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Technical Expertise network
SITEX-II
Radioactive Waste Disposal

SITEX-II

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Conditions and means for developing interactions with Civil Society

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CO	Confidential, only for partners of the SITEX-II project	

SITEX-II OUTLINES

Sustainable network for Independent Technical EXpertise of Radioactive Waste Disposal – Interactions and Implementation (SITEX-II)

The SITEX-II Project (Coordination and Support Action) was initiated in 2015 within the EC's Horizon 2020 programme to further develop the Sustainable Independent Expertise Function Network in the field of deep geological disposal safety. This Network is expected to ensure a sustainable capability for developing and coordinating, at the international level, joint and harmonized activities, related to the Expertise Function. SITEX-II brings together representatives from 18 organisations including regulatory authorities, technical support organisations, research organisations and specialists in risk governance and interaction with general public, including NGOs and an education institute. It is aimed at practical implementation of the activities defined by the former EURATOM FP7 SITEX project (2012–2013), using the interaction modes identified by that project. SITEX-II, coordinated by IRSN, is implemented through 6 Work Packages (WP).

WP1 - Programming R&D (lead by Bel V). The general objective of WP1 is to further define the Expertise Function's R&D programme necessary to ensure independent scientific and technical capabilities for reviewing a safety case for geological disposal. In this perspective WP1 will develop a Strategic Research Agenda (SRA) and define the Terms of Reference (ToR) for its implementation accounting for the preparatory work to be carried out in the framework of the JOPRAD project for construction of a Joint Programming of research for geological disposal.

WP2 - Developing a joint review framework (lead by FANC). The key objective of WP2 is to further develop and document in position papers and technical guides a common understanding of the interpretation and proper implementation of safety requirements in the safety case for the six phases of facility development (conceptualization, siting, reference design, construction, operational, post-closure).

WP3 - Training and tutoring for reviewing the safety case (lead by LEI). WP3 aims to provide a practical demonstration of training services that may be provided by the foreseen SITEX network. A pilot training module will focus on the development of training modules at a generalist level, with emphasis on the technical review of the safety case, based on national experiences, practices and prospective views. The training modules will integrate the outcomes from WP1, WP2 and WP4 and support harmonisation of the technical review processes across Europe.

WP4 - Interactions with Civil Society (lead by Mutadis). WP4 is devoted to the elaboration of the conditions and means for developing interactions with Civil Society (CS) in the framework of the foreseen SITEX network, in view of transparency of the decision-making process. The future SITEX network is expected to support development of these interactions at different levels of governance and at different steps of the decision-making process. Three thematic tasks, namely R&D, safety culture/review and governance will be addressed by institutional experts and representatives of CS within SITEX-II as well as externally through workshops with other CS organisations.

WP5 - Integration and dissemination of project results (lead by CV REZ). The overall objective of WP5 is to produce a synthesis of the results achieved within all the WPs of SITEX-II together with an Action Plan that will set out the content and practical modalities of the future Expertise Function network. WP5 will also foster the interactions of SITEX-II with external entities and projects, as well as the dissemination of SITEX-II results so as to allow possible considerations from outside the project in the process of developing the future SITEX network.

WP6 - Management and coordination (lead by IRSN).

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Further details on the SITEX-II project and its outcomes are available at **www.sitexproject.eu**

ABSTRACT

The European research SITEX-II project aims at implementing in practice the issues identified by the SITEX project (2012-2013), with a view to develop a European expertise network gathering national expertise organisations supporting the regulatory body in the field of radioactive waste management (RWM) and geological disposal (GD) of radioactive waste. A significant conclusion of the SITEX project (2012-2013) is the need for the foreseen SITEX network to reinforce the quality of the expertise function by establishing closer relationship with representatives of the public. Improved interactions between institutional experts and the Civil Society (CS) are also expected to raise the capacities of the latter to engage in a meaningful way along the radioactive waste management decision-making process at local, national and international levels and more specifically all along the safety case review. A continued engagement of the CS along the decision-making process is understood here as a way to reinforce the quality of the decisions as underlined by the Aarhus Convention as well as by Council Directive 2011/70/EURATOM. The SITEX-II project has developed an experimental way of conducting research by allowing interactions between representatives of technical experts supporting the regulatory authorities (notably, Technical Safety Organisations, TSOs) and CS.

