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Communication and Stakeholder Involvement in Radioactive Waste Disposal

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COMMUNICATION AND STAKEHOLDER INVOLVEMENT IN RADIOACTIVE WASTE DISPOSAL

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COMMUNICATION AND STAKEHOLDER INVOLVEMENT IN RADIOACTIVE WASTE DISPOSAL

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FOREWORD

The IAEA's statutory role is to "seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world". Among other functions, the IAEA is authorized to "foster the exchange of scientific and technical information on peaceful uses of atomic energy". One way this is achieved is through a range of technical publications including the IAEA Nuclear Energy Series.

The IAEA Nuclear Energy Series comprises publications designed to further the use of nuclear technologies in support of sustainable development, to advance nuclear science and technology, catalyse innovation and build capacity to support the existing and expanded use of nuclear power and nuclear science applications. The publications include information covering all policy, technological and management aspects of the definition and implementation of activities involving the peaceful use of nuclear technology.

The IAEA safety standards establish fundamental principles, requirements and recommendations to ensure nuclear safety and serve as a global reference for protecting people and the environment from harmful effects of ionizing radiation.

When IAEA Nuclear Energy Series publications address safety, it is ensured that the IAEA safety standards are referred to as the current boundary conditions for the application of nuclear technology.

Radioactive materials are widely used for many purposes in medicine, research, agriculture and industry, as well as for generating electricity using nuclear energy. The management of the radioactive waste generated through activities in these areas is often perceived as a challenge. In particular, implementing disposal as the final step in a radioactive waste management programme remains one of the major challenges that many Member States need to address.

Experience around the world suggests that the scientific and technological bases for the safe and secure implementation of disposal are available — disposal solutions exist or can be developed based on established knowledge. However, continuing concerns and opposition among the public and other stakeholders have slowed or so far prevented the implementation of specific radioactive waste disposal programmes.

This publication is aimed at providing practical information on communication and stakeholder involvement associated with radioactive waste disposal for interested Member States, especially those embarking on, relaunching or revising a disposal programme. It also emphasizes that practical implementation requires adjusting to the evolving context as given by the national, social and political circumstances.

This publication draws on experiences in those Member States where communication and stakeholder involvement can be seen to have enabled significant progress towards repository development. In addition, references are also made to programmes where amendments are considered necessary following lack of progress due to difficulties in communication and stakeholder involvement.

The IAEA wishes to acknowledge the assistance of the experts listed at the end of this report, in particular P. Richardson (United Kingdom) and S.J. Robinson (United Kingdom). The IAEA officers responsible for this publication were A. Izumo and S. Mayer of the Division of Nuclear Fuel Cycle and Waste Technology.

EDITORIAL NOTE

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Guidance provided here, describing good practices, represents expert opinion but does not constitute recommendations made on the basis of a consensus of Member States.

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CONTENTS

1. INTRODUCTION

1.1. BACKGROUND

Radioactive materials are widely used for many purposes in medicine, research, agriculture and industry, as well as for generating electricity using nuclear energy. The management of radioactive waste generated through activities in these areas is often perceived as a challenge. In particular, implementing disposal as the final step in a radioactive waste management programme remains one of the major challenges that many Member States need to address.

Experience around the world suggests that the scientific and technological bases for the safe and secure implementation of disposal are available — disposal solutions exist or can be developed based on established knowledge. Disposal programmes have been effectively implemented for very low level (VLLW), low level (LLW) and intermediate level waste (ILW). While no geological disposal facility for high level waste (HLW) and/or spent nuclear fuel (SNF) is in operation today, several national programmes have advanced towards the implementation of geological disposal for HLW and SNF.

To initiate and develop a radioactive waste disposal programme, a Member State needs to establish legal and institutional frameworks and to ensure sustained political support, suitable funding and the provision of competent resources to carry out the responsibilities assigned to the organizations within the national framework. The Member State also needs to elicit and establish a clear, understandable and acceptable decision making process. Sound communication and stakeholder involvement are key components of such a process.

In some Member States, good progress has been achieved towards siting and implementing disposal facilities with the consent of the local community. In other Member States, and even in other disposal projects within a Member State where a different project has progressed, continuing concerns and opposition among the public have slowed or so far prevented the implementation of the specific radioactive waste disposal programme. Public understanding and acceptance of a consent based disposal programme's development and implementation need adequate information to be provided to the public at large on the associated programme as well as proper involvement of the relevant stakeholders in the different stages of its development and implementation. The strategy and methods to be used for communication and stakeholder involvement need to be established, taking due note of challenges and lessons learned in similar programmes around the world, and building upon the specific national, social, political and institutional situations.

Experience from recent IAEA training courses and workshops on communication and stakeholder involvement has demonstrated a clear need for more practical guidance on how to address these issues. This publication responds to this need by summarizing the learning from various meetings as well as experiences from Member States.

Practical guidance, however, cannot be understood or provided as a type of generic recipe — it is important to emphasize at the outset that there is no one-size-fits-all or standard approach. The specific social, political and institutional situations pertaining in a country will significantly drive the practical implementation of communication and stakeholder involvement. An understanding, however, of the key factors behind the progress, or lack of it, in implementing a disposal programme in some Member States may help others to develop, implement and review communication and stakeholder involvement approaches compatible with their own specific national, social and political circumstances. A brief review of key elements relevant to the national framework for communication and stakeholder involvement, in the context of a disposal programme, is provided in Sections 2 to 4.

There are several IAEA publications addressing socioeconomic aspects and public involvement issues, including those relating to the life cycle of nuclear facilities [1]. In addition, the Forum on

Stakeholder Confidence (FSC) of the Organisation for Economic Co-operation and Development's Nuclear Energy Agency (OECD/NEA), as well as several projects implemented by the European Commission (e.g. the Nuclear Energy Forum's Working Group for Transparency), have developed numerous collections of experiences and case studies in a range of national programmes. However, only a few of these [2–5] were intended to provide practical guidance on how to actually implement a communication and stakeholder involvement programme for a radioactive waste disposal programme. This publication complements other planned and existing IAEA Nuclear Energy Series publications covering the various stages of a radioactive waste disposal programme.

Significantly, this publication draws on experiences in those Member States where communication and stakeholder involvement can be seen to have enabled significant progress towards repository development. In addition, reference is also made to those Member States where programme amendments are considered necessary following lack of progress due to difficulties in communication and stakeholder involvement. These experiences are broadly grouped under the main issues and challenges commonly encountered during disposal development and implementation. Examples of good practices are then provided through the specific responses implemented in a given national programme to address a given situation relevant to communication and stakeholder involvement. These issues, challenges and responses provide a source of practical illustrations on how a communication and stakeholder involvement programme can be implemented within the broader national framework.

1.2. OBJECTIVES

The main objective of this publication is to provide practical guidance on communication and stakeholder involvement associated with radioactive waste disposal for interested Member States, especially those embarking on, re-launching or revising a disposal programme.

Recognizing the situational nature of communication and stakeholder involvement, and their need to be in phase with the specific national, social and political circumstances, such practical guidance is provided through two associated objectives. The first is to revisit the broad principles, responsibilities and phases widely recognized as providing a robust framework for communication and stakeholder involvement in a disposal development and implementation process. The second is to collect, analyse and group lessons learned from both progress made and difficulties encountered in national programmes, to illustrate how practical implementation could be designed in response to specific challenges.

1.3. SCOPE

The approaches outlined in this publication apply to repository development programmes associated with all types of radioactive waste, and so are relevant to both surface and underground facilities. The issues identified and the lessons presented are generally similar, given the common concerns expressed by the public in most Member States when confronted with matters relating to radioactive waste. However, the timescales over which these take place will vary, with the development of deep geological facilities for high activity and long lived waste tending to take many decades, as opposed to surface or near surface facilities for low level and short lived waste. This publication mainly discusses communication and stakeholder involvement during the pre-operational phase of repository development, but also makes some reference to the operational and post-closure phases.

It is also important to recognize that the content and nature of communication and stakeholder involvement programmes will be different depending on the stage of the repository development process concerned. For example, during the initial stages of a siting process, and before specific candidate sites have been identified, the target audience for a communication and stakeholder involvement programme will generally include communities and interested stakeholders at the national level. As the site selection process focuses on more specific locations, those involved and their concerns, will tend to be much

more local. It is important to build this expectation into developing the communication and stakeholder involvement programme.

Once a site has been identified that provides the required safety as demonstrated through production of a safety case, the licensing process and societal acceptability, the facility undergoes construction. At this stage the types of information to be communicated will change, as will the local involvement methods. During the operation and post-closure stages, these will change again, as the local community becomes more familiar with the facility and confident in its safety. That does not mean, however, that the commitment to communicate with and involve stakeholders will diminish. Indeed, as shown in a number of Member States, the desire by local stakeholders for involvement in facility governance can actually increase.

1.4. STRUCTURE

This publication has been designed in such a way as to allow the reader to gain insight into the principles underlying communication and stakeholder involvement in radioactive waste repository development and learn from the responses to the inevitable challenges that arise, using real experiences in Member States. Sections 2 to 4 provide an overview of the broad principles, responsibilities and phases widely recognized as providing a robust framework for communication and stakeholder involvement in a disposal development and implementation programme.

Section 2 introduces the concept of a stakeholder and outlines several overarching principles that have been identified as essential to the implementation of a communication and stakeholder involvement programme within a repository development programme, while recognizing that these do not necessarily ensure or guarantee a positive or intended outcome in every case. It introduces several common steps that experience suggests need to be followed and discusses a few different approaches that have been used to implement them.

Section 3 identifies the functions, roles and responsibilities of the various parties involved in a communication and stakeholder involvement programme associated with radioactive waste disposal, indicating the need for clarity in the degree of influence each has in the decision making process. This is essential in order to avoid misunderstandings and confusion.

Section 4 lays out the basic phases in a comprehensive communication and stakeholder involvement programme, incorporating the principles previously identified. This includes the legal and institutional framework and discusses the need for political support, provision of suitable funding and development of an acceptable, clear and understandable decision making process. It discusses the stages in the development of the programme, beginning with initial planning and moving forward to communication and negotiation with potential host communities during siting and beyond, including the operational and post-closure stages.

Section 5 provides a structured overview of lessons learned, both from progress made and difficulties encountered in national programmes. These illustrate how practical implementation could be designed in response to specific challenges. The lessons learned are based on practical experiences from within Member States' programmes, as described through a suite of IAEA technical meetings and workshops. These lessons are broadly grouped by the main issues and typical challenges commonly encountered during disposal development and implementation. Examples of good practices are then provided through specific responses to identified challenges, as implemented in a given national programme, by describing how the programme communicated and involved stakeholders in the given context and circumstances. These issues, challenges and responses provide sources of practical illustrations on how a communication and stakeholder involvement programme can be implemented within the broader national framework, at different stages in the pre-siting process, siting process and beyond.

The conclusions are provided in Section 6 and Appendices I–IV describe a few key points and lessons learned that are useful to consider when developing, implementing or reviewing a communication and stakeholder involvement programme associated with radioactive waste disposal.

1.5. USERS

This publication is intended to provide practical guidance on communication and stakeholder involvement to three different groups of Member States — always recognizing that practical implementation requires adjustment to the evolving context as given by the national, social and political circumstances:

— Member States embarking on radioactive waste storage and disposal programmes for the first time, to assist them in developing suitable communication and stakeholder involvement programmes while demonstrating the potential challenges that may arise and illustrating examples of how these might be addressed;
— Member States that already have an operational storage or disposal site (or one approaching its design or radiological capacity) and that may be looking to site a new or additional one;
— Member States that have experienced difficulties in implementing a repository siting process and wish to initiate or restart a communication and stakeholder involvement programme as part of a new or revised process.

The primary intended users of this publication include those in government, regulatory bodies or waste management organizations or those with responsibility for radioactive waste management who need to develop new or revised approaches regarding communication and stakeholder involvement.

The publication may also be of interest to government officials (national, regional and local), industry, trade and environmental organizations, and the general public interested in the societal and political aspects of a radioactive waste management programme, including disposal, as well as the local public in and around potential or selected repository locations.

2. OVERARCHING PRINCIPLES AND APPROACHES TO COMMUNICATION AND STAKEHOLDER INVOLVEMENT IN RADIOACTIVE WASTE DISPOSAL

2.1. INTRODUCTION

To set the scene for a practical discussion on how to address the many issues and respond to the variety of challenges likely to arise in communication and stakeholder involvement in radioactive waste disposal, it is at first necessary to provide a general framework guiding their implementation.

This starts with defining what or who is considered a stakeholder. The publication then reviews several basic principles, recognized as underlying effective communication and stakeholder involvement in nuclear activities and related decision making, which need to be borne in mind and incorporated in all activities [1]. Given the continuing difficulties in gaining public and societal acceptability for developing disposal facilities, these principles can be seen to be of paramount importance to the development of an effective process. Finally, the general framework introduces a few key process characteristics of developing and implementing disposal, namely, that the process needs to be implemented in a sequence of steps, in a spirit of cooperation rather than opposition with relevant stakeholders and integrating the entire breadth of aspects relevant to informing the basis for each decision.

2.2. STAKEHOLDER: A DEFINITION

It is important to recognize that the definition of 'stakeholder' used in a particular situation can influence how (and even if) suitable stakeholder involvement is carried out. A broad definition of a stakeholder is anyone who feels impacted by an activity, whether physically or emotionally [1]. This needs to be reassessed on a regular basis as the repository development process moves forward. Stakeholder populations will evolve and change over time in step with the changing issues in and around the involvement process. The essential key to identifying stakeholders is an understanding of the issues involved that define whether people hold an interest in or concern about them. This definition makes it difficult to identify all relevant stakeholders in particular circumstances as some stakeholders may be self-selecting and situational [1] and can include any organization, group or individual with an interest in or a role to play in the societal decision making process [5]. The focus of communication and stakeholder involvement would therefore benefit from being an iterative process, allowing stakeholders to be identified and involved in relation to any issues that may arise.

Other definitions exist, and often include lists of those that need to be considered as stakeholders; for example, the definition provided in the IAEA Handbook on Nuclear Law [6] identifies:

> "the regulated industry or professionals; scientific bodies; governmental agencies (local, regional and national) whose responsibilities arguably cover [or 'overlap'] nuclear energy; the media; the public (individuals, community groups and interest groups); and other States (especially neighbouring States that have entered into agreements providing for an exchange of information concerning possible transboundary impacts, or States involved in the export or import of certain technologies or material)."

Finally, a useful distinction sometimes used is between 'statutory' and 'non-statutory' stakeholders. This distinguishes between those organizations and bodies that are by law required to be involved in any planning, development or operational activity (e.g. the regulator, local or national planning authorities and local government entities) and those which have no legal basis for involvement, even though they may be impacted, directly or indirectly (e.g. local communities and non-governmental organizations).

For the purposes of this publication, a stakeholder is regarded as any individual or group, statutory or non-statutory, within or beyond a local or national boundary, or a member of the current generation or of future generations. In short, a stakeholder is anyone who considers themselves affected.

2.3. PRINCIPLES OF STAKEHOLDER INVOLVEMENT

Several basic principles have been recognized as underlying effective communication and stakeholder involvement in nuclear activities and related decision making, and these must be borne in mind and incorporated in all activities [1]. These principles are consistent with the behavioural factors affecting public and political acceptance for the implementation of geological disposal described in Ref. [7]. Originally developed in relation to the complete life cycle of nuclear facilities, they therefore apply equally to the process of siting, constructing and operating a radioactive waste disposal facility.

Stakeholder involvement or participation is recognized as an essential component of a radioactive waste management plan, for example, as expressed in the European Commission, Council Directive 2011/70/Euratom [8] with open access to information, as mandated by the Aarhus Convention [9], an important public right. This section describes these principles of stakeholder involvement as highlighted in Ref. [1] with special reference to radioactive waste disposal.

2.3.1. Exhibit accountability

IAEA Safety Standards Series No. SF-1, Fundamental Safety Principles [10], states in Principle 1 that: **"The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risks."**

This awareness serves to create strong incentives for achieving a high level of safety and operational performance within the operating organization. In turn, it encourages involvement with stakeholders who will hold the operator accountable for any safety lapses or deviations from agreed programme activities.

In addition to the operator, a suite of other organizations, including the regulator, have a role in radioactive waste management and need to recognize the requirement for accountability. It is clear that the responsibility for monitoring and ensuring that the operator of a nuclear facility fulfils its role safely and effectively rests upon the regulatory authorities, who are of course also stakeholders in the process. Likewise, during the siting process for a radioactive waste disposal facility, the involvement of regulatory authorities is essential and interactions with the waste management organization would be expected to be extensive prior to a construction licence application. A monitoring role may also be fulfilled by various governmental advisory groups and, often, independent organizations and learned societies. The public will hold these bodies accountable for performing their respective functions and look to them for clear and balanced communication of the issues.

The requirement for accountability needs to ensure that all parties communicate their activities clearly and concisely, thereby avoiding accusations of secrecy and obfuscation, and helping to develop and maintain trust. A proactive approach to demonstrating the responsible implementation of assigned roles and tasks — thus exhibiting accountability — calls for stakeholder involvement to be considered as a strategic activity, not as an afterthought [11]. In other words, communication and stakeholder involvement should be part of the fundamental role of all organizations involved in radioactive waste management.

Accountability also refers to the importance of following up with clear feedback to those involved as to how and why their contributions have or have not influenced an outcome. Responsible organizations need to ensure that there are routes for public reporting on final decisions, strategies and implementation plans [12].

2.3.2. Recognize the purpose of stakeholder involvement

Having recognized the value of accountability in helping to ensure the safe and sustainable development and operation of nuclear facilities, the implementation of communication and stakeholder involvement programmes can be an important way for organizations responsible for disposal to demonstrate compliance with various requirements and regulations [13]. It is important to recognize that the level and type of stakeholder interaction will vary depending on the characteristics and interests of the particular stakeholder(s) involved, such that different methods and tools need to be used as appropriate.

A key purpose of stakeholder involvement is to enable all stakeholders to make known their views and to work together with decision makers to ensure that these views are considered. At the same time, it needs to be recognized that the aim of an effective communication and stakeholder involvement programme is not necessarily to gain consensus or 100% agreement, but rather to help decision makers make more informed and robust choices and for stakeholders to understand the basis for a decision and thus have greater trust that the decision was appropriate [14].

In most cases, the final responsibility for decision making lies with the respective authorities. However, stakeholder involvement in the overall process can be crucial in developing confidence and trust, without which progress can be difficult if not impossible.

This involvement preferably takes place throughout the development and implementation of a radioactive waste disposal programme. It benefits from being regular and frequent, not only when there is an issue or concern, in order to engender trust and confidence among all stakeholders.

Appropriate stakeholder involvement improves the quality and the sustainability of policy decisions and confidence in radioactive waste management programmes. Furthermore, it helps to build good relationships among stakeholders.

2.3.3. Understand stakeholder issues and concerns from the beginning

The principles are based upon the widely accepted attributes of good communication, including the goal of establishing and maintaining constructive two way interaction or dialogue. This involves listening to and understanding the concerns, issues and questions posed by stakeholders and responding to them in an appropriate and transparent manner.

The first steps in an effective stakeholder involvement process are the development of an appropriate strategy and a plan for implementing this strategy. This should be initiated early in the repository development programme and it requires a comprehensive approach to stakeholder identification and careful analysis to understand the potential issues or concerns affecting them. In no case would a particular stakeholder group's difficulty to comprehend issues be used as an excuse to withhold information, and efforts need to be made to present technical issues in an easy to understand format using non-technical language. Indeed, all the issues, concerns and expectations of stakeholders need to be considered. Public explanation of how these have been considered in arriving at decisions need to be made [14]. Such involvement may help reduce the potential for disputes or even legal challenges further down the line.

Having identified concerns and sensitivities among the various stakeholder groups and how those groups may impact the facility development, there is then a need, within decision making processes, to clearly assign responsibilities and roles for stakeholder involvement in these processes. This would include explanations of what decisions are required and how stakeholders can influence them, and if not, why not. Such clarity is now being incorporated into many national codes of practice and process guidelines, so that there is a transparent accountability trail from the very beginning.

2.3.4. Build trust

Trust is essential to an effective programme of engaging with stakeholders. Trust in institutions tends to lead to more confidence and to working more effectively together. Without trust, any stakeholder involvement is hollow and operates under a cloud of suspicion. However, trust is an emergent quality; trust cannot be simply created once and for all, and though openness and transparency are often cited as being significant in trust building, it is important to note that it is possible (though not necessarily intentionally) to be openly and transparently untrustworthy. Trust is a simple concept, yet achieving it may prove complex in practice, and openness and transparency are only a small part of the whole. For instance, participants from Member States in the IAEA Technical Meeting on Learning from International Experiences Related to Stakeholder Involvement in Radioactive Waste Disposal, 13–17 June 2016, cited a diverse range of behaviours or factors important in building trust including organizational integrity and competence, empathy, proactive communication, the use of independent experts, staff living locally, allowing sufficient time and flexibility and showing respect.

Research has identified three main characteristics of building or maintaining trust [15]: ability or having the technical knowledge and skills that enable a party to carry out a particular task; benevolence or a benign or non-detrimental orientation towards the trusting party; and integrity as expressed through consistent adherence to a set of principles or commonly accepted ethical standards such as honesty and fairness.

These findings and several on-line checklists of appropriate actions and behaviours may, however, overcomplicate what is essential to building trust, namely, respect. Respect is something people understand. People know what respect is and are sensitive to disrespect. A decision maker can change their behaviours through striving to be more respectful of others, even if the respect is not returned. Trust and respect are deeply connected: showing respect makes it more likely that trust will emerge. Experiences

within a range of waste facility development programmes show that where trust is broken or absent, actions or behaviours that are perceived to be or substantively are disrespectful are likely to be observed.

It is important to understand that what is perceived as respectful depends to a great extent on culture and context, including the degree of conflict within a situation, the availability of pertinent information and the characteristics of the people who are present. For example, in some situations, stakeholders and concerned or interested individuals may welcome detailed facts and figures; in other situations, they may feel they are being buried by science instead of being given the simple, direct answers they seek.

Transparency is identified as one of the basic principles in an IAEA Nuclear Energy Series publication on Radioactive Waste Management Objectives [16]:

> "Experience has shown that progress towards the goal of optimally and safely managing and disposing of radioactive waste can only be made if the concerned members of the public believe and respect the persons and organizations responsible for implementing the waste management procedures and are convinced that the planned procedures are effective and safe. To build this trust, the concerned persons, the 'stakeholders', many of whom have no formal role in the decision making process, have to see that their views are being taken seriously and that they can influence events."

In addition, involved organizations need to demonstrate respect for these views, and recognize that they are honestly held and based on individual experience. Reliability, responsibility and fairness are attributes that foster trust in participants in decision making processes, as does early stakeholder involvement in policy formulation at both a national and, where appropriate, local level. An important element in creating trust is the perceived credibility of the responsible organization and of the reviewing agency or agencies, and stakeholder confidence that commitments and promises will be kept [17].

Establishing trust can be enhanced when an inclusive approach to stakeholder involvement is adopted from the beginning of the planning process to help ensure that all those who wish to take part in the process have an opportunity to express their views and have access to information on how public comments and questions have been considered and addressed [18].

As stakeholder involvement becomes more widespread, confidence in the process and trust in the participants tends to increase. It is particularly important to be clear from the very beginning about why a particular facility is required, and what the roles and responsibilities of the various parties involved are. However, this trust can quickly be destroyed by unexpected events or changes to agreed programme steps. Trust can be strengthened by demonstrating technical competence and adherence to high standards both in performance and reporting. It can also be developed by demonstrating respect for people's concerns, and not dismissing them as irrelevant or emotional.

2.3.5. Practice openness and transparency

The principle of practising openness and transparency has been repeated often, has been considered fundamental to any process aiming at achieving broader acceptance, and indeed has been clearly inscribed into law for national programmes [19] and as guidance for international recommendations. All the more surprising, then, that it frequently has been, and continues to be, only partially and poorly implemented. It cannot be the goal to communicate only a well developed solution, explaining and justifying the robustness of its technical and scientific basis for safety. Rather, benefits would be gained from openness and transparency being part of a disposal project at its inception, with an open consideration of what may be a suitable development process. At this early stage, the need to demonstrate competence, one of the main characteristics to build trust, is achieved through interaction on a sound process, with associated objectives and decisions, rather than on a finished solution.

The 'Engage, Interact, Co-operate' model of stakeholder involvement, incorporating openness and transparency, is the opposite of the old approach, often referred to as 'Decide, Announce, Defend' (DAD). It is now usual for siting processes to be as open as possible [12, 20]. These are key elements in building the trust recognized as essential to making progress in a siting process, as outlined above [16].

Being as open as possible includes communication across national boundaries, in different languages if required. Although no nuclear facility is ever developed unless demonstrated to be safe according to a national legal and regulatory framework, experience shows public confidence in and relationships with neighbouring states will be equally important.

One challenge to implementing this principle of openness is the natural tension between the goals of transparency with stakeholders and restrictions on the disclosure of information that may arise for security reasons, as highlighted by the OECD/NEA Working Group on Public Communication of Nuclear Regulatory Organizations [21]. The aim would be to be as open as possible, explaining, where necessary, why certain information cannot be shared. It is possible to respect security sensitivities by undertaking discussions in a number of ways including considering points in principle rather than in detail or basing discussions on hypothetical scenarios [22]. More specifically during the initial facility siting and construction phases of a radioactive waste disposal programme, it may be possible to be open with generalised information concerning projected inventories and repository design, as only during operation would security issues become more relevant.

2.3.6. Recognize the evolving role of and methods for stakeholder involvement

Open and accessible means of stakeholder involvement in existing nuclear programmes have evolved, including in many areas of waste management facility siting and development. It can be anticipated that any future programme involving new reactors and associated facilities, including those for disposal [23], will follow this trend.

There are significant moves away from one way non-interactive communication to several more interactive modes of dialogue. Numerous efforts to classify these various methods have been undertaken over the last 50 years or more, one of the most useful being the Arnstein Ladder, first developed in 1969, which outlines levels of participation. This concept has since been modified many times, for example in Ref. [24].

Rather than referring to the concept of ladders, a number of sources now talk of the spectrum of stakeholder involvement, an Arnstein-like model developed by the FSC, such as that discussed in [25], as well as in other models [26, 27].

The spectrum of stakeholder involvement is characterized by varying degrees of interactivity, the simplest of which, ‘inform’, is one way communication or provision of information. The remaining interactive elements (whose names vary between sources) comprise activities involving two way communication. It is significant that aspects of siting policy development and the involvement of stakeholders within siting programmes in many Member States can be positioned within the spectrum as shown in Table 1.

