- The internal menu-driven document based on wiki-technology will be actively monitored and updated by the Secretariat and RK&M members.

Continuing work items²

Systemic Approach

The RK&M initiative supports a systemic approach to RK&M preservation, i.e. the implementation of a system whereby, within a strategy of mediated and/or non-mediated transmission of RK&M, the various RK&M transmission elements are linked, act as indices to one another and reinforce each other by offering redundant functions³. At the same time, any strategy should distinguish between the various life cycle phases of a repository⁴. These are cross-cutting aspects that will be taken into account in carrying out studies and structuring all discussions and initiatives.

Archives

- An ad-hoc group could be created to specifically allow archivists to interact in the RWM context. Aims and questions to be addressed by this initiative are listed below:
 - Member archivists would help identify current issues and possibilities for standardisation.
 - Requirements regarding the structure of records collections, metadata and contextual information, media, language, retention periods, access and confidentiality could be developed in concert with the institutional stakeholders (in particular the regulator) for RK&M preservation and compared to current archival policies and practices, as defined by international (e.g. International Organization for Standardisation (ISO)) and national standards.
 - Interaction with RepMet will be sought.
- As one of the key elements of RK&M strategies is redundancy, it would be useful to keep sets of records in several archives at multiple levels, e.g. in local (municipal), regional and national and international archives. The initiative would examine the practicability of this idea.
- National archives already cooperate at international level. This raises questions about how sharing waste repositories' RK&M can be fostered and which the potential difficulties are that could arise.
- It also appears worth analysing to what extent other mechanisms, such as the World Digital Library, could be used by national organisations as one further means to disseminate information.

² Sub-items in these lists will be selected for prioritisation in Phase-II.

³ For example, a systemic approach to reach out to future generations in the medium term through a strategy of mediated transmission of RK&M may include both national and international archives; creating tacit knowledge reservoirs; continuation of oversight and monitoring; building cultural links between the waste and the site region; use of markers placed visibly and in strategic locations; etc.

⁴ Four such time frames are defined in the RK&M glossary: very short term, short term, medium term, and long term.

- In the context of the Set of Essential Records/Key Information File, implementers, regulators and policy makers could be invited to define *jointly* what they would consider a reference set of essential records for archiving.
 - Studies of questions related to the types of RK&M that are most likely to be useful in the long term may become important input for the development of regulatory requirements for long-term preservation of RK&M.
- Similarly, it should be investigated whether several stakeholders (such as the implementer and the regulator) could compile a *joint set of records* that would synthesise the context and procedures, as complementary practice to the regulator, implementer and others sending their separate files to their national archives.
- Finally, the experience of Andra at the low-level waste repository “Centre de la Manche” and of other organisations in organising records at different levels of detail should be studied.
- The possibility to establish a dedicated archive, either at the national or – given the relatively small number of projects – at the international level, with dedicated funding, should be kept in focus. The project of a Nuclear Archive drafted by the Nuclear Decommissioning Authority (NDA, United Kingdom) should be followed closely.

Prevention of loss of records, knowledge and memory

The initiative conducted a study in Phase-I on the “Prevention of Loss of Records, Knowledge and Memory”, which lists potential causes of loss of RK&M in the field of hazardous waste management in the short term. These causes should be investigated with regard to the medium and long term.

- In Phase-II, the initiative will further examine which causes could be avoided and which methods could be used for this purpose. It will address the following items:
 - Possibility of remediating measures for loss of RK&M.
 - Development of the understanding of “knowledge reconstruction”, for instance by exploring the concept of “mothballing”.
 - Examples of reconstruction of extinct languages, interpretation of symbols.

Connection to safety

- The position of the RK&M initiative on safety (as expressed in its strategic article on the internal menu-driven document based on wiki-technology) will be tested and developed further with the help of other audiences.

Cultural heritage

- This concept will be studied further as a potential means of RK&M preservation, e.g., could surface facilities be turned into cultural objects and function as markers? Can a deep repository be considered as cultural heritage? Can rituals keep knowledge and memory alive?
- The initiative will study, keep track of or join projects that pertain to creating “an archaeology of the future”, such as the Memory of Mankind project in Austria or the Long Now Foundation in the USA.
- The initiative will also study examples of reconstruction of extinct languages, interpretation of symbols.

