Notes on Rolling Stewardship

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SUMMARY: *Rolling stewardship is a part of intergenerational stewardship culture, which also includes long-term stewardship. There is not only definition of rolling stewardship, several are possible. The paper identifies a dozen parameters that could be relevant for weak and strong versions of the concept. It is nearly invisible in current national, European and international law. Nonetheless, rolling stewardship has a close affinity with long-term stewardship that is well established in U.S. administrative practices. Long-term stewardship is also embedded in European law, necessitated by the many uranium mine and mill tailings sites in several EU Member States. In 2011, an EU Commission Staff Working Paper recommended long-term measures and institutional mechanisms that can be perceived as a version of rolling stewardship. Civil society is among the most important stakeholders, whose involvement is relevant to rolling stewardship. A prerequisite for interaction with civil society is to establish enduring governance models that include transparency, effective public participation, and access to resources and justice. Several arguments for and against rolling stewardship are possible. Arguments for are mainly based on recognition of the precautionary principle as a leading guidance principle in radioactive waste management and final disposal of radioactive waste, the notion of intergenerational justice and a strong version of sustainability. Arguments against are mainly based on its perceived impracticability, high economic costs, incompatibility with the polluter pays principle and a weak version of sustainability. During workshops in EURAD-1, rolling stewardship has been identified by the civil society larger group as a subject of interest. EURAD-2 could be an appropriate forum, in which the viability of rolling stewardship in its capacity as a long-term intergenerational radioactive waste management concept could be further explored and evaluated in the perspective of the parameters that have been established within EURAD-1.*

Due to the fact that final disposal of radioactive waste (RW) increasingly becomes a pressing matter, so does the different methods of disposing the waste and the issues related to disposal, including human factors such as good governance, provision of sufficient funding, transfer of knowledge and the possibility of reversibility of crucial decisions in the radioactive waste management (RWM) process. One of the management models that has attracted considerable interest is rolling stewardship, which can be described as a strong version of long-term stewardship (LTS) of RW. Because of the very long time-perspective that is required by rolling stewardship in regard to LTS, it is often perceived as controversial. However, because of its popularity and not least the increasing significance of the precautionary principle in environmental management and environmental law, which rolling stewardship embodies better than any other type of RWM, its

constraints notwithstanding, one could argue that it merits not only mentioning, but also a closer look within EURAD-2[1].

These draft notes will (A) try to provide a definition of the notion of rolling stewardship, possibly in more than one version, and describe its background and the terminology that is used, give examples (B) of its role in role in current national, European and international law, (C) the role of civil society in rolling stewardship, (D) the pros and cons of rolling stewardship, and (E) its relevance to EURAD-2.

A. What is rolling stewardship?

Rolling stewardship was first mentioned in 1995 in a study by the U.S. National Research Council[2]. At that time, it had a more limited scope than today, planning for stewardship only one generation ahead. The study recommended rolling stewardship as an option for addressing contaminated sites that pose significant clean-up problems and where no ample technological solutions are available.

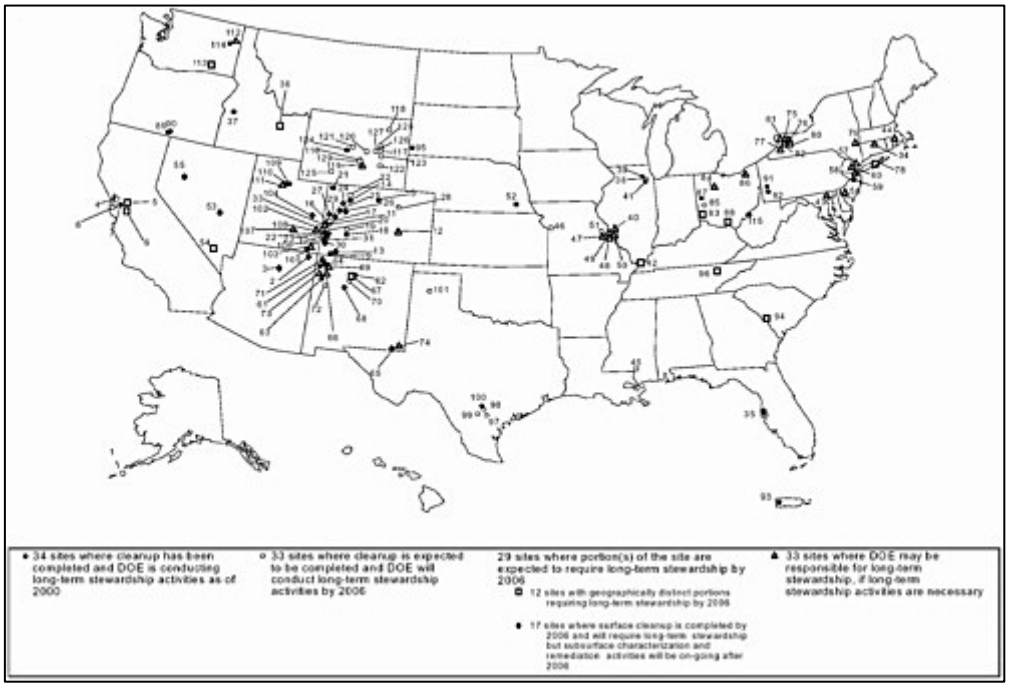
The basis of rolling stewardship is ***Long-Term Stewardship (LTS)***, a theoretical as well as a practical term, necessitated by the more than 140 sites in the United States heavily contaminated by radioactive substances (*see Figure 1*). The sites are part of the legacy of nuclear-weapons production during the Manhattan Project and the Cold War. The contamination at many of these sites continues to be dangerous to the public health and the environment and require management into an indefinite future. Thus, the U.S. Department of Energy (DOE) has dubbed its activities beyond closure of contaminated sites "long-term stewardship" (*for definitions of stewardship and LTS, see Text box 1*). LTS is preceded by *Long-term institutional management (LTIM)*, a concept developed by the National Research Council Committee. LTIM is an approach to planning and decision-making that balances the use of measures available to site managers in protecting public and worker health and safety, and the environment, i.e. contaminant reduction and contaminant isolation. LTIM also includes LTS[3].