Table 1 shows that moving along the spectrum indicates greater participation and possibly some local decision making (which is implicit if a siting policy and related process have a right of withdrawal or veto) are found at the local level close to the potential site being considered. Rather than progress step by step through the spectrum, siting policy development and implementation processes may involve several elements simultaneously: for instance, enabling people to consider whether to host a waste disposal facility means that people have to be informed that there is waste and that there is a need for a disposal facility. In responding to each interactive element in the spectrum (i.e. from ‘inform’ to ‘partner’), there are a number of different ways of implementing stakeholder involvement, which can vary from simple to complex. Some examples of methods or approaches are given in Appendix I.

TABLE 1. SPECTRUM OF STAKEHOLDER INVOLVEMENT

Scale of involvement (geographic)	Level of involvement (spectrum)	Activity or purpose	Siting programme examples
National	Inform and educate	Inform people of the waste issue and the need for action to ensure transparency.	• Early communication undertaken by the Nuclear Waste Management Organization in Canada.
	Consult and gather views and information	Consult on options for dealing with waste and related siting policy; to keep all parties informed, listen and provide feedback on how input has influenced the decision.	• The Commission on Storage of High-Level Radioactive Waste in Germany; • Use of a new public engagement commission in the Republic of Korea; • The Blue Ribbon Commission review in the United States of America.
	Involve and engage	Work with stakeholders and experts on options, siting process ideas and potential host regions to ensure that all concerns are considered and reflected in the alternatives.	• Development of new siting criteria in Japan and beginning of new public communication initiatives; • Development of the revised siting process in the United Kingdom.
Regional and local	Collaborate	Work with regions and communities considering hosting on implications of the decision process, site suitability investigations, compensation and rights of withdrawal, to incorporate relevant regional and local preferences, advice and recommendations as far as possible and in a way that is compatible with the national process and framework.	• Development of Local Partnerships in Belgium; • Formation of community advisory groups in potential host communities in Canada; • Formation of the Working Group on Dialogue in the Czech Republic; • Operation of commission locale d'information in France; • Involvement through regional conferences in Switzerland.
Local	Partner	Communities take an active role on whether to participate in the process or whether to withdraw; contribute to decisions on facility location and aspects of the design, on expected compensation ensuring long term sustainable development; and elaborate their ongoing role during siting and potential licensing, construction and operation, such as continued information, monitoring and oversight.	• Decisions by local partnerships in Belgium on what to use the local fund for; • Operation of the groupement d'intérêt public in France to plan and disburse investment funding; • Involvement of host community in Sweden in reviewing the licence application.

Another difference concerns the frequency of stakeholder involvement activities. Some elements require continuous involvement so that stakeholders and the public can provide regular inputs whereas in other elements the public is not involved regularly but only at one time or on limited occasions.

The further across the spectrum of stakeholder involvement a process or a tool is found, the more active the participants become in terms of collaboration, and the more directly they may influence decision making. Stakeholders thus take on a higher degree of responsibility and accountability. This may be a motivating factor for some stakeholders who seek a high degree of influence on the planning or

realization of the respective project. Use of particular tools among those listed in Appendix I will form part of the design of an engagement process and will reflect the wishes of those concerned, offering the degree of involvement identified from discussions.

This perspective will also influence the methods and tools to be used for future stakeholder involvement. These are likely to be different from those used currently, and the use of modern media such as social networking web sites and the Internet may ultimately become more influential than traditional forms of print or broadcast communication. Already, the traditional mass media are no longer the major channel for the interpretation and transfer of decisions and technical documents to the public by implementers and regulators, with web based reporting and consultation now being widespread [21].

Given the timescales involved in developing, constructing, operating and ultimately decommissioning nuclear facilities, especially disposal facilities, which can be of the order of 100 years [23], obtaining and maintaining stakeholder support needs to remain a forward looking activity, beyond the current generation of concerned citizens. Engagement with the younger generation forms an important part of any stakeholder involvement process, given that its members will be impacted throughout their lives and will be the decision makers of the future.

Irrespective of whichever tools and media are used for communication and dialogue, it is essential to build in ways of monitoring the progress and effectiveness of the various activities. This can include the use of opinion polls and surveys, both nationally and locally, as the siting process narrows down potential locations. Given that some programmes now incorporate (some form of) right of withdrawal or veto, such monitoring is vital in demonstrating the state of local opinion, especially up to the point where major decisions are being taken.

Finally, it needs to be recognized that developing and implementing flexible, iterative and effective engagement activities takes time, and it is important that these are taken under advisement prior to agreeing on the schedule for project milestones, to ensure stakeholders can remain as involved as they consider necessary to be able to contribute to relevant decisions.

2.4. PROCESS CHARACTERISTICS

As stated in Ref. [10], the fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation. According to this, IAEA Safety Standards Series No. SSR-5, Disposal of Radioactive Waste [28], states that: “disposal facilities are to be developed in such a way that people and the environment are protected both now and in the future” (para. 2.4).

Requirement 11 of the Specific Safety Requirements for disposal [28] states that: “**Disposal facilities for radioactive waste shall be developed, operated and closed in a series of steps.**” Referring to the disposal life cycle, SSR-5 [28] further states that:

> “Such a step by step approach enables: the ordered accumulation and assessment of the necessary scientific and technical data; the evaluation of possible sites; the development of disposal concepts; iterative studies for design development and safety assessment with progressively improving data; technical and regulatory reviews; public consultation and political decisions” (para. 1.18).

This step by step approach is in principle well suited to incorporate appropriate decision making and, therefore, stakeholder involvement activities, and to be continuously developed as more information becomes available throughout the life cycle of the disposal programme.

IAEA Safety Standards Series No. SSG-14, Geological Disposal Facilities for Radioactive Waste [29], identifies several items that the national, legal and organizational framework for geological disposal has to address, including: “Defining the overall process for the development, operation and closure of geological disposal facilities, including the legal and regulatory requirements at each step, and the processes for decision making and the involvement of interested parties” (para. 3.3d).

Examples now exist of where such stakeholder involvement can be seen in decisions on such issues as the choice of disposal concept, the selection and evaluation of facility sites, the design of facilities and operational and closure related issues. While the safety implications of design options are the overriding concern, SSR-5 [28] also acknowledges that: "If more than one option is capable of providing the required level of safety, then other factors also have to be considered. These factors could include public acceptability, cost, site ownership, existing infrastructure and transport routes" (para. 3.19).

As has been demonstrated by the continuing deliberations of the FSC, it has become usual for any significant decision regarding the management of radioactive waste to involve a comprehensive public review involving a diverse range of stakeholders. The development of management options will take decades to be identified and implemented and will involve stakeholders who have not yet been born [30]. Taking account of the various ways in which stakeholders are likely to be involved, a number of discrete yet similar approaches have been developed. From these, a number of fundamental process characteristics can be inferred, as follows:

— The development and implementation of disposal requires a sequence of decisions, and the associated stakeholder engagement process hinges on this decision making process.
— Involving stakeholders with decision making presupposes an understanding of partnership, possibly critical yet constructive, rather than one of opposition.
— Decision making builds upon demonstrated technical and scientific competence, and on the clear demonstration that safety requirements will be met, and the specific realization of the partnership approach is designed within the wider national context.

2.4.1. Stepwise approach

SSR-5 [28] describes the framework for disposal programme development in such a way that the safety assessment, safety case and related decision making evolve iteratively through a step by step approach. SSG-14 [29] explains how such a stepwise process can allow the ordered accumulation and assessment of the necessary scientific and technical data; the evaluation of possible sites; the development of disposal concepts; iterative studies for design development and safety assessment with progressively improving data; technical and regulatory reviews; public consultation; and political decisions. The OCED/NEA states that "For stepwise regulatory and policy decisions to be credible, they must be reversible or at least modifiable in the light of new information, to the extent that this is practicable." [31].

In general, three phases in the establishment of a disposal facility can be recognized, the pre-operational, operational and post-closure periods. Since the pre-operational phase is of significant importance with regard to stakeholder involvement, this phase can be further subdivided as follows:

— Development of a waste management policy and establishing the programme framework, including preparatory work for establishing the siting process;
— The siting process, comprising concept design, detailed planning, implementation and continuation.

Decision making at each stage can benefit from involving a wide range of stakeholders engaged in an open and transparent process, one which provides opportunities for various degrees of social and political review after identified steps. In some national programmes, this has been formalized within a governance framework of reversible management [31]. As the name suggests, this offers opportunities for reversing earlier decisions or modifying them. This approach is designed to provide reassurance that decisions can be reversed if experience shows the potential for adverse or unwanted effects or other management options are deemed to be suitable. As shown later in this publication (Sections 4 and 5), it is the lack of such involvement that often leads to delays in facility development. Clearly, there is no one-size-fits-all solution, and even when staged programmes are designed, they may not be acceptable to all stakeholders, or partial failures to move forward may occur [32].

2.4.2. Partnership approach

Involving stakeholders within such a decision making process presupposes, as mentioned above, an understanding of partnership — possibly critical yet constructive — rather than one of opposition. Many ongoing repository siting programmes have recognized the need to move from a 'Decide-Announce-Defend' (DAD) approach to one that can be described as 'Engage, Interact, Co-operate'. As pointed out in Ref. [1], early dialogue can result in the development of strong partnerships between the developer and potential host communities and can help overcome many of the concerns that will undoubtedly be expressed by some individuals and organizations. Dialogue between experts and citizens can assist mutual learning, understanding and public involvement, particularly at a community level, in the decision making process.

Collaboration with the relevant potential host communities, as currently practised in many Member States, may take place under the terms of legally binding agreements or according to less formal arrangements. All involve some degree of local control of how a process advances, although the degree to which this happens varies. In some cases, a partnership is simply a vehicle to improve communication, whereas in others, there is complete local participation in decision making on a range of project related issues, such as those discussed above (choice of disposal concept, selection and evaluation of facility sites, design of facilities and operational and closure related issues). A partnership approach allows local communities to assess, evaluate and disseminate information, consult experts of their choice and build up their own expertise. Furthermore, the common use of a formal partnership agreement can give the community confidence that their input will be taken account of regarding a range of project decisions. These inputs may include such things as benefit packages and sometimes even facility design where this does not compromise safety.

A partnership between the facility operator and the host community can also encourage long term participation in operational decisions including those involving monitoring in the post-closure period [33] when operational staff numbers will necessarily be reduced. It is important, however, that decision makers respect the role of these local partners and do not ignore their input or simply dispense with their activities when project goals have been met.

Irrespective of the degree of local control in the project, a partnership offers a means of empowering a community as regards its ability to understand the details of the project and for individuals to express their concerns and wishes through an open process.

2.4.3. Integrated approach

The way in which disposal challenges are addressed is also greatly affected by a number of factors within individual Member States. This includes the relationship between the public and government, the national energy infrastructure, the educational, cultural and historical background of the general public and the overall national financial and economic situation.

Within such a national context, decision making always builds upon demonstrated technical and scientific competence, and on the clear demonstration that safety requirements will be met, as a fundamental element needed to achieve acceptable levels of public and stakeholder involvement. It is necessary to integrate a range of activities designed to demonstrate the feasibility of the concepts and options being proposed. The national strategy for ensuring safety needs to be underpinned by robust research and development, with the results and interpretations clearly communicated. This will contribute towards better understanding among both the general public and political decision makers, and help to develop increased acceptability. Such communication would, however, benefit from recognizing stakeholder views and concerns, and feed into the ongoing societal decision making, leading to more acceptable solutions based on technical robustness underlain by social values and judgements.

Variations between Member States and the situations in which they implement a waste management programme mean that no one solution exists, and that the 'lessons learned' described in this publication merely outline possible solutions to specific issues that have arisen, although it is possible to identify

examples of so-called 'successes'[1] regarding particular stages in the stepwise process. Each Member State needs to assemble the components of a programme using these lessons as guides, rather than as hard and fast solutions, in order to develop an integrated approach most suitable for the local context. It is also notable that although progress can be achieved through good practice in engagement and participation, sometimes external factors may cause delays or even the cessation of the process. The fact that a previous process and those involved were trusted makes implementing the next process more likely to achieve an acceptable outcome.

3. FUNCTIONS, ROLES AND RESPONSIBILITIES WITHIN A REPOSITORY DEVELOPMENT PROCESS

3.1. INTRODUCTION

It will be very important to ensure that at an early stage in the overall repository development programme, the key stakeholders and their various functions are agreed and clearly acknowledged, including specific roles and responsibilities to be undertaken during the siting process. This will be important for clarity in decision making and communication with other stakeholders. Clearly, the radioactive waste producers, waste management organizations, the government and regulatory authorities will all have a significant role to play in this regard.

In relation to decision making, and as pointed out in Ref. [14], para. 29:

> "The authority or authorities who must decide upon any socially sensitive nuclear issue have the obligation to inform the public through well established procedures. The members of the public, individually or through recognized organizations, then have the right to present comments and proposals that the decision makers should analyse and consider formally before a decision is finally taken. Public participation in the decision making process should not aim to reach consensus and should not be viewed as a referendum on the issue."

Public participation can, however, indicate concerns and issues to be addressed, including an agreement on aspects of the siting process, derivation of siting criteria and so on. The public and other stakeholders should, therefore, have a role to play in a repository development process.

As discussed in Section 2.4, in recent years, a number of complementary approaches have emerged for stakeholder involvement in decision making associated with a repository development programme. It is generally accepted as obvious that human safety and protection of the natural environment are the prime objectives. However, it should also be obvious that, integration of the various siting activities through stakeholder involvement, especially including those stakeholders most affected, can be demonstrated as the most effective way forward. Based on experience, one of the most crucial challenges in the whole disposal endeavour is to design a decision making process in which all those involved understand their roles and the extent to which they can influence the outcome (or outcomes in different phases of the

[1] This publication favours using more objective terms or descriptions of involvement processes and siting outcomes rather than using judgemental words like 'success' and 'failure'. 'Successes' has been used here in relation to process stages to reinforce this point: if a process is halted because a community has exercised a right of veto or withdrawal, what some parties may denote a failure will be seen by others as a successful implementation of this aspect of the related siting policy.

process). If roles and the related extent of influence are not clear from the very start, challenges can arise when decisions are taken that particular groups of stakeholders do not accept as having been taken according to their expectations.

It is accepted in most Member States that the person or organization that creates the waste is responsible for its safe management, although national governments also have certain responsibilities, including the provision of control over various aspects, such as radioactive residues from past facilities and activities, and for orphan sources [34]. It is also important to recognize that while there is a need for clarity concerning such responsibilities for waste management, there is an equal need for clarity in identifying the different roles and responsibilities of the different organizations and institutions in relation to communication and stakeholder involvement. Otherwise, disposal programmes can fall victim to difficulties caused by public concerns not being considered and a consequent lack of credibility and trust.

3.2. THE DECISION MAKING PROCESS

There are two models of decision making that are commonly followed in Member States. The first holds that decisions about issues that are national in scope need to be made at a national level, whereas the second holds that where a national policy disproportionately affects a specific locality, then that locality needs to be given a strong role in related decisions [7]. It is also possible for some combination of the two to exist, for example in Member States with a federal system of governance. The transition between national policy decision making and site specific decision making will be treated differently in different Member States but can be vital in gaining and maintaining public support.

Issues relating to early stage siting programme developments tend to be national rather than location specific. Consequently, policy decisions are often made between applicable authorities and some affected stakeholders that may not include sufficient representation from the general public until much later on. The engagement on policy that does take place will tend to be at the national level, with decisions taken by national government, albeit informed by consultation through workshops and other more formal channels. Some Member States have used focus groups and public dialogues alongside stakeholder meetings to inform aspects of their policy development. Once the decision to proceed with a siting programme has been taken, it is becoming common for engagement over developing screening criteria and their application to begin, frequently involving consultation on developing proposals. The application of these screening criteria and the subsequent identification of potentially suitable regions, areas and sites require extensive engagement and opportunities for all interested stakeholders, enabling them to be as fully involved as they wish, although only when specific sites are being considered do local stakeholders generally become involved. This is increasingly being seen as too late in the decision making process.

There is now a general agreement that a decision making process needs to strive to strike a balance between competing values, such as participation, fairness, transparency, flexibility and accountability. The process also needs to facilitate (social) learning and allow for added value for the communities concerned [32]. This requires that communities and individuals can express their concerns and that these need to be addressed through a wide range of communication and stakeholder involvement activities. In order to deal with concerns about socioeconomic factors, mitigation measures such as community benefit packages could be made available, designed so as to guarantee long term sustainable community development that recognizes the contribution being made to solve a national issue [35].

It is, however, also seen as important that there is clarity and a lack of ambiguity as to what decisions need to be taken, who can take them and when they need to be taken. This has led to an increasing use of so-called ‘staged decision making’ (also sometimes referred to as ‘stepwise’ decision making, reflecting the stepwise approach to repository development discussed in Section 2.4), where specific decisions are ‘banked’ during a repository development process and generally not revisited over time. Such decisions can include, for example, agreement on geological and societal screening criteria, the amount and application of community benefits and more specific issues such as the waste inventory concerned and other design related factors.

Especially relevant here is clarity in communication (and agreement) of which if any of the decisions made can be reversed at a later stage in the process. Uncertainty in this area has caused difficulties in some programmes, as discussed in Section 5, because although many siting programmes now incorporate a 'right of withdrawal' (or veto) whereby a community can cease involvement, without prejudice, the exact point beyond which a potential host community can no longer refuse to accept a facility is often poorly understood. This may lead to an unwillingness to even enter a consent based or volunteer siting process. This right can normally only be exercised up to a certain stage in the process, generally following surface based exploration (involving boreholes etc.) and prior to any underground development (often associated with either a rock characterization facility or pilot facility, when large amounts of investment are usual). At issue here, however, is how a local community would decide, and this too is discussed in more detail in Section 5. The stepwise process is intended to allow access by all parties to the safety basis for the repository, thereby building confidence over time [30]. It is, therefore, important to demonstrate accountability in the decision making to illustrate how stakeholders' views are taken account of and when and if decisions are changed or amended in the light of them [7].

Clarity in the roles of the different parties in the decision making process is also important. While many of the decisions associated with licensing and approvals are necessarily the responsibility of so-called 'statutory' stakeholders, designated in legal instruments (regulators, government, etc.), given the highly contentious nature of radioactive waste disposal, political influence and control over many of the decisions cannot be ignored. Local communities and stakeholders need to be informed from the very start about the degree to which they can influence decisions, when such opportunities exist within the siting process, and where the limits of that influence lie. This is crucial to understand and address their expectations appropriately, in order to achieve meaningful involvement of all parties. It is also important to recognize that the roles and influence allocated to different bodies during a repository development process are likely to change as the different stages outlined in Section 4 unfold.

Finally, while the final responsibility for decision making always needs to lie with the relevant competent authorities, public involvement in the overall process can be seen to be crucial in developing confidence and trust. Given the timescales involved in designing, developing, licensing, constructing, operating and closing repository facilities, which can often be of the order of at least 100 years, continuing public support is obviously important [23]. Maintenance of this support during facility operation and subsequent closure can result in an overall process that is transgenerational, requiring the involvement of individuals yet to be born.

3.3. IDENTIFYING THE DIFFERENT FUNCTIONS OF SPECIFIC STAKEHOLDERS

The comments above regarding overall management responsibilities align with the requirements of SSR-5 [28], in which a number of salient points regarding the main actors in a disposal programme are made. All requirements are, of course, in turn derived from principles established in the Fundamental Safety Principles [10].

The principal bodies identified as having specific roles, functions and responsibilities outlined within relevant national legislation regarding both overall waste management and related stakeholder involvement are governments, regulators, operators of disposal facilities and waste producers. In addition, it is common for national programmes to include independent oversight and review through national advisory and consultative bodies together with scientific institutions and learned societies, as well as international peer review and various types of cooperation.

To the extent specified in the national framework (policy, legal or regulatory), these can be considered as statutory stakeholders, with a specific function assigned with the siting and disposal implementation process.

As was pointed out in Ref. [7], a generation ago (or even more recently in some situations) many of those responsible for developing and implementing radioactive waste disposal programmes were perceived, fairly or not, as being arrogant and intolerant of questions from non-specialists. It is now

recognized that behavioural factors such as openness, transparency and fairness (as discussed earlier) are essential components of any siting and implementation process that aims to achieve public acceptability through engagement with other relevant participants such as local governments and host communities as well as non-governmental organizations (NGOs) and civil groups. Alongside these, for many of the bodies identified, is a requirement to demonstrate technical competence and an ability to communicate this in an understandable way. Only then can waste management organizations hope to gain the trust of those required to accept their statements regarding safety, security, environmental protection etc.

Taken together, these additional groups of stakeholders can be considered as non-statutory, which does not diminish the importance of the stake they may have in the disposal siting and implementation process. Through participatory, consent based siting processes they also have a function to fulfil as part of the decision making process.

Key functions that need to be carried out by the relevant statutory stakeholders involved in geological disposal activities are:

— Policy making;
— Funding;
— Regulating;
— Implementing the disposal programme.

In addition, it is possible to discuss other recognized functions under the following groupings:

— Independent review;
— Participation.

3.3.1. Policy making

IAEA SSR−5 [28] states in Requirement 1 that: "**The government is required to establish and maintain an appropriate governmental, legal and regulatory framework for safety within which responsibilities shall be clearly allocated for disposal facilities for radioactive waste to be sited, designed, constructed, operated and closed**". In terms of communication and stakeholder involvement, it is also incumbent on the national government to explain to all interested stakeholders, clearly and in understandable terms, exactly how the policies to fulfil these requirements have been developed, and how and by whom they will be carried through. On an issue as emotive as radioactive waste management, there needs to be a presumption of openness as opposed to one of secrecy in terms of policy, public safety and national security notwithstanding. As discussed previously, it is also important for government to explain the extent to which the various stakeholders can influence decision making on policy development and implementation.

3.3.2. Funding

As discussed later in Section 4.2.3, the provision of sufficient and reliable funding for effective public and stakeholder involvement in the implementation of a repository development process is essential, and a lack of this can impact upon public trust and confidence. Along with the responsibilities of government discussed in Ref. [28] and already referred to above is the securing of financial and other resources. Different Member States approach this issue in different ways. In some, waste producers are required to establish segregated funds, with money raised by a tax on electricity generated. Others place the responsibility for waste management wholly on the waste producers and require them to demonstrate the existence of suitable financial resources. Whichever model is used, the national government is ultimately responsible for ensuring that such funds will be available when required.

3.3.3. Regulating

SSR−5 [28] states in Requirement 2 that: "**The regulatory body shall establish regulatory requirements for the development of different types of disposal facility for radioactive waste and shall set out the procedures for meeting the requirements for the various stages of the licensing process**". In order to develop such requirements, the regulatory body has to engage in dialogue with waste producers, the operator or implementer of an existing or proposed disposal facility, and other interested parties to ensure that the requirements are appropriate and practicable. Ideally, during this engagement process there would be opportunities made for involvement of the wider public, in order to allow their concerns to be communicated and for the regulator to demonstrate that they have been addressed insofar as is possible. Such involvement makes regulatory bodies aware that they are under public scrutiny, and may well result in more practical, relevant and coordinated administrative, technical and socially responsible decisions on safety issues [14]. Transparency in regulatory activities increases the motivation of individuals to meet their responsibilities in: (a) drafting rules and regulations; (b) strictly verifying compliance; and (c) enforcing necessary corrective actions. Transparency also increases awareness within regulatory organizations of the need for a quality regulatory programme and reinforces their responsibility to ensure the safety of the installations under their oversight. Although regulatory institutions and authorities in most Member States have a legal obligation to inform stakeholders of their activities, that obligation is not always clearly stated or well developed.

It is the regulatory body's prime responsibility to guarantee public safety, and it is important that it is trusted in this regard. Any suggestion of so-called 'regulatory capture', whereby those being regulated are too closely involved in developing the regulations they need to meet, is to be avoided. Even in those Member States where both repository development and regulation are ultimately the responsibility of government departments, it is important that the two bodies do not report to the same authority, except at the highest level of government [7].

Stakeholder involvement in regulatory assessment of licence applications, especially as regards interpretation of safety cases, can be an excellent way of demonstrating competence and engendering trust. It is, however, not the case in all Member States that the public, as opposed to the statutory stakeholders, is involved in this process.

3.3.4. Implementing the disposal programme

According to Requirement 3 of SSR−5 [28]:

> *"***The operator of a disposal facility for radioactive waste shall be responsible for its safety. The operator shall carry out safety assessment and develop and maintain a safety case, and shall carry out all the necessary activities for site selection and evaluation, design, construction, operation, closure and, if necessary, surveillance after closure, in accordance with national strategy, in compliance with the regulatory requirements and within the legal and regulatory infrastructure.**"

It is the implementing organization's responsibility to carry out the policies established by government, and to do this while meeting the regulatory requirements. This involves engagement with all affected parties, including 'non-statutory' stakeholders. Reference [14], para. 10 points out that:

"Stakeholder involvement compels the operators to be aware that plant operations, as well as their other actions to meet the rules and regulations, are under public scrutiny. This awareness serves to create strong incentives for achieving a high level of safety performance within the operating organization. Experience in many countries has shown that such transparency can be an extremely effective enforcement tool to enhance safety performance".

In order to implement national policy for radioactive waste disposal, it is common for the implementing body to develop detailed siting and stakeholder involvement strategies; the involvement of interested stakeholders in developing these can further engender trust.

Once a siting process for a disposal facility has begun, undertaken by the implementing organization, it is usually its responsibility to communicate with stakeholders and manage or commission the necessary involvement processes. These will necessarily evolve as the process proceeds to narrow down the site search. The various phases of a repository siting and implementation process offer different opportunities for stakeholder involvement [18]. The development of a conceptual design, for example, provides an excellent basis for informing and involving a wide range of interested parties, depending on the siting strategy adopted and the waste inventory. As also discussed in Section 5, it is becoming more common for some form of community volunteering process to be used in a siting process, and it is therefore important for all relevant technical and societal issues to be discussed as early and as openly as possible so as to allow potentially willing communities to be able to understand and enter the process. There would, however, be a continued involvement of both government and the regulator to offer their particular contributions to the discussion. Development of a partnership approach, as discussed in Section 2.4.2, can allow valuable community input in terms of their concerns and relevant local knowledge.

3.3.5. Independent review

3.3.5.1. Advisory and consultative bodies

When establishing the necessary legal and institutional infrastructure for radioactive waste management, it is standard practice in Member States to create or involve a number of independent specialist advisory bodies that are mandated to review the activities of the major parties, in particular the regulator and implementer. It is also normal for such bodies to report their observations to the relevant government department. Examples also exist of oversight bodies completely separate even from government departments. These can provide a completely independent review, and this can assist local governments and other stakeholders in obtaining information. The Environmental Evaluation Group, funded by the United States Department of Energy, which provided independent evaluation of the development and initial operation of the Waste Isolation Pilot Plant in New Mexico until it was disbanded in 2004, was an excellent example.

