

Stepwise decision making for the long-term management of radioactive waste

The context of long-term radioactive waste management is being shaped by changes in modern society. Values such as health, environmental protection and safety are increasingly important, as are trends towards improved forms of participatory democracy that demand new forms of risk governance in dealing with hazardous activities. These changes in turn necessitate new forms of dialogue and decision-making processes that include a large number of stakeholders. The new dynamic of dialogue and decision-making process has been characterised as a shift from a more traditional “decide, announce and defend” model, focused on technical assurance, to one of “engage, interact and co-operate”, for which both technical assurance and quality of the process are of comparable importance to a constructive outcome. Consequently, the scientific and engineering aspects of waste management safety are no longer of

exclusive importance. Organisational ability to communicate and to adapt to the new context has emerged as a critical contributor to public confidence.

In the new decision-making context it is clear that (a) any significant decisions regarding the long-term management of radioactive waste will be accompanied by a comprehensive public review with involvement of a diverse range of stakeholders; (b) the public, and especially the local public, are not willing to commit irreversibly to technical choices on which they have insufficient familiarity and understanding; and (c) any management options will take decades to be developed and implemented, which will involve stakeholders who have not yet been born. Thus, a “decision” no longer means opting for, in one go and for all time, a complete package solution. Instead, a decision is one step in an overall, cautious process of examining and making choices that preserve the safety and well-being of the present generation and the coming ones while not needlessly depriving the latter of their right of choice. Consideration is thus increasingly being given to the better understanding of concepts such as “stepwise decision making” and “adaptive staging” in which the public, and especially the most affected local public, are meaningfully involved in the planning process.

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Features of a stepwise decision-making approach

The key feature of a stepwise decision-making concept is a plan in which development is by steps or stages that are reversible, within the limits of practicability. In addition to the institutional actors, the public is involved at each step and also in reviewing the consequences of previous decisions. This is designed to provide reassurance that decisions may be reversed if experience shows them to have adverse or unwanted effects. Discrete, easily overviewed steps facilitate the traceability of waste management decisions, allow feedback from regulators and the public, and promote the strengthening of public and political confidence. They also allow time to build trust in the competence of the regulators as well as the implementers of a waste management project. A stepwise approach to decision making has long been implemented in national waste management programmes, e.g. since the early eighties in the USA and in the Scandinavian countries. However, despite the early implementation of the stepwise approach to decision making, the subject has not been widely developed and debated. In particular, accepted guiding principles have not yet been formulated, the roots of any such process in empirical social science research have not been fully reviewed, nor the difficulties of its implementation analysed. A satisfactory analysis might not have been possible until recently, however, before more experience was accumulated. The NEA Forum on Stakeholder Confidence has examined the above points in a report¹ soon to be released, whose key messages are summarised hereafter.

⇒ *Decisions are already being made in a stepwise and participatory fashion and there is thrust to increase public participation in decision making.*

Decisions are already being taken – and progress towards radioactive waste management solutions is already being made – in a stepwise fashion. Governments and the relevant institutions are incorporating provisions that favour flexibility in decision making, such as reversibility of decisions and retrievability of waste. In addition, governments and the relevant institutions are increasingly implementing instruments of participatory democracy that will require new or enhanced forms of dialogue amongst all concerned parties. For example, partnerships are created with local

communities or communities are given means to interact significantly with the decision-making process. These arrangements promote the building of trust in decision makers and implementers.

⇒ *Stepwise decision making requires the reversibility of decisions.*

Reversibility denotes the possibility of reversing one or a series of steps at any stage of a programme. Such a reversal, of course, must be the result of careful evaluation with the appropriate stakeholders. This implies a need for review of earlier decisions, as well as for the necessary means (technical, financial, etc.) to reverse a step. Reversibility also denotes the fact that fallback positions are incorporated both in the long-term waste management policy and in the actual technical programme. In the early stages of a programme for waste disposal, for instance, reversal of a decision regarding site selection or the adoption of a particular design option may be considered. At later stages during construction and operation, or following emplacement of the waste, reversal may involve the modification of one or more components of the facility or even the retrieval of waste packages from parts of the facility. Thus, reversibility in the implementation phase requires the application of a retrievable waste management technology.

Not all steps or decisions can be fully reversible, e.g. once implemented, the decision to excavate a shaft cannot be reversed and the shaft “un-dug”. On the other hand, these decisions can be identified in the process and used as a natural hold point for programme review and confirmation. Reversibility is thus also a way to close down options in a considered manner. If, for instance, in repository development the need to reverse course is carefully evaluated with appropriate stakeholders at each stage of development, a high level of confidence should be achieved, by the time a closure decision is to be taken, that there are no technical or social reasons for waste retrieval.