[1] A section on rolling stewardship has been included in: Dewoghelaere J., Fontaine G., Hooge N. H., Mraz G., Wales C. (2024): Synthesis report of WP UMAN outcomes from a civil society point of view. Final version of deliverable D10.17 of the HORIZON 2020 project EURAD. EC Grant agreement no: 847593: EURAD-D10.17-Synthesis-report-of-WP-UMAN-outcomes-from-a-civil-society-point-of-view.pdf Furthermore, parts of this paper has been included in: Zeleznik N., Swahn J., Daniška M., Haverkamp J., Hooge N.H., de Butler M, Wales C., (2024): Implementation of ROUTES action plan third phase. Final version as of 27.05.2024 of deliverable D9.18 of the HORIZON 2020 project EURAD. EC Grant agreement no: 847593. p. 72-78: EURAD - D9.18 Implementation of ROUTES action plan third phase.pdf

[2] National Environmental Policy Institute (NEPI): Rolling Stewardship: Beyond Institutional Controls, Preparing Future Generations for Long-Term Environmental Cleanups, December 1999, p. 10: http://nonuclear.se/files/rolling-stewardship-nepi199912.pdf

[3] National Research Council, Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites. 2000. Washington, D.C.: National Academy Press.

FIGURE 1. Map of sites anticipated to require LTS by DOE[4]



It is worth noting that completion of remediation does not put an end to LTS: remediation is considered complete when deactivation or decommissioning of all the facilities in question have been carried out, but long-term surveillance and monitoring are excluded; when releases to the environment have been cleaned up in accordance with agreed-upon standards; ground water contamination has been contained, or long-term treatment or monitoring is in place; nuclear materials and spent fuel have been stabilized and/or placed in safe long-term storage; and "legacy" wastes, i.e. types of waste that have been produced by past nuclear weapons production activities, with the exception of high-level waste, have been disposed of in an approved manner[5].

TEXT BOX 1. Definitions of stewardship and Long-Term Stewardship (LTS)

***Definition stewardship*:** (gestion, Verwaltung) "Stewardship" is derived from "steward" who, acting in various functions, can carry out several tasks simultaneously. According to the U.S. National Research Council[6], a steward of very long-lived hazards can act as a *guardian*, stopping

[4] A Report to Congress on Long-Term Stewardship, Volume I—Summary Report. Office of Environmental Management, Office of Long-Term Stewardship. DOE/EM-0563. January 2001. Washington, D.C.: U.S. Department of Energy.
[5] U.S. Department of Energy, Long-term Stewardship Planning Guidance for Closure Sites. Office of Environmental Management. August 2002.
[6] "Contents of Report." National Research Council. 2003. Long-Term Stewardship of DOE Legacy Waste Sites: A Status Report. Washington, DC: The National Academies Press. doi: 10.17226/10703: Contents of Report | Long-Term Stewardship of DOE Legacy Waste Sites: A Status Report | The National Academies Press (nap.edu)

activities that could be dangerous; as a *watchman* for problems as they arise, via monitoring that is effective in design and practice, activating responses and notifying responsible parties when needed; as a *land manager*; facilitating ecological processes and human use; as a *repairer* of engineered and ecological structures when failures occur and are discovered, as unexpected problems are found, and as re-remediation is needed; as an *archivist* of knowledge and data, to inform the future; as an *educator* to affected communities, renewing memory of the site's history, hazards, and burdens; and as a *trustee*, assuring the financial wherewithal to accomplish all of the other functions. Furthermore, stewardship is considered a *dynamic concept*: technological capabilities are likely to change and the study of monitoring data and the accumulating experience of stewards is likely to improve both understanding of the sites and of how to manage them effectively. Both sets of changes will likely prompt reappraisal of risks and consideration of additional remediation. This range of activities requires the human and institutional capacity to fulfil these roles as needed, through the decades and centuries in which the risks persist.

Definition LTS: The physical and institutional controls, and other mechanisms needed to ensure protection of people and the environment at sites where plans have been developed to complete clean-up after site closure (e.g., landfill closures, remedial actions, removal actions, and facility stabilisation). This includes land-use controls, monitoring, maintenance, and information management[7]. LTS applies to sites and properties where long-term management of contaminated environmental media is necessary to protect human health and the environment over time.