This report is presenting the activities and results of SITEX-II Work Package 4 (WP4). A specificity of WP4 is to include, as research partners, a small group of CSOs having developed expertise in the field of RMW together with other research organisations. WP4 also interacted, all along the project, with a larger group of CS representatives of 35 non-governmental organisations (NGOs) from 18 countries in Europe, each engaged, at national and/or EU level, in the field of RWM. WP4 has notably developed and tested a specific methodology (the double wing model of interactions with civil society) to enable cross-interactions between CS and other stakeholders in the field of RWM.

The SITEX-II WP4 includes the following three tasks:

- Task 4.1 formulated R&D key technical and socio-technical issues that civil society expects to be developed in R&D programmes on RWM. Interacting with the larger group of CS representatives, this task has actively contributed to the development of the SITEX Strategic Research Agenda (SRA), translating and channelling the CS perspective into the research matrix developed by the institutional expert community of the SITEX-II project. Task 4.1 has developed a methodology to support interactions with CS in the field RWM R&D, as the concept of "Knowledge Sharing and Interpretation". This concept is currently tested in the framework of EU project R&D BEACON (see section 2.1.2). One aspect of this input is regarding the need for including citizen sciences and social sciences in the SRA in order to better grasp the complex and holistic dimensions of RWM. As a result, socio-technical aspects of RWM have been reinforced into the SITEX SRA.
- Task 4.2 investigated how the notion of nuclear safety culture is understood by the different categories of experts as well as by civil society representatives, in the perspective of establishing a common ground of dialogue without prejudice to the role of each party in the various phases of safety case review. A survey was performed on the basis of a questionnaire. It also involved interviews of different categories of actors involved in the RWM safety case review together with CS representatives. This task has identified commonalities and differences in the vision of safety culture in the context of RWM. It has gathered the expectations of the different categories of actors vis-à-vis CS engagement in the safety case review of GD facilities. On that basis, Task 4.2 has drawn conclusions on the conditions and means to involve CS along the safety case review process.
- Task 4.3 has first performed a desk review on intergenerational governance of RWM on the basis of available research and on-going international projects (Insotec, SITEX, MoDeRn, …). Task 4.3 has

then investigated the possibility to develop specific tools and processes in order to support intergenerational engagement of CS in the context of RWM. It has conceptualised, developed and tested an innovative experimental exercise of participative and comparative assessment of different parallel alternative scenarios of long-term management of radioactive waste. This new approach, entitled **Pathway Evaluation Process (PEP)**, is to be proposed as a kind of "serious game" to different categories of stakeholders in order to support structured discussions on the possible strategies for RWM, with a view to enrich their mutual understanding of the multiple dimensions at stake (scientifical, technical, social, financial, political, legal & political).

