

Radioactive Waste Management

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Learning and Adapting to Societal Requirements for Radioactive Waste Management

**Key Findings and Experience of the Forum
on Stakeholder Confidence**

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NUCLEAR ENERGY AGENCY
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

Over the past decade or so, radioactive waste management institutions have become progressively more aware that technical expertise and technical confidence are insufficient, on their own, to justify waste management solutions to a wider audience, or to see them through to successful implementation. Because of changes in society's decision-making environment and heightened public sensitivity to all matters connected with environmental protection, nuclear power, radioactivity, and especially radioactive waste, any decision regarding whether, when and how to implement waste management solutions will typically require thorough public examination and the involvement of many relevant stakeholders. The latter include waste management agencies, safety authorities, local communities, elected representatives, and technical intermediaries between the general public and decision makers. The involvement of stakeholders will become increasingly important as countries develop their strategic choices for long-term radioactive waste management, and/or move towards siting and developing final repositories.

The Forum on Stakeholder Confidence (FSC) is an ongoing initiative of the NEA Radioactive Waste Management Committee (RWMC). The FSC is composed of nominees from NEA member countries and consists mostly of representatives of national organisations (implementers, regulators, policy makers, research and development personnel) with responsibility for, and experience of, interacting with stakeholders. The FSC mandate includes the following:

- To define, oversee and carry out work programme activities in the strategic area of public perception and stakeholder confidence, as assigned by the RWMC.
- To advise the RWMC on major and emerging issues in the area of public perception and stakeholder confidence related to waste management.
- To act as a forum to share experience in achieving stakeholder confidence and, in particular, in how to obtain the confidence of

local communities and their representatives and intermediaries with the technical decision makers.

- To analyse today's processes for embedding waste management programmes into a socio-political, decision-making context.
- To identify opportunities for harmonised views of member countries regarding:
 - successful and unsuccessful experiences in interacting with stakeholders,
 - technical concerns of stakeholders,
 - effective means of communicating with technical and non-technical audiences.

This report presents the key FSC findings based on the substantial documentation and experience developed by the Forum during its first four years of activity (2000-2004). The historical context within which the FSC was established is also described and provides a perspective to those findings. An appendix recounts the collective experience of the FSC members, including their views of the impact of FSC activities on participating organisations. The FSC will build upon the present findings during its next phase of work.

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SUMMARY OF MAIN POINTS

On favourable conditions for issuing radioactive waste management policy

- Clarity on the link between safely managing the waste and the future of nuclear energy as well as associating the public in the relevant debates are important contributors to confidence in decisions regarding solutions for long-term radioactive waste management.
- Chances for a successful long-term radioactive waste management programme appear to be improved, if it is widely understood and agreed that there is a true societal need to change the status quo and that an important problem needs to be solved. The scope of the programme should be made clear, e.g. the source, type and amount of waste to be handled and at which type of facility.
- The decision-making context of radioactive waste management has become increasingly more complex as more players demand an active role. Also, conditions and criteria for the perceived legitimacy of public policies have been evolving, placing participatory decision making higher on the political agenda.

On the design of the decision-making process

- Competing requirements of participation, flexibility and accountability can be reconciled by using a mix of informal and formal procedures structured within clearly defined frameworks.
- Radioactive waste management, like other socio-technical issues, involves decisions that are value- and politically-laden. Co-operation between stakeholders – including politicians – and experts is needed in order to reach those decisions. An interactive process allowing sufficient time and resources to all actors for weighing or considering interests and options is recommended. In this process important social learning takes place.
- An incremental, stepwise approach is useful for long-term radioactive waste management. This approach provides opportunities for

various degrees of social and political review after identified steps and for reversing earlier decisions or modifying them, within limits of practicability.

On the social and ethical dimension

- It is now broadly recognised that radioactive waste management involves both technical and societal dimensions which cannot be dissociated. New processes to forecast and monitor quality of life and social impacts are being brought to the fore.
- Risk – and its counterpart, safety – are multi-dimensional concepts. FSC experience suggests that in addition to technical requirements, societal and ethical concerns about risk and safety should also be captured and addressed by radioactive waste management processes and their outcomes.
- There exist multiple legitimate views and ethical principles concerning fairness of the outcome of decisions. If they clash, there is no encompassing theory that could help decide which of the competing views should be considered more important. Management strategies that meet multiple ethical principles simultaneously have a better chance of gaining broad societal support. Identifying such strategies may rely on fair processes in which stakeholders seek a compromise between divergent ethical principles.
- Requirements for technical safety and societal control need to be reconciled in radioactive waste management. To accommodate these often competing requirements, many implementing organisations are focusing their efforts on developing a final repository concept that incorporates provisions for retrievability.

On trust in the actors

- Some social concerns expressed in regard to waste management processes may stem from eroded trust in operating or managing institutions. In order to achieve and maintain stakeholder confidence, the FSC has identified desirable features for these institutions in the areas of organisation, mission, and behaviour.
- Since trust is easy to lose but hard to gain, building trust is a slow and incremental process. In addition to certain organisational characteristics, involving the affected public in policy decisions has

been indicated as the most important element that increases social trust.

- The FSC community emphasises the importance of role clarification at all levels, such that responsibilities are identified, transparent and assured. Roles and responsibilities should be clear to all stakeholders.
- A strong and long-term commitment of institutional actors is needed from the very start. Most importantly, institutional arrangements are needed that help the decision-making process to keep going and remain focused.

On stakeholder involvement

- Different stakeholders have different perspectives, perceptions, beliefs, interests and values. This complexity is best taken into consideration by promoting stakeholder involvement. Tools and techniques are available to facilitate this task.
- Clear aims and objectives will aid in planning a dialogue process, and can be used to evaluate it. The participants in a dialogue may have different views about its goals and so the planning and evaluation should involve these persons in order to come to a shared understanding of what the dialogue process is trying to achieve.
- There is an inherent conflict between the requirements of fair representation and competent participation. A balanced process has to be developed between one extreme where all technical choices are made by experts and another extreme where everything is open and can be changed by the national or local community.
- In many countries EIA requirements for stakeholder involvement provide the opportunity to make significant advances in addressing a wide range of concerns.

On the local dimension of radioactive waste management

- The goal of the selection process for a site and management concept for any waste stream ought to be the identification of a safe and licensable site and a safe and licensable waste management concept that enjoy host community support.

- Local communities who find themselves the de facto hosts of radioactive wastes (problem owners) often become active players (problem solvers) in radioactive waste management processes.
- It is now an important acquired principle in radioactive waste management worldwide to accompany siting efforts with sound local and regional development schemes taking into account the views of the affected communities. Enhanced oversight by local authorities, fully visible to stakeholders, builds public confidence in the decision-making process.
- A voluntary process in which the consent of host communities is sought from the outset of siting and communities are allowed to withdraw from consideration within a certain period or under certain circumstances, improves the chances for local support.
- The building of a long-term relationship between the local communities and the waste management facility is one of the most important contributors to sustainable radioactive waste management solutions. Building such relationships can be facilitated by designing and implementing facilities in ways that reflect the values and interests of local communities.

Three overarching principles

Three overarching principles are the essential elements of any decision making seeking broad societal support:

- *Decision making should be performed through iterative processes, providing the flexibility to adapt to contextual changes, e.g. by implementing a stepwise approach that provides sufficient time for developing a competent and fair discourse.*
- *Social learning should be facilitated, e.g. by promoting interactions between various stakeholders and experts.*
- *Public involvement in decision-making processes should be facilitated, e.g. by promoting constructive and high-quality communication between individuals with different knowledge, beliefs, interests, values, and worldviews.*

The aims are to ensure or augment familiarity and influence by the stakeholders, trust and confidence in the institutional actors, and legitimacy and supportability of the decisions.

Within those principles, a hierarchy of objectives should be considered when a modern long-term radioactive waste management programme is implemented. Namely, the waste management programme should be founded first upon a recognition by the national government that the status quo is no longer acceptable and that an important problem needs to be solved implying, for instance, a need for new policy or new facilities. The link between current waste management policy and the future of nuclear energy should be openly addressed. Identification of a safe and licensable site and a safe and licensable waste management concept that enjoy host community support should then follow. Next, siting efforts should allow for consideration of local and regional development schemes that take into account the needs and views of the affected communities. Finally, radioactive waste management facilities should be designed and implemented in ways that reflect the values and interests of local communities. According to the latter, “Safety – Participation – Local Development” are the main pillars of trust.

1. THE FORUM ON STAKEHOLDER CONFIDENCE

Issues of public confidence and stakeholder involvement figure prominently in the Strategic Plan of the OECD Nuclear Energy Agency (NEA), and in the working programme of the Radioactive Waste Management Committee (RWMC). The Forum on Stakeholder Confidence (FSC) is composed of nominees from NEA member countries. It consists mostly of representatives of national organizations (implementers, regulators, policy makers, research and development personnel) with responsibility, overview and experience in the field of stakeholders' confidence. The FSC was set in force by the RWMC in March 2000 as the result of a decade-long process during which stakeholder issues increasingly took a more central stage in the formulation and implementation of long-term solutions for managing radioactive waste and during which a cultural shift took place making "stakeholder dialogue" a lead principle in radioactive waste management.

1990-2000: A sharpening focus within NEA on stakeholder issues

Stakeholder-related activities have been underway at the NEA since the early 1990s. They responded to a wish to increase understanding amongst decision makers regarding public information and public participation. In the period 1990-1995 four major workshops were held by the NEA Publications and Public Relations Department, and it was recognised early in the series (NEA, 1993) that not only information, but also actual public participation in decision making was a central issue. The fourth workshop (NEA, 1996) was specifically on radioactive waste management and its conclusions today appear visionary. Among the outstanding findings, these may be quoted:

- "Public involvement, at the earliest possible stage, is perhaps the most vital requirement, although it will not necessarily be enough. The public deserves and should have our respect. We cannot expect their trust if we do not trust them. Without them we are lost."
- "We must include the economic dimension in our communication programmes, including setting out the funding methods that will

ensure that costs will be met when they are incurred, which may well be far in the future.”

- “Social and ethical issues are at least as important as technical issues. There is a difficult balancing problem to be resolved between local ethical *desirables* and national ethical *imperatives*.”

In parallel with these activities, the NEA committee that deals with radioactive waste management, the RWMC, had taken up in earnest the issue of ethics of engineered geologic disposal, and with it the issues of long-term intra- and inter-generational equity. The NEA released a collective opinion on this subject in 1995, which concluded that engineered geologic disposal meets the ethical imperatives, and that “stepwise implementation of plans for engineered geologic disposal leaves open the possibility of adaptation, in the light of scientific progress and social acceptability, over several decades, and does not exclude the possibility that other options could be developed at a later stage” (NEA, 1995). In sum, the issue of developing and maintaining stakeholder confidence and support over relatively long time scales was given central importance, and stepwise decision making was also clearly identified as a goal.

Although, by 1995, the NEA community had not yet addressed societal decision making in earnest, this aspect was understood to be pivotal, as national programmes for long-term waste management had encountered difficulties (e.g. in Germany) or had been re-directed (e.g. in France). The need to take up societal issues was re-enforced in 1996 and 1997 by the unfavourable results of the public inquiry dealing with the Sellafield underground rock laboratory project in the UK and the dismantling of the Canadian geologic disposal programme – in the latter case because “broad public support” and a “required level of acceptability”, assessors found, had not been demonstrated.