The concept of ***rolling stewardship*** in its current form is to a wide degree attributed to Gordon Edwards, who is the president of the Canadian Coalition for Nuclear Responsibility (CCNR)[8]. *Broadly speaking, it signifies an intergenerational management concept requiring monitoring and maintenance of the RW for an indefinite period of time, with responsibility being passed on from one generation to the next, preserving the possibility of retrieval, recharacterization and repackaging of the waste. It also requires a mechanism for reinstructing the next generation, which provides detailed information on the nature of the wastes and the associated hazards, and ensures that the next generation is fully aware of the need to spend time and money on the RW and if necessary, to see that corrective action is taken in a timely fashion. This process could last until a final safe solution is found which would no longer require constant care and memory.*

More specifically, rolling stewardship provides a framework for a chain of management decisions that can be changed over time, empowering each generation with greater information on stewardship tools and practices. Instead of focusing on an infinite, unpredictable future, it touches

[7] Homepage, U.S. Department of Energy: Long-Term Stewardship (LTS) — DOE Directives, Guidance, and Delegations

[8] Gordon Edwards: Comments on Consideration of Environmental Impacts on Temporary Storage of Spent Fuel After Cessation of Reactor Operation, submitted by the Canadian Coalition for Nuclear Responsibility to the US Nuclear Regulatory Commission, Docket ID No. NRC-2012-0246, 2013: http://www.ccnr.org/CCNR_NRC_2013.pdf See also: CCNR: Nuclear Waste: Abandonment versus Rolling Stewardship (undated): http://www.ccnr.org/Rolling_Stewardship.pdf

on practical problems that can be solved in the short term with some guarantee of success. Moreover, it includes institutional control mechanisms that are meant to address among others legal, technical, financial, administrative, and R&D issues. Among these are:

Development of overriding principles to guide stewardship activities: common principles might be useful, without insisting that they be implemented the same way in every context. As previously mentioned, the precautionary principle (as well as other environmental principles) would be relevant here, after being subject to further definition and interpretation in the light of the situation, to which it is applied, particularly in regard to the time horizon of the issue in question.

Determining guidelines for rolling stewardship activities: e.g. these could be a comprehensive and credible characterisation of the RW, definition and delineation of administrative responsibilities (also in the long term) and proper means of funding, transparency, public participation, access to resources, and monitoring. Such guidelines can result in larger public acceptance of long-term strategies, although there is political pressure to choose short term solutions.

Dissemination of information: relevant here is, who will be in charge of information on stewardship in a given context and ensure its integrity and passage to future generations?

Promotion of adaption capacity: the notion of adaptability -- that RWM decisions and perceptions of risk should be revisited and improved based on new science or technologies becoming available – could be in conflict with any type of GD. Thus, it is necessary to develop new tools of adaption, including suitable institutional mechanisms. Investments in new technologies and better science would be needed.

Funding: how should the different aspects of rolling stewardship activities be funded and who should hold and distribute the funds? How can the public be confident that it will not be squandered? Furthermore, the funding must not only support stewardship, but also rolling stewardship. There is a difference between addressing problems arising here and now and taking on issues with a very long timeframe. The financing should mainly be based on current spending, through commitments to future spending or through trust funds.

STRONG AND WEAK VERSIONS OF ROLLING STEWARDSHIP: One could ask where LTS ends and rolling stewardship begins and even if LTS constitutes a weak version of rolling stewardship, which would then be a question of terminology, but first and foremost delineation of the two concepts. Apart from the obvious fact that LTS focuses on radioactive contamination and rolling stewardship mainly pertains to geological disposal (GD) of RW, there appears to be more similarities than differences between the two (*see Figure 2*). Regarding the *time horizon*, weak versions of LTS and rolling stewardship could span a few human generations, whereas strong versions could be bordering on the interminable. Concerning the *scope* of rolling stewardship, a weak version would zero in on final disposal of RW, whereas a strong version could encompass final disposal of all highly toxic, long-lived waste, thus transcending the sphere of RWM.

FIGURE 2. Weak and strong versions of rolling stewardship

Parameters	Weak version →	Strong version
Time horizon	Few human generations	Interminable
Scope	Final disposal of RW	Final disposal of all highly toxic, long-lived waste
Start-up	After closure of DGR	Before and after closure of DGR / DGR is not closed (or no DGR)
Character	Reactive (mitigation)	Preventative
Continuity	Broken	Unbroken
Framework	Stop and go policies	Well-established institutional mechanisms for RWM
Normativity (Statutory)	Voluntary (Allowed by law)	Mandatory (Required by law)
Safety	Not part of safeguards	Part of safeguards
Stakeholder involvement	No or little stakeholder involvement	Comprehensive stakeholder involvement
T&PP	DAD	Well-established institutional mechanisms for T&PP
Funding	Funded by subsequent human generations	Funded by the RW-and waste-producing human generation(s)
Terminology	Semantically not different from LTS	Semantically different / very different from LTS