These advisory and oversight bodies would also benefit, where possible within the limits of security constraints, from being encouraged to operate openly and transparently, with opportunities for public participation and interaction, or, at the very least, by providing an ability to observe them in action. This is an important opportunity to develop the trust and confidence of the public and is not to be underestimated. The advisory and consultative bodies need to be prepared to invite and address stakeholder concerns and allow their work to be critiqued, in order to demonstrate their independence. It is also important that these bodies be sufficiently resourced so as to enable them to fulfil their role.

3.3.5.2. Scientific research institutions and learned societies

The majority of research institutions rely on external support to fund their activities, and this can place them in difficult situations when it comes to participation in engagement activities in their role as stakeholders. Such institutions are often called upon to present ‘independent’ information at public meetings or to take part in media activities. Every opportunity deserves to be taken to explain the origin of the institution’s funding for the research in question, so as to avoid any potential claims of bias.

Care needs to be exercised, however, where an implementer or project supporter claims validation by a research institution that they have funded to undertake research. The use of independent oversight or advisory groups, as discussed above, is a useful way to avoid accusations of bias, although this approach has not always proved effective.

As demonstrated in many places within this publication, stakeholder involvement in many repository development programmes is evolving into a partnership based process, in which national and more specifically local stakeholders are given integral roles in programme design and implementation. However, as also illustrated, challenges can arise with regard to stakeholder confidence in the information supplied by waste owners and governments, with non-experts unable to judge the soundness or otherwise of the scientific claims put forward. When opposition forces then provide counter arguments using their own experts to present their case, the public and other stakeholders can have difficulty in understanding the situation. This is where scientific research institutions and related learned societies can have an important role to play, especially in any joint fact finding commissioned by agreeing research or review parameters between the implementing body and other stakeholders.

Many local partnerships established during a siting process will have access to funds to enable them to consult independent sources of information. This is often referred to as an example of 'community empowerment'. Learned societies in such fields as geology, physics, chemistry, engineering and radiological protection can provide important independent underpinning to the arguments made by a project implementer. Validation of information by such bodies can be offset against the interpretation of independent experts.

3.3.5.3. International peer review and cooperation

International peer reviews have become much more common than in the past. In particular, in the areas of radioactive waste management, peer reviews have been gaining greater attention among Member States as an effective tool for receiving objective technical feedback and assessment to improve their organizational performance, enhance safety, optimize operations, and increase confidence in facilities, organizations and programmes. Especially for those IAEA Member States that also belong to the European Union, an international peer review of their national framework, regulatory authority and/or national programme is required every 10 years under the European Commission, Council Directive 2011/70/Euratom [8]. International organizations, such as the IAEA and the OECD/NEA, respond to such a need through their well designed peer review services (e.g. IAEA's ARTEMIS, the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation).

International cooperation activities, such as technical meetings and international and national workshops, also provide significant value for participating Member States through sharing experience and lessons learned with one another. For example, a national workshop organized by the FSC in a NEA member country provides a special venue for all the national stakeholders in the hosting country, the FSC members and invited international experts to take part in the discussion. While learning about the host country's radioactive waste management programme, the FSC members and international experts provide support by giving an external reflection building on their own experience, which is a real benefit for the hosting country.

3.3.6. Participating

Irrespective of which of the bodies introduced above is actually responsible for initiating and conducting stakeholder involvement, public views need to be considered at national level. When considering specific locations, stakeholders from the local community also need to be involved. In addition to the major groups discussed below, regional authorities, industry groups and others may also be involved at different stages in the process and be identified through recognition of specific project related issues, which may change over time.

3.3.6.1. Local community

The local community as discussed here includes both the elected members of regional and local government bodies as well as individual citizens as members of the potential repository host community.

The role of local governments in the decision making process for radioactive waste disposal varies significantly in each Member State. In some Member States, local governments have roles that are specifically defined by legislation. In others, the interactions with local governments are left in the hands of the implementing organizations [36].

One common generic mechanism used for interfacing with local governments is through preparation of an environmental impact assessment (EIA). Local government involvement in the EIA process generally consists of requiring the implementing organization to request representatives of the relevant local government to review and make comments on the study. These comments are then considered by the implementing organization and/or government organizations in deciding whether and how to proceed with the development of a repository. Members of the public may also participate in the EIAs through activities such as hearings, subject to national legislation. For example, provisions for increased public access to information and participation under the Aarhus Convention [9] have frequently been used by various groups who have felt excluded or poorly served by the formal processes.

On the other hand, in those Member States that have laws applicable specifically to HLW and/or spent nuclear fuel disposal, additional opportunities for local government involvement are often specified. These are discussed further in Section 5, with examples from particular Member States relating to challenges. Such challenges include the initiation of a consent based or volunteer process, the availability of a local veto or right of withdrawal, the development and application of screening criteria and the use of community benefits, many of which have been introduced following earlier siting difficulties.

While much of the responsibility for public involvement necessarily lies with the national government (during the policy and process development phases) and the implementing organization (during the siting and implementation phases), local government representatives and the local public also have certain responsibilities in an open and transparent process. Local politics would not, in an ideal world, influence the involvement process, especially as regards the negotiation of community benefits and other mitigation measures, although experience shows that this is unfortunately not always the case. It is, however, common that these benefits are ring-fenced and managed by independent boards, so as to ensure that funds are not used to shore up political campaigns or to manipulate decisions.

In the same way, members of the public in potentially suitable local communities would be encouraged to recognize that the safe management and disposal of radioactive waste are the responsibility of all those who benefit from the use of nuclear technology in the particular Member State and therefore they should be prepared to actively listen to the reasons why their location appears to be potentially suitable. That said, any associated financial incentives for involvement in the siting process and any other potential benefits would be developed based on the recognition that a host community is shouldering a responsibility on behalf of the whole country. In Member States with established nuclear power programmes, waste already exists and requires safe management, irrespective of whether new reactors are planned. However, the absence of a coherent well planned waste management policy in Member States starting out on a nuclear energy programme can cause severe difficulties in achieving public acceptability when facility siting difficulties elsewhere are observed.

3.3.6.2. The media

Radioactive waste management, and in particular disposal of all types of radioactive waste, has become one of the most controversial aspects of the use of nuclear science, energy and technology. During the implementation of a repository development programme, especially when potentially suitable areas or sites have been identified for further investigation, the issues are likely to receive significant coverage by the media. The media, therefore, represents an important communication channel with access to the whole range of impacted stakeholders. However, while the organizations involved in a siting process can use the media to disseminate information, the media itself represents an important stakeholder, especially where there is a dialogue component to a stakeholder involvement plan [37]. The presence of the media at dialogue events can potentially cause difficulties, with individuals either reluctant to state categorical positions or else prepared to use the opportunity to widen the issues under consideration to serve other

agendas. It may be preferable for deliberations to proceed with participants agreeing on what is best reported to journalists after the event.

Social media presents an additional aspect that needs to be given special consideration due to the speed and reach of the various platforms involved. Failure[2] to engage with stakeholders using social media as a tool will also cause difficulty when organizations are seeking to demonstrate openness and transparency. The expansion of social media has meant that traditional ways of interaction have ceased to dominate, and the role of 'citizen journalism' has grown. It is, therefore, incumbent on especially the regulator and implementing organization to fully engage with all the relevant platforms to hear views and opinions and respond with up to date and accurate information.

Despite this, the traditional media still retains a number of important responsibilities in the process of engagement with stakeholders related to the siting process for a repository. Informed reporting requires informed reporters, and this in turn means that media access to information deserves to be made as open as possible.

3.3.6.3. Non-governmental organizations

NGOs fulfil an important role in the repository development process and reflect a broad range of motivations and scope. There will of course always be NGOs and other citizen groups that will remain implacably opposed to a siting process, in the same way as there will be other NGOs who support the process. Many NGOs simply wish to monitor the activities of the main participants in the repository development process and understand the implications of the proposed activities for their area of interest. Involvement of NGOs from the very beginning can ensure that issues of concern are identified early on and enable the implementation process to be tailored to take these into account. This can help to engender trust and confidence among as wide a range of stakeholders as possible.

4. THE BASIC PHASES OF A COMPREHENSIVE STAKEHOLDER INVOLVEMENT PROGRAMME

4.1. INTRODUCTION

Experience over the last 20 years or more in programmes designed to implement the disposal of all kinds of radioactive waste has shown the importance of early communication with, and participation by, all those stakeholders who consider themselves affected. Many of the challenges in gaining acceptability have been due to a number of factors, such as a general perception of a process dominated by technical experts, a lack of trust (in both the process and those involved), a lack of political support (most project timescales do not match the political cycle), the absence of a clear public role in the decision making process or discussion about the needs and requirements for radioactive waste management, a lack of understanding of the issues and, most frequently, a lack of openness among those managing the process. More recent efforts to implement disposal strategies have begun to recognize these limitations and new approaches have been developed in order to address them.

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[2] This publication uses the terms 'fail' and 'failure' in relation to aspects of involving stakeholders that were not done or were not done effectively.

The sections below introduce several ways in which the approaches described in Section 2.4 (stepwise decision making and partnership, for example) have been developed and applied in an integrated way in a range of national repository development programmes. It needs to be recognized that to date few of these programmes have yet sited a repository, but it can be shown that progress has been made in several. Examples are also discussed where programmes have evolved in response to difficulties in gaining acceptability by society. It is this flexibility that is seen as crucial to progress.

While the stepwise approach allows the ordered accumulation and assessment of the necessary scientific and technical data so as to allow site selection to proceed, it has been recognized that it is also essential to involve stakeholders throughout the process. This would benefit from involvement from the very start during development of the overall policy and planning and design of the siting process, continuing through to design studies, followed by site selection and ultimately operation and post-closure. The methods used at each of these separate stages will vary, reflecting the increased knowledge among stakeholders, the changing groups of stakeholders over time and the associated developing trust between the various parties involved. It is when failures in communication and involvement occur that difficulties arise, and challenges present themselves. Section 5 discusses several such cases that have arisen in repository programmes in Member States and introduces a number of examples of how they have been addressed within particular national situations.

Radioactive waste management programmes are long term activities, frequently taking several decades or more to complete, especially in the case of geological disposal facilities for high activity waste. This is clearly longer than traditional political and electoral cycles, and given the required investment and research, it is essential that there is consistent political support once an overall policy and implementation strategy has been developed. That said, there are numerous examples where it has not been possible to implement facility siting due to a lack of public acceptability, although in general the overarching policy of disposal remains unchanged. A good example of this is seen in the United States of America, where a regulatory hearing on the proposed repository at Yucca Mountain in Nevada was suspended by a political decision made by the president in 2009. In 2012, the Blue Ribbon Commission, mandated to explore alternative management options, still recommended deep disposal, albeit associated with a consent based siting process.

As described in Section 2.4.1, a repository development process will proceed in a series of discrete phases using a stepwise approach, with each step requiring the involvement of various stakeholders. The phases may be described as follows:

— Involving stakeholders and the public in development of a radioactive waste management policy and establishing the programme framework (recognizing that this phase will also include preparatory work concerning arrangements for initiating the siting process);
— Involving stakeholders and the public in the siting process:
  - Planning the siting process;
  - Implementing the siting process;
  - Conducting the ongoing siting process.
— Involving stakeholders and the public in site activities during the construction, operation and post-closure periods of a repository development programme.

4.2. DEVELOPMENT OF A RADIOACTIVE WASTE MANAGEMENT POLICY AND ESTABLISHING THE PROGRAMME FRAMEWORK

Although geological disposal is now generally accepted as the safest management method for the long term protection of humans and the environment [38], other technical alternatives exist and have been considered in some Member States [7]. However, most have now acknowledged that some form of disposal will be required, and have developed national policies to recognize this, generally specifying

which technical option will be implemented. Other Member States are still considering the option of whether or not to reprocess spent fuel, meaning that possible changes in policy may occur.

4.2.1. Establishing the legal framework

Once a national policy has been established, a series of actions are then required, several of which are referred to elsewhere regarding possible opportunities for stakeholder engagement and confidence building.

The requirement for stakeholder involvement in the decision making process associated with a range of environmental issues, including the management and disposal of radioactive waste, is laid down in a variety of international conventions [9, 39, 40], European Union Directives [8, 41, 42], and other special or non-legal frameworks in Member States. These cover all stages of the planning and policy development process and have been transposed into the national legislation of most, if not all, Member States, as appropriate. These are briefly described in Appendix II.

4.2.2. Developing the institutional framework

As specified in the Joint Convention [40], it is necessary to establish appropriate infrastructure and regulatory systems for dealing with waste management. The necessary infrastructure includes, in addition to a nominated entity (or entities) responsible for disposal, a legal framework for safety and an independent regulator able to oversee and regulate the activities of the designated implementation body, all of which require the necessary financial and human resources and training [43]. In the context of this publication, in terms of communication and stakeholder engagement, this infrastructure includes not only the relevant institutions but also their systems and processes for such interaction and how these sit within the overall decision making process.

The existence of consistent political support [38] is also of importance given the long term nature of repository siting programmes, which last longer than normal political cycles.

4.2.3. Financial and human resources

Once the necessary legal instruments and policies are in place, it is important to secure and guarantee the associated financial resources that will be required to establish and support the institutional infrastructure identified as necessary. This in turn requires ongoing political support to ensure that policies will not change unless new information and technical solutions become available. Such long term commitment can contribute significantly to stakeholder confidence when invited to become involved. If policies and approaches are constantly changing, the implications of engagement can be seen as uncertain, with no guarantee that promises or agreements made will be honoured.

Developing a waste management infrastructure includes providing necessary financial and human resources to enable the policies to be implemented [34]. While significant proportions of these resources will necessarily be devoted to safety related activities such as the development of treatment and storage facilities, and, in time, the disposal facilities themselves, it is important that sufficient resources are also made available for communication and engagement activities over the appropriate timescales [16]. An issue that can arise in the absence of clear allocation of funds is fear among stakeholders that the siting process may stop, leaving a community fractured by controversy but with no definite outcome. The extent of these communication and engagement activities will vary between repository development stages, but experience has shown that they would benefit from beginning as early as possible in order to develop the trust and confidence of all stakeholders. This means that management strategies need to include allocating sufficient resources and staff to these activities rather than regarding them as ‘add-ons’ that are only included when difficulties in acceptability arise. It is noteworthy that there have been programmes suspended because of funding issues, such as a case in Hungary concerning the siting of an

LLW repository. This lack of adequate funding can lead to a loss of trust among local stakeholders, which can take many years to regain.

As has been pointed out elsewhere [38], a given national programme may not consider itself able, on its own, to assemble the scientific experts required for planning and implementing a safe and secure approach. This challenge may be mitigated by engaging in intensive cooperation with IAEA networks or by coordination with other programmes. This applies as much in the area of communication and stakeholder involvement as in the technical field.

4.3. THE SITING PROCESS

A comprehensive stepwise siting approach requires a clear and well defined decision making process in which all those involved understand their roles and the extent to which they can influence the outcome. Recognizing this has led to the development in most programmes of a number of ways in which stakeholders can exercise their influence. In line with developing practice for wide national dialogue on the need for the technically safe and societally acceptable waste management strategies discussed above, there are a number of specific components that can determine the effectiveness of the involvement process and the related outcome in terms of site selection. These are outlined in Appendix IV.

It is generally accepted that an authorization for repository construction is only likely to be achieved with local acceptance if communities are involved from the beginning and willing to give their consent (if investigations show that local geology proves suitable). Therefore, many Member States are now introducing a siting process where potential host communities are invited to volunteer for facility development. Volunteerism can be defined as "a process of joint evaluation and negotiation involving a proponent and local jurisdiction. Final agreement is made willingly by the local host" [44]. That said, there are various types of consent based or volunteer approaches that have been used, with each showing varying degrees of progress in Member States. The major concepts of volunteerism are as follows:

(a) Open volunteerism

Here, the implementing body, or sometimes the managing government agency, calls on all communities in that Member State to consider involvement in the siting process. In a variation of this approach [45] in which expressions of interest from volunteer sites are requested, the relevant body may first provide information on potentially suitable regions based on a national survey and preliminary screening to identify geological domains that are thought viable at that point. If no screening takes place prior to the call for volunteers, any who do come forward are examined using existing information in order to gauge their initial suitability prior to undertaking more intense investigations such as the drilling of boreholes.

(b) Focused volunteerism

In this variant of volunteerism, the invitation to participate is only made to communities that already possess some factors considered to be favourable. These can include apparently suitable geological and other technical conditions, or favourable social conditions, including the existence of nuclear facilities. This approach has the advantage of offering a greater chance of a positive outcome, given that the communities are already familiar with nuclear issues, but the disadvantage of excluding communities that might otherwise be interested in being considered and that might meet the initial screening criteria.

Having accepted, as is now generally the case, that it is important to have the consent of the local community around the proposed site of a repository, a growing number of Member States incorporate a system whereby the community can decide to cease involvement in the siting process up to some agreed point. As already mentioned several times, the exact nature of this 'right of withdrawal' or 'right of veto' varies; in some cases it is enshrined in legislation, while in others it is an informal, tacit agreement only,

although the authorities understand that developing a facility in an unwilling community is likely to be divisive and unsatisfactory. Ways in which this issue has been addressed in various Member States are discussed further in Section 5.

The pre-operational phase is of significant importance with regard to stakeholder involvement and can be divided as follows:

— Planning the repository siting process;
— Implementing the siting process;
— The ongoing siting process.

4.3.1. Planning the repository siting process

Experience shows that it is important to recognize throughout the development of a publicly acceptable process that the management of radioactive waste is a societal challenge, and one which will only be solved by active stakeholder involvement.

Recognizing that early in a siting process there is likely to be no preferred site or sites, it is becoming more generally accepted that before any local discussions take place, a national information and communication strategy would be devised, including the opportunity to discuss the issues. If a stakeholder involvement process is to be effective in terms of participation (irrespective of whether an acceptable site is actually identified), it is essential to design it such that all opportunities for engagement are taken advantage of. The important underlying principle here is one of trust, as has been discussed earlier. It is vital that all those involved in the process feel respected so that trust can emerge not only in the parties involved (the implementer, the regulator, politicians etc.) but that they also have confidence in the process itself and their own role in it.

Early on, involvement at a national level can allow all interested members of society to feel ownership of the developing process. It also permits the implementing body to develop its identity in full view of other stakeholders and helps to build the trust that will be so important later. This can in turn encourage local communities to take part in further, more focused engagement. Ultimately this means identifying a potentially suitable site will depend on a smaller group considering a facility, and that its participation will be acknowledged, through impact mitigation and a guarantee of a long term sustainable community future.

The independent participation of the regulator at this early planning stage can also be beneficial. Providing access to independent experts and researchers can also help to develop familiarity and trust in its activities and representatives, which will be essential when it comes to the assessment of any licence application. When a technically and socially acceptable site is identified in the future, demonstrable safety is the major criterion to be satisfied. The use of independent moderators at meetings and events can also be beneficial to trust building.

A 2015 overview of international siting processes and experiences points out that this means that those designing a process need to "…[begin] far in advance of a specific siting study, communicate and engage with interested and affected parties to discuss the overall goals and objectives of national radioactive waste management programs" [46].

It is essential to allow as much participation as possible in the development of aspects such as siting criteria (especially those concerning environmental and community issues) and how potential local communities will be involved in the decision making process. An essential component of this refers to the exact nature of the ability to withdraw up to a mutually agreed point in the process. This applies to both major parties in the process, the implementer and potential host community.

Clear communication and effective stakeholder involvement are essential components. Further guidance on practical stakeholder involvement throughout the life cycle of a nuclear facility [1] is provided in Appendix III.

4.3.2. Implementing the siting process

Following on from the initial dialogue surrounding the development of a national policy and the design of an agreed siting and decision making process, the actual implementation of the siting process beyond the planning stage has proved to be the most difficult step in many repository programmes. While discussions are being held at a national level it is generally easier to involve a wide range of stakeholders without major controversy, beyond those unwilling to engage on issues concerning the use of nuclear science, energy and technology. It is only when efforts to start identifying specific siting regions and sites are begun that difficulties frequently arise.

Section 5 provides some specific examples of how the various challenges that can be encountered have been addressed in various Member States, while repeating that a response that has been appropriate in one Member State may not always be suitable in another.

4.3.3. The ongoing siting process

As the siting process becomes more established, involving consideration of specific sites, the local communities, including local government and individual citizens, are more and more involved in the siting and the decision making process. As explained in Section 3.3.6, an EIA is a potentially important way of interacting with local government bodies during the siting process, allowing them to review and submit comments on proposed plans and, subject to national legislation, also allowing the public to be involved in the EIA through hearings and other mechanisms inherent in the process. It is important for local stakeholders to become more knowledgeable about the issues, to take part in the process and to oversee the project.

To support the participation of local communities in a siting process, the various payments and funding arrangements described in Appendix IV are sometimes amalgamated into a single agreement. These packages can include several items, such as secretarial support, the use of experts and management costs for partnerships. They can be available during site selection as well as during facility construction and operation once a site has been selected. Some examples of these elements that may make up a package are noted in Section 5.

4.4. CONSTRUCTION, OPERATION AND POST-CLOSURE

The comments and discussion above are almost all concerned with issues that arise during the repository siting process, which is generally recognized as the most controversial and difficult stage of a repository programme. Once a facility has been sited, and therefore assumed to be locally acceptable, it is important that the involvement of local stakeholders continues, in order to deepen the trust and relationship between the community and the facility operator, who will be entering a long period of coexistence. Community empowerment measures developed during the siting process would be expected to continue during construction and operation, with the establishment of local liaison committees, or site stakeholder groups to monitor and observe facility activities. The same can be true for those communities through which waste will be transported to the facility. Support and training, for example to establish robust and accepted procedures in case of accidents or emergencies, will also serve to raise local confidence.

Once public support for the siting of a repository has been gained and it has begun operation, there could be a tendency for the owner/operator to relax and reduce the level of stakeholder involvement. It is important that this tendency is resisted, and that the involvement and communication processes developed during siting are continued and, where possible, extended and improved. As discussed in Section 5, challenges of trust and acceptability can arise if community participation is stopped as soon as a site has been selected and approved. Once a community is involved and empowered, it will likely want to continue to be involved.

Many of the issues that arise during a siting process involve local concerns regarding safety and environmental impact, especially during the construction period, when heavy plant and industrial activities will be most prevalent. It is therefore vital to develop channels for liaison with all the parties involved, including the various on-site contractors. Such interaction with the local community needs to form integral parts of their contracts.

Where a community has a right of veto that right and any associated issues will clearly cease to exist at some stage during the siting process. As described, this is normally around the time that major investment in invasive and/or underground exploration and research begins. However, there is still a need to maintain the social licence to operate, such that where local partnerships have been developed, these need to be continued, with funding and support maintained. It is essential that local stakeholders are confident in the continuation of both the financial and political support, which contribute to maintaining local trust and confidence [17]. In some situations, there may have been a local referendum on whether to agree to facility development, although final approval of course needs to come from the regulatory authorities. Continued monitoring of this local acceptance through deliberative polling and other methods is nevertheless essential until final regulatory approval is granted.

Although the safety of geological disposal facilities does not depend on long term institutional controls after closure [28], these may contribute to confidence building by, for example, reducing the likelihood of future human intrusion and demonstrating the continued integrity of waste packages (through environmental monitoring). Such controls, while not necessary for safety, could form an integral part of the ongoing local participation, with clear demonstration of the need to ensure necessary technical and financial resources for these to be implemented. It is to be expected that community participation and confidence building throughout a facility's operation may lead to continued local acceptability after closure, when the implementing body may reduce its community presence. It can also help in guaranteeing the transfer of knowledge to future generations.

5. ADDRESSING CHALLENGES: LESSONS FROM MEMBER STATES

5.1. INTRODUCTION

Throughout the previous sections, reference has been made to the basic principles underlying requirements and recommended components of the range of approaches and processes comprising open and transparent public and stakeholder involvement in a repository development programme. It is possible to recognize that Member States are generally adopting more inclusive approaches to enable national and local acceptability, based on public participation and stakeholder involvement, and that this has been shown to lead to an improvement in mutual trust and, in some cases, progress where less inclusive approaches had previously stalled.

However, there is no standard way to implement such approaches and programmes. The differing political, social and cultural backgrounds in individual Member States means that each will need to adapt these approaches to suit the local situation. Furthermore, many aspects of the disposal development process may present a challenge to trust and confidence in the process and to those involved.

Many of these challenges can be encountered at any stage of a siting programme, but some are more relevant in particular stages. Examples are given in this section of how a particular challenge has been addressed in a Member State, some as general statements or recommendations, others with specific

practical details. Of course, there are to date few concrete examples of completed geological repository implementation programmes, especially for higher activity waste, such that learning is necessarily continuing. The discussion below is, therefore, not so much a list of 'do's and don'ts'; rather it presents ways in which these challenges have been addressed in some Member States and suggests some lessons that can be learned, with the tacit understanding that such examples of responses to specific challenges will be assessed and adjusted to the specific social, political and indeed situational setting.

Discussion of these challenges, and responses to them in a number of Member States, demonstrates their relevance across the various steps in a siting process, with some more relevant during policy development and establishing the programme framework, or as part of the planning and early implementation stages of a programme[3], while others are more likely to arise during the ongoing siting stage and even into the repository construction, operation and/or post-closure periods. Although a number of the challenges in this section refer specifically to building or maintaining trust at particular stages in the process, trust itself underpins many if not all of the activities discussed.

Below is an attempt to group these many challenges and responses under five distinct groups of issues.

5.1.1. Social licence issues

Social licence issues deal with basic challenges relating to communicating with stakeholders and the need to develop and maintain a mutual understanding of the issues among the parties involved.

5.1.2. Involvement process issues

Involvement process issues are issues and challenges that arise concerning the nature and degree of stakeholder involvement expected in or with decision making, the factors affecting progress and timescales inherent to the various activities. They need due consideration on how to initiate and then how to maintain stakeholder involvement and the needed flexibility in the overall process.

5.1.3. Political and regulatory framework issues

Political and regulatory framework issues include examples of the challenges associated with gaining and maintaining consistent political support over project timescales, and with the transparent involvement of the regulatory agencies and other authorities, according to their roles and responsibilities, to further develop confidence by other stakeholders that decisions are suitably informed and made. This includes issues such as acknowledging and clarifying a local community's rights in the process, such as veto or withdrawal.

5.1.4. Resourcing issues

Resourcing issues are challenges associated with the establishment and maintenance of institutional capabilities and capacity, as well as ensuring a broad understanding of the roles of different stakeholders in the decision making process. In particular, these issues concern the provision of adequate financial resources and professional competences to credibly contribute to the basis for sound decisions.