In the late 90’s the RWMC ran a questionnaire study of “where do we stand” with respect to achieving the premiere solution identified by the technical community for long-term waste management: engineered geologic disposal. Issues of communication with the public as well as of public participation in decision making were raised and examined. The 1999 report – known as the “10-year study” (NEA, 1999a) – observed significantly that:

- Most organisations saw it to be their duty to reach out.
- Even where there were no strong constraints on institutional bodies to consult with the public, the tendency was to seek dialogue.
- The means used to build dialogue had not been successful, which argued in favour of “increased attention to be devoted by the (radioactive waste management) community to the issues involved,

even if these issues do not strictly fall within traditional areas of science and engineering”.

- Where respondents to the NEA questionnaire “did cite national requirements for progressing repository programmes, the emphasis was on policy and organisational aspects, and the mechanisms for public acceptance of current technical solutions, rather than development of improved technical solutions”.

The 10-year study identified one main “needed” development:

“Clear procedures for staged siting studies and repository development, and methods for communicating effectively and for gaining public acceptance in the stepwise development of appropriate national solutions”

thereby highlighting the pan-national demand for clarity of procedures and for inclusive and stepwise decision-making processes.

A cultural shift in radioactive waste management: The creation of the FSC

Overall, within the last five years of the century the NEA documented the desire of many organisations to move forward by reaching out to a broader community of stakeholders, even if no specific requirement existed in their mandate or in law. As well, a strong call for stepwise decision making within appropriate decision-making frames was heard. It is not too strong to say that a cultural change had taken place: stakeholder dialogue had become a lead principle in radioactive waste management.

In this context, providing some observations and guidance on these topics fell quite naturally to the FSC, created in 2000. Taking seriously the need for dialogue, the FSC had to break away from the tradition of discussions within closed, technical circles. Indeed, one characteristic of the FSC has been to create a neutral ground – in the form of workshops in a national context – where all categories of actors may meet. In accordance with the FSC strategic directions of work, these workshops have provided a valuable opportunity to view the inner workings of national waste-management programmes, the methods employed for stakeholder interactions, their successes and failures, and to hear directly from the stakeholders their own views about the methods by which they were involved in the decision making. The aim was recognised to be “for all participants at the workshops to have a possibility to learn how to change their own approach and mindset in order to interact with other

stakeholders in a way that enhances understanding and builds mutual trust” (NEA, 2001).

The inaugural meeting and first workshop of the FSC held in August 2000 grouped academics, social scientists, political decision makers and policy and R&D specialists, implementers and regulators representing institutions from 15 countries and three international organisations. An informal assessment of cultural change could be made [Summary in (NEA, 2000)]. In contrast with some opinions expressed at the 1992 meeting on public participation in nuclear decision making, FSC delegates at the 2000 workshop recognised that existing public consultation mechanisms may be insufficient or inadequate. Finding new manners of communicating and receiving input from stakeholders was recognised as a significant challenge. The diversity of players in a democratic society, and the need to share power among them, was acknowledged. Local and regional players were regarded not as hindering progress, but rather, as holding a central position. A broader, more realistic view of learning and decision in society was embraced, removed from the more technocratic view seen earlier in the decade. Implementers and regulators in particular were frank in analysing the discomfort of public rejection. Revising organisational culture was admittedly difficult, but clearly it was underway, and delegates shared an interest in learning and adapting to societal requirements for radioactive waste management.

The move towards learning and adaptation is documented in several NEA documents from 2001 onwards, including the present synthesis of the FSC experience.

About this document

“Stakeholder involvement” is a key concept in modern approaches to governance. Involvement rests on providing information and may include consultation and, also, active participation. Stakeholder involvement in policy making has received considerable attention within the OECD, for instance (OECD, 2001a, b; 2003; 2004). The main focus of this document is to present a synthesis of the FSC key findings and experience regarding the governance of long-term radioactive waste management, and to serve as a gateway to the FSC documentary output of its first phase of work (2000-2004). Reviewers have pointed out that most of the main findings (i.e. 4 out of 6 main headings: design of decision-making processes/outcomes of decisions/trust in actors/stakeholder involvement) are of relevance to *all* public policy-making processes, not only radioactive waste management. In this sense, the document reads as primer on the concrete governance challenges facing complex collective decision making.

The intended audiences are the FSC members themselves, as well as the leadership in their organizations, the numerous participants in the FSC topical sessions and workshops, and the interested public. The theoretical underpinning to most of the current key findings as well as extensive references to the literature are provided in the FSC report reviewing the stepwise approach to decision making (NEA, 2004b).

In order to provide a broader perspective to the FSC key findings and experience, the present Chapter described the historical context within which the FSC originated. The FSC key findings are given in Chapter 2 and are traceable back to the substantial documentation and experience developed by the Forum. They represent what appear to be universal principles or situations with cross-cultural validity, or identify available tools and frontier issues. Examples are given from specific national situations that were studied or discussed. Belgium, Canada, and Finland take centre stage because three workshops in a national context were held in those countries (NEA, 2002; 2003a; 2004a). Examples are also drawn from topical sessions held on specific topics.

Conclusions are provided in Chapter 3, and an Appendix recounts the collective experience of the FSC members, including their views of the impact of FSC activities on participating organisations.

2. FSC KEY FINDINGS

On favourable conditions for issuing radioactive waste management policy

Technical expertise and technical confidence are insufficient, on their own, to justify waste management solutions to a wider audience, or to see them through to successful implementation. Heightened sensitivity of the public to all matters connected to protection of the environment, nuclear power and especially nuclear waste as well as the imperatives of democracy imply that successful waste management policy requires previous determination that the current approach to management needs changing, justification of waste arisings vis-à-vis energy choices that have been or are being made, and clarity on the scope of the needed waste management programme. Since mechanisms, procedures and practices for managing radioactive waste are chosen to be compatible with the political system and decision-making culture of each country, there is no-one-size-fits-all solution. However, as more and more players demand an active role, all national programmes will have to achieve a balance between the approaches of participative and representative democracy.

Clarity on the link between safely managing the waste and the future of nuclear energy

Clarity on the link between safely managing the waste and the future of nuclear energy as well as associating the public in the relevant debates are important contributors to confidence in decisions regarding solutions for long-term radioactive waste management .

Nuclear power generation and the management of associated radioactive wastes are amongst the technologies that are perceived as the riskiest and generate the greatest levels of concern, a finding that is replicated cross-culturally in many settings. The perception exists that radioactive waste management involves risks that are higher than operating nuclear power plants and it has been observed that the public in general are prepared to support the continued use of nuclear power if assurances can be given regarding the safe management of radioactive waste.

- In the Autumn of 2001, a Eurobarometer public opinion survey was conducted throughout the 15 EU member states with, in total, some 16 000 people being questioned on their attitudes to radioactive waste issues in general (EC, 2002). On the issue of acceptability of nuclear power, there was a clear two-to-one majority (of those who offered an opinion) in favour of maintaining the nuclear option providing all the radioactive waste could be safely managed.

By the same token, within the public, some may fear that by demonstrating a permanent solution to the radioactive waste problem the nuclear power industry will be invigorated. An important aspect is thus the clarity of the link between achieving a long-term, final solution for radioactive waste and the future of nuclear power. When radioactive waste management is part of a broader, widely accepted nuclear energy policy framework, waste management efforts, including siting of a disposal facility, are more likely to gain public support (NEA, 2000).

- In Finland, the first application for the Decision in Principle (DiP) on developing the Olkiluoto site for disposal of spent fuel was criticised at Government level because it included spent fuel from a power plant that might possibly be built later. This implied an engagement on nuclear power beyond the engagements that had been taken that far. The applicant, Posiva, amended its application by eliminating from the proposal the spent fuel from the new nuclear power plant, and the DiP on Olkiluoto passed Parliament with an ample majority including the Green Party. A year later, once a decision in principle on constructing a new nuclear unit was taken, a separate DiP was made on the disposal of the additional spent fuel that would arise from this facility. These two later decisions did not enjoy the ample majority that the first one did (NEA, 2004e).
- In Canada, the Nuclear Waste Management Organisation (NWMO), are holding discussions with the Canadian public in order to propose to the government a long-term management solution for spent nuclear fuel in that country. Initial discussions with senior environmental and sustainable development executives have indicated that the NWMO mandate would be greatly facilitated if there were an overall coordinated approach to energy in Canada that acknowledged the need for a balance of different energy generation types. The discussions have also revealed that earning public trust for the nuclear industry in general will be important for NWMO to be successful in accomplishing its mandate (NWMO, 2004).

- It has been observed that, in Sweden, the decision on phasing out the use of nuclear energy has facilitated radioactive waste management-related decision processes [(NEA, 2000), International Perspective in (NEA, 2004a)].

The FSC delegates acknowledge that it is difficult to involve stakeholders in debates on broad, national strategic choices and the priority assigned by the public to resolving energy-related issues may be lower when and where economic and energy shortages are just a memory. On the other hand, stakeholders' perception that they are able to participate meaningfully in debates and decisions on fundamental questions of overall energy policy is expected to be an important contributor to advancing radioactive waste management programmes (NEA, 2004b).

- In Finland, links between nuclear energy and waste management are openly discussed at all levels. It has been observed by FSC participants that, since energy supply is an important concern for Finnish people, connecting it with the waste management problem may have increased public support for the repository [International Perspective in (NEA, 2002)].

A shared understanding that a true societal need exists for a change in current arrangements

Chances for a successful long-term radioactive waste management programme appear to be improved, if it is widely understood and agreed that there is a true societal need to change the status quo and that an important problem needs to be solved. The scope of the programme should be made clear, e.g. the source, type and amount of waste to be handled and at which type of facility.

Radioactive waste exists as a result of past and ongoing practices that are independent of choices regarding future energy sources. In many countries, however, safe management of radioactive waste is not necessarily perceived to be a shared societal problem. The FSC community views that one of the conditions to be met for the successful implementation of a radioactive waste management programme is a statement by the national government on the need for a radioactive waste management facility, and support and commitment to that policy. People need to be told why a policy and why now, and a dialogue must be set up for the broader public to appropriate these issues [Brown and Hooper and Thegerström in (NEA, 2000)]. The interest of the common good in finding a long-term solution ought to be stressed [English in (NEA, 2000)].

- It appears that residents of Belgian local partnership communities generally do not question the importance of the problem of low-level waste (LLW) management and the necessity of finding a long-term solution. Public acceptance of a repository solution is facilitated by the fact that the federal government took a decision on the necessity of such solution, as well as on the requirements that this solution should be stepwise, flexible and reversible, and that it would have to fit the needs of host communities.
- In Finland, a series of decisions by the national government facilitated the societal recognition of the need for a change in the status quo. First the government decision of 1983 excluded storage as a long-term solution, then in 1994 the Nuclear Energy Act amendment banned the export of waste after 1996. The importance of the waste management programme has repeatedly been confirmed by Parliament as well.

Chances of success are enhanced if waste streams to be handled are well-defined and guarantees are given that no additional wastes, e.g. from other national or extra-national sources, will be shipped to the planned facility (NEA, 2004b).

- In Finland, the goals of the programme, the source, types, and amount of waste to be disposed of at the facility are clear. Sentiments in the Eurajoki community turned around when it was assured that no waste can be exported from, or imported into, Finland.
- In Sweden, the Oskarshamn manifesto clearly defines the waste streams to be handled by the facility if the site is accepted: “Only spent nuclear fuel and nuclear waste produced within the country, with the volumes indicated by SKB in FUD-K, will be treated in the siting process. The municipal yes to a site investigation does not entail a decision whatsoever with regard to site investigations or siting of SFL 3-5 and does not in any respect constitute a prerogative concerning a future decision on site investigations or co-siting of SFL 3-5 with the repository for spent nuclear fuel.”¹
(www.oskarshamn.se)

1. The SFL 3-5 facility would deal with other long-lived radioactive wastes than spent fuel.

Achieving a balance between approaches of participative and representative democracy

The decision-making context of radioactive waste management has become increasingly more complex as more players demand an active role. Also, conditions and criteria for the perceived legitimacy of public policies have been evolving, placing participatory decision making higher on the political agenda.