A weak version regarding the *start-up* of rolling stewardship could begin after closure of a Deep Geological Repository (DGR), while preserving the possibility of retrieval, recharacterization and repackaging of the waste. A strong version could begin before and after closure of the DGR, in the latter case ensuring that the DGR is not sealed off. The difference between the strong and the weak version would then be that the strong version ensures easier access to retrieval of the RW. A strong version of rolling stewardship could proceed even without a DGR as an interminable version of an intermediary RW storage facility. If rolling stewardship begins before the post-closure phase of the DGR, it could encompass all phases of RWM, i.e. policy, framework and program establishment, site evaluation and site selection, site characterization, facility construction and facility operation and closure. In a weak version, rolling stewardship could be reactive, i.e. focus on mitigation of already existing radioactive contamination, and not in its *character* be any different from LTS, or it could be preventative in regard to disposal of RW in order to see that leakage of radioactive substances into the environment is not going to happen. Its *continuity* could be broken due to deficiencies in a weak version of its institutional *framework*, which could result in stop and go policies for the RWM, or it could be unbroken if suitable institutional mechanisms are in place. This would also be dependent on *normativity* manifesting itself as proper legislation that in a strong

version would make these mechanisms mandatory and in a weak version voluntary. Regarding its role in *safety*, it could be part of a system of safeguards or not. In a strong version of rolling stewardship, a wide range of *stakeholders* would be *involved* in the RWM decision-making process, including operators, regulators, Waste Management Organisations (WMOs), Technical Support Organisations (TSOs), Research Entities (REs) and not least CS. In a weak version there would be no or little stakeholder involvement. In a weak version, *Transparency and Public Participation (T&PP)* would be based on the authorities Deciding, Announcing and Defending (DAD) decisions in the RWM – a top-down attitude, which loosely can be translated into: "We know best, decide things for ourselves, inform about them no more than we have to, and defend our decisions with all available means". In a strong version, there would be well-established institutional mechanisms in place to ensure T&PP. Also, in a strong version, proper *funding* for final disposal would be accumulated at the same time RW from the Nuclear Power Plants (NPPs) is generated, whereas in a weak version, funding would be provided by subsequent human generations. Finally, in regard to *terminology*, rolling stewardship would not be semantically much different from LTS in a weak version, whereas it could be very different in a strong version.

B. Rolling stewardship in current national, European and international law

There is very little implementation of any strong version of rolling stewardship in current national, European and international law. However, in regard to rolling stewardship perceived as a succession of stewards tending to needs from one generation after another, DOE's Site Transition Framework has been seen as a step in this direction, because it identifies documents that should be passed to new site owners or stewards[9].

Lack of implementation is not the case with LTS, especially in regard to U.S. national law and in parts of European law. *In the U.S.*, on a site-specific basis, where residual hazards remain after nuclear cleanup activities, management of any associated LTS is conducted in accordance with DOE Orders and guidance, Federal, State and local environmental and resource protection laws, and site-specific agreements between DOE and U.S. State and Federal environmental regulators[10]. Regarding the cleanup activities, the main laws are the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). Long term mitigation efforts are coordinated by DOE and might involve other Federal

[9] However, the Framework only ensures that a document is passed, not that it contains what it is supposed to, or that the relevant underlying information is available and accessible. DOE relies on external regulatory mechanisms - i.e. oversight by state and federal regulators - to make sure that needed data are provided. See: Preface to the Site Transition Framework for Long-Term Stewardship. Office of Environmental Management, Office of Long-Term Stewardship. Draft, Revision 1. July 1, 2002.

[10] DOE, Site Transition Summary: Cleanup Completion to Long-Term Stewardship at Department of Energy Ongoing Mission Sites, February 2012: Site Transition Summary: Cleanup Completion to Long-Term Stewardship at Department of Energy On-going Mission Sites

Agencies as stakeholders such as the Defense Nuclear Facilities Safety Board, the Department of Agriculture, the Natural Resources Conservation Service, the Department of Commerce, the National Oceanic and Atmospheric Administration, the Nuclear Regulatory Commission, the Department of Interior (i.e. the Bureau of Land Management, National Park Service, and Fish and Wildlife Service and U.S. Geological Survey) the Department of Transportation and the Environmental Protection Agency, Local Region[11].

In *European law*, the need for LTS is not addressed because of the legacy of nuclear-weapons production, but is necessitated by the many Uranium Mine and Mill Tailings (UMMT) sites located in 12 of the EU Member States (MS)[12]. Here, residues of the past six decades of mine and mill processing of uranium ore in Europe have resulted in a considerable environmental legacy[13]. The uncertainty of what will happen if institutional control with these sites breaks down sometime in the future, is a significant concern. Subsequent EU Commission reports have concluded that there is a need for an effective set of measures for coordinated institutional control of UMMT, which only LTS can provide[14].

Particularly interesting is a Commission Staff Working Paper from 2011 that recommends long-term measures and institutional mechanisms, which can be perceived as a version of rolling stewardship[15]. The working paper calls for establishment of LTS programmes at national level as a useful solution to ensure a more effective implementation of the European Community (EC) framework for managing uranium mining and milling residues. The programmes should integrate all the measures under existing EC and national legislation and take on board all closely interrelated managerial, societal, economic and technical aspects during the RWM decision-making process. Furthermore, effective stewardship should take into account continuing changes to social, technical and economic conditions and processes, such as changing stakeholders, perceptions of risk, science and technology, societal structures, governmental systems, economic circumstances and priorities. The paper also views knowledge preservation as an essential prerequisite for a successful stewardship programme.