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[3] The distinction between stakeholder communication and involvement activities that occur prior to, or as part of a siting process during detailed planning, is sometimes difficult to make, especially when an earlier period of siting studies has concluded and a new siting process is required. Presenting the challenges identified in this section of the publication and examples of Member State responses acknowledges this difficulty.

5.1.5. Community support issues

Community support issues include all issues associated with the use of community benefits as a means to mitigate the real or perceived impacts of repository development and operation and to recognize community participation.

For easy reference, various issues associated with each of the above groups of challenges and for different phases in a repository development programme are provided in Table 2. Examples of relevant responses in Member States to these challenges and issues are provided in Sections 5.2–5.4 (relevant sub-sections are signposted in parentheses in Table 2).

TABLE 2. ISSUES AND CHALLENGES IN EACH PHASE OF A REPOSITORY DEVELOPMENT PROGRAMME

Phases	National level challenges	Locality specific challenges		
Issues	Development of a radioactive waste management policy and establishing the programme framework	The siting process		Construction, operation and post-closure
		Initiating the siting process (detailed planning and implementation)	The ongoing siting process	
Social licence issues	Development of mutual understanding and confidence → (5.2.1.2)	Continued development of mutual understanding and confidence → (5.3.1.1b)	Communicating changing timelines and processes → (5.3.1.2b)	Continuation of mutual understanding and confidence → (5.4.1.2)
	Discussing complex issues with non-specialist stakeholders → (5.2.1.4)	Communication with neighbouring states → (5.3.1.1d)	Provision of clear and understandable information about the issues → (5.3.1.2d)	Continuation of local engagement → (5.4.1.4)
	Provision of clear and understandable information → (5.2.1.6)		Improving public confidence in the safety case and technology development → (5.3.1.2f)	Maintaining social licence and intergenerational knowledge → (5.4.1.6)
	Communication with the concerned public or outspoken opponents → (5.2.1.8)		Keeping promises → (5.3.1.2h)	
			Engaging with opponents (or the concerned public) → (5.3.1.2j)	

TABLE 2. ISSUES AND CHALLENGES IN EACH PHASE OF A REPOSITORY DEVELOPMENT PROGRAMME (cont.)

Phases	National level challenges	Locality specific challenges		
Issues	Development of a radioactive waste management policy and establishing the programme framework	The siting process		Construction, operation and post-closure
		Initiating the siting process (detailed planning and implementation)	The ongoing siting process	
Involvement process issues	Development of an acceptable decision making process → (5.2.2.2)	Beginning a consent based or volunteer process (5.3.2.1b)	Allowing sufficient time and process flexibility → (5.3.2.2b)	Ensuring flexibility → (5.4.2.2)
	Understanding the need for a flexible and long term process → (5.2.2.4)		Tailoring the engagement process to local needs → (5.3.2.2d)	
	Designing a national level stakeholder involvement → (5.2.2.6)		Maintaining and enhancing local support → (5.3.2.2f)	
	Selecting a consent based or volunteer siting process; right of withdrawal → (5.2.2.8)			
Political and regulatory framework issues	Obtaining political support → (5.2.3.2)	Involvement of the regulator → (5.3.3.1b)	Involvement of the regulator → (5.3.3.2b)	Ensuring ongoing local support → (5.4.3.2)
	Ensuring the competence and independence of a regulator → (5.2.3.4)		Continuation of national political support → (5.3.3.2d)	
	Involving all suitable levels of government while defining a role that does not prematurely thwart the consent based siting process → (5.2.3.6)		Obtaining local political support → (5.3.3.2f)	
			Testing local approval → (5.3.3.2h)	

TABLE 2. ISSUES AND CHALLENGES IN EACH PHASE OF A REPOSITORY DEVELOPMENT PROGRAMME (cont.)

Phases	National level challenges	Locality specific challenges		
Issues	Development of a radioactive waste management policy and establishing the programme framework	The siting process		Construction, operation and post-closure
		Initiating the siting process (detailed planning and implementation)	The ongoing siting process	
Resourcing issues	Ensuring provision of funding (national waste funds) → (5.2.4.2)	Making first contact with potential host communities → (5.3.4.1b)	Using suitable staff → (5.3.4.2b)	Ensuring the existence of a suitably qualified workforce → (5.4.4.2)
	Ensuring staff are aware of processes → (5.2.4.4)		Establishing a credible presence within potential host communities → (5.3.4.2d)	
Community support issues	Benefits agreed in principle → (5.2.5.2)	Supporting local involvement → (5.3.5.1b)	Negotiating locally acceptable benefits → (5.3.5.2b)	Ensuring mitigation of adverse impacts → (5.4.5.2)
			Maintaining progress while making benefits available → (5.3.5.2d)	Maintaining benefits over time → (5.4.5.4)
	Supporting involvement of all interested stakeholders → (5.2.5.4)		Satisfying communities not selected to continue → (5.3.5.2f)	Ensuring visibility of the long term commitment of the facility operator → (5.4.5.6)

5.2. DEVELOPMENT OF A RADIOACTIVE WASTE MANAGEMENT POLICY AND ESTABLISHING THE PROGRAMME FRAMEWORK

From the very beginning of a repository development programme, establishing and building trust in all the parties involved and in the process is crucial to effective communication with stakeholders. Furthermore, the involvement of stakeholders in process planning from the very beginning of a repository development programme is essential to prevent accusations of decisions having already been made. This is the embodiment of the 'Discuss, Deliberate and Decide' approach, as opposed to 'Decide, Announce and Defend'.

5.2.1. Social licence issues

5.2.1.1. Challenge: Development of mutual understanding and confidence

At the initial stage of a repository development programme, the national policy for radioactive waste management as well as the overall repository programme design is developed. This necessarily includes establishing the radioactive waste management framework and preparations for instigating repository

siting. During this phase, preceding the actual siting process, the target audience for a communication and stakeholder involvement programme will generally include the public at the national level and specific interested stakeholder groups. Through active discussions with those stakeholders, mutual understanding and confidence in the policy and process will be developed.

5.2.1.2. Responses

- In **Canada**, prior to any attempts to identify potential siting areas for a low and intermediate level waste (LILW) repository, the Nuclear Waste Management Organization (NWMO) spent several years engaging with public groups, local communities and experts to improve understanding on both sides of the issues and to develop a management and siting process acceptable to the majority of citizens. Only when this was completed were communities invited to learn more and become involved. Given that 22 communities subsequently agreed to do so, this approach appears to have been effective in developing a degree of mutual trust and confidence.
- Failure to undertake this kind of initial public discussion is recognized as one of the main causes of the difficulties encountered in a repository development process in **Germany** in the 1980s and 1990s. In 2013, a new approach to site selection was taken with the Site Selection Act, followed by the establishment of a commission in 2014, which included scientists, relevant societal groups and representatives of the national parliament and the federal state governments. This commission issued a report outlining a proposed new process in July 2016 and this is now underway.
- In the **United Kingdom**, when a repository siting process was abandoned in 2013, following a decision by a potential host region to withdraw, the government undertook a comprehensive national consultation with stakeholders including public dialogues on how to amend and improve the previous siting process, resulting in a new process which sought to address the issues that arose. This revised process is now underway and it remains to be seen how effective the new approach is in practice.

5.2.1.3. Challenge: Discussing complex issues with non-specialist stakeholders

One of the fundamental complexities relating to radioactive waste management resides in the broad range of radioactive waste categories, their associated potential hazard and the suite of disposal solutions available to safely manage such waste. An important issue that requires effective communication, especially in these initial stages, is therefore the distinction between the different types of radioactive waste, their sources of production and the ways in which they are to be managed and disposed of. It is generally acknowledged that the general public tends not to distinguish between LLW and HLW in terms of degree of potential harm, despite the clear differences in management and disposal approaches. In Member States where disposal facilities for LLW have operated for some years, this can be less of a challenge, but where no such facilities exist, or where the distinction between waste types is not well understood, clear and well designed communication of issues and options needs to form an important part of the development of the siting process. Even then, authorities need to expect to have to continually repeat the information as new communities and audiences become involved. Early involvement in the education system can be a useful approach, as given the timescales involved in facility siting and operation, some of today's schoolchildren will be tomorrow's decision makers.

If the development of the siting process is being undertaken following earlier challenges, it is vital to demonstrate, in clear and unequivocal terms, that the reasons for the challenges have been recognized and that the new process is clearly distinct. Several siting processes that followed earlier stalled attempts illustrate good examples of how this has allowed renewed progress to be made.

This specific challenge had also been recognized during the implementation of the Euratom Horizon 2020 programme and gave rise to a request to conduct dedicated research on the matter.

5.2.1.4. Responses

— In **Belgium**, in autumn 2009 and in early 2010, the King Baudouin Foundation organized a citizens' conference with a group of 32 citizens. This conference was held at the request of the Belgian National Agency for Radioactive Waste and Enriched Fissile Material (ONDRAF/NIRAS), which wished to organize a societal consultation before the strategic environment assessment legal process for the waste plan. A group of citizens, representative of the diversity of the Belgian population, worked intensively on the decision making process, considering such questions as: Under what conditions can a policy decision be taken? How, with whom, when and where to decide? The citizens' conference was organized independently of ONDRAF/NIRAS and in a completely transparent way. The foundation ensured that the process was accompanied, from the beginning to the end, by a support committee made up of academics and professionals. The report of the citizens' conference has been used to enrich the waste plan project, and was delivered unedited to the government, together with the waste plan and the strategic environment assessment.
— In **Canada**, as part of the communications programme for a deep geological repository for LILW, only part of the communications concerned scientific and technical issues. A large part of the programme related to values based decision making. Research has shown that the general public is better equipped to engage in a dialogue about what values are expected to underlie programmes involving radioactive waste, rather than the technical details. Furthermore, a shared understanding of values leads to greater public support than an understanding of the science.
— In **Japan**, the Atomic Energy Commission set up a Special Committee on High-Level Radioactive Waste Disposal between 1995 and 1998 to develop extensive discussions covering social and economic aspects so that citizens' understanding of the issue of HLW disposal could be enhanced. The committee consisted of not only key representatives of the nuclear industry but also of social scientists from universities, as well as lawyers, journalists, representatives from general society and freelance commentators. The committee organized opinion exchange meetings on its interim report in six major cities nationwide to allow public opinions to be reflected in the final report. It was the first time in Japan that public comments on the issue of HLW final disposal had been collected by the government.
— Within the Euratom Horizon 2020 programme, the special project SITEX II 'Sustainable Network for Independent Technical Expertise of Radioactive Waste Disposal — Interactions and Implementation' investigated different possibilities for cooperation in involvement of non-specialists in complex issues. The project completed in 2017 and results show that non-specialist stakeholders can be very effectively and efficiently involved in the development of different research activities.

5.2.1.5. Challenge: Provision of clear and understandable information

As part of the involvement of a wide range of stakeholders in process design there is a need for organizations involved in disposal to provide clear and understandable information. Trust is again important here, and if the responsible authorities are not trusted then the public will go elsewhere for information. The use of independent oversight and advisory groups, involving, for example, members of learned societies and independent researchers, can help to develop trust in the relevance and veracity of the information provided. Their use can also help to convey such information to other stakeholders in a clear and concise manner.

In particular, the scientific basis underpinning the concept of passive safety, which is fundamental to ensuring confidence in disposal, needs to be communicated using well considered methods. In many Member States, this has been assisted through the use of anthropogenic and natural analogues for some of the design components and for explaining safety related issues.

5.2.1.6. Responses

The use of natural analogues, to illustrate and explain complex processes, is just one example of how scientific and technical information can be provided in terms that are generally understandable by a non-specialist audience. Over the last 20–30 years, many natural analogues, displaying geological and chemical conditions similar to those expected in different parts of a repository system at different periods of time, have been studied in detail. Appropriately selected, the results of these studies are intended to demonstrate how certain assumptions made in developing a safety case are based on real world evidence involving well understood natural systems and processes.

Another tool to support scientific understanding is through the use of existing underground research facilities. Participation is encouraged in several international research programmes involving underground laboratories, and explaining the design and results of experiments, as well as demonstrations of equipment and testing methods, can facilitate broad stakeholder understanding of key processes that potentially impact safety. It is helpful when these facilities allow the public and others to visit and experience conditions underground, so that their relevance can be communicated within Member States. Experience suggests that developing explanatory material early in siting process design, exemplified by the use of natural analogues and results arising from generic studies, would be of significantly beneficial to be available for use in different situations when the siting process begins.

— In **Canada**, as part of the communication programme for a deep geological repository for LILW, critics of the proposed siting process expressed the view in regulatory hearings that there was a need for clear and simple information on the risks and hazards of radioactive waste to be provided to the public up front, in order to help them better understand and evaluate the importance of the siting process. Ontario Power Generation (OPG) provided this information in context at subsequent public meetings to help the public understand the need for a process to permanently remove the waste from the biosphere.
— Also in **Canada**, campaigners were asked for input on valued ecosystem components to help form the guidelines of the siting process, ensuring their views were incorporated in decision making.
— In **Japan,** the authorities began a national programme of communication in 2015, intended to improve public understanding of the technical issues surrounding the search for a repository and how the proposed safety measures can be relied upon within the geological conditions available. One of the ways being used is to demonstrate the role being played by underground in situ research facilities, of which there are several in the country.
— In the **United Kingdom**, after an earlier geological disposal facility siting process in Cumbria was halted in January 2013, the government undertook a policy review. A public dialogue on the review of the siting process was conducted between May 2013 and February 2014. This provided further evidence to policy makers alongside specialist stakeholder views and consultation responses. The public dialogue was supported by Sciencewise, the national centre for public dialogue in policy making involving science and technology issues. Information, in the form of ‘stimulus materials’, was developed by independent public dialogue contractors working closely with the sponsoring government department’s policy team. Although informal, discussions were highly structured, being designed and led by an experienced facilitator. Besides plenary sessions, the policy makers joined in subgroup discussions that again were led by facilitators working alongside specialist note-takers.

5.2.1.7. Challenge: Communication with the concerned public or outspoken opponents

The development of a siting process has to recognize that it will never be possible to gain universal acceptance by the concerned public for a proposed facility. This does not remove the requirement to communicate the need for a solution, and the process by which it can be implemented. A significant aspect of this is finding ways of how to respond to and, if possible, involve those who will inevitably oppose the process from the very beginning.

5.2.1.8. Responses

— In **Canada**, as part of the communication programme for a deep geological repository for LILW, OPG developed and maintained a stakeholder list of any and all members of the public who had expressed an interest in the project, positive or negative. Throughout any given year, many updates were sent to the stakeholder list to keep opponents and proponents alike informed. Questions resulting from the updates were answered personally, and lines of communication kept open.
— Following the cessation of the investigation of the potential Gorleben disposal site, the 2013 Site Selection Act in **Germany** established a commission to discuss the fundamentals of the disposal of, in particular, HLW and make suggestions on a new process, with the final report being submitted in 2016. The membership of the commission included scientists, politicians and societal groups such as trade unions and NGO representatives, with all but the politicians having voting rights on the final report.
— In **Switzerland**, opponents of nuclear energy were able to contribute comments to the commission that developed the radioactive waste disposal concept. In addition, different groups including opponents were involved in the development of the sectoral plan.

5.2.2. Involvement process issues

5.2.2.1. Challenge: Development of an acceptable decision making process

It is important to demonstrate from the start that there is a well-designed decision making process, with clear roles and responsibilities for the various participants contributing to providing information, deliberating and making a given decision. For disposal siting, development and waste emplacement, this is a stepwise process with clear decision points, although with enough flexibility to allow issues that will inevitably arise to be suitably addressed. The involvement of suitably qualified academics, especially in the field of social sciences and political theory, can be important in the development of acceptable approaches to informing, deliberating and building consensus prior to taking a decision.

Fundamental to this, and indeed a prerequisite for developing trust in the whole process, is adequate involvement and communication with potentially impacted stakeholders, in order to understand local issues and concerns, and develop ways of addressing them.

5.2.2.2. Responses

— In **Australia**, the process adopted for selecting a LLW disposal site included at an early stage the formation of an independent advisory panel comprising representatives with expertise in technical and socioeconomic issues relevant to radioactive waste management. The panel focused on providing independent expert advice to the government on processes and tools for implementing the siting project. To improve the robustness of the process, a representative from the Australian Conservation Foundation, which openly opposes nuclear science and technology, was invited to form part of the independent advisory panel. Their active participation in the independent advisory panel meetings provided another perspective on issues such as community and traditional owner[4] concerns and resulted in further discussion and consideration of perspectives. The representative also provided advice on how best to overcome some of the challenges and on ways to ensure all voices were heard as part of the site selection process.
— The partnership concept, originally developed in **Belgium** and now implemented in several Member States, was the result of work carried out by academics from the Universities of Antwerp and

[4] 'Traditional owner' is a term used in Australia to describe an Indigenous Australian who is a member of a group that has traditionally had certain rights and responsibilities for an area of land or water.

Luxembourg, following the total lack of progress of a directed siting process instituted by ONDRAF/NIRAS in the 1990s.

— In **Canada**, NWMO supported the development of local groups in those communities requesting more information, and undertook extensive local dialogue, involving all interested stakeholders, including Indigenous Peoples, business associations and various NGOs.
— The siting process for a geological repository in **France** has included the use of two legally mandated public debates at specified points designed to involve as wide a range of stakeholders as possible. The second of these public debates took place on-line as a result of opposition from some groups to planned public meetings in a number of localities.
— In the **United Kingdom**, the siting process underway has involved an initial period where two strands of work have been undertaken. One relates to the development of geological information relevant to the long term safety of the facility, reviewed by an independent oversight group nominated by the Geological Society. Another strand concerns the development of an approach to community representation in an open and transparent process. Both strands have been incorporated into a decision making process that includes public consultation and discussion prior to a call for volunteer communities. The process is now underway.
— Efforts began in 2016 in the **United States of America** to involve the wider national public in designing a consent based siting process for a deep repository following years of opposition in Nevada, where Yucca Mountain was designated in 1987 as the sole candidate site for the disposal of spent fuel and other higher activity waste. This move responded to the 2012 recommendations of a Blue Ribbon Commission on America's Nuclear Future. The findings of eight public meetings held throughout the United States of America were published in 2016 and asked for public comments. Although consent based siting was recommended by the Blue Ribbon Commission, at the time of writing the United States Congress had yet to amend legislation governing the site selection disposal facilities established in 1984 and modified in 1987.

5.2.2.3. Challenge: Understanding the need for a flexible and long term process

Even if a national policy for the safe management of radioactive waste was well established, it is important to note that the issues, technical options, decision making process and participants in the repository development programme will almost certainly change over time. This may require timely and flexible adjustments of the policy, strategy, process and schedule.

5.2.2.4. Responses

— In **Canada**, the NWMO consulted with citizens for several years at the outset of its repository development programme. As part of its consultations, it found they wanted an adaptive and phased programme that could be modified if technologies change in the future.
— In **Japan**, the national government amended the Basic Policy on the Final Disposal of the Specified Waste in 2015. One of the newly added points is an emphasis on the flexibility of future generations' choices. It is specifically mentioned in the policy that current generations need to ensure the potential for the reversibility of the programme and the retrievability of the waste. The promotion of R&D for alternative disposal options and the expansion of storage capacity for spent nuclear fuel are also mentioned.

5.2.2.5. Challenge: Designing a national level stakeholder involvement

Before initiating discussion at any local level, there needs to be a well designed communication and stakeholder involvement programme at the national level. This would allow a full range of interested members of society to discuss all relevant topics, understand the issues and feel ownership of the repository development process.

5.2.2.6. Responses

— In **Canada**, following earlier difficulties with public acceptability, the implementer, NWMO, created under a new law in 2002, undertook a comprehensive programme of stakeholder engagement. Designed to involve as wide a range of the Canadian public as possible, it intended to learn their concerns and understand how they felt used fuel needs to be managed. This resulted in the development of the so-called 'adaptive phased management' process in 2005, intended to promote the development of a centralized deep geological repository, but with the option of shallow storage and continuous monitoring, with the waste retrievable for an extended period. Significantly, an informed, willing community would be sought to host the centralized facility. NWMO continued the national dialogue for a further five years, only proposing a siting process in 2010, having again attempted to involve as wide a section of the Canadian public in the discussion as possible. Only then did the engagement shift from the national to the more local level as they invited interested communities to come forward to participate in the so-called 'Learning More Process'. Even then, they were initially only participants in high level discussions intended to allow the public to understand what was being proposed, without any form of commitment.
— Following the recommendations of the Commission on Storage of High-Level Radioactive Waste, a national citizens' oversight committee has been established in **Germany**. This commission is an independent observer of the site selection process and it can act as a mediator if conflicts arise. The committee specifically observes whether the participation process follows the rules of the Site Selection Act, which sets the framework for the participation process. The commission has the right to access all relevant documents of both the implementer and the regulator. The commission consists of well-known public figures appointed by the German Bundestag and Bundesrat. In addition to these experts, citizens are also a part of the commission. They are nominated in a participation process and appointed by the German Environment Minister.

5.2.2.7. Challenge: Selecting a consent based or volunteer siting process and right of withdrawal

Many Member States are now introducing a siting process in which they strive to establish a consent based sequence of programme decisions, with special focus on site selection. There may be some need for proactive local involvement, such as through a volunteer approach, and this is typically associated with some form of local right to veto and/or withdraw from the process, reflecting the specific national governmental, regulatory and social settings. This offers a mechanism for the local community to express the state of local opinion and cease involvement if adequate consent cannot be reached to pursue locally.

5.2.2.8. Responses

— In **Australia**, the National Radioactive Waste Management Act 2012 was specifically developed to allow for individual land owners to volunteer their land for consideration to host the proposed LLW disposal facility. The act provides for procedural fairness whereby during a 60 day consultation period anyone with a right or interest can submit comments, in support of or against the nomination. The minister broadened this consultation to 120 days during the 2015–2016 consultation period and included anyone who had an interest in the project. The government also committed that a facility will only be sited if it has broad community support, noting that no individual or group has a right of veto.
— In **Belgium**, in 1998, when a new site selection approach was launched, one of the main principles was based on voluntarism, local participation in decision making through joint project development, site specific repository design and development of an integrated repository project. The focus was on existing nuclear sites and interested municipalities. The new approach led to the establishment of three local partnerships, uniting local councils' representatives, local civil society and the ONDRAF/NIRAS in joint project development. Engagement at this stage did not mean immediate agreement

to eventually host the facility. Crucial for the volunteering municipalities has been the de facto local right to veto that they were given.

— In an existing siting process in **Japan**, three siting stages are legally provided in the Act on Final Disposal of Specified Radioactive Waste, but no methodology for initiating them is specified. In 2002, the Nuclear Waste Management Organization proceeded with an open volunteer process, beginning with an 'open solicitation', inviting local municipalities to accept a literature survey as a first step, which may or may not be followed by further steps. According to the act, to progress through the different stages, the minister of economy, trade and industry, as decision maker, has to hear and respect the opinions of the potential host municipalities and the competent prefecture. This is regarded as an actual right of veto or withdrawal for the municipality and the prefecture.
— In **Switzerland**, in contrast to several other programmes, the site selection process is not a volunteer process. The main reasons are the focus on safety in the complex Swiss geological situation and the eventuality of insoluble further processes if the volunteer approach did not result in a publicly accepted site. Instead, the sectoral plan, according to which the site selection proceeds, mandates that the implementer applies for a general licence for one or more sites that best fulfil the safety requirements. Additionally, siting regions, defined by geographical as well as socioeconomic criteria rather than host communities, are substantially involved in each phase of the siting process and can voice concerns and demands within it. Studies have shown that this 'safety first' approach is well supported by the Swiss population.

5.2.3. Political and regulatory framework issues

5.2.3.1. Challenge: Obtaining political support

Strong and consistent political support is one of the key elements underpinning the sustained implementation of the repository development programme. To obtain such support, a wide range of politicians at both national and local levels need to be fully informed of and accept the national policy of radioactive waste management and the repository siting process.

5.2.3.2. Responses

— In **Germany**, the 2017 Site Selection Act was passed with broad cross-party consensus. This constitutes a strong political basis for the site selection process.
— In **Romania**, the Nuclear and Radioactive Waste Agency has developed, according to its strategy on communication and stakeholder involvement, an action plan for gaining continuous political support. In this respect, it has organized several dedicated events. For example, in May 2013, in partnership with the Committee for Industry and Services of the Chamber of Deputies, the lower chamber of its parliament, organized the NucInfoDay, a conference that focused on stakeholder involvement, international cooperation and public acceptance, all requirements for sustainable nuclear investment. The event was attended by more than 100 guests from Romania and abroad. In partnership with the Chamber of Deputies, the Nuclear and Radioactive Waste Agency also organized a scientific conference dedicated to the celebration of 60 years of nuclear activity in Romania. The event brought together members of the Romanian Parliament and government officials, national and foreign experts in nuclear energy, representatives of the national authorities and of the diplomatic corps accredited in Bucharest, and representatives of the local community around the proposed LLW repository. Finally, with the support of the IAEA, scientific visits were arranged for representatives of the Chamber of Deputies to Member States that already operate final repositories, to acquaint them with the technology, in order to generate support for the Nuclear and Radioactive Waste Agency's activities.

5.2.3.3. Challenge: Ensuring the competence and independence of a regulator

The presence of a strong and independent regulator is an important component of any well designed siting process, and a major factor in gaining and maintaining societal trust and confidence. It is the government's responsibility to empower and provide adequate resources to a regulator, ensuring it can competently and independently oversee and contribute to those decisions likely to impact on the capacity to provide a safe disposal solution.

5.2.3.4. Responses

— In **China**, while the China Atomic Energy Authority is responsible for policy making for and the project management of radioactive waste management, the National Nuclear Safety Administration, which is part of the Ministry of Environmental Protection, is an independent regulatory body. To ensure the necessary competences were available, the Nuclear and Radiation Safety Centre was established to provide technical support as needed.
— In **Italy**, the Decree (45/2014) implementing EC Directive 2011/70/EURATOM prescribed the constitution of a new competent regulatory authority in the nuclear safety and radioactive waste management fields, the Inspectorate for Nuclear Safety and Radiation Protection, responding to the need for a well structured, independent and expert authority. The inspectorate has consolidated and incorporated all the functions concerning nuclear safety and radiation protection that were previously assigned by the national legislation to several other bodies in Italy.
— How a failure to demonstrate clear independence of the regulator from government and/or industry can lead to a lack of public confidence was witnessed in **Japan** following the accident at the Fukushima Daiichi nuclear power plant in 2011. The response to public concerns over sufficient past regulatory oversight led to the formation of the Nuclear Regulation Authority, a completely new regulatory body, deliberately distanced from previous relationships.