Large-scale technologies have both short and long-term consequences, some of which are indirect, unintended, and highly uncertain. Their implementation is usually in the interests of some social groups, but they may also adversely affect other groups of people, including future generations. Such technologies may be incomprehensible and uncontrollable for many, and require an unusual degree of trust in operators and authorities. For similar reasons, conditions and criteria for the perceived legitimacy of related public policies have also been evolving and a trend has arisen to place participatory decision making higher on the political agenda and to modify the decision-making mechanisms of representative democracy accordingly. As an increasing number of players demand more active involvement and participation [Zwetkoff in (NEA, 2004a)], decisions related to large-scale technologies – such as nuclear energy production and radioactive waste management – have become increasingly more complex.

Representative democracy sees the role of individual citizens as forming, joining, and supporting interest groups. In this model citizens are not directly involved in governance, but participate in forming and maintaining interest groups [Webler in (NEA, 2004a)]. Participatory democracy posits that democracy is the direct participation of individuals in making decisions about governance. National governance systems incorporate both democratic approaches, but to a different extent. Since mechanisms, procedures and practices for managing radioactive waste are chosen to be compatible with the political system and decision-making culture of the country, there is no-one-size-fits-all solution. An appropriate balance of both approaches is needed, however, with attending clarity as to which approach is to be followed on which decision.

- In Finland it was observed that the country's model of government is characterised by traditional, strong democratic parties, a consensual rather than adversarial decision-making culture, and the dominance of the State. Finnish processes aimed at selecting an engineering concept and a site for final disposal of spent nuclear fuel were compatible with this pluralistic model. For example, the geologic

disposal option was selected by the government with no public input. On the other hand, it was also recognised that sound interaction with society should support decisions by elected officials and it was accordingly decided that the Decision in Principle to develop a specific site should be approved by the municipal government and ratified by Parliament following as well a statement by the Safety Authority on the potential reliability of the concept [Bouder in (NEA, 2002)].

- The Belgian local partnerships manifest a more participatory model of governance. The role of these partnerships is to elaborate integrated repository concepts and to formulate recommendations for implementation to local municipal councils. Although participants represent mainly established interest groups and there is only moderate involvement by citizens who are not representatives of such groups [Webler in (NEA, 2004a)], the composition of the partnerships is believed to cover the range of different values, attitudes and interests in the community with regard to this specific siting issue. Some elected local representatives are also members of the local partnerships, and the partnerships have an outreach programme to their communities [Vanhoof in (NEA, 2004a)].
- Elected national representatives may question the need for public participation in decisions or see this as betraying a lack of confidence in traditional representative democracy. They may argue that only parliamentarians have the legitimacy to create law. Interestingly, policy makers polled in Denmark characterised the consensus conference format as a unique way to learn what people think [Andersen in (NEA, 2003b)].

On the design of the decision-making process

In the context of present-day decision making a “decision” no longer means opting, in one go and for all time, for 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.

Achieving a balance between participation, flexibility and accountability

Competing requirements of participation, flexibility and accountability can be reconciled by using a mix of informal and formal procedures structured within clearly defined frameworks.

Radioactive waste management decision-making processes are expected to meet a number of competing requirements. Thus it is desirable that radioactive waste management processes be participatory and flexible and, at the same time, accountable. In a participatory process, opinions of all key stakeholders are considered in each phase of the decisions and have considerable influence on process and outcome. A decision is accountable if it is clear, well-documented, and can be readily justified. Processes relying on formalised procedures usually result in highly accountable decisions, but such procedures are likely to be weaker in terms of flexibility (NEA, 2004b). Competing requirements of participation, flexibility and accountability can be reconciled by using a mix of informal and formal procedures structured within clearly defined frameworks. Finding a balance is a significant challenge for the designers of decision-making processes.

- In Finland a mix of policy instruments was applied over time, in order to ensure safety requirements and to improve stakeholder involvement. However, it was observed that “procedural safeguards (i.e. legally binding prescriptions concerning decision-making procedures), although an essential component of a sound decision-making process, are also potentially a source of possible rigidities when they are not fully adapted to new conditions”. One example is given by the necessity to conform to already formalised procedures, e.g. of Environmental Impact Analysis (EIA). The procedure was applied to the site selection process and was carried out through public hearings, written comments and an EIA contact person in each municipality. This created concerns among some stakeholders, in particular environmental organisations, based on the lack of room for interaction between the average citizen and decision makers [Bouder in (NEA, 2002)].
- The Port Hope (Canada) case demonstrates a highly flexible bottom-up process where management solutions are worked out in partnership and affected communities elaborate desired options. The process, however, could not have developed if effective *frameworks* for decision making had not been constructed. Sequentially, the framework elements structuring the Port Hope dialogue were: the Cooperative Siting Process recommended in 1987; the formal Legal Agreement that established the terms under which the project, the

Port Hope Area initiative, would proceed. Finally, the EIA framework will structure the further evolution of the conceptual technical approaches defined in the Legal Agreement [International Perspective in (NEA, 2003a)].

- In Belgium, local partnerships have functioned outside formalised, legal site-selection procedures; therefore they can function in a more flexible way. Such informal procedures, being outside the “political framework”, can facilitate public involvement and build trust. Local partnerships can also be instrumental in building confidence for taking legally-binding decisions at the local level later. However, members of the FSC community feel that even in the case of informal procedures a clearly defined framework is needed [Session I roundtable in (NEA, 2004a)].

Facilitating social learning by promoting interaction between stakeholders and experts

Radioactive waste management, like other socio-technical issues, involves decisions that are value- and politically-laden. Co-operation between stakeholders – including politicians – and experts is needed in order to reach those decisions. An interactive process allowing sufficient time and resources to all actors for weighing or considering interests and options is recommended. In this process important social learning takes place.

In traditional policy-making processes, decisions are based primarily on information provided by experts. In such processes, scientists make assumptions that are value laden, e.g. on the problems to be resolved, on solutions to be investigated, and on the acceptability of certain risks. Policy judgements must emerge, however, from a political process, and there is a need for a decision-making model where scientists make use of, but do not make themselves, overarching policy judgements. In this model, experts provide data on alternative solutions, on their technical characteristics and constraints but, for generating and evaluating the various solutions, policy makers consider as well objectives, needs, and concerns defined by politicians and other stakeholders [Webler in (NEA, 2004a)].

The proposed model is implemented through *interactive processes between experts and non-experts*. Such processes combine analysis and deliberation, where analysis is a way of using techniques to reveal patterns, and deliberation is a result of collaborative inquiry through making assertions, asking for justifications, and weighing or considering the validity of arguments.

One of the most important features of this model is that it does not restrict learning to the lay public. On the contrary the model highlights a more symmetrical social learning process, best called *mutual learning* [Webler in (NEA, 2004a; 2004b)].

- Planning activities of the Belgian local partnerships successfully combine analysis and deliberation. The General Assembly, representing various local stakeholder groups, including politicians, frames questions for the working groups where interested citizens and experts of the respective specialty fields carry out the necessary analyses together. Admittedly, this collaboration is not without difficulties. For local actors it is often difficult to understand the technical jargon used by the experts. At the same time, experts are often insufficiently informed on the tasks of local actors and may lack the necessary communication skills. The most serious problem, however, is that the perception of local actors on the impact and safety of a waste management facility is radically different from that of technical experts. In spite of these problems it was observed that, in time, the co-operation between local actors and experts had improved, the experts' influence on the selection of the technical concept had diminished, and the social impacts of the facility were taken better into account [Draulans in (NEA, 2004a)].

Achieving a balance between goal-centredness and adaptability by following a stepwise approach

The FSC community agrees that an incremental, stepwise approach is useful for long-term radioactive waste management. This approach provides opportunities for various degrees of social and political review after identified steps and for reversing earlier decisions or modifying them, within limits of practicability.

In order to be effective, radioactive waste management decision processes need to set clear goals and focus resolutely on achieving them. At the same time, it should be possible to adapt these processes to unexpected events and interventions over relatively long periods. Tensions between the requirements of goal-centredness and adaptability can be decreased by following a stepwise approach. The key feature of the stepwise approach is *a plan in which development is by steps or stages that are reversible*, within the limits of practicability (NEA, 2004b).

Reversibility of decisions is a conceptual and operational tool that enables adaptability in decision making. Reversibility denotes the possibility of reconsideration of one or a series of steps at various stages of a programme. This implies a need for review of earlier decisions, as well as for the necessary means (technical, financial, etc.) to reverse a step.

When adopting the reversibility framework in developing a waste disposal facility, it must be made clear from the outset that not all options can be kept open at all times and that the ease of retrieval diminishes as the closure of the facility approaches. 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 a way to close down options in a considered manner. If the need to reverse course is carefully evaluated with appropriate stakeholders at each stage of development of a facility a high level of confidence may be achieved, by the time a closure decision is to be taken, that there are no technical or societal reasons for waste retrieval. At the same time, a stepwise decision-making process must be designed to maintain commitment and focus throughout the many decades of waste management planning, approval and implementation (NEA, 2004b).

- In Finland, the process aimed at establishing a disposal facility follows a stepwise approach. As early as 1983, a clear decision-making path with attending milestones was laid down. The government decision excluded storage as a long-term solution and required that a site for a final disposal facility should be selected by 2000 and operations should start by 2020. In 1994 the Nuclear Energy Act amendment banned the import of radioactive waste to Finland, as well as the export of waste after 1996. This framework channelled the available alternatives, and exercised a strong forward pressure on the decision process. By 1999 the Olkiluoto site was identified and it was approved by the host municipality of Eurajoki in 2000. The Decision in Principle (DiP) on this site was ratified by the Finnish Parliament in 2001 (NEA, 2002).

Of note, in the Decision-in-Principle no definite conclusion on the safety of the proposed disposal concept was required. Only a preliminary safety appraisal was needed, stating that nothing had been found which would raise doubts about the potential to achieve the required safety level. In other words, no disqualifying factors were found, and therefore the decision process could proceed to the next phase, which will include site characterisation. In the phase of implementation, the project will be frequently reviewed by the

regulators. It is noteworthy that in addition to the original programme, two new future milestones were added for the implementer to submit reports for review: one before proceeding to construction of the underground rock characterisation facility and the other in 2006 when an interim report will be published [Summary in (NEA, 2002; 2004a)].

- In Belgium, the management of low-level short-lived waste follows a stepwise process consisting of a series of reversible decisions. First, a decision was made on the interim storage of LLW and a centralised storage facility was established in Mol-Dessel in the 1980s. After a failed attempt aimed at finding a technically superior site for a long-term radioactive waste management facility while at the same time excluding the nuclear communities, in 1998 the government prescribed a new procedure to find a solution which would focus on the nuclear communities and would meet social as well as technical requirements. Local partnerships between potential host communities and ONDRAF/NIRAS were established to formulate, with the help of local stakeholders, proposals integrating both technical concepts and local development plans. These proposals by the local stakeholders are non-binding and municipal governments can decide to withdraw from the process at any stage. Even when the proposals are accepted by the municipalities, the final decision lies with the federal government, who will determine which site and design shall be accepted. [International Perspective in (NEA, 2004a)].

On the social and ethical dimension

Competing values inevitably need to be embodied in societal decision processes for these to be successful. The tension that exists between competing values such as technical efficiency, community support and distributive equity, lends complexity to decision-making processes. Additionally, the dominant values approved by society may change over time. Research indicates that it is impossible to satisfy all the competing values through an idealised decision-making process. In a highly developed democratic society, however, all desired criteria should be accommodated at least to a degree.