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[11] Idaho National Engineering and Environmental Laboratory, Environmental Management Long-Term Stewardship Transition Guidance, Prepared for the U.S. Department of Energy Office of Environmental Management Under DOE Idaho Operations Office, November 2001: 2001EXT1477.pdf (unt.edu)

[12] The MS are: Bulgaria, Czech Republic, Estonia, France, Germany, Hungary, Poland, Portugal, Romania, Slovenia, Spain and Sweden.

[13] Maria de Lurdes Dinis and António Fiúza, The Long-Term Stewardship of Uranium Mine and Milling Remediated Sites in Europe, Department of Mining Engineering, Centre for Natural Resources and the Environment and Faculty of Engineering, University of Porto, Presentation, 2015: EUROPEAN MINE WASTE STANDARDS (energy.gov)

[14] Two Commission reports appear to be particularly relevant: W. Eberhard Falck, The Long-Term Safety of Uranium Mine and Mill Tailings Legacies in an Enlarged EU, JRC Scientific and Technical Reports, 2008: The long-term safety of uranium mine and mill tailing legacies in an enlarged EU - Publications Office of the EU (europa.eu) Among others, the report recommends a shift of interest from a mere managing legacies from the past to preventing the creation of future liabilities. Regarding the latter report, see the next note.

[15] Commission Staff Working Paper, Situation concerning uranium mine and mill tailings in the European Union, Brussels, 11.03.2011: st07721.en11.doc (europa.eu)

Finally, it points out that its analysis "is expected to facilitate the discussion on the long-term regulatory and management approaches to uranium mining and milling waste in the context of the overall policy on radioactive waste management as an integral part of sustainable development of the nuclear fuel cycle. It will form a basis for the European High Level Group on Nuclear Safety and Waste Management (ENSREG)[16] to develop a common understanding and, if appropriate, suggest a common approach to establishing long-term stewardship programmes".

EU legislation seems to cover most aspects of mining-related long-term RWM that fall within the scope of Directive 2006/21/EC on the management of waste from extractive industries[17]. It also covers some of the issues connected with uranium mining and milling. In primary law, Chapter III of the EURATOM Treaty and secondary legislation originating from EURATOM touch on the radiological aspects of the management of waste from extractive industries, including current and past uranium mining and milling activities[18]. The Chapter authorises Basic Safety Standards (BSS) which requires licensing of disposal, recycling and reuse of residues, such as from uranium mining, unless they comply with clearance levels established by national authorities on the basis of basic criteria laid down in the BSS and technical guidance published by the Commission. For existing UMMT disposal sites in Europe, BSS also lay down specific rules on intervention in case of lasting exposure resulting from past practice, including, if necessary, demarcating concerned area, monitoring arrangements and restricting access or use of land or buildings situated in demarcated area. Additional Commission recommendations cover protection of the population against the dangers arising from radon in dwellings and in drinking water[19].

C. The role of civil society in rolling stewardship

The role of Civil Society (CS) in RWM has long been recognised in international, European and national law. Among the stakeholders, whose involvement is relevant to a strong version of rolling stewardship, CS is among the most important. A prerequisite for Interaction with Civil Society (ICS) is to establish enduring governance models for ICS, e.g. by providing resources to NGOs on the international, national and local level; to improve technical and legal capacities of NGO

[16] Commission decision of 17 July 2007 on establishing the European High Level Group on Nuclear Safety and Waste Management: LexUriServ.do (europa.eu)
[17] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC: EUR-Lex - 32006L0021 - EN - EUR-Lex (europa.eu)
[18] Articles 35-38 in the EURATOM Treaty's Chapter III refer to levels of radioactivity in the air, water and soil and are important regarding surveillance and the radiological impact of current and past uranium mining and milling activities. Every MS is obligated to establish the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil and to ensure compliance with the basic standards. Obligations for continuous environmental monitoring and reporting of the level of radioactivity in the air, water and soil are set and the Commission is empowered to verify the operation and efficiency of monitoring facilities. Furthermore, Commission issues opinions on plans to release radioactive effluents, including those from uranium mining and milling operations. See the Consolidated version of the Treaty establishing the European Atomic Energy Community: EUR-Lex - 12012A/TXT - EN - EUR-Lex (europa.eu)
[19] Commission Staff Working Paper, Situation concerning uranium mine and mill tailings in the European Union, Brussels, 11.03.2011: st07721.en11.doc (europa.eu)

representatives participating in research projects; to promote the inclusion of CS and NGOs as part of the RWM process; to involve CS and NGOs as respected partners in international and European networks; and last but not least to enable the development of a legal framework for effective public participation in RWM that takes into due account the input of NGOs.