5.2.3.5. Challenge: Involving all suitable levels of government while defining a role that does not prematurely thwart the consent based siting process

Obtaining and maintaining sustained political acceptance of the siting process at all levels of government — national, regional and local — necessitates careful consideration, especially as specific regions or sites will need to be considered. In the absence of adequate involvement of one or all those governmental bodies concerned in the process, one or several of them may recommend withdrawing from further site considerations.

5.2.3.6. Responses

— The **United States of America**, when attempting to site a disposal facility for transuranic waste in southern New Mexico, did not initially negotiate a role for the state of New Mexico. In 1979, in legislation authorizing the Waste Isolation Pilot Plant for transuranic waste, United States Congress mandated that the Department of Energy (the relevant waste management organization in the United States of America) negotiate a Consultation and Cooperation Agreement with the state of New Mexico. However, the attorney general of the state of New Mexico sued the federal government in 1981 when the Department of Energy became unresponsive to state demands, could not execute a Consultation and Cooperation Agreement, and unilaterally decided to proceed with the Waste Isolation Pilot Plant. The lawsuit prompted the Secretary of Energy to negotiate the mandated agreement with the Governor of New Mexico. The Consultation and Cooperation Agreement, enforceable in court, provided a detailed process for state involvement at the Waste Isolation Pilot Plant. The agreement helped garner sufficient support to go forward with the project.

— The **United States of America**, when attempting to voluntarily site radioactive waste management facilities, defined a role for states and Native American peoples (who, under the concept of sovereignty, are given the authority to govern themselves). A volunteer process for siting either a disposal or interim storage facility was included in the 1987 Nuclear Waste Policy Amendment Act. The act did not specify any constraints on the negotiation process except that the agreement was to be ratified by the United States Congress. The nuclear waste negotiator, a position established in the act, developed a consent based siting process that required consent by the regional authority at each phase of the selection process (i.e. creating several points in time where the regional authority could exercise a veto). While local officials and a citizen task force pursued interactions with the nuclear waste negotiator, the regional authority was the focal point of petitions to stop the volunteer process, even at the information phase, before the local community had an opportunity to survey support and assess the rationale for accepting the facility. Consequently, most regional authorities did not approve communities exploring interest or going beyond the first phase.

5.2.4. Resourcing issues

5.2.4.1. Challenge: Ensuring provision of funding (national waste funds)

Irrespective of how a siting process is designed and initiated, experience shows that the time taken to achieve project milestones is likely to be much more than was originally estimated. This demands that from the very start, sufficient resources, both financial and human, are made available, and committed for the long term.

5.2.4.2. Responses

— In 2015, a special commission was established in **Germany** to develop recommendations as to how to fund the nuclear phase-out, including decommissioning, interim storage and waste disposal. In April 2016, the commission proposed that power utilities pay into a specially created state owned fund. The amounts include specific allocations for siting, constructing and operating a geological disposal facility. A corresponding act was passed in December 2016.
— In the **United States of America**, as in many Member States, a fee is levied on electricity production in order to establish a specific waste fund to be used for repository development. In 2012, the Blue Ribbon Commission suggested that the United States of America form a new, well funded, clearly independent organization, to avoid programmes becoming mired in political manoeuvring, which leads to project delays and community uncertainty.

5.2.4.3. Challenge: Ensuring staff are aware of processes

Irrespective of the design and content of a siting process, it is essential that the responsible organization ensures the involvement of suitably qualified and able individuals, capable of engaging well with a range of stakeholders. This is not always easy, and the involvement of people from different parts of the organizations and from different disciplines, is recommended, with training provided as appropriate. The development of cross-departmental project teams and steering groups in this way can be important drivers for successful stakeholder engagement.

If suitable staff are not available within the responsible organization, the use of external consultants could be considered, although care needs to be taken not to use non-specialized public relations organizations used to selling products and ideas alone, as this could alienate concerned stakeholders. Experience shows it can be beneficial to involve professional dialogue designers and facilitators who take pride in working on behalf of all parties in the search for effective solutions. The role of the implementing organization's process aware staff in such circumstances is then as 'intelligent customers', defining tasks and selecting the appropriately skilled practitioners suited to the engagement tasks.

5.2.4.4. Responses

— In **Italy**, the state owned company responsible for the management of radioactive waste, Società Gestione Impianti Nucleari (Sogin), has established a scientific committee that brings together a wide range of experts, including sociologists, physicians, economists and geologists, to debate issues related to the development of a repository project on a regular basis; furthermore, such cooperation is useful in fostering stakeholder engagement based on shared confidence, thanks to the involvement of expert individuals.
— In the **United Kingdom**, staff in the then Department for Energy and Climate Change between 2013 and 2016 undertaking a geological disposal facility siting policy review used a range of engagement methods including a call for evidence and views from interested parties; a formal consultation; deliberative meetings with stakeholders; advice from a specialist community representation working group; and two phases of public dialogues. Process aware staff acted the role of customers, appointing dialogue practitioners to design and lead the stakeholder and public dialogues they themselves then took part in.

5.2.5. Community support issues

5.2.5.1. Challenge: Benefits agreed in principle

Another important aspect of the siting process that deserves to be recognized early on and in turn developed and communicated during the process planning stage is the availability or otherwise of community benefits. Recognizing that repository development is answering a societal need requires a local community to act on behalf of the whole country. It is now common, as described earlier, to offer various economic and social benefits to acknowledge this, in addition to ways of mitigating the unavoidable impacts of exploratory works, facility construction and operation. In some Member States these benefits are negotiated with communities later in the siting process; in others they are laid down in legislation and therefore designed during policy development. Difficulties arise when these are seen as bribes or inducements to attract underdeveloped communities to enter a volunteer process [17]. This is a challenging area that requires careful management and communication.

5.2.5.2. Responses

— In **France**, economic development support initiatives around the Bure site have been supported through money generated through special taxation measures, with management and disbursement of significant amounts of investment undertaken by local management groups (groupements d'intérêt public), as laid down in legislation. In addition, local investment has been negotiated over the years between the district level authorities, the National Agency for Radioactive Waste Management (ANDRA) and the utilities, through enhanced local purchasing and investment that has been pursued by both ANDRA and major waste producers in France.
— In **Italy,** the 2010 decree outlining the new siting process appointed Sogin as the implementer instructed to develop, through the national workshop, a series of direct benefits, agreed at the national level, and a package tailored to local communities' needs and agreed with them. This could include implementing specific R&D activities and other sustainable development activities, also agreed with local communities, within a co-located technology park.
— The outreach scheme proposed in **Japan** by the Nuclear Waste Management Organization in their open solicitation in 2002 included annual payments to an interested community during an initial literature and desk study stage. This would increase during detailed site investigations and continue beyond the construction stage. These funds were to be used to support the development of public facilities, for industrial development, and to support local enterprises, regional activities and other welfare measures.

— Following an earlier community withdrawal from a siting process, where details of the potential community benefits were cited as one of the areas of uncertainty leading to rejection of the process, the **United Kingdom** government undertook a public consultation and developed a revised siting process. An important component of this process that is now underway, is a commitment to local investment in those communities participating in the siting process. The amounts available increase as the process moves forward into borehole investigations. This investment is additional to the expected financial impact of the geological disposal facility development itself in any location where it might proceed.

5.2.5.3. Challenge: Supporting involvement of all interested stakeholders

For effective stakeholder involvement, it is important that the stakeholders are fully informed of and understand the issues. It is now more common to provide financial support to stakeholders to become more knowledgeable about the issues involved. This can allow stakeholders to organize meetings, hire independent experts and oversee a project.

5.2.5.4. Response

— In **Canada**, stakeholders are incentivized to participate in the review process of deep geological repositories through the environmental assessment process. Interveners are encouraged to apply for funding to help defray the costs of studying the proposals or hiring independent experts. Applications are made through the Canadian Environmental Assessment Agency. Funding for successful applicants is provided by OPG.

5.3. THE SITING PROCESS

Once the decision has been made to initiate a siting process and the necessary funding agreed, together with enough political and societal support to proceed, the important work of detailed planning and subsequent implementation can begin. However, this does not mean that the challenges have all been met, indeed, far from it. The development of trust gained during the preparatory stage needs to continue into the detailed planning and design of the siting process through the involvement of all relevant stakeholders, together with open communication of the activities and plans as they are developed and implemented. It is the way in which the implementing body and other authorities behave as the siting process begins that will determine whether trust already earned continues and whether that trust can be strengthened, in turn influencing whether the process has any chance of success.

Despite the most comprehensive communication and engagement that may have been carried out during the preparatory development of the process, once it begins in earnest many of the original challenges will return, along with a whole set of new ones. Some of these will appear as soon as the process begins and are specific to the initiation of the siting process. Other challenges may appear progressively, throughout the ongoing siting process. Challenges typical to siting are therefore grouped according to these two phases.

5.3.1. Social licence issues

5.3.1.1. Initiating the siting process

5.3.1.1a Challenge: Continued development of mutual understanding and confidence

Examples exist of well-designed processes failing because promised involvement by the affected communities either did not happen or did not achieve local acceptance. Therefore it is important to be

clear from the very beginning of the siting process exactly who will make what decisions, and how public concerns will be taken account of. If the process is seen to be equitable and fair, there will be a much greater chance of progress being achieved.

5.3.1.1b Response

Some ways that appear to offer promise have already been discussed elsewhere in this publication, such as geological screening in order to focus community engagement on those communities with the most potential; approaching communities hosting existing nuclear facilities; and conducting extensive national dialogue to improve public understanding.

— In **Sweden**, when the Swedish nuclear fuel and waste management company Svensk Kärnbränslehantering (SKB) began to develop the concept of feasibility studies in selected communities, it failed to clarify that the total number of such feasibility studies could be limited to those sites where conditions were expected to be potentially suitable. Despite this having been an oversight — or a lack of precision — when first presenting the process to stakeholders, SKB nevertheless felt compelled to strictly adhere to the process as stated, which resulted in invitations having to be sent to every municipality rather than just those where conditions were expected to be potentially suitable, resulting in additional effort and cost.

5.3.1.1c Challenge: Communication with neighbouring States

As soon as the siting process begins, it is generally considered important to begin discussions with adjacent Member States. This can be necessary to comply with international agreements, including those relevant to signatories to the Espoo Convention [39], for example, but is also important when not mandated by agreements to maintain relationships and reassure the population of adjacent Member States about the proposals.

5.3.1.1d Responses

— **Hungary** specifically avoided seeking potential sites close to its borders, beyond the requirements of the Espoo Convention, to reduce potential issues arising with its neighbours.
— Such communication can be seen to have led to identification of a publicly acceptable site in **Lithuania**, where responding to certain concerns from neighbouring states allowed the LLW repository at Visaginas to proceed.
— **Switzerland** has maintained close contacts with the authorities in Germany due to the location of the proposed repository siting areas close to the border between the two Member States. It has included representatives from the relevant German federal states and community authorities on the regional conferences established under the terms of the sectoral plan. In addition, Austria is involved in several commissions established in the sectoral plan and participates in the consultation for each stage of the process.

5.3.1.2. The ongoing siting process

5.3.1.2a Challenge: Communicating changing timelines and processes

Even though planning has ideally produced a clear and understandable decision making process, with well defined roles and responsibilities for all the expected participants, it is almost certain that unexpected factors will arise. To maintain trust and confidence in the entire process, it is crucial to communicate the issues and any changes to the schedule and amendments of the process in a timely manner.

5.3.1.2b Response

— In a siting process in **Switzerland**, the original timetable has been revised on multiple occasions. Any revision is transparently communicated either by media announcement or by means of an electronic newsletter. Based on a request by members of the regional conferences, the Swiss Federal Office of Energy has also published a document outlining the reason for the increased duration of the siting process along with an overview of which stakeholders were involved at which point in the decision making process.

5.3.1.2c Challenge: Provision of clear and understandable information about the issues

During the siting process, it is important for local stakeholders to become more knowledgeable about the issues. There are several examples from Member States where educational materials or scientific visits have been provided so that the community members can understand the technologies involved and see how those issues have been or will be addressed.

5.3.1.2d Response

— In **Switzerland**, following the formation of regional conferences, the Swiss Federal Office of Energy has provided educational opportunities on a variety of scientific topics (including, for example, a visit to the interim storage facility of radioactive waste and the rock laboratory) as well as modules on regulatory topics (ethics, the legal and procedural framework of the siting process). These modules are open to members of regional conferences as well as land owners of potential surface infrastructure sites. In addition to educational modules, information events for the general public are frequently organized by the Swiss Federal Office of Energy in prospective siting regions.

5.3.1.2e Challenge: Improving public confidence in the safety case and technology development

Experience around the world suggests that the scientific and technological basis for the safe and secure implementation of disposal is available. However, it is always challenging to enhance the public's confidence in the safety and technology of the radioactive waste disposal facility to be constructed in their community.

5.3.1.2f Responses

— In order to test and further substantiate the design process for a LLW repository, in **Belgium** ONDRAF/NIRAS set up several prototypes: a subsidence test monitoring the subsidence of the subsurface under a weight comparable to that of a filled disposal module; a demonstration test in which part of the module, including the inspection area, was constructed; and practical tests enabling the examination of materials and construction techniques and verification of whether the stability and performance of the facility would remain ensured, including in the long term. A great deal of attention is paid to the concrete's composition and the way in which it is cast into the moulds. A test cover was as part of a study concerning the evolving behaviour of the covering layers. Research will also continue during the facility's construction, now underway, to enable the continuous adjustment and optimization of construction techniques. ONDRAF/NIRAS has also introduced a health monitoring programme in Dessel and the surrounding areas in collaboration with leading research centres.
— In **France**, ANDRA has developed several demonstration projects designed to allow members of the public to see physical examples of the proposed equipment and techniques to be used in the repository, such as for waste canister emplacement.
— In **Romania**, it is intended to construct a pilot module of the LLW repository for demonstration purposes. The local community will be able to visit this module and the installation will also exhibit

details of the project, such as how the local ground conditions can enhance the safety of the facility (with special regard to flooding and other extreme conditions). In addition, the structural integrity of the pilot module will be monitored over time.

— In **Slovakia**, the shallow LLW repository at Mochovce has been in operation since 2001. In order to determine the best materials for the final repository cover, a programme of long term monitoring has been developed involving the physical construction of a small scale in situ model of the proposed cover. The model can be viewed and the results of the monitoring, which is planned to continue for a 15−20year period, will be made available.

— In **Sweden**, SKB have developed an underground laboratory at Äspö in which waste emplacement equipment can be seen in a demonstration repository. Members of the general public, especially from the candidate site host communities, were encouraged to visit these facilities and examine them first hand.

5.3.1.2g Challenge: Keeping promises

This mainly refers to the issues agreed with stakeholders as important parts of the decision making process. It is important, though, that promises or commitments are also met concerning more day to day issues such as holding meetings by agreed dates, returning phone calls, replying promptly to emails, sending a consistently constituted team to meetings, and providing information or notes within timescales agreed. Keeping these kinds of promises is vital as a demonstration that more substantial commitments will also be honoured.

5.3.1.2h Responses

— In **Australia**, it was made clear in calling for volunteer nominations that a repository would not be imposed on an unwilling community, but only on one in which broad community support had been demonstrated. There were encouraging levels of support across a number of prospective sites, but only one of the six nominated sites was determined to have a broad level of support. The remaining five sites were therefore removed from the process.

— In **Sweden**, when SKB was seeking volunteer communities in the north of the country in the 1990s, two local referendums were held to decide whether to continue involvement in the siting process. In each case, when the community voted to leave the process, SKB stopped all efforts immediately and withdrew.

5.3.1.2i Challenge: Engaging with opponents (or the concerned public)

The issue of how to engage with opponents to a process is not confined to the preparatory stages and is probably even more significant once the siting process has begun. This is where earlier communication to lay the foundations for a well informed public is so important. Information needs to be easily available to all interested stakeholders, with recognition of the fact that no concern is too trivial to be addressed. There are numerous examples of national surveys in various countries demonstrating that the general public is more trusting of other providers of information than of the relevant authorities. It is therefore important to design ways in which opponents can be involved in siting discussions, while accepting that not all will be willing to take part, although endeavouring to involve them in ongoing discussions rather than excluding them is crucial. The development of formal partnerships between the implementer and potential siting regions or communities, suitably funded to allow access to independent expertise, has been shown to contribute to stakeholder confidence, although in some Member States such partnerships can be viewed with suspicion by some stakeholders, and so care needs to be taken in their use.

5.3.1.2j Responses

— Partnerships in **Belgium** were specifically designed to include representatives from local NGOs and others not necessarily supportive of the project, and these participants were able to present their views in a non-confrontational environment.
— In **Canada**, OPG identified all opponents to the deep geological repository and added them to their developing stakeholder database. They were provided with regular information and invited to all events.
— In the **Czech Republic**, despite a programme of local debates and engagement, with some 25 local referendums being held between 2003 and 2008, it proved difficult to gain any degree of public support for a spent fuel repository siting process. Beginning in 2007, as part of a series of European Union supported projects, representatives from these communities, together with others from national bodies (the Czech Radioactive Waste Repository, the regulator and government departments) have taken part in a series of meetings and discussions intended to improve the level of confidence and mutual trust. This culminated in 2010 in the formation of the Working Group on Dialogue on the Deep Repository by the Ministry of Industry and Trade in cooperation with the Ministry of Environment, involving relevant state institutions, municipalities and NGOs.
— In **France**, the requirement in law for national debates informed by the results of ongoing research in the underground research laboratory at Bure allowed ANDRA to demonstrate that public concerns were important and that they were listening. Following considerable opposition involving blockades and sit-ins in the siting area during the debate in 2013 (necessitating abandonment in favour of on-line discussions and a citizen's conference, which took place over three weekends), ANDRA made several specific amendments to its technical approach. These included the introduction of a pilot disposal area in the repository, together with a commitment to improve its dialogue with local stakeholders. This latter move followed a report from the debate commission that there was a need to improve the ability of local groups to access independent experts.
— In **Italy**, dealing with the siting process at the national level, Sogin fostered the involvement of environmentalist NGOs through cooperation with the different organizations and by taking part in independently organized public meetings. The aim is to debate various issues, seeking perspectives that may be different from those of an implementer.
— In **Slovenia**, there has been a deliberate effort by the implementing body to develop and maintain contacts with NGOs and the media throughout the siting process, rather than just responding to issues as they arise.

5.3.2. Involvement process issues

5.3.2.1. Initiating the siting process

5.3.2.1a Challenge: Beginning a consent based or volunteer process

One of the major challenges that arise in any siting process is how to transition from process design to process implementation. There are numerous examples of where a seemingly acceptable process has been developed, often through public consultation, but where little or no progress has been achieved in implementation. This is particularly the case where a consent based or volunteer process has been proposed. There are examples from a number of Member States where such a process has been initiated and has not always resulted in the selection of a publicly accepted site.

5.3.2.1b Responses

— The siting process in **Canada**, initiated in 2010, is a good example of the benefit of carrying out a national dialogue to inform all communities and learn about concerns. Despite an earlier

technical approach being accepted by a national scrutiny panel, it was not considered to be socially acceptable. As discussed earlier, a proposal for a so-called adaptive phased management approach was developed after the national dialogue. This included a 'learning process' to explain the purpose of the undertaking. Only then were communities invited to learn more about their potential specific suitability, which involved high level screening using both technical and social criteria. NWMO is currently engaged with potential host communities as part of the step wise siting process that is expected to lead to the selection of a preferred site, possibly in 2023.

— In **France**, earlier attempts to obtain public support for siting a repository in sedimentary (clay or salt) and granitic rocks remained ineffective due to an almost total lack of public participation. Later, based on a 1991 law stating the terms of radioactive waste management (research to be undertaken, creation and role of the waste management organization), a process was initiated whereby a mediator issued a national call for volunteers to host an underground research laboratory (URL). Four candidate areas were identified and public hearings held, and in 1998 the government selected a site containing clay rocks at repository depths near the village of Bure as the sole location for a URL. Attempts to identify a site in granite were later abandoned. A site for a repository has been identified in the same area as the URL and, following public debates in 2005, 2006 and 2013, the project has now entered its industrial phase and the schedule is established up to the beginning of operations.
— In **Italy**, following previous difficulties in siting a national repository, a new siting process has been established. It has been designed to exclude areas not corresponding to accepted safety criteria (derived from IAEA guidelines and national requirements) in order to develop a national map of potentially suitable areas. The map was published in early 2021 and a national seminar commenced later in the same year, with an objective to debate the map and deepen the analysis of the technical aspects related to a national repository for radioactive waste, with the involvement of all interested parties. The national seminar will be followed by a volunteer phase during which regions and local communities in potentially suitable areas will be invited to express interest in hosting the facility.
— It needs to be recognized that not all instances of the use of open volunteerism have resulted in progress, at least not in the short term. In **Japan**, for example, a so-called 'open solicitation' was issued in 2002 by the Nuclear Waste Management Organization. A benefits package was linked to this solicitation, but many other factors (such as lack of trust, dominance by technical experts and lack of a clear public role) all contributed to a lack of volunteers. In order to overcome this impasse, in 2015 the government announced a series of national symposia to improve public understanding of the need for a geological disposal facility. Two municipalities in Hokkaido Prefecture volunteered to be considered for their suitability to host a final disposal facility for high-level radioactive waste and in 2020 the initial stage of assessing the sites began.
— In the **Republic of Korea**, in order to develop an acceptable approach to national engagement, the government established several commissions and policy forums to explore the issues associated with radioactive waste disposal, with representation from all groups in society. The Public Engagement Commission for Spent Fuel, established in 2013, included technical experts, NGOs, government and industry representatives among its 13 members who were mandated to design a national engagement process. Other forums included NGOs, local government officials and experts to develop specific policies for engagement. More recently, in 2017, the government decided to review the basic plan on HLW management through public engagement programs and in 2018 a preparation group was formed to collect opinions of stakeholders and experts. The group held 21 meetings to set a guideline for agendas and procedures for a new series of public engagement activities.
— In the **United Kingdom**, only three local elected bodies responded to a call for volunteers issued by the government in 2008. After the cessation of the original open volunteerism process in 2013, government undertook a public consultation on possible alternative ways forward and published a new white paper in 2014 outlining an amended process involving a two year period of 'initial actions'. The revised siting process involves a modified geological screening exercise using criteria developed as described above. The intention is to allow any community that may consider volunteering to be able to understand whether its geological environment could be suitable. During

the initial actions period, currently underway, efforts are being made to better explain geological disposal to the whole country.

5.3.2.2. The ongoing siting process

5.3.2.2a Challenge: Allowing sufficient time and process flexibility

One of the most important things to recognize once a siting process has begun is that, no matter how well it has been designed, the probability is that it will take longer to complete than expected. Therefore, it is advisable that in the planning stage it is made clear exactly which decisions need to be taken, but that these are not attached to specific rigid timescales. If this is not evident from the start, challenges will inevitably arise.

Too many examples exist of project milestones being missed and processes halted because authorities seek to make decisions without sufficient consultation, thereby engendering mistrust and lack of public support. That said, a well designed and flexible stepwise process can allow progress to be made at a speed acceptable to the relevant stakeholders. Although a programme schedule needs to be in place, demonstrating a lack of rigid deadlines can become a major contributor to the maintenance of trust.

5.3.2.2b Responses

— In **Australia**, revised nomination guidelines were developed specifying the need for some demonstration of community support to participate in the process before a nomination could be formally progressed. This followed a first round of site nominations that were made public through a media announcement and this took communities by surprise.
— In **Belgium**, the initial planning of a surface disposal project was adapted according to the needs of the partnerships and the progress of the project.
— The benefits of allowing sufficient time for a programme to run are well illustrated by a process in **Finland**, which began in the 1980s, and where a repository construction licence was finally granted in 2015. The existence of a clear decision making process, where both the national government and the local community had clear roles, meant that all knew where they could influence the outcome under the decision in principle (DIP) approach (see below).
— As described above, the ‘open solicitation’ process in **Japan** has been running since 2002 and it is only recently that two volunteer communities have engaged with the siting process (2020), demonstrating a need for flexibility regarding timescales.
— In **Switzerland**, the original milestones specified in the sectoral plan have not been met, due to slower than anticipated progress in the participatory decision making process. However, this has not derailed the project but merely extended it, with stakeholders appreciating the flexibility.

As a process continues there is merit in allowing responsibilities and roles to further evolve, based on a continuing evaluation of what works well and what approaches have not been effective. The degree of stakeholder involvement will vary depending on the types of waste involved although, as pointed out elsewhere, there is often no distinction evident in the public’s reaction to proposals for repository development of any kind. Experience also suggests that experts need to understand stakeholder concerns as being real, and genuinely held, and not to dismiss them as unworthy of being addressed. It is also important to recognize that differences or even conflicts may well exist between the nuclear industry and community visions of the future and these need to be acknowledged and, hopefully, compromises reached.

5.3.2.2c Challenge: Tailoring the engagement process to local needs

The engagement of local communities in the siting process for a repository development programme works well when the whole process is tailored to accommodate local needs and designed

to enable communities to participate in the discussions, identify issues, provide proposals and cooperate with the project.

5.3.2.2d Responses

— In **Australia**, community consultation is an important part of the process for siting a national radioactive waste repository. Following shortlisting of preferred sites for an LLW repository, two sites were identified in the Kimba district. The Kimba Consultative Committee was established as part of the Australian government's commitment to ensuring the community plays a key role in providing advice to the government on their requirements for the facility. The committee is comprised of community members and stakeholders from the local community, except for an independent convener. In February 2020, the government identified Napandee as a suitable site to host the facility, one of the two sites in the Kimba district. The Australian Radioactive Waste Agency is now responsible for moving the project forward, in consultation with stakeholders.
— In **Belgium**, a disposal concept for LLW (category A waste) has been developed in collaboration with local partnerships and accommodates their societal concerns. The implementer, ONDRAF/NIRAS, is working with local partnerships to achieve added value for the inhabitants of the Dessel and Mol region. For example, a fund has been set up to support sustainable local projects and activities, including a communication centre, among others.
— In **Switzerland**, each of the potential siting regions is represented by a regional conference, acting as the voice of regional stakeholders (communities, organizations and the general public). While concept papers provide a general outline of requirements, such as purpose, process and organization, each regional conference has considerable leeway in the application of these general requirements. Moreover, each regional conference decides for itself on the size and composition of working groups, selects its own experts and has a certain degree of latitude in selecting investigated topics beyond those required by the stage of the process.
— In the **United States of America**, to determine public preferences on the development of a consent based siting process, a number of activities are being undertaken. These include holding workshops and meetings in cities around the country, involving brief introductory presentations followed by panel discussions and public question and answer sessions. In addition, national surveys on public perceptions towards nuclear energy and waste management have been undertaken in order to identify public preferences and thereby inform decisions by the waste management agency. These annual surveys have occurred since 2006 and have sampled a total of more than 19 000 citizens. In addition, an analysis of the public narratives on Twitter, Google News and Google Trends is also conducted as a way to gauge public sentiments.