“Quality of life” as a key criterion to monitor and judge success

It is now broadly recognised that radioactive waste management involves both technical and societal dimensions which cannot be dissociated. New

processes to forecast and monitor quality of life and social impacts are being brought to the fore.

The importance of forecasting and monitoring changes in quality of life over the phases of a facility project, e.g. the feasibility study phase or construction phase that may physically intrude on a community, has been pointed out repeatedly [Storey and Simard in (NEA, 2003a)]. Innovative techniques for performing a social impact analysis and ethical analysis are being developed [English in (NEA, 2000), Summary (NEA, 2003a)]. FSC delegates anticipate that the concept of quality of life – a state of physical, psychological, and social well being – will be used increasingly to monitor and judge progress, as well as to capture the complexity of risk issues.

- The Canadian nuclear fuel waste policy embodied in the new Nuclear Fuel Waste Act represents a combined technical and societal focus on both process and outcome. It sets up assurance that due consideration will be given to social concerns. The Act explicitly requires the study of ethical, social and economic considerations, as well as relative benefits, risks and costs associated with each proposed management approach. This combined focus is also visible in the dealing with the Port Hope waste issue. Overall these examples are in line with world trends towards putting greater effort into integrating societal considerations that influence public confidence in radioactive waste management activities [International Perspective in (NEA, 2003a)].
- Social Impact Assessment (SIA) is the advance analysis of “all social and cultural consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organise to meet their needs, and generally cope as members of society” [US Dept of Commerce, 1994 *quoted by Storey in (NEA, 2003a)*]. Such analysis can be applied to assessing quality of life. Management strategies can be designed to minimise the disruptions to quality of life that may be identified through SIA.

Risk and safety are more than just technical, numerical concepts

Risk – and its counterpart, safety – are multi-dimensional concepts. FSC experience suggests that in addition to technical requirements, societal and ethical concerns should also be captured and addressed by both the applied processes and their outcomes.

Risk – and its counterpart, safety – are *multi-dimensional concepts* that deal with the likelihood of harm to humans (both physical and psychological), the environment, economy, society (e.g. stigma, impacts on democracy, and impacts on science) and culture. A number of contextual variables have been identified that shape individual perception of risk and safety. These include, e.g. familiarity with the hazard, voluntarism of risk taking, associated benefits, and social/cultural factors such as, e.g. equity, trust, and worldviews. In particular, feelings of being in control of the hazard and of being active in formulating the risk management strategy seem to play an important role in decreasing the perceived level of risk [International Perspective in (NEA, 2003a; 2004a)].

- In Belgian local partnership communities a rather insignificant perceived level of health risk has been observed, which may be attributed to the combination of several factors. The local partnership methodology greatly increases the familiarity of the community with the safety of the project – because the safety details are studied and decided together in technical working groups with participation of the local stakeholders – and the control by the community over the decisions – because it is only the local partnerships’ decisions that will be carried forward. Also, the inhabitants of at least Mol and Dessel appear to share the experts’ view that a new disposal facility would increase safety vis-à-vis the current interim storage facility. Additionally, there are socio-economic benefits expected from local development projects and the residents of potential host communities do not question the equity of hosting the disposal facility if it is safe and compensated. Of note, during the discussions participants from these communities acknowledged their responsibility for the waste both as direct economic beneficiaries of the nuclear industry and as consumers of electricity [International Perspective in (NEA, 2004a)].
- Feelings of being in control of the local waste and of being active in formulating the long-term management solution each seemed to play an important role in allaying risk in the Port Hope community (Canada). Perceptions from more distant communities’ (largely amplified by the media) that Port Hope was an unhealthy living environment had cast a stigma on this community posing a risk to its economic viability. However, as knowledge was gained from community studies that the waste posed few health risks, health and safety receded as primary local concerns. The community’s conceptual solution, building a readily accessible and monitored surface facility, is felt to be preserving safety. Ultimately, it was important that this solution came from the community itself, for this

both improved the self-image and removed the stigma [Summary in (NEA, 2003a)].

Achieving a balance between competing ethical principles

There exist multiple legitimate views and ethical principles concerning fairness of the outcome of decisions. If they clash there is no encompassing theory that could help decide which of the competing views should be considered more important. Management strategies that meet multiple ethical principles simultaneously have a better chance of gaining broad societal support. Identifying such strategies may rely on fair processes in which stakeholders seek a compromise between divergent ethical principles.

In ethics, as in policy, the focus is on the fairness of both the means (process fairness) and the ends (outcome fairness) of decision making [Fleming in (NEA, 2003a)]. There exist multiple legitimate views and ethical principles concerning outcome fairness and there is no encompassing theory that could help decide which of the competing views should be considered more important if they clash. Siting methods, for example, in the past have been dominated by approaches focusing on finding technically optimal solutions, i.e. maximising social *welfare*. Over time, this approach has given way to the *individual-rights* principle, with a focus on participation and on reaching decisions that are both safe and have community support. When participation and individual rights are accommodated in the siting process, a further shift is then seen to meet the principle of *distributive equity* (NEA, 2004b).

Experience suggests that strategies that meet multiple ethical principles have a better chance of gaining broad societal support. Such strategies are called *robust*. A fair process is equivalent to a pluralistic, deliberative process, with equal opportunity to participate for anyone who feels potentially affected. Since in fair processes it is the stakeholders who are seeking a compromise between divergent ethical principles, such processes may be key to identifying robust strategies [Vári in (NEA, 2004a)].

- In Finland, shifting social values may underlie changes concerning radioactive waste management strategies. We can observe a shift from a focus on “individual rights” (including the right of a community to determine its own policy in regard to radioactive waste management) towards a strong emphasis on “distributive justice” and “responsibility”. In the latter case, the view is held that a society, or even a municipality, benefiting from the advantages of a technology

(e.g. energy, jobs) should assume responsibility for handling its liabilities (NEA, 2002).

The large number of stakeholders potentially involved in the siting decision means that a large set of possibly conflicting interests and views was present. Key to managing this complexity was the emphasis on “the good of society”. A robust strategy, i.e. one that meets multiple ethical principles was found: the Eurajoki site appears technically feasible, it is supported by the local public and located near a nuclear power plant. The recent Decision in Principle according to which final disposal at this site “is in the overall interest of the society” reflects societal views in present circumstances. Future generations may redefine the collective interest [Vári in (NEA, 2002)].

- In Canada, the embedding of ethical requirements in national radioactive waste management legislation appears to be innovative. There is an inherent ambiguity associated with this requirement: an ethical assessment could target finding out what Canada “ought” to do (prescriptive ethics) or, alternatively, could be used to determine simply if Canadians’ current values are reflected or expressed in proposed solutions (descriptive ethics). Canadians will need to determine which meaning is intended by that requirement. These two levels could each be addressed through a stepwise ethical assessment process, similar to the gradual elaboration over time of values, goals and solutions in Port Hope [Fleming in (NEA, 2003a)].

Developing robust radioactive waste management systems

Competing requirements of technical safety and societal control are to be reconciled in radioactive waste management. In response to these competing requirements, many implementing organisations are focusing their efforts on developing final repositories that incorporate provisions for retrievability.

Due to the extremely long-lasting hazardous nature of radioactive waste, waste management facilities should demonstrate long-term passive safety. At the same time, several stakeholders demand future controllability of waste, also when these are placed in underground repositories. The world trend for persons to prefer extended institutional control of a repository, rather than to depend completely on passive safety systems, reflects a general preference to judge at any time amongst alternatives, rather than be obliged to “buy” or reject a total package (NEA, 2000).

Competing requirements of passive safety and controllability should be balanced, and *robust systems* for waste management should be established. Such robust systems may include provisions for retrievability, monitoring during characterisation, operation, and – in the case of final disposal – in the post-operational phase. In some cases retrievability is also a legal requirement.

- Retrievability, over some period of time, has become a requirement in the siting and engineering programmes of several countries, including Belgium, Finland, France, Switzerland, the UK, and the US (NEA, 2004b).

FSC delegates are of the view that the choice among safe and secure waste management methods should be made on the basis of societal values (NEA, 2004b).

- In Canada, the Nuclear Waste Management Organisation (NWMO) must examine and present at least three nuclear fuel waste management options (they are not barred from presenting the “do-nothing” or other options as well), and Government must select one of the submitted options. At issue is increasing and maintaining public confidence in a long-term solution, founded upon three pillars: technical safety, financial aspects, and social considerations. The NWMO therefore must analyse ethical and social as well as the more traditional economic and safety considerations associated with any options. Furthermore, it must perform comprehensive Aboriginal and other public consultation. The final solution in this way is to reflect “Canadian values” [Summary in (NEA, 2003a)].
- Some community concepts might be described as technically sub-optimal (for instance, when a low-level waste facility lacks full passive safety features). However, some technical proposals, in turn, may be called socially sub-optimal. One of the outstanding criteria for social optimality is whether residents have confidence in the chosen concept. For example, in Clarington, Canada confidence was predicated on the ability to stabilize, without moving, the waste and on the ability to monitor it [Summary in (NEA, 2003a)].

On trust in the actors

Trust is “a relationship between individuals within an existing or emerging group. It takes place in situations where individuals depend on people they trust to achieve important projects entailing significant risks for them” (EC, 2000). Process components can be designed to limit the reliance on trust. These

include: (i) involving in the decisions those who are affected, so that they gain more control; and/or (ii) dividing major decisions into smaller steps, providing feedback after each step and allowing the affected people to halt the procedure if they lose trust in the “trustees” (NEA, 2004b). FSC delegates recognise the importance of stakeholder involvement in building trust, but also the importance that institutions develop appropriate features in the areas of organisation, mission, and behaviour. Building and maintaining trust requires sustained commitment of substantial resources.

Institutional aspects

Some social concerns expressed in regard to waste management processes may stem from eroded trust in operating or managing institutions. In order to achieve and maintain stakeholder confidence, the FSC has identified desirable features for these institutions in the areas of organisation, mission, and behaviour.

A deficit of trust may arise from lack of familiarity, misinformation or missing information, changing sensibilities of society over time, specific past failures of particular institutions, or inadequate general education. In some cases media treatment of the issues may accentuate distrust [Summary in (NEA, 2003a)].

Views of the FSC community on the desirable characteristics of institutions capable of achieving stakeholder confidence were classified into three main areas: organisational, mission, and behavioural features. Organisational features include independence, clarity of role position, public ownership, dedicated and sufficient funding, a non-profit status, structural learning capacity, an internal culture of “scepticism” allowing practices and beliefs to be reviewed, high levels of skill and competence in relevant areas, including stakeholder interface, strong internal relations and cohesion, an ethical chart or code of conduct, and a general “quality consciousness”. Mission features implied in achieving long-term confidence include a clear mandate and goals, a specified management plan, a grounded and articulated identity, and a good operating record. Good integration with other institutions for dealing with countries’ responsibilities for the back-end of the nuclear fuel cycle, including decommissioning, would be a bonus. Behavioural features include respect for each other’s roles, openness, transparency, honesty, consistency, willingness to involve others, an active search for dialogue, willingness to listen to and respond to stakeholders’ concerns, freedom from arrogance, recognition of limits, commitment by a highly devoted and motivated staff, coherence with organisational goals, emphasis on stakeholder interface, a policy of continuous

improvement, use of allies and third-party spokespersons, and a level of commitment comparable to that displayed by NGOs [Summary in (NEA, 2000)].