A European legal framework already exists that is relevant to rolling stewardship. Particularly relevant in this regard is the Aarhus Convention and the Radioactive Waste Directive's (2011/70/Euratom) Article 10 on transparency. A description of best practices for ICS and T&PP can be found in Nuclear Transparency Watch's (NTW) BEPPER report[20] (BEPPER stands for *Broad framework for Effective Public Participation in Environmental decision-making in Radioactive waste management*), which was published in December 2015. The report contains elements on the definition of transparency in the Radioactive Waste Directive, which take the form of broadly formulated requirements for T&PP during RWM decision-making, and sets four pillars for effective transparency which are mainly based on the Aarhus Convention: (i) effective access to information and communication, (ii) effective access to public participation and consultation, (iii) effective access to justice and decision-making, and (iv) effective access to resources. It also establishes a level system for evaluation of effective transparency in RWM with regards to these pillars. Among the conditions, named by the report, for what constitutes effective T&PP are:

- Building societal confidence, adopting a multi-generational perspective, considering public perceptions of safety and risk, taking into account energy policy), good practices (e.g., enhancing dialogue in pluralistic spaces, demystifying and democratising, adopting new decision-making processes, setting horizontal as well as vertical information exchanges, implementing and facilitating access to justice), plus components on innovation in resources and transparency assessment (e.g., make sure that civil society has the resources to participate; create the conditions for civil society access to expertise; engage experienced and widely trusted facilitators; develop libraries, compendia, websites of good practices, etc; elaborate standards for transparency assessment).
- Application of all international regimes and strengthening them continuously at the national level in order to improve the quality of the decision-making processes, leading to higher safety and possibilities for higher trust by the CS[21].

[20] The BEPPER report, December 2015: NTW Transparency in RWM - BEPPER report - December 2015 (nuclear-transparency-watch.eu)
[21] Nadja Zeleznik, Johan Swahn, Jan Haverkamp, Niels Henrik Hooge, Honorine Rey, Michal Daniska, Draft Deliverable 9.16: Implementation of ROUTES action plan first phase, EURAD Work Package 9, 2021.

D. Pros and cons of rolling stewardship

Several arguments for and against rolling stewardship are possible. Some of them relate specifically to the practical viability of the concept itself and some of them are generic and based on general principles, focusing on issues typical of long-term, intergenerational management.

ARGUMENTS SUPPORTING ROLLING STEWARDSHIP: Considering that rolling stewardship is a prominent and possibly the best example of application of the *precautionary principle*[22] in RWM, the main argument in support of rolling stewardship would presume a strong emphasis on safety under all conditions as the primary goal of RWM and final disposal of RW, which should not be diminished, offset or compromised. As an intergenerational management concept dealing with uncertainty, rolling stewardship sets out to define an "intergenerational common good"[23] in order to address the uncertainties triggered by the extremely long time-horizons of the issues that it deals with. It does so by introducing a sequential process and abandons all immediate deadlines in the RWM decision-making by requiring monitoring and maintenance of the RW for an indefinite period of time, with responsibility being passed on from one generation to the next, including episodes of retrieval, recharacterization and repackaging of the waste. It also provides a proper knowledge basis for maintaining these precautions by requiring a mechanism for reinstructing next generations, providing detailed information on the nature of the wastes and the associated hazards, and ensuring that the next generation is aware of the need to spend time and money on RW and to see that corrective action is taken on a timely basis if needed.

Furthermore, rolling stewardship is a strong manifestation of both the *responsibility principle*[24] and *intergenerational justice*[25]. Considering that RWM reaches far into the future because of the slow decay of the RW, one has to assume that the decision-makers have to take more responsibility for

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[22] In addition to be one of the basic pillars of European environmental law, the precautionary principle is mentioned as Principle 15 of the Rio Declaration: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" .In other words, if there is strong suspicion that an activity may have environmentally harmful consequences, it is better to act before it is too late than wait until full scientific evidence is available that unequivocally demonstrates a causal connection between the activity in question and its possible impacts. Systematically, the precautionary principle is a sub-category of the *prevention principle*, which says that is easier to respond to environmentally harmful activities before rather than after they occur, by preventing them.

[23] Gilles Hériard-Dubreil, Comment mener une politique de très lomg terme ? Le cas des déchets nucléaires, Esprit No. 269, Novembre 2000, pp. 81-97: Comment mener une politique de très long terme? Le cas des déchets nucléaires | Revue Esprit (presse.fr)

[24] The *responsibility principle* can be defined as an ethical principle, in which a sense of responsibility plays a central role. To be responsible presupposes that one possesses the causal capability to carry out an act. First and foremost, the sense of responsibility is based on a will to act unselfishly in regard to a valuable object and this responsibility is prima facie not reciprocal. To take responsibility implies moral accountability. For a moral agent, this responsibility becomes acute, when such an account is included in the possible consequences of a course of action. Arguably, the responsibility principle is particularly important in technology ethics, because of the way that technology application impacts the world. See: Hans Jonas, Das Prinzip Verantwortung, Versuch einer Ethik für die technologische Zivilisation, Frankfurt am Main: Suhrkamp, 1979/2003.