⇒ *Competing requirements of technical safety and societal control are to be reconciled in long-term waste management.*

Due to the extremely long-lasting potential danger of radioactive waste, the primary feature that waste management facilities should demonstrate



Involving stakeholders in a stepwise decision-making process can have significant impact on repository development.

is long-term safety. At the same time, several stakeholders demand future controllability and retrievability of waste when these are placed in underground repositories. Only a step-by-step approach to technical implementation can assure that the competing requirements of safety and controllability may be met simultaneously, and that robust systems for waste management may be established. Such robust systems include monitoring during characterisation, operation and, in the case of final disposal, the post-operational phase. In response to the competing requirements of technical safety and societal control, many implementing organisations are focusing their efforts on developing a final repository from which the waste is retrievable. In some cases retrievability is also a legal requirement.

⇒ *Public involvement and social learning processes are facilitated by a stepwise approach.*

There is significant convergence between the approach that is being taken by the practitioners of radioactive waste management and the indications received from field studies in social research. Empirical research studies in social science identify confidence in the radioactive waste management methods and trust in the decision-making and implementing institutions as key factors of public acceptance. These studies also indicate that gaining familiarity with, and control over, radioactive waste management technologies and institutions are crucial for

building up trust and confidence. Familiarity and control are to be gained through public involvement and social learning processes. Therefore, bottom-up approaches are proposed, where decision makers and other stakeholders are advised by scientific experts, but at the same time, decision makers and experts consider the objectives, needs and concerns defined by stakeholders. Bottom-up approaches are largely facilitated by stepwise procedures that provide sufficient time for developing, through deliberation, discourses that are both competent and fair.

⇒ *Competing social values exist and lend complexity to decision making.*

Research on organisational management suggests that competing values inevitably need to be embodied in societal decision processes for these to be successful, and that the dominant values may change over time. For example, in the past, decisions related to radioactive waste management were dominated by a technical command-and-control approach, focusing primarily on finding technically optimal solutions. Later, this approach has given way to an individual-rights orientation, with a focus on participation and on reaching decisions that have community support, even if they may not result in optimal solutions initially chosen by the experts. When participation and community support are accommodated, a further shift is then seen in seeking distributive equity. The tension that exists between competing values like technical efficiency, community support and

distributive equity, lends complexity to decision-making processes. Research indicates that it is impossible to satisfy all the competing values by an idealised decision-making process. In a highly developed democratic society, however, all desired criteria should be accommodated at least to a degree.

⇒ *Overarching principles of public involvement, social learning and adaptive decision making are emerging from practical experience and social research.*

A consensus appears to emerge from the experience in both social research and practical radioactive waste management. Three overarching principles are the essential elements of any decision making that seeks broad societal support, namely:

- public involvement in decision-making processes should be facilitated, e.g. by promoting interactions between various stakeholders and experts;
- social learning should be facilitated, for example by promoting constructive and high-quality communication between individuals with different knowledge, beliefs, interests, values and world views;
- decision making should be iterative and provide for adaptation to contextual changes.

⇒ *In the radioactive waste management context, a set of specific action goals should be targeted.*

A set of goals specific to the radioactive waste management context may be stated as a way of translating into action the principles outlined above. In particular, in order to identify and implement solutions that are widely regarded as legitimate, it will be important:

- to have an open debate and decisions on the national policy regarding energy production and the future of nuclear energy;
- to develop a broad understanding that the status quo is unacceptable and that an important problem needs to be solved;
- to define clearly the goals of the waste management programme, including the source, type and volume of waste to be handled;

- to define a technically and politically acceptable waste management approach;
- to identify one or more technically and politically acceptable site(s) for a waste management facility;
- to negotiate tailor-made compensation/incentive packages and community oversight schemes with host and neighbouring communities;
- to implement decisions by fully respecting agreements.

⇒ *Implementing a stepwise process raises a number of methodological issues to be resolved.*

Long-term solutions to manage radioactive waste will typically take decades to be implemented. Incorporating the views of national, regional and local stakeholders and allowing for the integration of their views will likely be difficult to implement in the decision-making process. In particular, progress can no longer be expected to be linear when an iterative approach is used.

The concrete arrangements for sketching out and agreeing on decision phases, for selecting and involving stakeholders in a participatory process, and for adapting institutions to meet long-term expectations, will require careful planning and tuning in each national context. Criteria will be needed for balancing the social sustainability and the efficiency of a process made more lengthy and uncertain by added decision checkpoints. It will be important that focus and attention are kept with time and that a guarantor of the process be properly chosen. Continued reflection and exchange on an international level can make a positive contribution to these efforts. ■

Reference

1. NEA (forthcoming), *Stepwise Decision Making in Radioactive Waste Management*, OECD, Paris.