- In Belgium, the local partnership methodology had significant impacts on the organisational culture of the implementer. Recently ONDRAF/NIRAS representatives play three different roles in the local partnerships. In the General Assembly they are a partner amongst other partners, in the Board of Management they help integrate various aspects of the project, while in the working groups their primary role is to provide technical information. Accordingly, an evolution from a closed and defensive attitude towards a very open-minded one has been observed within the implementer organisation. However, this evolution has been accompanied by new challenges. One challenge is that technical experts have to acquire skills of dialogue and communication. Another challenge is to maintain a high degree of flexibility but avoid chaos. The latter requires a strict organisation with clear and well defined responsibilities and a strong coordination team [De Preter in (NEA, 2004a)].
- In the UK, Nirex has developed a Transparency Policy to outline its commitment to operating in an open, transparent and inclusive way (Nirex, 2004). In a similar vein, in France, Andra has developed a code-of-conduct charter (Andra, 2002).

Willingness to involve the affected public

Since trust is easy to lose but hard to gain, building trust is a slow and incremental process. In addition to certain organisational characteristics, involving the affected public in policy decisions has been indicated as the most important element that increases social trust.

A number of dimensions of trust have been identified, including for example, openness, objectivity, caring, and competence on the part of the decision-making actors [Summary in (NEA, 2000)]. The importance of the various dimensions may vary between risk issues, or between groups and individuals around the same issue and this has significant implications for the risk management process. In order to increase trust, first the significance of the various dimensions for the various stakeholders needs to be understood (NEA, 2004b). FSC delegates recognise the importance of stakeholder involvement in building trust, and also acknowledge that building trust is not a fast, but rather a slow, stepwise, incremental process.

- In Finland, organisational factors were paramount in strengthening public confidence in the decision-making process. Competence of the institutional actors (regulators, nuclear industry) was demonstrated and provided an important foundation for public confidence. (Note that this is facilitated in Finland by a tendency to trust and delegate to government, and inherent confidence that science and technology, used appropriately, can help solve problems.) Good intentions were demonstrated in various ways. The shared goal of safety was given a central place. The absolute veto right of the municipality built in a high degree of control by those most directly affected. Government and parliament took decisions predicated on the overall good of society, including responsibility for waste, and stuck to their commitments. Legislative history showed that nuclear power equipment was measured against Finnish needs, not pushed through.

All these stepwise developments provided confidence to the public that reasonable next steps in approving a Decision in Principle and a municipality acceptance for repository development would keep public safety and overall societal good pre-eminent. Frank discussions and a willingness to change and adapt to societal requirements built confidence. The regulator was present in the community, engaged in dialogue, and dedicated to serving community needs in guaranteeing safety. A public information programme designed specifically to address the concerns, expectations, and information needs of local residents was designed by the regulator and proved to be successful. People wanted the regulator to have a referee role and be on the side of the municipality in regard to health issues. Confidence and trust in the regulator were built up through their active municipal presence as guarantor of safety. This confidence and trust were positive assets to the decision process [Summary in (NEA, 2002)].

Well-defined roles and responsibilities

The FSC community emphasise the importance of role clarification at all levels, such that responsibilities are identified, transparent and assured. Roles and responsibilities should be clear to all stakeholders.

FSC participants view that the technical side of waste management is no longer of unique importance. Practitioners acknowledge that their *roles have changed* in response to a change in the definition of the problem of radioactive

waste management. Social and ethical issues need to be taken into account and dialogue and stakeholder involvement are now part of the process. It is agreed that there need to be *clear roles and responsibilities* in radioactive waste management; stakeholders need to understand the roles of the different participants [Summary in (NEA, 2000)]. Observed evolving roles and responsibilities are reported in Table 1.

- Canada has a set of complementary legislative and governmental policy documents that frame radioactive waste management. The 1996 Policy Framework for Radioactive Waste defines respective roles of Government and waste owners in the goal of implementing long-term solutions in a safe, environmentally sound, comprehensive, cost-effective, and integrated manner. Health, environment, safety and security requirements are legislated by the 2000 *Nuclear Safety and Control Act*. The 2002 *Nuclear Fuel Waste Act* directs waste owners to set up a Waste Management Organisation, and legislates requirements on financial, socio-economic and ethical considerations (NEA, 2003a).

The “polluter pays” principle is central to Canadian law and tradition: waste owners are responsible for establishing, funding and carrying out acceptable waste management plans. Federal policy is to manage radioactive wastes to protect human health and the environment, and ensure that those who benefit from the waste-producing activity bear the costs of long-term management. Where no waste owner can be identified or held responsible, the federal government recognises its residual responsibility. Federal regulatory philosophy is based on two principles: i) licensee responsibility for ensuring that health, safety, security, and the environment are protected and that international commitments are respected; ii) regulator responsibility to the Canadian public for ensuring that licensees correctly discharge these responsibilities. Safety regulations are performance-based, and regulatory action is based on risk level. The Canadian regulator CNSC views that the notion of risk covers also public perceptions and social concerns. Its mission is to act on behalf of all citizens in Canada to ensure that this type of requirement is met (NEA, 2003a).

Table 1. **Traditional and evolving roles and responsibilities**

Stakeholders	Traditional roles and responsibilities	Evolving roles and responsibilities
Policy makers	Defining policy options, investigating their consequences under different assumptions, making policy choices.	Informing and consulting stakeholders about policy options, assumptions, anticipated consequences, values and preference. Setting the “ground rules” for the decision-making processes. Communicating the bases of policy decisions.
Regulators (policy makers in safety authorities)	Defining regulatory options, investigating their consequences under different assumptions, making choices regarding regulatory options.	Informing and consulting stakeholders about regulatory options, assumptions, anticipated consequences, values and preferences. Communicating the bases of regulatory decisions. Providing independent expertise for local communities.
Scientific experts, consultants	Providing qualified input for the decision makers.	Providing balanced and qualified input for stakeholders and encouraging informed and comparative judgement. Acting as technical intermediaries between the general public and the decision makers.
Implementers	Finding a solution for the radioactive waste management problem, implementing the solution.	Co-operating with local communities to find an acceptable solution for the radioactive waste management problem. Co-operating with local communities in implementing the solution.
Potential host communities	Accepting or rejecting the proposed facility.	Negotiating with implementers to find locally acceptable solutions for the radioactive waste management problem that minimise negative impacts and provide for local development, local control, and partnership.

Table 1. **Traditional and evolving roles and responsibilities** (cont'd)

Elected local or regional representatives	Representing their constituencies in debates on radioactive waste management facilities.	Mediating between several levels of governments, institutions and local communities in seeking mutually acceptable solutions.
Waste generators	Providing (partial or full) finance for solving the radioactive waste management problem.	Providing finance for solving the radioactive waste management problem under transparent arrangements and demonstrating this transparency.

Need for institutional commitment and actors that keep the process going and remain focused

It has been recognised by the FSC community that a strong and long-term commitment of institutional actors is needed from the very start. Most importantly, institutional arrangements are needed that help the decision-making process to keep going and remain focused.

Whilst the roles and responsibilities of various actors may change, institutional arrangements need to be robust and have to survive changes in political orientation. Building and maintaining trust will require committing substantial resources to safety, monitoring, consultation and information exchange with affected communities and appropriate compensation. Institutions must demonstrate their commitments and honour legal agreements [Summary in (NEA, 2003a)].

It has been emphasised by the FSC community that a – preferably public – organisation is needed that helps to keep the decision-making process stay focused (“*driver of the process*”). At the same time another organisation is also needed to keep the process going (“*engine*”). Driving any process requires both determination and a framework within which organisations and individuals know their roles and through which commitments can be taken.

- The role of “driver of the process” has been played by the Ministry of Trade and Industry in Finland over the last 20 years and such is also the role that has been played by Canada’s Department of Natural Resources over the same amount of time (NEA, 2002; 2003a).
- In Finland, the main engine of the process has been Posiva. In Sweden it is SKB. In the latter country the Safety Authorities have

played the most important driving role. The mechanism for this to be possible is the issuance of a detailed Research & Development Plan every three years by SKB to the Authorities, who then issue their review and advice to Government based also on the inputs of numerous stakeholders [Thegerström in (NEA, 2000; 2002; 2003a)].

- Outstanding aspects of the Port Hope (Canada) low-level waste management experience include the engagement of local players to solve their problem; the determination of local and federal players to come to a mutually agreed resolution; the attention given to developing a comprehensive solution; and the willingness to take the time needed to discuss and learn. The determination of the local and federal players and drivers of the process emerge as paramount to the success of the initiative. The process, however, could not have developed if effective frameworks for decision making had not been constructed [Summary in (NEA, 2003a)].

On stakeholder involvement

Stakeholder involvement is a key concept in modern approaches to governance. Involvement rests on providing information and may include consultation, active participation, and shared decision authority. There exist national and international instruments that require stakeholder involvement and it is nowadays an accepted principle that stakeholder involvement improves the information base for decisions. Broad participation may also compensate to some degree for the unavoidable absence of future generations in today's reflections or negotiations. The OECD countries are moving away from a traditional "decide, announce and defend" model, for which the focus was almost exclusively on technical content, to one of "engage, interact and co-operate", for which both technical content and quality of process are of comparable import to a constructive outcome. In this context, the technical side of waste management is no longer of unique importance; organisational ability to learn, to communicate and to adapt now moves into the foreground [Kotra in (NEA, 2000)].

Designing a process of dialogue

Different stakeholders have different perspectives, perceptions, beliefs, interests and values. This complexity is best taken into consideration by promoting stakeholder involvement. Tools and techniques are available to facilitate this task.

One of the complexities of the decision-making process for the long-term management of radioactive waste is related to the significant number of different players and the attending multiplicity of views. Stakeholder involvement allows to reflect on these different inputs, which improves the information base for decisions. Broad participation may also compensate, to some degree, for the unavoidable absence of future generations in today's reflections or negotiations.

There are many possible levels of stakeholder involvement, ranging from the simple provision of information to consultation, active participation, and shared decision authority (NEA, 2003d). A number of tools and techniques have been developed and applied for facilitating stakeholder involvement. As well, there have been several attempts to develop guidelines for facilitating the choice of adequate stakeholder dialogue tools/techniques for various types of decisions, in a variety of settings (NEA, 2004d). Proposed selection criteria include the purpose of public involvement (information, consultation, participation); the level of the decision (local, regional, national, cross-national); the phase of the decision-making process (problem definition, identification of alternative solutions, evaluation of consequences, choice of a preferred solution); the number of stakeholders (individuals, groups, organisations) to be involved; the probable level of controversy; the cultural, ethnic, social, and educational background, the motivation and the competence of the stakeholders [Vergez and Vári in (NEA, 2003b)].

- Belgian local partnerships apply a variety of tools. The working group format is adequate for discussions and joint decision making within well-informed and highly motivated groups of members. On the other hand, for the broader community different information and consultation tools are used. For example, in Mol an information counter, a newsletter, and a website were established, a calendar was issued, and a game was played [Vanhoof in (NEA, 2004a)].
- An innovative arrangement to promote stakeholder involvement in site selection has been prescribed by the 2002 amendments of the Atomic Energy Act of Germany. A Working Group on the Selection Procedure of the Final Repository (AkEnd) was established, which has defined site selection criteria and a procedure for involving the public (AkEnd, 2002).

Setting clear aims and objectives

Clear aims and objectives will aid in planning a dialogue process, and can be used to evaluate it. The participants in a dialogue may have different

views about its goals and so the planning and evaluation should involve these persons in order to come to a shared understanding of what the dialogue process is trying to achieve.

Good practice has highlighted the need to set clear aims and objectives for stakeholder dialogue and use these to help to design the process itself. It may be useful to develop the aims of the dialogue process and the criteria for evaluating it with the people who will be participating in it. This can help build a shared understanding of what the dialogue process is trying to achieve. Evaluation criteria can be developed from the aims of the dialogue process itself and used to determine whether the process achieved its original aims. This in turn can be used to identify lessons that can be learned and ways in which improvements can be made to the design of the dialogue processes [Atherton in (NEA, 2003b)].