5.3.2.2e Challenge: Maintaining and enhancing local support

To maintain and enhance local support, community partnerships including a wide range of local stakeholders are becoming more common. Such partnerships often provide an opportunity for the local community to influence the repository development programme, sometimes including the technical design and concept of the facility, but more frequently regarding associated economic development.

5.3.2.2f Responses

— In **Australia**, the Kimba Economic Working Group has been established to ensure neighbouring communities are best placed to take advantage of the economic development opportunities afforded by the selection of the site at Napandee to host the national disposal facility.
— The local partnerships in **Belgium** are a good example of how maintaining and enhancing local support can be done. Using different working groups (open not only to the partners, but to all interested members of the community), all aspects of a possible disposal facility (such as the concept of the

facility itself, its impact on the environment, and health and safety related issues) were discussed. By entering into dialogue with the local community, the ONDRAF/NIRAS experts had an opportunity to better explain the project to local stakeholders and to adapt the initial concepts to the needs of the public. The outcome of this decision making exercise was therefore a mutual project, undertaken by both experts and local stakeholders through a process of collective design.

— In OPG's deep geological repository project in **Canada**, a host community approached OPG to find a way to manage the LILW that was stored at the site for the long term. OPG worked with the community to evaluate global best practices for long term waste storage. Once the community determined that a deep geological repository was its preferred approach, OPG began feasibility studies into this solution.
— In **France**, after the second legally mandated public debate on the Cigéo project in 2013, ANDRA took notice of public comments on its activities and proposals and introduced a number of amendments to its plans. In particular, these include improvements in societal involvement in the management of the project.
— In a similar way to Belgium, the regional conferences in **Switzerland** play an important role in project design and implementation regarding the siting of the surface facilities.

5.3.3. Political and regulatory framework issues

5.3.3.1. Initiating the siting process

5.3.3.1a Challenge: Involvement of the regulator

Even at an initial stage of the siting process (and ideally before), it is important for the regulatory body to have engaged in dialogue with the relevant interested parties to demonstrate their competence and to engender trust.

5.3.3.1b Response

— In **Japan**, as part of the revised strategies developed to restart the volunteer siting process that began in 2002, a framework was developed to allow increased pre-licensing dialogue between communities and the regulator. The aim was to assure potential host communities that the siting procedure is reliable in terms of the safety features of the repository. This has proven successful, in so far as there are currently two prospective communities engaged in discussion.

5.3.3.2. The ongoing siting process

5.3.3.2a Challenge: Involvement of the regulator

Processes where the regulator acted as a resource for national and local stakeholders during an active siting process tend to enjoy the highest levels of trust.

5.3.3.2b Responses

— In **Canada**, legislation setting up the NWMO in 2002 also introduced a legal mandate on the nuclear regulator to take a proactive role in communicating safety issues in potential repository host communities, albeit separately from NWMO, beyond the normal requirement to communicate its role and responsibilities to the general public.
— In **Finland**, the decision making process, incorporating the DIP approach, depends on the independent advice given to all parties from the regulator.

— In **Sweden**, the nuclear regulator is particularly well regarded in the community and was involved from the very beginning of the siting process as a source of independent review and oversight. It is of course important for the regulator to demonstrate continued independence from the implementing body as part of the decision making process.

5.3.3.2c Challenge: Continuation of national political support

The importance of continued political support cannot be overemphasized, given the long timescales involved in a repository siting process. Implementing bodies need to ensure that politicians are kept fully informed of progress and actively involved in the decision making process.

5.3.3.2d Responses

— In the **Czech Republic,** the Working Group on Dialogue, established in 2010 by the Ministry of Industry and Trade in cooperation with the Ministry of the Environment, is intended to define acceptable ways and criteria for selecting a suitable locality for a deep repository through the involvement of relevant state institutions, municipalities and NGOs.
— In **Finland**, there was a requirement for a DIP to be taken by the national government on the site selection by Posiva, in parallel to that taken by the local municipality.
— In **Switzerland**, communal and cantonal stakeholders are continuously involved during the three stages of the site selection process according to the sectoral plan. The federal council (i.e. the government) approves the results at the end of each stage. The general licence must be approved by the federal assembly (parliament). This decision is subject to an optional national referendum.

5.3.3.2e Challenge: Obtaining local political support

As the repository siting process focuses on specific locations, politicians at the local level and community leaders who represent the community's voice will come to take a vital role in decision making. It is important to implement a wide range of communication and stakeholder involvement activities to provide up to date and accurate information, to address their opinions and concerns, and to obtain their support. It is necessary, however, to ensure that contacts with politicians are as open and transparent as possible, in order to avoid accusations of irregular dealings.

5.3.3.2f Responses

— In 2015, an exploration tunnel of 50 m depth was constructed in **China** in the Beishan area of Gansu Province. Its purpose was to develop and test in situ technology and techniques to support URL construction. When the application for a construction licence of this exploration tunnel was initially refused by the county government, a series of meetings was organized to explain the main purpose and the research aims of the project. In particular, it was stressed that no tests involving radioactive materials would be performed in the facility. The meetings were considered helpful, and the construction licence was approved by the local government. As part of additional communication activities, representatives of local communities were invited to visit some existing URLs worldwide to help them gain a clearer understanding of what a URL project entails. Significant progress has now been made and a URL is currently under construction, also in the Beishan area of Gansu Province.
— In the **Islamic Republic of Iran**, there was a dispute between central and local government about the location of an LLW repository (to be situated in the central part of the country in proximity to the town of Anarak). A series of meetings was organized between the two parties, with presentations of authoritative documents concerning safety and cost–benefit analyses. This was able to convince the local government about the benefits of the facilities for the local citizens, especially as the construction of an access road would allow the restarting of operations at two local mines. The

meetings were followed by lobbying among local opinion formers and ultimately the proposal for construction of the facility received approval.

— To start a new repository siting process with 'nationwide scientific screening' in **Japan**, the national government organized a range of activities to provide appropriate information and encourage understanding, such as briefings in local municipalities and explanatory presentations in the meetings of the association of the prefectural governors and of mayors of cities, towns and villages. The status of the expert deliberations for the development of the screening process was explained and responses to the nationwide discussions were requested.

5.3.3.2g Challenge: Testing local approval

An issue that needs to be addressed during the design of a siting process, but which causes much debate, is the question of how to decide whether a community has accepted its involvement in a siting process or in a decision to continue. It is also important to clarify, for all interested stakeholders, exactly how the establishment of this acceptance will be determined during the planning stage of a siting process. As the siting process progresses, it will also be important to monitor the level of community acceptance and to be aware of any developing concerns. This is at the heart of so-called consent based siting and is one of the main issues in any national programme. Several Member States incorporate a right of veto, or withdrawal, for communities involved in the siting process, although difficulties can arise in agreeing when such a right ceases as part of a stepwise process. It is normally regarded as being at the point at which the implementing body begins major underground investigations, given the large investment this requires.

5.3.3.2h Responses

— In **Canada**, despite considerable opposition to the proposed deep repository for LILW to be sited in Kincardine, surveys conducted by the developer, OPG, in 2016 indicated around 71% of the population of Ontario actually supported the development. In May 2020 OPG withdrew its application after members of the Saugeen Ojibway Nation voted to reject the proposal.

— In **Finland**, a siting programme for a repository for spent fuel began in 1983 and led to the confirmation of a site at Olkiluoto, following the granting of a construction licence in December 2015, the first such licence for a spent fuel repository in the world. The process was a staged process, with clearly identified decision points, each requiring local and national government approval, the latter based on advice from the national regulator, the Radiation and Nuclear Safety Authority. The decision making process is structured in such a way that once decisions are made, they cannot easily be reversed. The DIP process, involving as it does national and local government, was designed to allow full and open discussion prior to final acceptance or withdrawal. Prior to the licence application submitted by the waste management organization, Posiva, in 2012 the Nuclear Energy Act required a DIP to be taken by a vote in parliament, following a similar positive DIP by the relevant local municipality, after which the ability to withdraw ceased. The original DIP application for a deep geological repository for spent fuel was submitted in 1999. This was approved by the Eurajoki municipality and endorsed by the Finnish parliament in 2001. It is also true that it was only after Posiva applied for the initial DIP that there was any meaningful debate at the national level.

— Following a long siting process in **Hungary**, in which a potentially suitable site was identified at Bátaapáti, a referendum was held in July 2005 to determine local support. The initiative for this came from the relevant local government body, not the Hungarian waste management organization, and 75% of the electorate took part, with 91% voting in favour of facility development. In November 2005, the national government gave its approval in principle to proceed. The repository was opened in November 2012.

— In a previous siting programme in **Sweden**, two communities in the north of the country rejected involvement through a local referendum, leading to a revised siting process. Now, while legislation does not provide a formal veto, it is generally accepted that a repository can only be sited in a

community willing to accept it. This means that although refusal by a community could in theory be overridden, in practice this is extremely unlikely, as it can only happen if SKB asks the government to override the refusal and SKB has already stated that it would not do this. The Östhammar community, selected as host community in 2009, is able to perform its own review of the SKB proposal, and has made it clear that it considers itself to have the final decision on the development of the facility, subject to approval by the safety regulators and the Swedish environmental court, under whose code a community can reject a development that it considers environmentally unacceptable.

— Rejection by a cantonal decision in a series of referendums held for siting an LILW repository in Wellenberg, **Switzerland** in the 1990s, even though the host municipality was in favour of the proposal, has led to the removal of a local right of veto in the revised siting process currently under way. The sectoral plan, which came into force in 2008, calls for a national referendum when a potentially suitable site for an LILW and/or an HLW repository has been identified. The waste management organization, the Nationale Genossenschaft für die Lagerung radioaktiver Abfälle, has proposed two out of six original siting areas for further evaluation. The regulator, the Swiss Federal Nuclear Safety Inspectorate, has determined that an additional siting region is to be included in the next stage. Whether specific locations prove to be locally acceptable remains to be seen. Ultimately, the Swiss federal council will decide on granting a general licence, which subsequently will require parliamentary approval and may be subject to a referendum by the general population.
— In contrast, a referendum to accept or reject proposed sites for a LILW repository was used in the **Republic of Korea** to decide between several willing communities after a long siting process where little progress had been made. In 2005, Gyeongju in North Gyeongsang province on the east coast was designated as the site. Almost 90% of its voters approved the proposal.
— The siting process in the **United Kingdom** includes a requirement for a 'test of local support'. The exact form that this will take and at what exact stage it will happen has yet to be decided. It was the subject of examination by a governmental advisory group and the proposals will be subject to public consultation.
— In the **United States of America**, 'consent based siting' was recommended in 2012 by the Blue Ribbon Commission, appointed by the president to examine alternative approaches to the stalled repository siting process. Work has examined public attitudes to what is meant by consent and has explored the issue of withdrawal or veto. A majority of the American public questioned in national surveys favoured broad involvement in the siting decision. As regards those members of the public who were considered to have legitimate authority to veto, citizens within 50 miles of the site and all registered voters in the host state were identified. As regards political officers who were considered to have legitimate authority to veto, the governor of the state in which a potential site might be located and Native American authorities in the area were identified. As regards regulatory agencies, both the state's department of environmental quality and the federal agencies were identified (i.e. the United States Environmental Protection Agency and the United States Nuclear Regulatory Commission). Withdrawal of consent needs, it was felt, to be possible until a licence is granted by the national regulatory agency to construct the disposal facility.

It is therefore important that all parties understand from the very start how community consent will be measured and how withdrawal can take place. In some cases, this may be through regular deliberative polling leading to a final community profile, although failure to consult sufficiently is often cited as a reason for local opposition.

It needs to also be acknowledged that an implementer also has the right to withdraw from a community at any stage, in case any of the technical requirements providing the basis for a safe facility cannot be met.

5.3.4. Resourcing issues

5.3.4.1. Initiating the siting process

5.3.4.1a Challenge: Making first contact with potential host communities

One of the most difficult steps in initiating a siting process, especially one that incorporates a consent based or volunteer approach, is how to make the first contact with potential host communities and begin the process.

5.3.4.1b Response

(i) Focusing on existing nuclear communities

An approach focusing the siting process on existing nuclear communities has been suggested in a number of Member States. It assumes that communities already familiar with nuclear activities will be more likely to have confidence in the technology, understand the issues involved and have confidence in the safety case.

— Until 1996, ONDRAF/NIRAS applied a site selection approach in **Belgium** based purely on technical criteria for the siting of a surface disposal facility for LILW (category A waste). However, all the local councils with potential sites declined to host a facility, leading to a drastic change in the decision making process. After a governmental decision in January 1998, ONDRAF/NIRAS was instructed to limit site characterization activities to existing nuclear sites or to sites in volunteering municipalities. In order to make the decision making process an open and transparent one, methods including management and dialogue structures, necessary to integrate a repository project at the local level, needed to be developed. As discussed before, ONDRAF/NIRAS concentrated its activities on the development of local partnerships to facilitate project proposals in areas where interest in hosting a disposal facility was expressed. Local partnerships were formed in the area of existing nuclear facilities at Mol, Dessel and Fleurus-Farciennes to allow full local participation in all aspects of the repository project. In 2006, Dessel was selected as the site for the facility with the full support of the community.
— Following ineffective attempts to gain support for investigations from communities in northern **Sweden**, the waste management organization, SKB, approached communities in the south that already hosted nuclear facilities, in the hope that they would allow work to proceed, as they were familiar with the industry and therefore understood the issues better. This was also relevant as regards the trust issue discussed earlier, in that the local communities know many of the organizations involved and have confidence in what they hear. The nuclear regulators (formerly the Swedish Nuclear Power Inspectorate and the Swedish Radiation Protection Authority, later merged as the Swedish Radiation Safety Authority) have for more than 20 years taken part in local workshops and hearings and this has meant that they are also trusted. Detailed investigations were undertaken in the Östhammar municipality (host to the Forsmark power plant and an LLW repository) and in Oskarshamn municipality (host to the Oskarshamn power plant, the Central Interim Storage Facility for Spent Nuclear Fuel and the Äspö Hard Rock Laboratory, an URL). The Östhammar site was chosen by SKB in 2009 and a licence application was submitted in 2011.

(ii) Employing the use of a mediator or independent third party

This approach has been developed as a way of distancing the repository proponent from the initial discussions in potential siting areas and/or communities. To be effective in this regard, it requires the

careful direct appointment of a person or independent organization able to gain the trust of a wide range of stakeholders.

— Following earlier, unsuccessful attempts in **France** to obtain public support for siting a repository in sedimentary (clay, shale and salt) and granitic rocks, a 1991 law introduced a process whereby a well known national politician was appointed as mediator to identify possible locations for a URL as a precursor to a repository. At the beginning, the mediator focused on communities with potentially suitable geological conditions, and then engaged in discussions with regional government authorities prior to recommending several potential areas for further investigation.
— Several ineffective attempts to elicit public support for sites for a near surface LLW repository in **Slovenia** led to the appointment of an independent mediator in 2002. She was able to discuss local issues and concerns in communities across the country, resulting in several potential host communities becoming involved. Her activities were coupled with a range of stakeholder workshops and seminars for various interest groups, including national and local government politicians, NGOs and the media. A site was selected in 2009.
— Following the refusal by communities in northern **Sweden** to allow SKB to proceed with detailed investigations, the government appointed a national coordinator for nuclear waste disposal in 1996. He liaised between the various parties involved as SKB began to approach nuclear communities in the south of the country and acted as a source of independent information. He also reported on related international activities to the Ministry of Environment.
— In **Switzerland**, as mandated in the 2008 sectoral plan, regional conferences in the potential siting regions, which were identified by the national waste management organization the Nationale Genossenschaft für die Lagerung radioaktiver Abfälle, were held by a so-called 'start team' immediately following their designation. Each start team was led by an independent moderator identified by the relevant local government bodies. Although not playing quite the same role as the French and Slovenian mediators, the Swiss moderators led meetings and ensured that the views of all were considered. In some cases, they were also responsible for the development of future participation activities.

(iii) Developing local partnerships and contacts

Where the proposed volunteer process involves focusing on areas or specific communities identified using screening or other criteria (such as the existence of nuclear facilities), significant benefits can be seen in developing formal partnerships between the implementer and the community. It requires considerable financial involvement and an understanding that progress will be at a pace decided by the community.

— The first partnerships of this type in relation to radioactive waste disposal were developed in **Belgium**, in three communities hosting existing nuclear facilities. They were set up according to formal agreements between ONDRAF/NIRAS and local municipalities, with a management board and several subgroups dealing with different aspects of the project, including local investment initiatives, safety, environmental aspects and technical review. The intention was to ensure that every party that could be directly affected by a collective decision had an opportunity to express its opinions. The partnerships were funded directly by ONDRAF/NIRAS and employed professional management teams. The process has resulted in local acceptance of facility development, incorporating a raft of financial benefits and mitigation measures developed in partnership with the community.
— The local partnership approach was applied in **Slovenia** in the communities that came forward following the involvement of the mediator, as described above. They were funded to allow participation in a range of activities to improve local knowledge and understanding of the repository project. However, following the agreement to site the repository, the partnerships were disbanded, much to the concern of the local stakeholders. An independent partnership has since been established, without support from the implementing body.

— Regional conferences established in **Switzerland** under the sectoral plan have acted as partnerships between the potential siting regions and the Federal Office of Energy. The conferences provide the municipalities and the population the opportunity to discuss suggestions made concerning the layout and design of the surface infrastructure. They are also able to elaborate strategies, measures and projects to help them understand and estimate the socioeconomic impact of the proposed repository on the sustainable development of the region.
— In the **United Kingdom**, a local partnership formed to advise the relevant local government bodies on whether to participate in the previous siting process was funded directly by the central government. The funding enabled independent facilitators and other experts to be involved and to support regional outreach and communication. Similar support is part of the new siting process currently underway.

5.3.4.2. The ongoing siting process

5.3.4.2a Challenge: Using suitable staff

During the planning stage, as discussed above, it is important to ensure that suitably qualified and capable staff are identified for the future collaborative negotiation and related communication activities. It is preferable to have an established team of experts and communicators ready to take part in meetings and workshops as soon as the process begins and available as the process progresses.

5.3.4.2b Responses

— In **Australia**, consultation teams comprised a mix of government officials (implementers) and technical experts (the Australian Nuclear Science and Technology Organisation, the waste generator, and Geoscience Australia, geologists). This ensured that community concerns about technical aspects of the project were responded to directly during the consultations. The approach enabled two way learning within the consultation teams, resulting in both non-technical and technical experts being capable of addressing questions and concerns related to both aspects. This helped to improve information delivery to the community.
— In **Canada**, OPG has used only community relations staff local to the proposed repository site. This has helped to ensure they are attuned to the cares and concerns of the community.
— In **Poland**, the involvement of senior government officials in cross-departmental groups attending public dialogue events has assured stakeholders that their concerns are being listened to at a high level and helped to earn their respect, serving to demonstrate the importance of the issues under discussion. As during the planning stage, however, it is necessary to avoid the impression that communication during the siting process is merely 'public relations', carried out in order to meet arbitrary requirements.
— In **Slovenia**, a public relations agency was originally contracted to develop and implement a communication strategy on behalf of the national radioactive waste management agency, as part of a repository site selection process. However, their approach was based on propaganda and not on stakeholder engagement; they did not have enough understanding of the issue and depended on agency experts when required to respond to questions. The agency therefore terminated the contract and organized training in communication for its own technical and natural sciences employees. The communication and stakeholder activities were subsequently developed and carried out by the agency itself, with only minor activities contracted out.

5.3.4.2c Challenge: Establishing a credible presence within potential host communities

It is common for the implementing organization to establish a presence in potential host communities from an early stage. In many cases, they employ local people to staff exhibitions and respond to telephone

enquiries, and they allow project supporters who are known in the community to act as champions and to demonstrate local confidence.

5.3.4.2d Responses

— In **Australia**, the government established a local office at a site shortlisted for the development of a facility and recruited a community liaison officer to act as the interface with the local community. This allowed staff to engage with the community on a full-time basis and assist in developing the partnership between community members and the project team. This has already led to an increased trust in the project team and thus a better appreciation of the project. The community liaison officer is integral to the project, being able to quickly identify key stakeholders and seek out answers to issues and concerns that arise in a timely fashion.
— In **Canada**, following expressions of interest in learning more about the siting process by local communities, NWMO established local information offices in each community, to provide rapid responses to questions and to provide information as required.
— In **Sweden**, SKB opened local offices in the communities originally identified in the north of the country, to act as information points and, importantly, they actively sought to recruit local people to operate them. However, the communities voted not to proceed.

5.3.5. Community support issues

5.3.5.1. Initiating the siting process

There needs to be continued communication throughout the siting process about the potential benefits, both financially and socially, of involvement by potential host communities, and it is important that these are clearly explained from the very start of the siting process.

5.3.5.1a Challenge: Supporting local involvement

Even if there is a framework in place to invite local stakeholders to take part in deliberation of the policy and in decision making, it is sometime difficult for those stakeholders to express their opinion or make a proper judgement due to lack of knowledge of and expertise in the issues discussed and technologies applied. Experience in many Member States suggests that proposed community benefits include provision of funds to allow full participation by local stakeholders without cost to them.

5.3.5.1b Responses

— The partnerships in **Belgium** are funded directly by the waste management agency ONDRAF/NIRAS. The partnerships autonomously manage their budget in order to hire independent scientific expertise, to allow professional managers to be employed and to cover all communication and participation costs.
— In **Canada**, the local communities that approached NWMO to learn more and that allowed desk studies and other investigations to proceed were provided with funds in order to establish an oversight committee. The communities that were subsequently excluded from further study were also paid a lump sum as a ‘thank you’ payment to acknowledge their participation.
— In **France**, details of the funding support for the groupements d’intérêt public around potential deep repository sites was laid out in the 1991 Waste Law prior to site identification. The details were amended by a government decree in 2000. The 2006 Waste Law increased the amount that had been allocated in 2000 and the role of the groupements d’intérêt public was restated.
— In **Hungary**, municipal information and control associations around proposed or operational storage or disposal facilities receive support from the Central Nuclear Financial Fund. The amount is

calculated according to a rigid algorithm laid down in legislation. Most of the funding is used for communication activities, although some may also be used for investment in local projects.

— In **Slovenia**, the 2003 Compensation Decree specified an exact amount of compensation for the resulting 'limited land use' that would be available to the LLW repository host community prior to identification of the final site.
— In **Sweden**, local 'Reference groups' established in potential siting communities were funded through the national waste fund to allow them to employ managers and undertake independent studies.
— In **Switzerland**, the regional conferences established as part of the sectoral plan signed a formal performance agreement with the national government that lays down in considerable detail the financial resources available to the conference. This is presented in terms of representative hourly rates that can be paid to external experts, for example, as well as payments available to members of the working groups established by the conference. Levels of financial support for attendance at conferences and for site visits are also set out in detail.

5.3.5.2. The ongoing siting process

5.3.5.2a Challenge: Negotiating locally acceptable benefits

In some Member States, the type, scope, amount and associated preconditions of community benefits are determined beforehand in legislation or in an agreed process. In others, however, these need to be negotiated with the key stakeholders representing the local communities and subsequently executed under an agreement or arrangement between the negotiating parties. Improper negotiations sometimes lead to benefits being defined that are not necessarily accepted by stakeholders and that arouse complaints and opposition among them and, in the worst case, lead to a delay or halting of the entire project.

5.3.5.2b Responses

— In 2001, the municipality of Kincardine in **Canada** approached OPG to discuss options for the long term management of LILW at the Bruce site. Following a period of discussion and learning, a memorandum of understanding was signed outlining the financial benefits that would be available to the municipality if the local communities supported the development of a deep repository. The agreement was approved in a local plebiscite. In 2020 OPG withdrew its application for a construction licence after members of the Saugeen Ojibway Nation voted to reject the proposal.
— In **Belgium**, at the same time as developing the surface repository for LILW, ONDRAF/NIRAS is working with local partnerships on achieving added value for the inhabitants of the Dessel and Mol region. A local fund has been set up to support a number of initiatives, including sustainable local projects and activities. These projects and activities may be of a diverse nature and may include social, economic and cultural projects, providing added value beyond that created by the repository project itself.
— In **Finland,** the repository host community in Olkiluoto negotiated the so-called Vuoki Agreement with Posiva, the waste management organization. Rental of a former old peoples' home, now renovated and used as Posiva's headquarters, has been used to pay back a loan from Posiva for the construction of a new home and to support other local infrastructure developments. This is in addition to other direct benefits with respect to employment, based on legislation and the local economic structure of the region.
— In **Switzerland**, the 2008 sectoral plan consists of three specific stages, each characterized by various studies on sustainable economic development designed to offset negative impacts and bring about positive benefits and added value from the repository development. It will be possible for additional compensation payments to be negotiated between the host canton, the communes of the siting region and the implementing agency in the final stage, and these will be dependent on regulatory approval.

5.3.5.2c Challenge: Maintaining progress while making benefits available

It is important that, once a community begins to receive some form of project related benefit, the implementer (or the national government) is able to see that progress is being made.

5.3.5.2d Responses

It is common, albeit not universal, for monetary payments and other benefits to be made contingent on satisfactory progress in terms of various permissions and approvals. These usually include the various stages of community agreement followed by more formal regulatory milestones. The intention of this linkage is to ensure smooth forward momentum in the development of the facilities and to assure both sides that benefits are not to be seen as separate from this. Where benefits have been developed through negotiation, this linkage is even more significant and helps to recognize continuing political support.

— In **Belgium**, for example, the development of the so-called Local Fund is linked to the granting of the construction and operating authorizations and was officially inaugurated in Dessel in 2016. It will be resourced from the so-called Medium Term Fund, established by a legal instrument through taxes levied on the waste producers. Between 90 and 110 million euros will be transferred from the Medium Term Fund to the Local Fund. This initial capital will be invested, and subsequent generations will be able to use the interest generated to finance their projects and activities. It will also help to keep the memory of the disposal facility alive: it is necessary to ensure that in hundreds of years to come, the population will still know that a disposal facility for radioactive waste is located in Dessel.
— In **Canada**, the Kincardine Agreement between OPG and the host community specifies payments that are only available at particular project milestones, such as the gaining of a construction licence. Delays in obtaining this licence have meant that the relevant payments have been placed in trust and will not be available in the event that the licence is not granted, as has transpired.
— In **Japan**, the 'Outreach' scheme proposed by the Nuclear Waste Management Organization in the original open solicitation in 2002 included annual payments. These were based on the existing government subsidy system for nuclear facilities and were to be made to an interested community during an initial literature and desk study stage, followed by increased amounts during detailed site investigations, and continuing beyond the construction stage.
— The **Republic of Korea** provides an example of how such payments have apparently encouraged participation following a lack of progress in previous siting attempts. A legal instrument in 2005 included the provision of a lump sum, payable in two instalments, to a community prepared to accept an LILW repository. Four communities responded and one was chosen following local referendums. The Gyeongju facility has been constructed and received a final authorization to operate in December 2014.
— Most of the financial support available to Oskarshamn and Östhammar in **Sweden** through the Added Value Programme is dependent upon SKB gaining a construction licence.
— The revised siting process in the **United Kingdom** incorporates the provision of increasing amounts of local community investment, dependent on continuing engagement. The amount increases for communities involved in surface based site investigations.