International mechanisms

- With a view to the medium and long term, the initiative will continue the investigation of the potentialities of existing international mechanisms linked to RK&M preservation in RWM, in order to build a comprehensive set of relevant international mechanisms.
 - New ones vis-à-vis Phase-I have been identified already, for example the IAEA Net-Enabled Radioactive Waste Management Database (NEWMDB), the Hague Convention of 1954 for the Protection of Cultural Property in the Event of Armed Conflict, the Intangible Cultural Heritage Convention of 2003.
 - Contacts with the IAEA & EURATOM safeguards groups on memory aspects will be renewed.
- The RK&M initiative will continue to identify and build relationships to other stakeholders that may have set up similar international mechanisms, e.g., companies that manage hazardous waste, seed banks, etc.
- Considering that the subject of RK&M for radioactive waste repositories in the short and medium-term consists of (i) emplacing radioactive waste packages and radioactive materials (ii) in a geological layer (iii) in order to protect mankind and the environment (iv) and preserve the related records, knowledge and memory, a systematic research of additional, relevant mechanisms that could be helpful will be based on four tracks:
 - Mechanisms devoted to controlling radioactive waste and materials circulation
 - Mechanisms devoted to sharing knowledge on geology
 - Mechanisms related to environment protection
 - Mechanisms related to cultural heritage preservation.
- Relevant mechanisms may be commercial or semi-commercial projects, not only institutional.

- For example, referring to the second track above (geology), the Solution Mining Research Institute (SMRI). Established in 1958, the Solution Mining Research Institute (SMRI) is interested in the production of salt brine and the utilisation of the resulting caverns for the storage of oil, gas, chemicals, compressed air and waste; the solution mining of potash and soda ash are also of interest. SMRI is a non-profit, worldwide organisation with more than 150 member organisations in Asia, Australia, Europe, and North and South America.
- Another example is the International Society for Photogrammetry and Remote Sensing (ISPRS), which is an international non-governmental organisation that enhances international cooperation between the organisations worldwide with interests in photogrammetry, remote sensing and spatial information sciences. Established in 1910, ISPRS is the oldest international umbrella organisation in the field of “information from imagery”.
- The analysis of the mechanisms will be deepened on the products and activities triggered by the mechanisms (cooperation, database, expertise...). Namely, attention will be devoted to identifying possibilities of cross reference or index used to locate information. The possibilities related to land registers could be investigated.

Markers

- The topic was explored in Phase-I and deserves further investigation.
- Important questions are:
 - Which role can markers play for RK&M preservation and on which time periods?
 - How can they be part of a systemic approach to RK&M preservation?
 - Is international standardisation of at least some types of markers a good idea?
- Time capsules will be looked at as a type of markers having potential to carry information that goes beyond a simple concise message.

Regulation

- The role of regulators and other oversight bodies in ensuring that RK&M will be preserved for long periods of time needs to be better understood and discussed, especially in light of the recent (June 2013) release of the ICRP-122 guidance document and its recommendations regarding the need to maintain oversight of a geological repository for as long as practicable.
 - The work on regulatory aspects should be undertaken in the first place by groups such as the RWMC’s Regulators’ Forum.
 - Since some of the issues related to preservation of RK&M in the long-term may transcend the typical boundaries of responsibility of present-day regulators, the roles of other policy-making national and local institutions merit further investigation.

- The RK&M initiative will liaise with regulators and ensure adequate representation of regulators in the discussions, and will address the implications for RK&M of factors such as sharing of responsibility among institutions and transfers of responsibility for oversight, e.g., at the time of closure.
 - It would be useful to study the question of how policy makers and regulators formulate and put in place requirements to ensure that applicants address medium- and long-term preservation of RK&M in their repository projects and what role this has in the stepwise licensing process.
- It will be useful to investigate the potential role of international governmental mechanisms and their interactions with regulatory aspects of RK&M preservation.

Key Information File

- In the context of preserving RK&M, implementers, regulators and policy makers could be invited to define *jointly* what they would consider a reference Key Information File.
 - Studies of questions related to the types of RK&M that are most likely to be useful in the medium and long term may become important input for the development of regulatory requirements for long-term preservation of RK&M.

Additional synergies

- There will be collaboration with the Repository Metadata initiative (RepMet) of the NEA.
- The initiative will liaise with and follow current developments at the IAEA, as well as European initiatives such as IGD-TP (JA14 and JA15), Petrus II, etc.