- Evaluation may bear on the utility, feasibility, and perceived legitimacy of a participatory approach and should also address legal and ethical questions on the property and use of information gained. Evaluation criteria can relate to pragmatic issues (how the dialogue meetings were organised, how they unfolded) or address the outcomes of the dialogue process (what decisions were made about policy or practice, what actual changes occurred). Possible evaluation criteria may include: transparency, legitimacy, equality of access, ability to speak, deliberative environment, openness of framing, generation of new meanings; inclusive knowledge elicited; acceptable/useable outcomes; improved trust and understanding; development of sense of shared responsibility (NEA, 2003b).
- The OECD Public Management programme (PUMA) has developed 10 guiding principles for engaging citizens in policy making to avoid disappointment and frustration on the part of both government and the public. These ten principles are: commitment, rights, clarity, time, objectivity, resources, co-ordination, accountability, evaluation, active citizenship. It was proposed that the evaluation criteria be based on the above principles [Caddy in (NEA, 2000)].

Achieving a balance between fair representation and competent participation

There is an inherent conflict between the requirements of fair representation and competent participation. A balanced process has to be developed between one extreme where all technical choices are made by experts and another extreme where everything is open and can be changed by the national or local community.

In a fair decision-making process, affected individuals are involved from the very early stages, when the agenda and the rules of the process are being defined. They also participate in defining the sequences and stages of various decisions, criteria and schemes for evaluating options and choosing the most preferred one(s) (NEA, 2000).

There is an inherent conflict between the requirements of fair representation, i.e. equal opportunity to participate and influence both processes and outcomes for anyone who feels potentially affected, and competent participation, i.e. construction of the most valid understandings and agreements possible [Webler in (NEA, 2004a)]. A balanced process has to be developed between one extreme where all technical choices are made by experts and another extreme where everything is open and can be changed by the national or local community [De Preter in (NEA, 2004a)].

- Belgian local partnerships strive to create a balance between the requirements of competence and fairness. On account of problems that are highly demanding in terms of competence in technical matters (e.g. selection of a technical concept, safety assessment, site selection), local partnerships are compelled to make compromises regarding process fairness. For example, this might be one reason for the current gender imbalance within the partnership groups and for involving a large, but yet still limited number of local stakeholders. At the same time, effort is being made to carry on a dialogue with the broader community. Process fairness – and also the legitimacy of decisions – is enhanced by plans that strive to measure acceptance through public opinion polls and/or local referenda and to base municipal government decisions on the acceptance by the broader public. The question of how and when to include in the decision-making process stakeholders from outside the host communities (e.g. neighbouring communities, transit communities) is also related to the problem of process fairness [Webler in (NEA, 2004a)].
- The Canadian Environmental Assessment Panel on Nuclear Fuel Waste (NFW) Management and Disposal Concept spelled out the criteria it believed would justify a judgement of “broad public support” and “required level of social acceptability” associated with a nuclear fuel waste management concept. These highlighted knowledge issues and information needs. Namely: the Canadian public must be well informed if it is to make decisions about the long-term management of NFW; there must be a sustained two-way information flow between the implementer and the public; the public must be aware of, and have participated in, developing the decision-making process; the public must know the key points at which safety

and acceptability are assessed, who makes the decisions, how disputes are resolved and how the needs of significant minorities are to be addressed [Summary in (NEA, 2003a)].

An obstacle to achieving fair representation is that the public may have demands, but at the same time, people are not always willing or able to devote the time and effort that true involvement would entail. Very strong motivation is needed to participate in a complex deliberation process that includes learning about, and analysing, a wide range of technical and non-technical issues, as well as gradually working out solutions or plans that are acceptable to all parties. Accomplishing such participation is an even more significant effort when it is a “spare time”, unpaid occupation [Vári and Secretariat in (NEA, 2003b)].

It has been observed that the persons who attend all consultation meetings tend to be the ones who feel most deeply concerned for the future of their community. Involving the “silent majority” is one of the key challenges for the designers of dialogue processes. The FSC community views that, in order to increase both competence and fairness of participation, some financing should be provided for citizens and civil society organisations to increase their capacity to take part in consultation processes (NEA, 2003b).

EIA as a tool for stakeholder involvement

In many countries EIA requirements for stakeholder involvement provide the opportunity to make significant advances in addressing a wide range of concerns.

It is observed that in many countries the EIA framework will be used increasingly as the primary tool for stakeholder involvement (NEA, 2000). The main strength of EIA is that it has been institutionalised in most industrialised countries and gives certain consultation rights to stakeholders.

- The success of EIA is demonstrated by looking to the non-nuclear area where has been wide use made of this instrument. Indeed, the strength of EIA is that it is not a one-off instrument just for radioactive waste management but a general and “umbrella” procedure for all projects having impact on people and the environment.

There should be awareness, however, that there are reported difficulties in the application of the EIA as a stakeholder involvement framework. These difficulties are related, in part, to the fact that EIA is seen by some stakeholders as a too highly formalised and complex process.

- In Finland the ample, timely provision of good quality and transparent information, along with public meetings in the EIA context, were perceived as good vectors for communication with the industry and good bases for local representatives to understand the decisions at hand. There was, however, limited public input of a formal written nature to the EIA, and participation decreased over time. This may partly be due to the inherent conflict between the procedures of EIA, which were perceived by several local stakeholders as strongly formalised and rational, and the needs of the affected public. Other reasons include a lack of participatory tradition (emphasis and reliance on representative democracy), lack of familiarity with the complex EIA instrument and the opportunities offered, lack of confidence that individual participation in EIA would effectively influence the decisions, exhaustion of local or opposing stakeholders, and the lack of resources to support their efforts, including funds for counter-expertise (NEA, 2002).

In principle an EIA would be centred mostly on physical impacts on the environment, yet this mechanism is also used as a vehicle for identifying and addressing societal concerns and impacts. Because technological and safety questions have a societal component, there may be a need – in specific circumstances – to adapt legislation or create other, targeted opportunities for societal impact assessment (NEA, 2002).

- In Finland, local opponents of the spent nuclear fuel (SNF) disposal facility voiced their concerns about the image of the host community, the stigma effect, and adverse impacts on the market of local agricultural products. In response to the public concerns identified during the scoping phase of EIA, social impact assessment studies were conducted, and a very extensive programme of research was created. Along with public information materials developed in the assessment phase of EIA, the SIA performed by Posiva showed sensitivity to the difference between expert risk definitions and public or societal risk perceptions (NEA, 2002).
- The most recent European Council Directive on the EIA requires that both direct and indirect effects on human beings be included (EC, 1997).

EIA creates a significant opportunity for *analysing local impacts*. However, key radioactive waste management questions are national: the decision at stake is to determine the interest of society at large (NEA, 2002).

- In Finland, the EIA process was also used as a forum to express opinions on energy policy or on the radioactive waste management decision-making processes overall, which suggests that deliberative fora for such questions had not been foreseen or utilised sufficiently in advance. In the same light, some stakeholders requested that the EIA provide the opportunity to evaluate a larger set of options for SNF management, rather than one selected method vs. the zero-option. Some stakeholders also felt that the impact assessment by its nature limited the scope of concern, and this should have been balanced by a larger consultation (NEA, 2002).

FSC delegates view that EIA processes should be preceded by a national strategy on radioactive waste management, which must be developed through broad consultation with the public.

- In the US the strategic outlook can be obtained through the preparation of a Generic Environmental Impact Statement. In the European Union, a directive on Strategic Environmental Assessment is about to enter into force.

On the local dimension of radioactive waste management

Long-term radioactive waste management involves the construction of only a limited number of facilities and it is therefore a national problem with a strong local dimension. Typically, it is only once a facility is located, or investigations are carried out, at a specific site that the greatest attrition manifests itself between national imperatives and local desires. Moving from the national to the local dimension requires the pre-existence of a decision-making-process that is widely supported, and is adhered to, by all actors. The informing principles of this decision-making process should take into account that safety is the paramount criterion for the local acceptability of a facility and that participation in decision making and oversight as well as the provision of community development schemes are further contributors to trust in the process and to acceptability of the facility.

Achieving a combination of licensable site and management concept with host community support

The goal of the selection process for a site and management concept for any waste stream ought to be the identification of a safe and licensable site and

a safe and licensable waste management concept that enjoy host community support.

For site selection the FSC delegates recommend a stepwise process combining procedures to exclude sites that would not meet technical licensing criteria with procedures to identify sites where residents are willing to accept the facility. Regarding the selection of the management concept, it is observed that, in most efficient processes, developers first select concepts applicable to broad siting characteristics and then remain open to modifications by taking the preferences of potential host communities and site specific characteristics into consideration (NEA, 2004b).

- The recent Belgian approach is aimed at identifying a technical design and a repository site where technical requirements are but one element in the deliberations that precede decision making. Other elements include socio-economic circumstances, interests, and values of the host communities. A key feature of the methodology is that local partnerships are entitled to identify details of the technical design and the location of the site [International Perspective in (NEA, 2004a)].

Local communities analyse the decision to host using both economic and social criteria. Local support depends primarily on *the balance of anticipated positive and negative impacts*: a net benefit to be gained from hosting, in comparison to current community status, must be perceived. *Perceived fairness* of the decision is also a key factor of support. This is achieved not only by economic arrangements, but moreover by the ability of the host community to influence the project [Summary in (NEA, 2003a)].

- In Finland, the municipality of Eurajoki performed a “SWOT”² analysis and discussed a number of future scenarios for community development. Based on the review of a number of economic and environmental criteria, a strategy was chosen which included a spent fuel repository. In this strategy, financial compensation was not regarded as legitimate or needed. The arrangement found in which the implementer renovates a historical building for its offices, and rent on this building then funds a new retirement care centre, appears less as a compensation but more as mechanism for local partnership and community ownership (NEA, 2002).
- Similarly, the Legal Agreement signed at Port Hope brings confidence by creating an enduring multi-partite relationship and

2. Strengths – Weaknesses – Opportunities – Threats.

shared responsibility. This is judged more important than the financial benefits accrued to the community through the same Agreement [Summary in (NEA, 2003a)].

Nuclear host communities

Local communities who find themselves the de facto hosts of radioactive wastes (problem owners) often become active players (problem solvers) in radioactive waste management processes.

Nuclear host communities – where the waste is stored already in a semi-permanent way or where waste is being produced – tend to be the communities most interested in having a permanent, safe solution brought to bear. They also have a level of familiarity with the nuclear industry, knowledge of the dangers and control of radioactivity, as well as an interest for continued partnership with industry and government with a view to long-term community development. A dialogue can develop more easily with these communities than with non-nuclear communities, and experience world-wide shows that it is with nuclear host communities that progress in facility siting has been made quickest [International Perspective in (NEA, 2003a)].

- This trend was recognised by the Belgian government in 1998 when it restricted potential sites for a LLW repository to the four existing nuclear sites (Doel, Fleurus, Mol-Dessel and Tihange) and other possibly interested localities. Communities around two of the four nuclear sites (Fleurus, Farcienne, Mol, and Dessel) volunteered to form local partnerships to investigate the development of a LLW repository. This may be attributed to a number of factors, including their familiarity with nuclear technologies, the economic significance of nuclear activities, and the expected socio-economic benefits (NEA, 2004a).
- Similarly, in Finland a nuclear host community, – Eurajoki, which is already hosting a nuclear power plant and a low and intermediate level waste disposal facility – was chosen for hosting the SNF repository. In Eurajoki a remarkably positive attitude towards the facility can be observed. Familiarity in the community with the excellent operating record of the nuclear industry is a strong basis for confidence in future undertakings. Socio-economic benefits and the presence of local liaison (monitoring) committees with long-established and satisfactory dialogue with the nuclear power plant

may also contribute to the relatively high local support [Vári in (NEA, 2002)].