5.3.5.2e Challenge: Satisfying communities not selected to continue

Irrespective of the benefits associated with the achievement of specific milestones, provision of support for local communities that have not been selected is seen as vital to demonstrating fairness and maintaining trust.

5.3.5.2f Responses

— In **Canada**, NWMO paid each community that was excluded following detailed examination a sum of money as a 'thank you' for participation.
— In **Sweden**, during the parallel investigations in the two final potential host communities of Oskarshamn and Östhammar, local politicians began discussions with the proponent, SKB, in order to develop the Added Value Programme. It was agreed that financial support capable of providing added value to the communities would be made. A novel aspect of this formal agreement was that the community selected for the final repository would only receive 25% of the financial support available, with the remaining 75% being available to the community not selected. This arrangement recognized the numerous additional benefits that would accrue for the selected community (employment, infrastructure etc.). The programme operates in two stages, with 20% of the support available prior to the authorization for construction, which is currently pending subject to regulatory approval. The money allocated according to the agreement is managed through a specially created committee involving both communities and SKB.

5.4. CONSTRUCTION, OPERATION AND POST-CLOSURE

It would seem logical to assume that once a facility has been sited and constructed, most of the potential difficulties associated with communication and stakeholder involvement would have been addressed. In reality, however, this is far from the truth and maintenance of trust between a community and a facility operator can be one of the most important issues of concern. It is essential that the operator is seen to adhere to all the promises and agreements that were made during the siting process, and that the local community feels comfortable with how things have developed and are progressing.

5.4.1. Social licence issues

5.4.1.1. Challenge: Continuation of mutual understanding and confidence

There deserves to be close monitoring of local opinions as construction begins and the repository becomes operational, to ensure that the actual and perceived impacts identified through the EIA process are mitigated as planned. Establishment of site stakeholder groups representing the community and able to monitor operations and challenge the operator as necessary, are essential tools to demonstrate openness and transparency.

5.4.1.2. Response

— Given that there are only a few examples of operational geological repositories, there is little experience upon which to draw. Perhaps the best example is the ongoing situation in the **United States of America** following events in 2014 at the Waste Isolation Pilot Plant in New Mexico. Throughout the investigations as to the cause of the elevated radiation measured locally (but below the level of regulatory concern of the United States Environmental Protection Agency), the United States Department of Energy held public meetings and dialogue to inform the local population of the situation and its significance. Despite the imposition of fines by the state of New Mexico for identified safety violations, the local community is still generally supportive of the facility and its future operation.

At the end of the repository operational period, which might be as long as 50−100 years depending on the scale of inventory to be disposed of, completely new communication issues will arise. The local community will expect that the predicted performance of the repository components as defined in the

safety case will be monitored and the results communicated into the future. It is probable that this will involve some form of cooperation between the operator and the community through the development of joint groups in order to ensure confidence in the results.

5.4.1.3. Challenge: Continuation of local engagement

It is important that the engagement processes established during the siting process do not simply end when a location has been selected. Nothing destroys confidence more than apparent indifference once a decision has been obtained.

5.4.1.4. Response

— In **Slovenia**, the siting process involved establishment of local partnerships in the candidate communities. They were able to discuss all relevant issues and undertake visits to active facilities. Unfortunately, once the approval for the site was obtained, the partnerships were disbanded, even in the chosen locality. This caused a great deal of concern and led to the formation of a new, independent partnership. This means that the implementer now has less input into its activities, and there will have been some loss of local confidence in the ongoing process.

5.4.1.5. Challenge: Maintaining social licence and intergenerational knowledge

Any lack of continuation of communication and stakeholder involvement can have an impact in terms of knowledge transfer across generations. There needs to be a way of informing those yet to come as to how and why the siting decision was made.

5.4.1.6. Response

— The Centre de Stockage de la Manche disposal facility in **France**, which operated from 1969 to 1994, is now in the post-closure monitoring phase. The detailed memory of the facility includes more than 10 000 documents covering every phase of its entire lifetime, which are regarded as ‘passive memory’ mechanisms, as opposed to those involving ‘active memory’ processes. Active mechanisms, including information dissemination and communication actions such as production of a site information newspaper, a visitors’ centre, a web site, exhibitions and visits to the facility, are undertaken by the local information committee and the national waste management organization, ANDRA, in order to share information about the facility with stakeholders, neighbours and the public. ANDRA also encouraged the creation of a local ‘memory group’ consisting of 10 to 20 individuals including diverse members such as representatives of neighbourhoods and elected officials’ associations and artists, who meet at least twice a year to collectively imagine and implement solutions regarding memory conservation and transmission.

5.4.2. Involvement process issues

5.4.2.1. Challenge: Ensuring flexibility

In the same way as the siting process needs to remain flexible to allow stakeholder concerns to be addressed satisfactorily, often at the expense of achieving project milestones, it is almost certain that the operational lifetime of a repository will turn out to be different than originally planned. In some cases, this will be due to changes in waste volumes requiring disposal or the addition of new waste streams, so it is important to build into the early siting stages an agreed process by which such changes can be negotiated with the host community. Otherwise, trust and confidence may be lost, and this may even derail the process.

5.4.2.2. Response

— In **Canada,** the Kincardine Agreement in connection with the proposed LLW repository included the possibility for the parties to the agreement to renegotiate the various benefit payments available in the event the developer were to consider disposing of waste from new reactors that may be developed in the future.

5.4.3. Political and regulatory framework issues

5.4.3.1. Challenge: Ensuring ongoing local support

Given the long timescales envisaged for the operational period of a repository, it is clearly essential that local support for the repository continues throughout its construction and operation. This will depend to a large extent on public confidence in the safety of the facility, fostered through open and transparent communication.

5.4.3.2. Responses

— In **Belgium**, in the early 90s ONDRAF/NIRAS created an information centre called Isotopolis in Dessel, where the industrial subsidiary of ONDRAF/NIRAS treats and stores radioactive waste. This centre provides clear, easily understandable information for anyone interested in radioactive waste. Isotopolis has a strong scientific focus and is intended as a local learning tool. Up to 2015, this centre also provided an opportunity to visit an existing storage facility for processed LLW that already existed in the community. Since 2016, Isotopolis has provided a possibility to visit the demonstration test. In 2022, Isotopolis was replaced by a new communication centre as part of the integrated repository project (Tabloo).
— In **Romania**, the Nuclear and Radioactive Waste Agency organizes periodic meetings with the representatives of the LLW repository host community in Saligny, in order to have detailed discussions of their needs and concerns, and to explore ways of improving their social well being.

5.4.4. Resourcing issues

5.4.4.1. Challenge: Ensuring the existence of a suitably qualified workforce

It is obvious that construction and operation of a repository, once sited, will have a significant impact on the host community. This will vary depending on issues such as the size of the community, whether it is a rural or urban community and to what extent the local population is able to provide the necessary human resources. The enhanced skills development and employment opportunities that will result from a facility development are advanced as potential benefits designed to encourage communities to become involved.

5.4.4.2. Response

— In **Italy,** a decision to build the national repository within a technology park will help ensure a qualified workforce across generations. The technology park will include a training centre, focused on issues related to radiological protection, radioactive waste management and environmental protection. The aim is to guarantee to the hosting region a specific, long term role in such sectors, ensuring at the same time continuous training on the job, in order to have a qualified workforce available during all phases of the national repository's life. Beyond the need for a qualified workforce, sharing this kind of expertise is helpful in providing a basis for knowledge transfer.

5.4.5. Community support issues

5.4.5.1. Challenge: Ensuring mitigation of adverse impacts

There is a common perception that the presence of a radioactive waste management facility can reduce house prices and reduce the overall economic profile of a region. It is therefore not uncommon for benefit packages to include some form of property price protection, whereby funds are put aside to compensate claimants for demonstrable decreases in value.

5.4.5.2. Response

— In **Canada**, as part of its hosting agreement with the host city of Kincardine, OPG developed a property protection plan. The plan set out compensation for any loss of property value as a result of the proposed deep geological repository.

5.4.5.3. Challenge: Maintaining benefits over time

A part of the benefit packages developed in a number of Member States is provision for continued payment during the operation of a repository in the form of a tax on the waste emplaced. This is intended to allow potential siting communities to gain an understanding of what hosting a facility will mean in the long term.

5.4.5.4. Responses

— In the **Republic of Korea**, the 2005 Waste Act stipulated that in addition to the initial lump sum that would be payable when a site was selected, an annual payment would be paid as a so-called 'carrying in' fee, based on the amount of waste emplaced.
— In **Spain**, since the promulgation of the corresponding national regulation in 1986, ENRESA is responsible for the provision of projects with the aim of contributing to the economic and social development of those communities located in the neighbourhood of a radioactive waste storage and disposal installation. An amendment to the original regulation was issued in 2015, which introduced the provision of additional annual funds to support proposals for co-financed projects between the government, through ENRESA, and one or corresponding beneficiary communities, in order to contribute to economic and social development, as well as to environmental protection.
— In the **United States of America**, a privately operated LLW repository in Texas pays a proportion of the income it receives to the local government jurisdiction. A similar arrangement has been proposed in conjunction with a proposal to use the site for the interim storage of spent fuel.

5.4.5.5. Challenge: Ensuring visibility of the long term commitment of the facility operator

As part of the benefits offered to local communities for agreeing to host a repository, it is becoming increasingly common for a facility operator to offer to relocate its main operational headquarters to the locality. This could indeed bring a number of potential local benefits, for example, through increased local tax revenues and improved employment opportunities. Perhaps more importantly, the commitment is often seen as a vote of confidence in the safety of the facility itself.

5.4.5.6. Responses

— In **Finland**, following agreement by the local community for the development of the ONKALO research facility, the waste management organization Posiva transferred a large part of its headquarter's functions to the Olkiluoto community.

— In the **Republic of Korea**, the Korea Radioactive Waste Agency has located its headquarters in the Gyeongju host community.

6. CONCLUSIONS

6.1. INTRODUCTION

Many international conventions now recommend stakeholder involvement in decision making associated with controversial issues, such as nuclear facility siting and other major infrastructure projects, reflecting a general trend towards wider deliberative participation. This publication provides practical information — through illustrations and examples — on how to comply with such conventions through involving stakeholders in aspects of radioactive waste disposal facility siting decisions. It does not, however, provide information on developing a pre-determined engagement process. This is because there is no 'magic bullet' that will guarantee to deliver a societally acceptable site. Rather, a process needs to be developed that is specifically designed for a national and historical context and it will require continuous adjustment as it evolves. The examples and illustrations provided here can help inform decisions on designing a stakeholder involvement programme and adjusting it over time.

This publication discusses the challenges associated with radioactive waste disposal in terms of three main phases, namely the development of policy and the establishment of a programme framework, the siting process itself (distinguishing between the planning and implementation stages and the ongoing process) and the construction, operation and post-closure phase of a facility. Many of these challenges, and the responses to them reported from experience in Member States, are common to the three stages; however, the relative importance of the roles played by the different stakeholders may vary.

The ability to site and subsequently develop any waste facility in partnership with potential host communities is closely related to the quality of stakeholder involvement. Stakeholder involvement and engagement during facility siting may seem elaborate, time consuming and resource intensive, but experience suggests that they can be cost effective in finding acceptance for potential sites, especially as engagement costs are a tiny fraction of the capital costs of any facility.

Member States are increasingly adopting more inclusive approaches, based on public participation and stakeholder involvement, and this has led to an improvement in mutual trust, understanding, and, in some cases, progress, where traditional approaches had previously stalled. Many aspects of the disposal facility development process present various challenges to those involved that can be grouped under five distinct headings:

(a) Social licence issues: They deal with basic challenges relating to communicating with stakeholders and the need to develop and maintain mutual understanding of the issues among the parties involved.
(b) Involvement process issues: They arise from the nature of involvement expected in or with decision making, the factors affecting progress and timescales inherent to the various activities. They concern due consideration on how to initiate and then how to maintain stakeholder involvement and flexibility needed in the overall process.
(c) Political and regulatory framework issues: They include examples of the challenges associated with gaining and maintaining political support over project timescales, and with the involvement of the regulatory agencies and other authorities in a transparent way, according to their responsibilities, to further develop confidence by other stakeholders that decisions are suitably informed. This includes issues such as the local community's rights in the process, such as veto or withdrawal.

(d) Resourcing issues: They are challenges associated with the establishment and maintenance of institutional capabilities and capacity and understanding of the roles of different stakeholders in the decision making process. In particular, these concern the provision of adequate financial resources and professional competences to credibly contribute to the basis for sound decisions.
(e) Community support issues: They include all issues associated with the use of community benefits to mitigate the real or perceived impacts of repository development and operation and to recognize community participation.

The responses from Member States to the challenges associated with these issues leads to several key lessons that are useful to consider when developing, implementing and reviewing any communication and involvement programme associated with radioactive waste disposal.

6.2. SOCIAL LICENCE ISSUES

From the very beginning, the development of trust among stakeholders and in the process is crucial to effective working. Early stakeholder involvement, ideally prior to the development of a siting process, is essential to prevent accusations of decisions having already been made. This mutual understanding, developed through the respectful discussion of complex issues, helps build trust and ideally continues into the construction, operation and closure phases. Nothing destroys confidence more than apparent indifference once a decision has been obtained.

Of major importance is the challenge of how to respond to and, if possible, involve all those who will inevitably be affected by the process from the very beginning. Development of a siting process needs to recognize that it will never be possible to gain universal acceptance for a proposed facility, but this does not remove the requirement to communicate the need for a solution. It is crucial to endeavour to involve even those who may oppose the project while accepting that not all will be willing to take part.

Communication with potentially impacted stakeholders in order to understand local issues and concerns, and developing ways of engaging with them through hearings, open meetings and other forums, can be an important way of developing trust especially where this has broken down following previously low levels of involvement in a siting process.

It is important that promises or commitments are met concerning mundane issues such as holding meetings by agreed dates, returning phone calls, replying promptly to emails, sending a consistently constituted team to meetings and providing information or notes within timescales agreed. Keeping these kinds of promises is vital as a demonstration that the larger ones will also be kept.

As soon as the siting process begins, it is important to begin discussions with adjacent Member States. This is not only necessary to comply with international agreements but helps maintain relationships and reassure the population of these states about the proposals.

It is important to consider effective ways of informing future generations as to how and why a siting decision was made, considering the long timescales required for disposal activities.

6.3. INVOLVEMENT PROCESS ISSUES

It is important to demonstrate from the start that there is a well designed decision making process, with clear roles and responsibilities assigned to the various parties, preferably involving a stepwise process with clear decision points. Sufficient flexibility is essential to allow the issues that will inevitably arise to be suitably addressed.

Once a siting process has begun, no matter how well it has been designed, the probability is that its completion will take longer than expected. Therefore, it is advisable that in the planning stage it is made clear exactly which decisions need to be taken, but that these are not attached to rigid timescales. If this is not evident from the start, difficulties may arise.

It is important to be aware that one of the major challenges arising in any siting process is how to transition from process design to process implementation. There are numerous examples of where a seemingly acceptable process has been developed, often through public consultation, but where little or no progress has been achieved.

At the heart of consent based siting is the question of how to decide whether a community actually accepts involvement in a process or a decision to continue. When designing a siting process, it is important to clarify, for all interested stakeholders, exactly how any consent based approach will operate and what constitutes consent.

6.4. POLITICAL AND REGULATORY FRAMEWORK ISSUES

The importance of continuing political support cannot be overemphasized, given the long timescales involved in a repository siting process. It is important that the implementer ensures that national, regional and local politicians are kept fully informed of progress and actively supported to take part in meetings and seminars. It is also important to ensure that any contacts with politicians are as open and transparent as possible, in order to avoid accusations of irregular dealings. It is important to ensure the involvement of all governmental bodies concerned in the siting process, otherwise one or more of them may recommend withdrawing from further site considerations.

The presence of a strong and independent regulator is an important component of any well designed siting process and a major factor in gaining and maintaining societal trust and confidence. It is the government's responsibility to empower and provide adequate resources to a regulator, ensuring it can competently and independently oversee and contribute to those decisions likely to impact on the capacity to provide a safe disposal solution. Those processes where the regulator acted as a resource for national and local stakeholders during an active siting process tended to enjoy the highest levels of trust.

6.5. RESOURCING ISSUES

Experience shows that the time taken to achieve project milestones is likely to be much more than was originally estimated. This demands that from the very start, sufficient resources, both financial and human, are made available and committed for the long term.

It is essential to ensure the involvement of suitably qualified and able individuals, capable of engaging well with a range of stakeholders. This is not always easy, and the involvement of people from different parts of the organization, and from different disciplines, is recommended, with training provided as appropriate. Development of cross-departmental project teams and steering groups in this way can be important drivers for success.

As the siting process begins it is preferable to have an established team of experts and communicators ready to take part in meetings and workshops. If such suitable staff are not available, the use of external consultants will need to be considered. The role of the implementing organization's process aware staff in such circumstances is then to be 'intelligent customers', defining tasks and selecting appropriately skilled practitioners suited to the engagement tasks.

To help raise awareness and build local confidence it is advisable for the implementing organization to establish a presence in potential host communities from an early stage, and to employ local people to staff exhibitions, answer enquiries and undertake other project related activities.

It is advisable that the development of the decision making process takes account of the knowledge and expertise of those involved from the local community and their roles and responsibilities. These include social context, political influence and roles and economic capacity and may also consider knowledge of the local environment and any technical background that may be considered useful.

6.6. COMMUNITY SUPPORT ISSUES

The availability of community benefits can be a significant aspect of the siting process, recognizing that repository development is answering a societal need requiring a local community to act on behalf of the whole country. In some Member States, these benefits are negotiated with communities later in the siting process, in others they are laid down in legislation and therefore designed during policy development. In order to avoid these benefits being perceived as bribery or inducements to attract underdeveloped communities to enter a consent based process, links to sustainable community development projects and infrastructure development are essential. This is a sensitive area that requires careful management and communication.

Proposed benefits often include provision of funds to allow full participation by all interested stakeholders without cost to them. Information about employment and infrastructure related benefits also needs to be explained, and the linkage to project milestones clearly demonstrated, if relevant. The use of formal agreements may be considered where these benefits are not specified in legislation, and negotiation with potential host communities can allow packages that reflect local aspirations and respond to specific identified needs.

Appendix I

SPECTRUM OF STAKEHOLDER INVOLVEMENT AND RELATED STAKEHOLDER INVOLVEMENT METHODS

A spectrum of stakeholder involvement exists, from the lowest level of involvement, described in Table I.1 as 'inform/educate', to the highest, described in Table I.1 as 'partner'. Different methods of stakeholder involvement, which vary in their complexity, are appropriate at each of these levels. Some examples given in Table I.1 further develop ideas first introduced in table 4 of Ref. [47].

TABLE I.1. DIFFERENT TYPES OF STAKEHOLDER INVOLVEMENT

Spectrum of stakeholder involvement	Stakeholder involvement methods
Inform/educate	Fact sheets Reports Web sites Social media Press conferences and press notices Open houses Drop-in sessions Operating a public relations centre Presentations, including one to one or small group briefings and larger group briefings/meetings
Consult/Gather views and information	Feedback channels Public comments Consultations Public meetings Surveys Focus groups Citizens' panels Referendums
Involve/engage	Public hearings Consultative groups Citizen advisory groups Citizens' juries Public dialogues Consensus conferences
Collaborate	Stakeholder dialogues Local partnerships Site stakeholder groups Roundtables Scenario workshops Citizen task forces Open space conferences Regional dialogue forums
Partner	Community representation groups Participatory site selection groups Local monitoring, oversight and information committees

The examples of potential stakeholder involvement methods provided in Table I.1 are described in Sections I.1–I.5. It is important to note that the list is not exhaustive and some similar methods may be known under different names in various programmes and/or as employed by engagement practitioners.

I.1. INFORM/EDUCATE

Though informing people seems a one way process, in practice many methods involving the provision of information contain some kind of feedback mechanism allowing for responses from stakeholders, such as the traditional 'letters to the editor'after press announcements and comments boards associated with social media.

I.2. CONSULT/GATHER VIEWS AND INFORMATION

Consultations are often associated with printed or digital proposal documents. They are generally focused on acquiring views and opinions by eliciting printed or digital responses to ideas and proposals, for example, through providing feedback, public comments or answering surveys. Examples of more structured interactions, which may be timed in advance, during or even after formal or statutory consultations include:

— Focus groups: These comprise single, or more usually a series of, small groups of invited or recruited people, usually representing or reflecting a cross-section of the population involved. Focus groups are usually run by a facilitator or moderator. Some information is provided to enable structured discussions of a theme or proposal with the aim of providing insights on people's reactions, values, concerns and perspectives, and perhaps an indication of how group dynamics influence opinions.
— Citizens' panels: These may be similar to focus groups in that they comprise a group or groups of invited or recruited people, usually representing or reflecting a cross-section of the population involved. A panel may sometimes comprise different groups meeting in different locations to consider the same matter. A citizens' panel can consider a matter in more detail than in a focus group setting as there may be a series of meetings in a much more interactive and deliberative format. Citizens' panels differ from citizens' juries in that the information provided and matters considered are given and even discussed within an agenda provided by the organizer.
— Referendums: A popular vote is a very large scale public decision format. All normally registered voters (or all persons meeting a stated criterion) can express their opinion through voting. While this technique enjoys a high level of perceived legitimacy, it also presents some limitations. Complex decisions need to be reduced to their simplest binary form to be proposed to the ballot. Setting up such a procedure can be an efficient way of attracting citizens' attention to the issue at hand and allowing citizens to collect information about the different positions taken by public figures. Referendums can be incorporated into aspects of wider deliberative processes, such as siting geological repositories for nuclear materials as tests of progress and public opinion.

I.3. INVOLVE/ENGAGE

This is a more interactive form of engagement with a range of structured methodologies being available.

— Public hearings: These are regulated, formal arrangements usually within a wider statutory process or consultation process at which members of the general public and other interested groups from civic society can give evidence or question public authorities about decisions under consideration.

— Consultative groups and citizen advisory groups: These comprise small formally constituted groups of persons who represent various interests or expertise such as community leaders (this sort of method may be familiar under another name). They meet on a regular or ad hoc basis to discuss concerns and provide informed input to decision makers. Ideally, they have a clearly stated purpose with supporting terms of reference outlining their task, such as commenting on or suggesting amendments to existing policies or plans or making recommendations when these are under development. Site Stakeholder Groups (SSG) are one example of this activity.
— Citizens' juries: These are a more formal mechanism, often created by the decision maker or sometimes by a SSG with an interest in the matter in hand, to provide deeper insights into difficult choices with ethical, moral or other value linked dimensions. Participants can be recruited by lottery or by some other selection process. A major factor is finding people with the time and commitment to remain involved over what may be a considerable period of investigations and discussions. The organizing institution, or delegate staff, may propose some number of decision options among which the jury need to choose. These options could be developed beforehand by the institution alone, or with the input of other consultative techniques. The citizens' jury process is to some extent self-organizing with participants having a considerable degree of control over the ordering of their work, the sourcing of further information and comment and how their outputs are framed.
— Public dialogues and consensus conferences: These government or governmental agency methods bring together members of the public, policy makers, scientists and other experts to consider and develop conclusions on or recommendations about national public policy issues. The name shows the main difference between the two approaches: consensus may be found in public dialogues, though the value is in exploring the range of opinions. Public participants are recruited to reflect the make-up and views of a population. Participants may be incentivized to attend one or several deliberative meetings. The undertaking and outputs of effective public dialogues and consensus conferences can help policy makers to:
    - Make better, more robust decisions that reflect public values and societal implications;
    - Increase legitimacy for tough decisions;
    - Demonstrate accountability in public investment;
    - Overcome entrenched positions to enable policy to move forward;
    - Gain a deep understanding of public aspirations and concerns that goes beyond media headlines and focus groups.

The low numbers of people involved (dozens rather than hundreds or thousands) means the outputs are not representative of wider views but they are a reflection of what civic society thinks or how it reacts to a particular challenge. Furthermore, such approaches tend to uncover arguments or points that 'stand on their own merits', which policy makers need to consider. Public dialogues may form one strand of evidence in a wider policy making approach involving consultations, surveys and other methods.

I.4. COLLABORATE

Collaborative working can be regarded as an effective form of negotiating around sensitive issues. Unlike confrontational approaches that focus on the positions of and differences between the parties, collaborative negotiation seeks to identify and then build on any common ground.

— Stakeholder dialogues: This method deserves to be regarded as 'first among equals' in that the products of a stakeholder dialogue can not only help the organizing entity or decision maker reach better informed decisions, but it can be used to provide insights or advice on the overall design of any wider engagement process.
— Roundtables: Representatives of different views or interests come together or are bought together to consider choices and recommendations on an equal footing. They may be ad hoc or standing groups,

reporting to a government department or other decision maker. Deliberations may last for several days. In many aspects, particularly the presence of interested parties, they are similar to stakeholder dialogues. Roundtables can be most valuable when used at the beginning of a process to set broad policy orientations or confirm project scope.

— Citizen task forces: Persons with some special knowledge or representing some interest of the community may be appointed to a temporary task force, organized to consider in depth some issue on which a decision is required. These are similar to citizen juries in that the group self-organizes to some extent and meets a number of times, often in the company of organizing entity representatives, to consider information and formulate recommendations.

I.5. PARTNER

Considering local communities and their representatives as partners in a disposal project is an effective approach to maintain the trust and acceptance needed to implement disposal. At an early stage, this may involve significant empowerment, the best example of the principle in practice being policies that grant communities a right of withdrawal or veto over siting after due consideration.

— Participatory site selection: Committees grouping citizen representatives and various types of technical experts work together over a significant period of months or years to develop solutions acceptable from both a technical and societal point of view. Auxiliary techniques may be used to inform or consult the larger community (e.g. information campaigns, referendums) and the committee may extend its lifetime to the period after construction and/or operation.