[25] In intergenerational justice, at least four questions are relevant: Do current generations have obligations towards future generations, and if so, what are the arguments for these obligations, how far do they reach, and what is their content?

the welfare and safety of future generations than is normal in regard to large-scale infrastructure projects, which is the case for rolling stewardship. For intergenerational governance to be just, legal and moral standing has to be given to future generations in long-term RWM within a framework that relates both to the process for and the content of the decision-making. This presupposes a concept of legitimacy that is not only technical, but also possesses an ethical and political dimension[26]. The most convincing ethical grounds for a future oriented responsibility is *intergenerational egalitarianism*, which is not an absolute, but relative standard. It says that future generations should not be put in a worse position than current generations, which is also the basis of the definition of sustainability. This presupposes a universal equality principle, which makes it possible to justify equal rights for all currently living persons: If such a principle applies to current generations, it also applies to future generations, because the qualifying properties in such an extension do not have to be changed. This argument is supported by risk ethical reflections on symmetry and distance in time and space, because it is generally accepted that moral agents who affect people located far away in space, have a responsibility for these people, which is recognised in all types of universal ethics. This also means that currently existing persons have obligations towards future existing persons, irrespective how far in the future they might exist. The fact that people distant in space can be identified, but not people distant in time, is irrelevant.

ARGUMENTS AGAINST ROLLING STEWARDSHIP: The predominant argument against rolling stewardship is its perceived lack of practicality, because it is doubtful whether it can be sustained for tens or hundreds of thousands of years. Due to its high economic costs, it could also be argued that it puts undue burdens on future generations, violating the *polluter pays principle*[27], which says that the party responsible for the pollution must pay for the damage done to the natural environment. This is not the case with rolling stewardship, where the responsibility for and management of the RW are passed on from the generations who have produced the waste to potentially countless future generations.

Rolling stewardship also raises some fundamental questions regarding *the responsibility of current generations towards future generations.* The argumentation is part of a long-standing discussion on whether obligations to future generations exist and if so, how far they go, whether a comparative, egalitarian or absolute standard should be applied, how risks and uncertainties should be dealt with, whether we are allowed to discount future events and conditions, and what types and quantities of goods a fair intergenerational bequest package must contain[28]. Using the terminology of *sustainable development*, the choice is between preserving natural capital or over time substitute what is lost of

[26] Gilles Hériard-Dubreil, Comment mener une politique de très lomg terme ? Le cas des déchets nucléaires, Esprit No. 269, Novembre 2000, pp. 81-97: Comment mener une politique de très long terme? Le cas des déchets nucléaires | Revue Esprit (presse.fr)
[27] The polluter pays principle, which is mentioned in Principle 16 of the Rio Declaration on Environment and Development and in Article 191(2) of the Treaty on the Functioning of the European Union and is widespread in secondary legislation, is considered one of the cornerstones of European, as well as international environmental law.
[28] Konrad Ott, Folien zu den Vorlesungen Umweltethik I und II, Greifswald, 2007.

the natural capital with artificial capital[29]. Natural capital consists of natural resources, e.g. freshwater, soil, forests, ecosystem functions and services, biological and genetic diversity and natural units of cultural importance. Artificial capital is mainly means of production. Choosing natural capital over artificial capital, is considered a strong version of sustainable development, choosing artificial capital over natural capital a weak version. In regard to RWM and final disposal of RW, rolling stewardship represents a strong version of sustainability, whereas it could be argued that the decision-makers in conventional RWM and conventional final disposal might be willing to run a calculated risk, although as small as possible, of potential leakage of radioactive substances into the environment. In a weak version of sustainability, this would be justified by the nuclear electricity generation that has produced the RW. Other arguments for weak sustainability, which could be used to oppose rolling stewardship, are:

- *The pure time preference argument*: The argument implies a depreciation of all future utility and loss. It is based on the assumption that future benefits and disadvantages are less worth today and that current generations are put in an unfavourable position if they are valued at future prices. Thus, all investments potentially beneficial to future generations should be discounted.
- *The preference for contemporary time argument*: This signifies depreciation of future preferences under the assumption that people in the future – just like now – will have different interests subject to different cultural conditions. Hence, the interests and needs of future people are not known today and special consideration for future generations is meaningless.
- *The moral distance argument*: Harm suffered by people who are not connected to us are less significant to us than harm suffered by people who are. In addition, better technologies in the future will make it easier to compensate for harm inflicted by current generations. Future generations will also be able to benefit from already existing technologies, i.e. the benefits will offset the disadvantages.
- *Other no-obligation arguments*: Inevitable obstruction of sustainable action due to the high number of future generations ('time-span-argument'), the argument of the potentially 'evil' middle generation, and arguing where no rights exist there are also no duties ('no-claim-argument')[30].

DISCUSSION OF THE ARGUMENTS FOR AND AGAINST ROLLING STEWARDSHIP: The objections to rolling stewardship as an implementation of a sustainability strategy can be refuted with reference to the principle of responsibility in combination with recourse to the precautionary principle. However, the responsibility principle can be interpreted both for and against rolling stewardship in the perspective of intergenerational justice, because rolling

[29] Niels Henrik Hooge, Klimaetik: Etiske perspektiver i den globale klimapolitik, København, Den Økologiske Arbejdsgruppe, 2009: (PDF) Klimaetik: Etiske perspektiver i den globale klimapolitik (researchgate.net)
[30] Konrad Ott, 'The Case for Strong Sustainability', in: Konrad Ott, Philipp Pratap Thapa (eds.), Greifswald's Environmental Ethics, Greifswald, 2003, and Konrad Ott, Ralf Döring, Theorie und Praxis starker Nachhaltigkeit, Marburg: Metropolis-Verlag, 2008.

stewardship shares the responsibility for the RW by giving moral and legal standing to future generations. More weight has the argument of undue burdens that it supposedly puts on them. Whether its high economic costs are proportional to the safety level that it achieves, will depend on the dependability the passive defence mechanisms of a DGR and also on the potential economic and environmental costs, if they fail. Under all circumstances, rolling stewardship is not compatible with the polluter pays principle. In conclusion, it could be said that any position on the viability of rolling will depend on a preference for weak or strong sustainability.