- Port Hope (Canada) was the de facto host for uranium-refining legacy wastes. When the federal effort to find an outside host community failed, elected officers of Port Hope felt it was important to “just get on with it and clean it up” and deal with a 20-year stigma issue. The municipality had to become a problem solver. They chose to form working groups, building relationships with the refinery owner-operator and with federal ministries, and attempting to interest and consult local residents. Mainly, the residents agreed that the municipality should resolve the problem [Summary in (NEA, 2003a)].
- The Canadian Association for Nuclear Host Communities (CANHC) was created in recognition of the need for nuclear host communities to come together to engage not only the nuclear industry, but provincial and federal government as well in a public dialogue. It will champion host community needs [Summary in (NEA, 2003a)].

Compensation, local control and development opportunities

It is now an important acquired principle in radioactive waste management world-wide to accompany siting efforts with sound local and regional development schemes taking into account the views of the affected communities. Enhanced oversight by local authorities, fully visible to stakeholders, builds public confidence in the decision-making process.

- Examples of oversight schemes on the part of local communities and regions are seen for instance in France [Piguet in (NEA, 2004e)] and Sweden [Carlsson in (NEA, 2000)], amongst others.

It is necessary to find a management solution that not only reduces unwanted impacts but also lets the community grow as it sees fit. FSC delegates acknowledge that local support is facilitated if a compensation and incentive package is negotiated with the host community and their concerns and needs are taken into consideration.

Open communication is needed for communities to be able to analyse a situation properly and make valid decisions about what they are getting and what they are willing to trade. If they come too early in a decision process, discussions about economic arrangements may affect the credibility of

assertions about safety, environmental and even economic impacts. If an agreement is reached, a sound, accountable infrastructure should be set up under the control of a neutral party to administer funding and compensation [Summary in (NEA, 2003a)]. “Safety – Participation – Local Development” are the three main pillars of trust, in the words of local communities [Vila in (NEA, 2004c)].

- Financial assistance is provided to states in the US, and to local communities in France and Sweden, amongst others.
- The Property Value Protection Programme in Port Hope addresses an important dimension of compensation. This programme and fund respond to a primary concern voiced by communities and individual residents. A data base of comparable properties in non-host communities is maintained, such that any loss to owners at the time of sale that can be attributed to the presence of the waste facility will be compensated. Residents who walk into the office have stated that the presence of this programme does contribute to their confidence in the waste management initiative [Summary in (NEA, 2003a)].

It is important that the target geographic region for compensation should not be drawn too narrowly, so as to ensure that neighbouring communities, who may have legitimate rights, are not excluded from consideration (NEA, 2004b). Ideally, the siting process is integrated in a local/regional development process, preferably in such a way that the repository project itself serves as a tool for development [Ipsen in (NEA, 2000; 2004a); Mormont in (NEA, 2004a)].

- When choosing the long-term above-ground waste management option, Port Hope emphasised the demonstration of safety, along with the added value of a positive tourist image. The waste management area had to be fully compatible with future recreational use: “If citizens can walk and play there, it shows everyone it is safe”, and the recreation space becomes a community asset. In contrast, nearby Clarington had the goal of not moving or disturbing the deposited wastes. They preferred the option of a monitored in-situ stabilization of the wastes in combination with a small above-ground storage facility [Summary in (NEA, 2003a)].
- In Belgium it is an important element of the support that host communities themselves elaborated proposals on local development projects. The proposals show great variety and are adjusted to the special needs and character of the communities. For example, in Fleurus, which struggles with the problems of widespread

unemployment, the aim is to invigorate the community. On the other hand, in Dessel, a nuclear industry centre, people asked for assistance in establishing a community centre that would show the public what nuclear research and production is about [International Perspective in (NEA, 2004a)].

- In addition to the Port Hope Initiative and the Belgian local partnership communities, the AkEnd siting process recommendations in Germany and the siting programme undertaken by NUMO in Japan are two other examples of integrating the siting process in local development plans [Summary in (NEA, 2003a)].

Community veto right

A voluntary process in which the consent of host communities is sought from the outset of siting and communities are allowed to withdraw from consideration within a certain period or under certain circumstances, improves the chances for local support.

It is recognised that granting a veto right, even on an informal basis, to host communities is an important factor of local support. The explicit consent of the residents needs to be sought, by the appropriate means, e.g. through a local referendum or a vote of the community's elected representatives.

Site selection can be bottom-up or top-down in authorisation. In the first case, the host community has to express its consent to siting before the national government approves the decision. In other cases, the national government has first to approve the potential site(s) and the local community(ies) decide at the end to accept or not to accept the facility.

- In Finland, a formal right to veto was provided for the potential host communities during the site selection process. The municipality is recognised as a major stakeholder and its veto right is a very important element of perceived fairness. In the Finnish process, local government representatives had to say Yes to siting before the national level (DiP³ and its ratification by Parliament) took over to evaluate and enshrine the decision (NEA, 2002). In Sweden, in contrast, Government had to give the impulse and the local community will vote at the end of the siting process.

3. Decision in Principle.

- The Port Hope experience confirms that community veto power, even informal, helps win local players to the dialogue. One means of guaranteeing a negotiated solution is the signature, as in Port Hope, of a Legal Agreement between host communities and central government. It is a contractual guarantee of the municipalities' requirements and objectives, and they draw confidence from their ability to withdraw from the process if these are not honoured. In addition, the EIA is regarded with confidence as the opportunity to address any remaining technical questions and social impacts perhaps not covered in the Legal Agreement. As the project design evolves through the EIA process, if significant impacts heretofore unidentified become apparent, this could influence the municipalities' choice of a preferred option for waste management. If the regulatory authorities, through their environmental review, change that preferred option to a different one not consented to by the municipalities, under the Legal Agreement they may veto the project from proceeding [Summary in (NEA, 2003a)].
- Since Belgian law does not contain any provision on a community right to veto, municipal governments are not formally guaranteed this right. The local partnership model works merely on the basis of a "gentlemen's agreement", assuming that communities can withdraw from the process at any time. It was observed that even this legally non-binding arrangement has been instrumental in increasing local support [Hooft in (NEA, 2004a)].

Forming relationships between communities and the waste management facility

The building of a long-term relationship between the local communities and the waste management facility is one of the most important contributors to sustainable radioactive waste management. Building of such relationships can be facilitated by designing and implementing facilities in ways that reflect the values and interests of local communities.

Due to the exceptionally long time frames that are involved, three key dimensions for a viable solution to the radioactive waste management problem are seen as paramount. First, scientific knowledge and technical competency should be maintained and developed to measure and control the present and eventual exposure of affected populations to radioactivity. Second, a relationship between the communities and the waste management facility should be envisaged and built up. Third, relevant knowledge and resources

should be mobilised for the implementation of an agreed societal solution to the management and monitoring of the wastes [O'Connor in (NEA, 2003a)].

The second of the above components, the relationship between communities and waste management facilities has been the least explored one. FSC delegates agree that building such relationships can be facilitated by *designing and implementing facilities in ways that reflect the values and interests of local communities*. For example, while engineering projects tend to be conceived as being mono-functional (e.g. dispose of waste), *building flexibility into the project* to reflect the interests of the local stakeholders can measurably improve stakeholder satisfaction. What the implementer may see as a single purpose project may indeed provide additional, desirable capabilities to a creative local population. Also, waste management projects are often designed and built in uninteresting, utilitarian ways. A more creative design and implementation can add a *sense of enjoyment and pride* to the local stakeholders. Finally, while engineering projects are often conducted in a closed manner to their environment, a *more transparent, inclusive process* may draw local stakeholders more intimately into the project [Van Hove in (NEA, 2004a)].

- In Port Hope (Canada) the solution found for handling historic wastes grew out of the relationship that the community was willing to establish with those wastes. Long-term radioactive waste management will depend on establishing many such relationships between communities and waste. Waste management strategies may differ considerably as regards the relationships (in social, economic, cultural and symbolic terms) that they establish between the people – individuals, localities, classes, interest groups, succeeding generations, whole nations – implicated in the situations of production, storage and monitoring of the wastes. Choosing solutions will imply examining which relationships are wanted [Summary and O'Connor in (NEA, 2003a)].

3. CONCLUSIONS

Radioactive waste exists as a result of both past and current practices. In nuclear countries it arises mostly from the production of energy by nuclear power and, in a subset of nuclear countries, from defence activities. In nuclear and non-nuclear countries radioactive waste arises from medical and research applications, as well as from industrial applications of radioactive materials. Thus, most countries possess some amounts of radioactive wastes and must manage them safely by isolating them from the human environment for hundreds to thousands, or even hundreds of thousands, of years. Similar challenges are found in the management of other wastes that are not radioactive but are also hazardous and never, or only slowly, change their nature.

Although significant technical progress has been made in developing management schemes that, according to the technical experts, would ensure long-term safety, e.g. engineered geologic disposal, the rate of progress towards implementing such solutions has been slower than expected. The contrast in expected and observed rates may be partly attributable to an earlier technical optimism. More significant, however, are the setbacks, which have arisen mainly from an underestimation of the societal and political dimensions. The environment for decision making has been changing in a significant way in society, and large-scale technology projects are rejected, in general, when stakeholders have not been actively involved in creating them or developed a sense of responsibility for them. A trend can be seen in OECD countries towards implementing forms of participatory democracy that require new or enhanced dialogue amongst all concerned parties. Dialogue and stakeholder involvement have thus become a central part of the waste management process.

The new dynamic of dialogue and decision making is characterised as a shift from the traditional “decide, announce and defend” model, for which the focus was almost exclusively on technical content, to one of “engage, interact and co-operate”, for which both technical content and quality of process are of comparable importance to a constructive outcome. In this context, the technical side of waste management is no longer of unique importance; organisational ability to learn, to communicate and to adapt now moves into the foreground. Institutions must be able to accommodate these changes in order to carry out the long-term projects for which they are responsible. Institutions capable of

achieving and maintaining stakeholder confidence will need focused efforts in the three main areas of organisational aspects, mission, and behaviour. Trust and fairness issues will play an important role all along the decision-making process.

Practitioners acknowledge that their roles have evolved in response to a change in the definition of the problem of radioactive waste management (see Appendix). In particular, as dialogue and stakeholder involvement has become a central part of the waste management process, scientists are having to address new questions raised by the general public, implementers are engaging in early, pro-active dialogue and regulators are becoming involved in the waste management process far earlier than before. Indeed, regulators have come to see their role increasingly as “safety communicators” and “peoples’ experts” and recognise they need to be involved in that role from the start of consultations with local communities, before final decisions on facilities, sites, and concepts are rendered (NEA, 2003c). Policy specialists are also exploring new forms of dialogue with a wider range of stakeholders. There is broad acknowledgement that there needs to be clarity of roles for the institutional actors as well as visibility.

Decision processes are expected to meet a number of competing requirements: they need to be participatory and accountable, goal-centred and adaptable. Competing requirements should be balanced by combining various policy tools, formal and informal procedures, analytic and deliberative techniques, linear and reversible steps, and their balance should be compatible with the type and context of the decisions.

Three overarching principles are the essential elements of any decision making seeking broad societal support:

- *Decision making should be performed through iterative processes, providing the flexibility to adapt to contextual changes, e.g. by implementing a stepwise approach that provides sufficient time for developing a competent and fair discourse.*
- *Social learning should be facilitated, e.g. by promoting interactions between various stakeholders and experts.*
- *Public involvement in decision-making processes should be facilitated, e.g. by promoting constructive and high-quality communication between individuals with different knowledge, beliefs, interests, values, and worldviews.*

The aims are to ensure or augment familiarity and influence by the stakeholders, trust and confidence in the institutional actors, and legitimacy and supportability of the decisions.