— Local monitoring, oversight and information committees: Instigated at the time of site (pre-) selection, or created when a risk producing installation is built, such committees are a mechanism for ongoing involvement and dialogue among interested parties, local communities and perhaps also the general public. In some Member States, these committees are required by law; in other contexts, they may be created to improve relationships between the community and institutional personnel and contribute to better risk management. Different levels of empowerment are provided to these committees: in some contexts, they take major decisions (e.g. they can require installation closure if certain safety requirements are not met); at the other end of the scale, they serve primarily as a forum for the exchange and dissemination of information. They typically include representatives from elected bodies and from civil society organizations (chambers of commerce, environmentalist groups, etc.) and they may be of any size (from 6 to 90 persons, depending on the definition given to ‘affected public’ and the system of representation that is chosen). The management of the industrial installation, or of the organization responsible for the risk producing site, as well as safety authorities and other national organizations, may be represented on the oversight committee as members, or they may be permanent or occasional participants.

Appendix II

INTERNATIONAL CONVENTIONS, EUROPEAN UNION DIRECTIVES AND OTHER SPECIAL OR NON-LEGAL FRAMEWORKS GOVERNING STAKEHOLDER INVOLVEMENT

A requirement for stakeholder involvement in the decision making process associated with radioactive waste management is laid down in a variety of international conventions, European Union Directives, and other special and non-legal frameworks in Member States. Some examples are given in Sections II.1–II.5.

II.1. THE UNECE CONVENTION ON ACCESS TO INFORMATION, PUBLIC PARTICIPATION IN DECISION-MAKING AND ACCESS TO JUSTICE IN ENVIRONMENTAL MATTERS (THE AARHUS CONVENTION)

Normally referred to as the Aarhus Convention, the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters [9] is not only an environmental agreement, it is also a convention about government accountability, transparency and responsiveness. The convention grants the public rights and imposes on parties and public authorities obligations regarding access to information and public participation and access to justice in environmental matters. The convention applies to nuclear activities, including radioactive waste management. Under the convention, participation is required not only in projects, but also in development of policies, plans and programmes.

II.2. THE UNECE CONVENTION ON ENVIRONMENTAL IMPACT ASSESSMENT IN A TRANSBOUNDARY CONTEXT (THE ESPOO (EIA) CONVENTION)

The UNECE Convention on Environmental Impact Assessment in a Transboundary Context, known as the Espoo Convention [39], sets out the obligations of parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult one another on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries. The convention entered into force on 10 September 1997. The public and NGOs are recognized as having a vital role to play in the development, implementation and support of the convention.

II.3. THE JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT (THE JOINT CONVENTION)

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [40] was the first legal instrument to directly address those issues on a global scale when it entered into force on 18 June 2001. The Joint Convention applies to spent fuel and radioactive waste resulting from civilian nuclear reactors and applications and to spent fuel and radioactive waste

from military or defence programmes[5]. The IAEA serves as the Secretariat for the Joint Convention and the obligations of the contracting parties with respect to the safety of spent fuel and radioactive waste management are based on the principles contained in the IAEA Fundamental Safety Principles [10].

The Preamble to the Joint Convention recognizes "the importance of informing the public on issues regarding the safety of spent fuel and radioactive waste management", and both Article 6 (on the siting of proposed facilities as they relate to the safety of spent fuel management) and Article 13 (on the siting of proposed facilities as they relate to the safety of radioactive waste management) require the contracting parties to "make information on the safety of such a facility available to members of the public".

II.4. EUROPEAN UNION DIRECTIVES

II.4.1. Directive 2011/70/Euratom of 19 July 2011 (The Waste Directive)

Directive 2011/70/Euratom of 19 July 2011 (the Waste Directive) [8] establishes a European Union framework for ensuring the responsible management of all types of spent fuel and radioactive waste stemming from or managed within civilian activities, from generation to disposal, and promotes public information and participation. The directive is based on and fully conforms with the Fundamental Safety Principles [10]. According to the directive, European Union member states have to provide for appropriate national arrangements for a high level of safety in spent fuel and radioactive waste management, including the establishment, implementation and updating of national programmes for the management of spent fuel and radioactive waste. It requires that European Union member states report to the European Commission on the directive's implementation. The directive contains special articles dealing with transparency and participation, and it requires appropriate steps to be taken by European Union member states in the form of a national radioactive waste management programme, including transparency.

II.4.2. Directive 2001/42/EC on Strategic Environmental Assessment (SEA)

Directive 2001/42/EC on Strategic Environmental Assessment, or the SEA Directive [41], applies to a wide range of public plans and programmes (e.g. concerning land use, transport, energy, waste, agriculture). The directive does not refer to policies. The directive was to be transposed into national legislation by July 2004. For other plans, European Union member states have to carry out a screening procedure to determine whether they are likely to have significant environmental effects. If there are significant effects, an SEA is needed.

The directive stresses that the public and the environmental authorities are informed and consulted during the development of an environmental report. If the plans and programmes are likely to have significant effects on the environment in another European Union member state, the European Union member state in whose territory the plan or programme is being prepared needs to consult the other European Union member state(s).

II.4.3. Directive 2014/52/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment (the Environmental Impact Assessment (EIA) Directive)

Directive 2014/52/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment, known as the EIA Directive [42], introduced a European Union wide procedure to ensure that the environmental consequences of projects are identified and assessed before authorization for them is given. The public can give its opinion and all results are taken into account in the authorization

[5] If such military or defence related materials are transferred permanently to and managed within exclusively civilian programmes, or when declared as spent fuel or radioactive waste for the purpose of the Convention by the Contracting Party concerned.

procedure of the project. The public is informed of the decision afterwards. Opportunities for public involvement in the decision making process would include such things as hearings and invitations for submission of written responses to proposals.

II.5. SPECIAL AND NON-LEGAL FRAMEWORKS IN MEMBER STATES

EIA reports are also mandated by regulations in many IAEA Member States outside the European Union. In addition, Member States receiving support from institutions such as the European Bank for Reconstruction and Development also need to complete relevant assessments, with involvement of the public and other national stakeholders.

Appendix III

GUIDANCE ON PRACTICAL STAKEHOLDER INVOLVEMENT THROUGHOUT THE LIFE CYCLE OF A NUCLEAR FACILITY

The IAEA Nuclear Energy Series publication on Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities [1] demonstrates the importance of this topic and provides guidance on practical stakeholder involvement. The guidance, which will equally apply to the process of siting, constructing and operating a radioactive waste disposal facility, includes the essential elements described below in Sections III.1–III.3.

III.1. DEVELOPING A STRATEGY FOR STAKEHOLDER INVOLVEMENT

A strategy for stakeholder involvement needs to include:

— A clear goal for the programme (i.e. development of a radioactive waste disposal facility);
— Well defined and measurable objectives for achieving the goal (e.g. public acceptability of the site selection criteria and the process);
— Identification of the issues to be addressed and the stakeholders in these, and an indication of priorities (e.g. understanding the level of knowledge and opinions of the public and stakeholder groups regarding the programme to be obtained through opinion polls, opinion surveys, meetings with focus groups and other methods).

III.2. DEVELOPING A STAKEHOLDER INVOLVEMENT PLAN

A stakeholder involvement plan needs to:

— Identify and prioritize the stakeholder groups to be considered;
— Identify the issues and determine the most effective means and tools for involving the stakeholder groups;
— Design an evaluation component for continually monitoring the effectiveness of the stakeholder involvement activities as well as the progress against the programme goal and objectives (e.g. periodical evaluations) and look for ways to improve;
— Assign ownership of the elements of the plan (i.e. clarify responsibility);
— Allocate sufficient resources (both human and financial) to accomplish the actions;
— Develop the competencies needed for effective stakeholder involvement;
— Involve professional independent conveners or facilitators, as appropriate.

III.3. ENSURING SUFFICIENT CAPACITY TO EFFECTIVELY IMPLEMENT A STAKEHOLDER INVOLVEMENT PLAN

The capacity to effectively implement a stakeholder involvement plan should be considered in terms of:

— Financial resources;
— Competencies of implementer staff, especially around interactive working;
— Availability of implementer staff;
— Knowledge available from participants;
— Time available from participants.

Appendix IV

COMPONENTS OF COMMUNITY BENEFITS AND COMMUNITY SUPPORT

It is becoming common in Member States where disposal facilities for radioactive waste have been proposed, developed or, in some cases, operated, to offer some form of mitigation measures to offset perceived fears among the host community and any potential financial impacts, in the event they occur. These are in addition to other measures designed to compensate for real impacts and ensure long term sustainable development. Such measures have also been offered not to compensate for risk or impact, real or imagined, but in recognition of the community's participation in an activity that is perceived as being in the national interest. The tendency for them to be regarded as bribery by opponents can prove difficult to counter, but if there is close involvement of potential recipients and explanation of their role from the very early stages of the siting process, this can be overcome.

Not least among these measures has been the offering of specific benefits packages to a community, by way of compensation, not necessarily for bearing an increased risk, but simply for allowing itself to be considered. It is now generally the case that such benefits comprise a mixture of financial payments and measures designed to assist the community to take part and build competence (engagement packages) and ensure enhanced well being over and beyond the lifetime of the facility in question (benefit or added value packages).

In those Member States where benefits are paid or proposed, there are also variations in the way in which they are calculated or proposed. It is possible to recognize two types, namely [48]:

(1) The 'legally imposed approach', where the type of incentives and benefits, their amount and any associated preconditions are mainly determined beforehand in legislation or agreed processes.
(2) The 'locally negotiated approach', where the type of incentives and benefits, their amount and any associated preconditions are negotiated between the key players at the local level without a legislative procedure. They are then often subject to formal agreement between the negotiating parties.

Whichever model is applied, it is important to demonstrate that the benefits available will actually be forthcoming. Various types of benefits can be recognized [49]. Some examples of how these have been applied in a number of Member States are provided in Sections IV.1–IV.4.

IV.1. FINANCIAL INCENTIVES

Financial incentives tend to be exactly what their name implies: a monetary inducement to a community to either become involved in a process, or to allow a development to continue, or both. Some examples of this type are fixed and not subject to negotiation, having been laid down within some pre-existing legal instrument, while others are often open to negotiation after an initial expression of interest has been registered, as a way of maintaining community interest.

However, such payments can also cause local issues, as has been the case in some Member States, where local politicians have used them to further their own particular programmes and where local people have felt excluded from the decision making process. Experience suggests that these payments need to be clearly ring-fenced and not used for normal community expenditure.

Payments can be in the form of lump sums or of annual payments. Lump sums are payments made directly to an affected community in order to encourage participation. In many cases there are few controls on what the money may be used for; in some cases, conditions are attached. It is common for payments to be made in instalments dependent upon the achievement of project milestones. Annual payments

are used in many cases. Agreements or incentive packages contain details of regular payments that are available, enabling local communities to estimate the benefit they could receive. The level of payments can vary depending on certain factors, such as the volume or activity of the waste emplaced, and whether regulatory approvals are forthcoming. In some instances, the amounts are specified in legal instruments.

Although very helpful in demonstrating a long term commitment to a potential or actual host community during an ongoing siting process, payments can also cause local issues. For example, where the payments are continued throughout the operational lifetime of a facility, the local community can become dependent on them and face hardship when the facility is closed and the payments cease.[6]

Other forms of financial incentive are found. For example, in some programmes, expert support packages are offered to assist communities to commission reviews by independent experts. This is seen as an important way of demonstrating transparency in the way in which information is supplied to the community during a project. In many cases, these funds are paid as part of the support provided as 'community empowerment', described in Section IV.3. In some cases, special tax benefits are available to a local community as an additional incentive for involvement.

Trust funds for future generations are funds established with the aim of supporting a community in the long term, in case the facility operation affects local economic development. Funds can also be established to provide capability to carry out any necessary remediation in the future if situations arise where the original site operator is no longer in existence.

Profit sharing has been proposed in some instances to allow the host community to benefit from facility operation by some form of proportional profit-allocation scheme. In some cases, a share of any profit is paid as a levy directly to the relevant local government entity.

IV.2. SOCIAL BENEFIT MEASURES

Social benefit measures are any compensatory measures, financial or otherwise, that are intended to offset any stigma, perceived or actual, for either the community's participation in any stage of the siting process or associated with the actual location, development and operation of the facility within the community or area. Improvement to infrastructure such as roads and other services can also come under this heading. In many cases, some details of benefits and payments are available from the start because they are laid down within legal instruments, and these include schemes such as emergency preparedness training and payments-equal-to-taxes[7].

Employment can be considered a social benefit measure. In many cases the enhanced skills development and employment opportunities that will result from siting and operating a facility are advanced as potential benefits designed to encourage communities to become involved. This has to be carefully balanced so as not to appear as if a proposal is targeting an area with high unemployment.

Infrastructure improvements are likely to be part of any plan as it is generally recognized that the development of a radioactive waste repository will have a number of impacts upon a local community, especially on one where no nuclear facilities have previously existed. For example, there may be a requirement to upgrade transport links. In many cases any potentially adverse impacts are perceived, rather than actual, especially at the beginning of a siting process.

Some host communities are offered property value protection. There is a common perception that the presence of a radioactive waste management facility can reduce real estate prices. Benefit packages may therefore sometimes include some form of property price protection, whereby funds are put aside to compensate claimants for demonstrable decreases in value. It is notable, however, that there are few examples of large payments having been made. Indeed, there have been cases where significant positive

[6] An example is in Poland, where an existing LLW repository is due to close by 2025, and where the current host community has come to depend on the regular payments.

[7] Payments-equal-to-taxes is a programme under which the federal or national government transfers funds to regional, state and local government by a tax-like funding transfer mechanism.

impacts on property prices from facility development impacts were observed, for example due to increased demand for housing from incoming staff.

It is also becoming more common for community benefit packages to comprise integrated development projects designed to benefit the community not only during the immediate siting process and subsequent facility operation, but long into the future (similar to trust funds). Structured development plans, comprising support industries, specialist services and linked research facilities can be seen in numerous programmes. While the actual monetary value of these projects cannot always be quantified, the associated benefits in terms of jobs, taxes, improvement in local services and standard of living are expected to be appreciable. It is normal that such benefits only become available following local agreement to host a facility and the granting of the necessary construction permits and regulatory authorizations. In some cases, funds are distributed through a local management board set up to involve community and operator representatives.

As part of the benefits offered to local communities for agreeing to host a repository, it is becoming increasingly common for the facility operator to offer to relocate its main operational headquarters to the locality. While this can be perceived as a potential benefit that would bring increased local taxes, improved employment opportunities and other advantages, the commitment is often seen as a vote of confidence in the safety of the facility itself.

IV.3. COMMUNITY EMPOWERMENT MEASURES

Community empowerment measures can also be regarded as a form of incentive designed to allow a community to develop a degree of control over the siting, development and even operation of a facility. They usually include such mechanisms as establishing local monitoring or review groups, especially where the community is a volunteer participant, but vary as to the extent of real decision making power conferred. This is an important issue that needs to be clearly stated throughout the development and implementation of the siting process. Such measures are valuable enough to also continue once a site has been selected. The ability in Finland of the local community to veto a siting decision, mentioned earlier, is an example of a major empowerment tool.

As discussed earlier, it is becoming common for community partnerships to be established in a repository siting process, in order to allow a degree of ownership and control to be developed locally.

Local involvement in decision making, in the form of community partnerships, is becoming more common, involving local elected bodies, interest groups, citizen groups and others. Such partnerships are often given the opportunity to influence the details of the project, rarely including technical design, but more frequently regarding associated integrated economic development projects. The local community partnership often receives financial support to allow it to oversee the project and ensure that local views and concerns are considered.

Capacity building is somewhat similar to the above, but includes measures designed to allow the oversight group or partnership to become more knowledgeable about the issues involved. This can include the organization of meetings, discussions between local stakeholders and independent experts, as well as visits to operating facilities, assisted by the involvement of independent process advisers, convenors and facilitators. It can also assist a community to develop the capability to cope with additional demands on health and other services that may be required and can include support for other groups to allow them to be involved.

There are numerous examples from Member States where representatives from communities in potential repository locations have been supported to visit operational facilities, proposed sites and host communities in other Member States, to familiarize themselves with both the technologies involved and how local concerns have been addressed. In relation to the geological disposal of radioactive waste, visits to underground research facilities have been especially valuable.

IV.4. INVOLVEMENT SUPPORT PACKAGES

The various payments and funding arrangements described in Sections IV.1–IV.3 are sometimes amalgamated into a single agreement designed to support the participation of local communities in a siting process. Such packages can include items discussed in the main body of this publication, such as secretarial support, the use of experts and management costs for partnerships. They can be available during site selection as well as during facility construction and operation once a site has been selected.

Although such benefits are important components of the discussions that will take place with potential host communities during a siting process, it is vital they are not seen as outweighing safety related issues, and are not allowed to be misconstrued, especially early in the process.

Evidence also shows that while the principle of providing benefits to host communities has been applied in relation to facilities for the management or disposal of all types of radioactive waste, it is usual to set the amounts and levels relative to the radioactivity of the waste. That said, the fact that the general public tends to regard all radioactive waste as being generally similar makes designing such benefits a delicate activity that needs to take account of local views and concerns.

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GLOSSARY

acceptability. Acceptability, as in ‘stakeholder acceptability’ or ‘public acceptability’ of a proposed disposal facility, is used in this document in preference to the more passive ‘acceptance’. Acceptability implies a degree of involvement activity for those interested and/or affected to better inform plans. By contrast, ‘acceptance’ implies little or no such involvement.

accountability. An obligation or willingness to accept responsibility or to explain individual or organizational actions.

biosphere. That part of the environment normally inhabited by living organisms.

community engagement. Community engagement is the term for processes that help to build active and empowered communities. Its characteristics include enabling people to understand and exercise their powers and responsibilities as citizens, empowering them to organize through groups to work for their common good, and requiring public bodies to involve citizens in influencing and carrying out public services.

consent based siting. A consent based siting process means far more than asking communities ‘yes’ or ‘no’ as regards their willingness to consider hosting a repository. Consent concerns issues such as who needs to be involved in such a process, when, and how that would be decided; whether those who decide need to be elected officials, or other stakeholders and community members; how people need to be supported to learn about the issue of radioactive waste management before making any decisions; and who would provide this information, or how communities can learn this information on their own.

deep geological repository. See *geological disposal facility.*

deliberative polling. A form of consultation where randomly selected representatives of citizens are engaged in deliberation on policy issues through small group discussions and conversations with competing experts to produce more informed public opinion and more considered judgement.

disposal. Emplacement of waste in an appropriate facility without the intention of retrieval.

disposal facility. An engineered facility where waste is disposed for disposal.

geological disposal facility. A facility for radioactive waste disposal located underground (usually several hundred metres or more below the surface) in a stable geological formation to provide long term isolation of radionuclides from the biosphere.

intelligent customer. The capability of the organization to have a clear understanding and knowledge of the product or service being supplied. The intelligent customer concept relates mainly to a capability required of organizations when using contractors or external expert support.

interested party. A person, company, etc., with a concern or interest in the activities and performance of an organization, business, system, etc.

interim waste storage. The holding of radioactive sources, radioactive material, spent fuel or radioactive waste in a facility that provides for their/its containment, with the intention of retrieval. Storage

is by definition an interim measure, and the term interim storage would therefore be appropriate only to refer to short term temporary storage when contrasting this with the longer term fate of the waste. In many cases, the only element of this definition that is important is the distinction between disposal (with no intent to retrieve) and storage (with intent to retrieve).

orphan source. A radioactive source which is not under regulatory control, either because it has never been under regulatory control or because it has been abandoned, lost, misplaced, stolen or otherwise transferred without proper authorization.

radioactive waste. For legal and regulatory purposes, material for which no further use is foreseen that contains, or is contaminated with, radionuclides at activity concentrations greater than clearance levels as established by the regulatory body.

repository. See *disposal facility.*

right of withdrawal. An option offered in many siting programmes where a community can decide to cease involvement (also known as a veto), without prejudice. It usually ceases to be available at an agreed point in a siting process.

social licence. The acceptability of the siting and/or operating of a facility to stakeholders, wider society and communities involved.

stakeholder. See *interested party.*

The term stakeholder is used in the same broad sense as interested party. To 'have a stake in' something, figuratively, means to have something to gain or lose by, or to have an interest in, the turn of events. The IAEA Handbook on Nuclear Law [12] states that: "Owing to the differing views on who has a genuine interest in a particular nuclear related activity, no authoritative definition of stakeholder has yet been offered, and no definition is likely to be accepted by all parties."

In this publication, 'stakeholder' applies to any individual or organization who has or thinks that they have an interest in any of the issues related to radioactive waste management and the siting, operations, closure and post closure of a waste facility.

stakeholder concern. This relates to views about the consequences of particular issues being or not being taken into account; for instance, if safety is cited as an issue, safety concerns may be expressed over whether and/or how particular procedures are applied.

stakeholder involvement. Working directly with stakeholders, including the public, throughout a siting process to ensure that public concerns and aspirations are consistently understood and considered.

veto. See *right of withdrawal.*

waste classes.

exempt waste (EW). Waste from which regulatory control is removed in accordance with exemption principles.

high level waste (HLW). The radioactive liquid containing most of the fission products and actinides present in spent fuel — which forms the residue from the first solvent extraction cycle in

reprocessing — and some of the associated waste streams; this material following solidification; spent fuel (if it is declared as waste); or any other waste with similar radiological characteristics.

intermediate level waste (ILW). Radioactive waste that, because of its content, in particular its content of long lived radionuclides, requires a greater degree of containment and isolation than that provided by near surface disposal.

low level waste (LLW). Radioactive waste that is above clearance levels, but with limited amounts of long lived radionuclides.

very low level waste (VLLW). Radioactive waste that does not necessarily meet the criteria of exempt waste, but that does not need a high level of containment and isolation and, therefore, is suitable for disposal in landfill type near surface repositories with limited regulatory control.

very short lived waste (VSLW). Radioactive waste that can be stored for decay over a limited period of up to a few years and subsequently cleared from regulatory control according to arrangements approved by the regulatory body, for uncontrolled disposal, use or discharge.

ABBREVIATIONS

ANDRA	National Agency for Radioactive Waste Management (France)
DAD	Decide Announce Defend
DIP	decision in principle
EIA	environmental impact assessment
ENRESA	Empresa Nacional de Residuos Radioactivos S.A. (Spain)
FSC	Forum on Stakeholder Confidence (OECD/NEA)
HLW	high level waste
ILW	intermediate level waste
LILW	low and intermediate level waste
LLW	low level waste
NEA	OECD Nuclear Energy Agency
NWMO	Nuclear Waste Management Organization (Canada)
OECD	Organisation for Economic Co-operation and Development
ONDRAF/NIRAS	National Agency for Radioactive Waste and Enriched Fissile Material (Belgium)
OPG	Ontario Power Generation (Canada)
SEA	strategic environmental assessment
SKB	Swedish Nuclear Fuel and Waste Management Company (Sweden)
SNF	spent nuclear fuel
SOGIN	Nuclear Plant and Waste Management Company (Italy)
UNECE	United Nations Economic Commission for Europe
URL	underground research laboratory
VLLW	very low level waste

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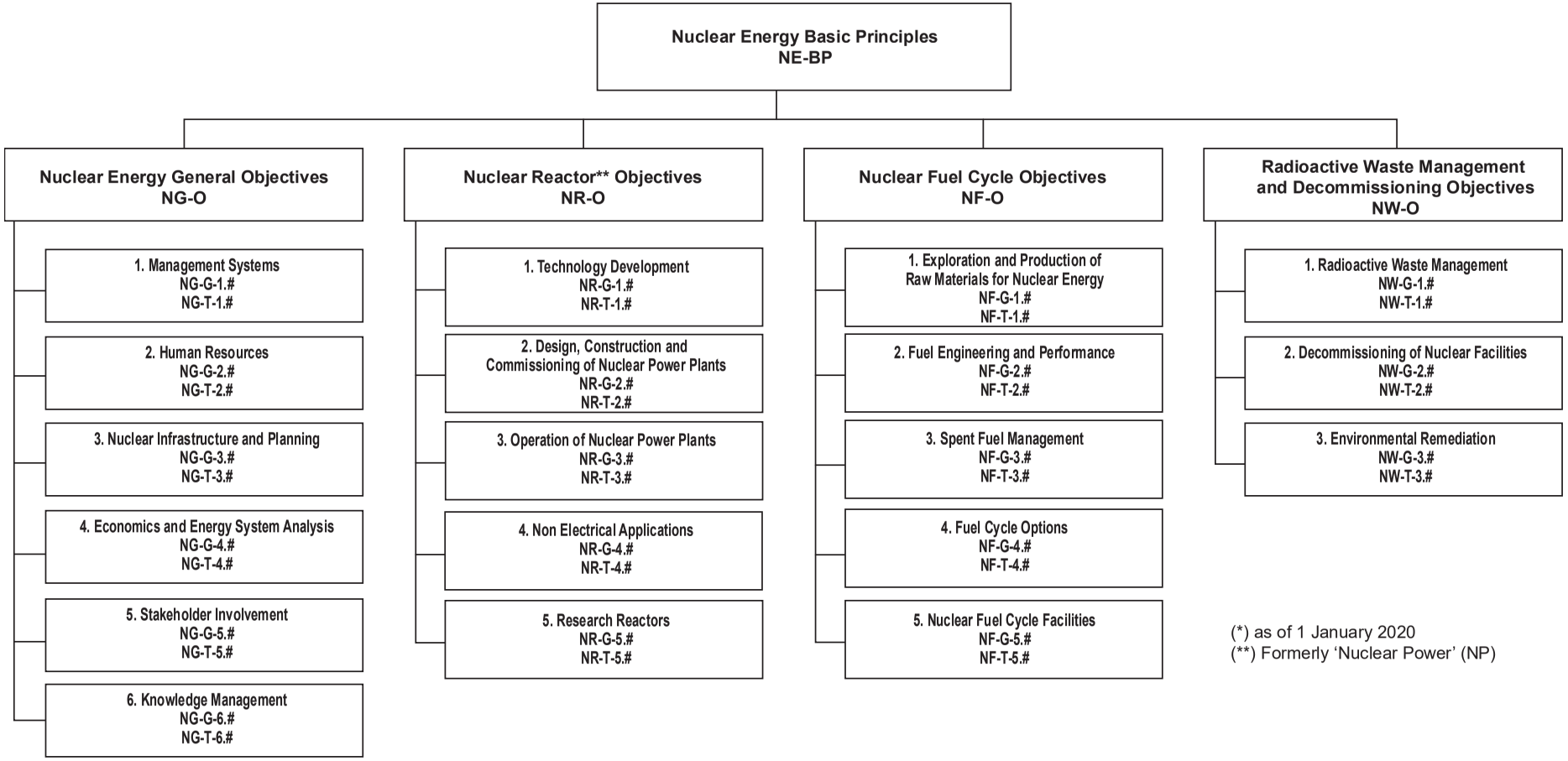

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