E. Transversal relevance to EURAD-2

The question is, what is the relevance of rolling stewardship to the European Joint Programme on Radioactive Waste Management (EURAD-2)? The main objective of EURAD-2 is to develop a common understanding among the different categories of actors (WMOs, TSOs, REs and CS) and how it relates to risk and safety in the management of RW. In cases where a common understanding is beyond reach, the objective is to achieve mutual understanding on why views on uncertainties and their management are different for different actors. Another objective is the sharing of knowledge and discussing common methodological and strategical challenging issues on uncertainty management.

During EURAD-1 workshops, rolling stewardship was identified by the CS larger group as a subject of interest, which means – one could argue - that it is already an integrated part of the agenda or on its way to be. The main questions that have been put forward to the CS larger group are: what levels of uncertainty could be acceptable from CS perspectives and which could not? How should they be managed? And more specifically: when comparing current on-going RWM to GD, what would be the most important differences regarding the types of uncertainty and risks entailed by each of these options? Should the precautionary principle be fully integrated into European RWM decision-making, including regulations at all levels, and be one of the dominant if not the dominant management principle? And last, but not least: how could rolling stewardship involving CS be operationalised[31]?

According to the CS larger group, when comparing current on-going RWM to GD, the most striking difference is perceived to be that the former due to the time-scale is a well-known entity, which has existed for more than half a century, whereas the latter is still an unproven technology that has not yet stood the test of time. There is also a consensus that there has to be a structure in place for both options – economically, socially and in regard to knowledge - that hands over management of uncertainties and risks from generation to generation. What the next generations want to do is up to them. Equally, in regard to the precautionary principle, there exists a consensus

[31] Julien Dewoghélaëre, Gilles Hériard-Dubreuil, Niels Henrik Hooge, Gabriele Mraz and Honorine Rey, Preliminary elements for D10.17: Uncertainties in Radioactive Waste Management – Views of the Civil Society's Group, Work Package 10, UMAN/EURAD, November 2020.

that regulation of NWM has not much credibility if the precautionary principle is not integrated at all levels of RWM decision-making.

Arguments have been presented by the CS larger group for and against implementation of the rolling stewardship model: most of the arguments against rolling stewardship has been mentioned in the previous section of these draft notes. However, it was also argued that the notion of rolling stewardship as the least irreversible RWM solution represents the most appropriate manifestation of the precautionary principle, because it addresses the problem of collapse of memory and reversibility and retrievability better than any other option. Similar points of views have emerged not only during workshops, but in most sections of the UMAN CS questionnaire as described in D10.17 (see note 32)[32].

In conclusion, there is little doubt that rolling stewardship addresses one of the core uncertainties in EURAD-2, namely the extremely long time-perspective of RWM and final disposal of RW, which is likely to make most risk estimates very complex and difficult. Thus, EURAD could be an appropriate forum, in which the viability of rolling stewardship in its capacity as a long-term intergenerational RWM concept could be further explored and evaluated in the perspective of the parameters that have been established within EURAD.

[32] E.g. the sections in Chapter 3 on uncertainties on transparency and communication, on the future of nuclear policies, on governance, on trust, on retrievability and reversibility, on human resources, on inventory, on security, safety and risk assessment, on technology selection, on quality assurance now and in the future, on trans-generational aspects, and on the human factor. The uncertainties identified by the CS group members in the questionnaire relates to all phases of RWM, including policy, framework and program establishment, site evaluation and site selection, site characterisation, facility construction, facility operation and closure and post closure.

Glossary

BSS: Basic Safety Standards
CCNR: Canadian Coalition for Nuclear Responsibility
CERCLA: U.S. Comprehensive Environmental Response, Compensation, and Liability Act
CS: Civil Society
DAD: Decide, Announce, Defend
DGR: Deep Geological Repository
DOE: U.S. Department of Energy
EC: European Community
ENSREG: European High Level Group on Nuclear Safety and Waste Management
EU: European Union
EURAD: European Joint Programme on Radioactive Waste Management
GD: Geological Disposal
IAEA: International Atomic Energy Agency
ICS: Interaction with Civil Society
LTIM: Long-term institutional management
LTS: Long-Term Stewardship
MS: Member State or Member States
NGO: Non-Governmental Organization
NPP: Nuclear Power Plant
RCRA: U.S. Resource Conservation and Recovery Act
RE: Research Entity
RW: Radioactive Waste or Radioactive Wastes
RWM: Radioactive Waste Management
T&PP: Transparency and Public Participation
TSO: Technical Support Organisation
UMAN: Uncertainty Management Actor Network
UMMT: Uranium Mine and Mill Tailings
WMO: Waste Management Organisation