Within those principles, a hierarchy of objectives should be considered when a modern radioactive waste management programme is implemented. Namely, the waste management programme should be founded first upon a recognition by the national government that the status quo is no longer acceptable and an important problem needs to be solved implying, for instance, a need for a new policy or new facilities. The link between current waste management policy and the future of nuclear energy should be openly addressed. There should be support and commitment to that policy, e.g. roles and responsibilities should be clearly defined. Identification of a safe and licensable site and a safe and licensable waste management concept that enjoy host community support should then follow. To this effect, siting efforts should allow for consideration of local and regional development schemes taking into account the needs and views of the affected communities. Finally, the radioactive waste management facilities should be designed and implemented in ways that reflect the values and interests of local communities. According to the latter, “Safety – Participation – Local Development” are the main pillars of trust.

REFERENCES

AkEnd, (2002), *Selection proceedings for Repository Sites, AkEnd*. Available from Bundesamt für Strahlenschutz, Salzgitter, Germany, (email: info@bfs.de).

Andra, (2002), “*Pour une éthique des relations de l’Andra avec ses publics – Charte des relations de l’Andra avec ses publics*”, Agence Nationale pour les Déchets Radioactifs (Andra), September 2002.

EC, (1997), Article 3 of Council Directive 97/11/EC of 3 March 1997 *amending Directive 85/337EEC of 27 June 1985*, European Council Official Journal L 073, 14/03/1997 P. 0005 – 0015, (online at: http://europa.eu.int/comm/energy/nuclear/legislation/community_en.htm).

EC, (2000), *The TRUSTNET Framework: A New Perspective on Risk Governance*. Project Report, Nuclear Science and Technology, No. FI4P-CT96-0063, European Commission, Brussels.

EC, (2002), “*Europeans and Radioactive Waste*”. Eurobarometer 56.2, April 2002. European Commission, Brussels, (online at: http://europa.eu.int/comm/energy/nuclear/publications/doc/eb56_radwaste_en.pdf).

NEA, (1993), *Public Participation in Nuclear Decision Making – Participation du Public aux Décisions Nucléaires*, Proceedings of an International Workshop, Paris, France, 4-6 March 1992, OECD, Paris.

NEA, (1995), *The Environmental and Ethical Basis of Geological Disposal: A Collective Opinion of the NEA Radioactive Waste Management Committee*. OECD, Paris.

NEA, (1996), *Informing the Public about Radioactive Waste Management – Informer le Public sur la Gestion des Déchets Radioactifs*, Proceedings of an NEA International Seminar, 13-15 June 1995, OECD, Paris.

NEA, (1999a), *Geological Disposal of Radioactive Waste: Review of Developments in the Last Decade*. OECD, Paris, [see also the shorter brochure (NEA, 1999b)].

NEA, (1999b), *Progress Towards Geologic Disposal of Radioactive Waste: Where Do We Stand?*, OECD, Paris, (online at: www.nea.fr/html/rwm/reports/1999/progress.pdf).

NEA, (2000), *Stakeholder Confidence and Radioactive Waste Disposal*. Workshop Proceedings, Paris, France, 28-31 August 2000, OECD, Paris.

NEA, (2001), *Strategic Directions of the Forum on Stakeholder Confidence*, NEA\RWM\FSC(2001)2/REV2, OECD, Paris, (online at: www.nea.fr/html/rwm/fsc.html).

NEA, (2002), *Stepwise Decision Making for the Disposal of Spent Nuclear Fuel in Finland*, Workshop Proceedings, Turku, Finland, 14-16 November 2001, OECD, Paris, (The Summary and International Perspective is available online at: www.nea.fr/html/rwm/fsc.html).

NEA, (2003a), *Public Confidence in the Management of Radioactive Waste: The Canadian Context*, Workshop Proceedings, Ottawa, Canada, 14-18 October 2002, OECD, Paris, (The Summary and International Perspective is available online at: www.nea.fr/html/rwm/fsc.html).

NEA, (2003b), *Stakeholder Involvement Tools: Criteria for choice and Evaluation*, Report NEA/RWM/FSC(2003)10, OECD, Paris, (online at: www.nea.fr/html/rwm/fsc.html).

NEA, (2003c), *The Evolving Image and Role of the Regulator in Decision Making for the Long-term Management of Radioactive Waste*, OECD, Paris.

NEA, (2003d), *Public Information, Consultation, and Involvement in Radioactive Waste Management: An International Overview of Approaches and Experiences*. OECD, Paris.

NEA, (2004a), *Dealing with Interests, Values and knowledge in Managing Risk*. Workshop Proceedings, Brussels, Belgium, 18-21 November 2003, OECD, Paris, (The Summary and International Perspective is available online at: www.nea.fr/html/rwm/fsc.html).

NEA, (2004b), *Stepwise Approach to Decision Making for Long-term Radioactive Waste Management: Experience, Issues and Guiding Principles*, OECD, Paris.

NEA, (2004c), *Strategy Selection for the Decommissioning of Nuclear Facilities*, Seminar Proceedings, Spain, 1-4 September 2003, OECD, Paris, (The Summary and International Perspective is available online at: www.nea.fr/html/rwm/wpdd/tarragona/index.html).

NEA, (2004d), *Stakeholder Involvement Techniques – Short guide and annotated bibliography*, OECD, Paris.

NEA, (2004e), *Addressing Issues Raised by Stakeholders: Impacts on Process, Content, and Behaviour in Waste Management Organisations*, NEA/RWM/FSC(2004)8, Proceedings of a Topical Session, OECD, Paris, (online at: www.nea.fr/html/rwm/fsc.html).

OECD, (2001a), *Citizens as Partners: Information, Consultation and Public Participation in Policy-making*, (online at: www1.oecd.org/publications/e-book/4201131E.PDF).

OECD, (2001b), *Citizens as Partners: OECD Handbook on Information, Consultation and Public Participation in Policy-making*, (online at: www1.oecd.org/publications/e-book/4201141E.PDF).

OECD, (2003), *Open Government: Fostering Dialogue with Civil Society*, (online at: www1.oecd.org/publications/e-book/4203011E.PDF).

OECD, (2004), *Problems and Promise of E-Democracy: Challenges of Online Citizen Engagement*, (online at: www1.oecd.org/publications/e-book/4204011E.PDF).

Nirex, (2004), *Nirex Transparency Policy*, United Kingdom Nirex Limited, (online at: www.nirex.co.uk).

NWMO, (2004), *Report on Discussion with Senior Environmental and Sustainable Development Executives – Discussion Summary*, Authors: Carole Burnham Consulting and Robert J. Readhead Limited, January 2004, (online at: www.nwmo.ca).

FURTHER READING

The FSC documentation is described or available through the FSC web site www.nea.fr/html/rwm/fsc.html.

Understanding Risk: Informing Decisions in a Democratic Society, National Research Council, National Academy Press, Washington, DC (1996).

Disposition of High-level Waste and Spent Nuclear Fuel: The Continuing Societal and Technical Challenges, National Research Council, National Academy Press, Washington, DC (2001).

One Step at a Time: The Staged Development of Geologic Repositories for High-Level Radioactive Waste, National Research Council, National Academy Press, Washington, DC (2003).

Considering Reversibility and Retrievability in Geologic Disposal of Radioactive Waste, OECD/NEA, Paris (2001).

Society and Nuclear Energy: Towards a Better Understanding, OECD/NEA, Paris (2002).

Transparency and Public Participation in Radioactive Waste Management, RISCOM II Final Report, Report SKI 2004: 08, SKI, Stockholm, October 2003, (available through: www.ski.se).

Nuclear Waste Management from a Local Perspective: Reflections for a Better Governance, COWAM 2000/2003 Final Report, November 2003, (www.cowam.com/documents/cowam-fr2003.pdf).

Appendix

THE COLLECTIVE EXPERIENCE OF THE FSC

The (FSC) completed its first 4-year mandate and is now entering Phase 2. In this context, FSC members were asked (February 2004) to evaluate Phase 1 on the expectations and aims originally given in the FSC Strategic Document. As well, they were asked to outline how the FSC experience has affected their work and perhaps provided opportunities for self-improvement. The views that were expressed are reflected herein.

Impacts on members' practice: Self-improvement

Almost every member described at length how the FSC has been an excellent opportunity for self-improvement. The FSC provides tangible support for persons who engage with stakeholders in the radioactive waste management area. It also provides moral support for those fostering inclusiveness in radioactive waste management decision making, even when their home institution or home programme may not yet be geared to integrating stakeholder input.

FSC networking and exchange, and the involvement and input from “non-technical” players including social scientists, have increased members’ learning. Their vocabulary has grown, and they have mastered new concepts. Participants state that they have changed their outlook and opened their minds. They have dialogued with people they never would have met, and thought about issues they may never have encountered. They have gained better understanding of their own specific role, and of the needs of other stakeholders.

Some members report that the FSC has influenced their personal “code of conduct”. Their interaction with stakeholders is different, becoming more “friendly”. Through workshops in particular, they have realised that frequent, sincere and two-way communication with the full range of stakeholders is ultimately the way to identify the best overall radioactive waste management solution for a given community.

Some are more comfortable today exploring the profound ethical issues surrounding the relations between technology and society.

Members have learned to express technical information in a more simple, accessible way (and desire more training in this area). They have achieved more explicit understanding of basic communication principles (like openness, transparency, availability). They are willing to be “stretched” or challenged by stakeholders, and look for ways to integrate societal concerns into their organisation’s technical work.

Members actively disseminate information and documents within their organisation and outside. They discuss FSC learning with their colleagues and contribute to outreach, lobbying other members of their organisation to become sensitive to stakeholder needs and providing tools and suggestions. Members elaborate and improve their organisation’s communication plan using concepts and examples gathered from the FSC. Their personal credibility has increased, and their stakeholder engagement work has gained visibility.

First-hand, in-depth learning about another country’s experience has helped many participants gain perspective on their own national situation. They can better assess the societal values found in different contexts.

Participants clarify their dialogues with specific examples drawn from FSC work. They bring insight about procedures to their discussions with authorities. They bring useful information about potential impacts to their discussions with local and regional stakeholders.

The very fact that an international organisation takes stakeholder participation seriously, and documents this work, represents valuable support to all national players. Access to state-of-the-art learning and international best practice strengthens the position of each one in the national debate.

Impacts on organisations: Competence and credibility

Xxx FSC work supplies comprehensive international information used by member organisations’ management boards. FSC influence can be seen in strategic plans. FSC experience supplies insight for analysing national programme events including failures. Guidelines for improving future procedures or practice are developed with FSC input. Policy organisations may in future apply FSC learning to the formulation of new policy.

According to participants, access to international best practice improves the credibility of member organisations as information sources in their own country. Participation in the FSC lends prestige and credibility to proposals for dialogue with stakeholder groups.

Workshops have allowed host organisations to tighten bonds with (and between) stakeholder groups and have created common references. The visibility and credibility of host organisations have been reinforced. More stakeholders are now invited to institutional meetings or seminars.

Participation in the FSC allows individuals to become more competent in skills needed within their organisations. FSC members are regarded as experts or “gateways” to stakeholder confidence learning. They are asked to meet and discuss outreach activities with foreign visitors.

FSC findings and insight have been shared in training programs. They have been applied in internal evaluation or policy advice actions. Many participants mention that their colleagues are becoming sensitised to involvement issues, resulting in increased stakeholder interaction overall. FSC member organisations are planning or implementing stakeholder engagement exercises.

FSC findings have supported and thereby strengthened outputs from organisations’ own dialogue programmes. Members’ recognised expertise in stakeholder affairs adds to their institution’s credibility beyond the technical domain. Some members use their knowledge in the role of expert consultant to foreign programmes. FSC participants are often asked to speak outside their organisation.

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