MAIN CONCLUSIONS

Grounding on the results of the previous SITEX research project (2012-2014) regarding public access to expertise, SITEX II - WP4 has further clarified the purpose and need for engaging civil society in the context of long term RWM decision-making and more specifically along the Safety Case review processes. In this perspective, the development of a shared safety culture has been recognised as a powerful means to establish the ground for genuine engagement and cooperation between different categories of RWM stakeholders and civil society. Although data was limited by the qualitative nature of the methodology and limited number of performed interviews, the conclusions drawn (Task 2) provide a comprehensive picture of the expectations of different actors regarding the conditions and means for meaningful interactions with CS along the safety case review process. Concerning long term decision-making processes, milestones have been highlighted as a way to allow the sharing and updating of common elements of a safety culture between institutional and non-institutional actors, and the reinforcement of the participation of CS in a long-lasting perspective, as a necessity to achieve intergenerational confidence. WP4 has also conceived, developed and implemented several methological tools in order to support Civil Society access along long term technical decision-making processes characterised by complex socio-technical stakes. A first experiment has been performed along the development of the SITEX Strategic Research Agenda. (Task 1). In order to support CS engagement, a specific methodology has been developed and tested (the "Knowledge Sharing and Interpretation") articulating the "double wing" deployment of a small team of more involved CS experts with a larger group of CS representatives. As a result of this methodological approach, specific CS contributions to the SRA have been drawn by Task 1 creating the conditions for them to be "duly" taken into account by the group of institutional partners (TSOs, Regulators) of the project. The participation of CS in the development of the SRA has more specifically contributed to contextualise the technical scope of research themes in order to better grasp the complex dimension of the questions at stake in long term RWM. As a result of this, a set of sociotechnical question have been incorporated into the SITEX SRA. Furthermore, the desk review (task 3) of previous work on intergenerational governance show interesting convergence on the fair conditions for intergenerational public engagement in the context of Geological Disposal development (need for reversibility as response to public concerns, inclusion of stakeholders in successive stages of the decision-making including post-closures phases). Last but not least, the conceptualization, development and testing of a "serious game", the Pathway Evaluation Process (PEP), an innovative support tool to pluralistic dialogue on RWM and GD, provides opportunities to develop in the future new types of interactions between stakeholders (notably between technical experts and CS representatives) and possibly as a way to support the engagement of coming generations along the successive stages of decision-making on the medium and long term. The SITEX II project governance provided a secured framework to enable fair participation of a plurality of actors in the PEP process. During the different tests, at national and international levels, the PEP exercise has demonstrated its capacity to enlarge the basis of understanding of the key issues at stake regarding long term RWM. Future developments will be considered in the framework of the SITEX Network.

Glossary

CS: Civil Society

CSO: Civil Society Organisation

DGR: Deep Geological Repository

DMP: Decision Making-Process

EC: European Commission

EJP: European Joint Programme

GD: Geological Disposal

HLW: High Level Waste

IGD-TP: Implementing Geological Disposal of radioactive waste Technology Platform.

ILW: Intermediate Level Waste

JOPRAD[1]: European **JO**int **PR**ogramming Project on **RAD**ioactive Waste Disposal"

KSI: Knowledge Sharing and Interpretation

NGO: Non-Governmental Organisation

NTW: Nuclear Transparency Watch (European network of NGOs)

R&D: Research and Development

RWM: Radioactive Waste Management

SC(R): Safety Case (Review)

SRA: Strategic Research Agenda

TSO: Technical Safety Organisation

WMO: Waste Management Organisation

WP: Work Package

[1] The European research project JOPRAD started in June 2015 and end in November 2017. It aimed at preparing a proposal for the setting up of a "Joint Programming (JP) on Radioactive Waste Disposal" between Waste Management Organisations (WMOs), Technical Support Organisations (TSOs) working for regulators, and Research Entities (REs). The JP will contribute to the EU objective of building the European Research Area through enhanced cooperation and coordination of national research programmes. It would bring together at the European level, the aspects of R&D activities implemented within national research programmes where synergy from Joint Programming is identified. The aspects of R&D activities brought together concern geological disposal of spent fuel and other high activity long lived radioactive waste, including waste management aspects linked with their disposal and accompanying key activities (Education and Training, as well as Knowledge Management). The research needs of the three main actors identified in the project (WMOs, TSOs, and RE) should be established independently.

CONTENT

1 Introduction

1.1 EXPERTISE FUNCTION AND ITS INTERACTIONS WITH CIVIL SOCIETY

According to the perspective developed by the SITEX (2012-2013) project, transparency of the decision-making process (DMP) includes several requirements such as to maintain over time, consultations and interactions with interested parties, in particular with civil society (CS). The role and the interactions of the expertise function with the other stakeholders involved in the DMP are represented in the following scheme[2] (**Figure 1**).:

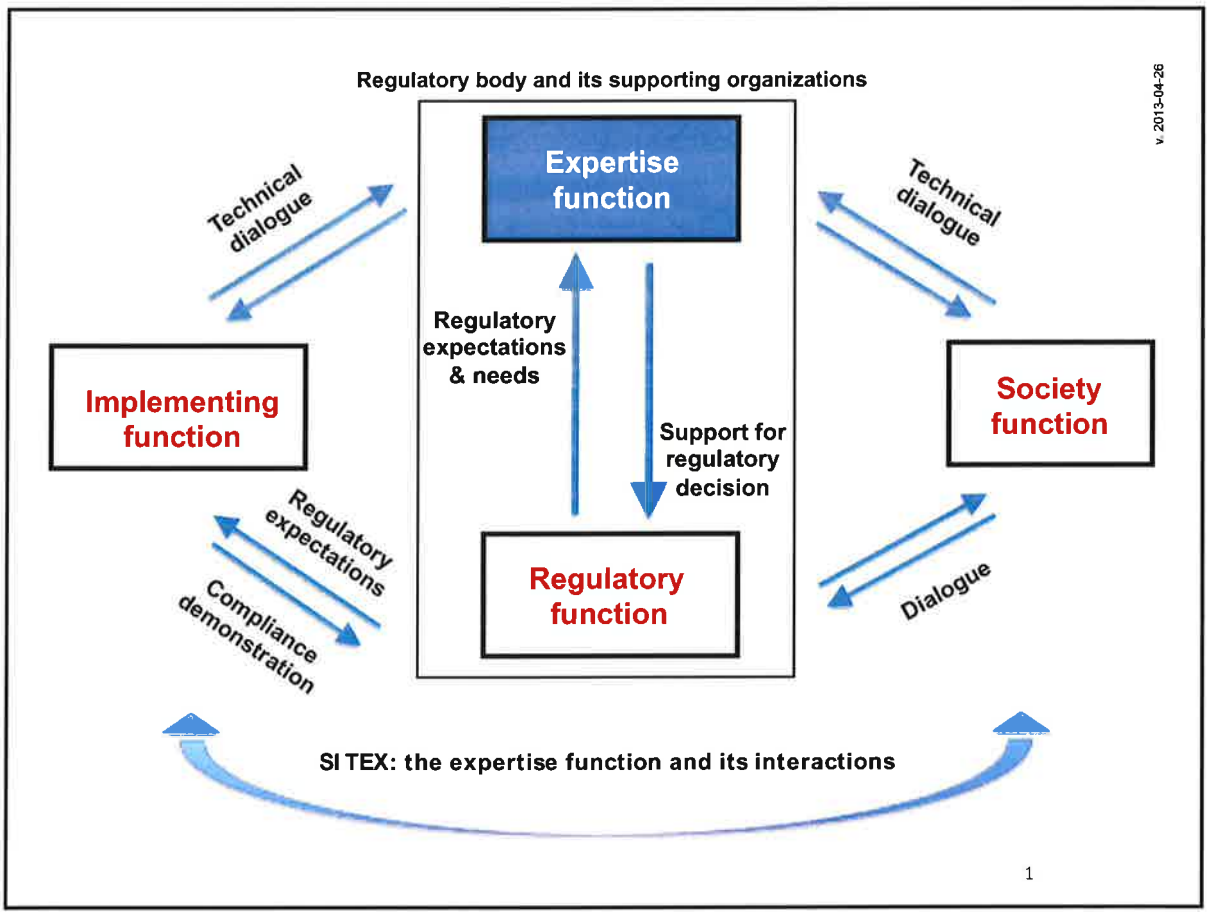


Figure 1: The expertise function and its interactions

According to the common definition of the SITEX members, one of the tasks of the expertise function is to improve the quality of the interactions between institutional experts and CS. *"The public is considered in this study as the "end user" of the decision-making process. The ultimate mission of expertise function is to enhance nuclear safety in the public interest. This mission is linked with the capacity of the expertise function to identify the priorities and concerns of the public and therefore necessitates regular interactions with the public. It also entails the expertise function to provide the public with its expertise and to make*

[2] See *Characterization of the national expertise function at the national level*, pp 5-12, DELIVERABLE N°: 6.1 Conditions for establishing a sustainable expertise network, SITEX (2012-2013), available here: www.sitexproject.eu

itself available to answer the questions of the public and to provide it with information and explanations on the technical review conclusions[3]".

In this perspective, the expertise function interacts with the regulatory and implementing functions but also with the society function. It is indeed requested from the CS to interact on the definition of the R&D programme carried out by expert's bodies and on Safety Case Review (SCR) with a specific emphasis on the assessment of the safety strategy and safety concept adopted by the implementer. The SITEX network is therefore expected to support the development of these interactions at different levels of governance and at different steps of the DMP, also identified in the conclusions of the SITEX (2012-2013) project[4]:

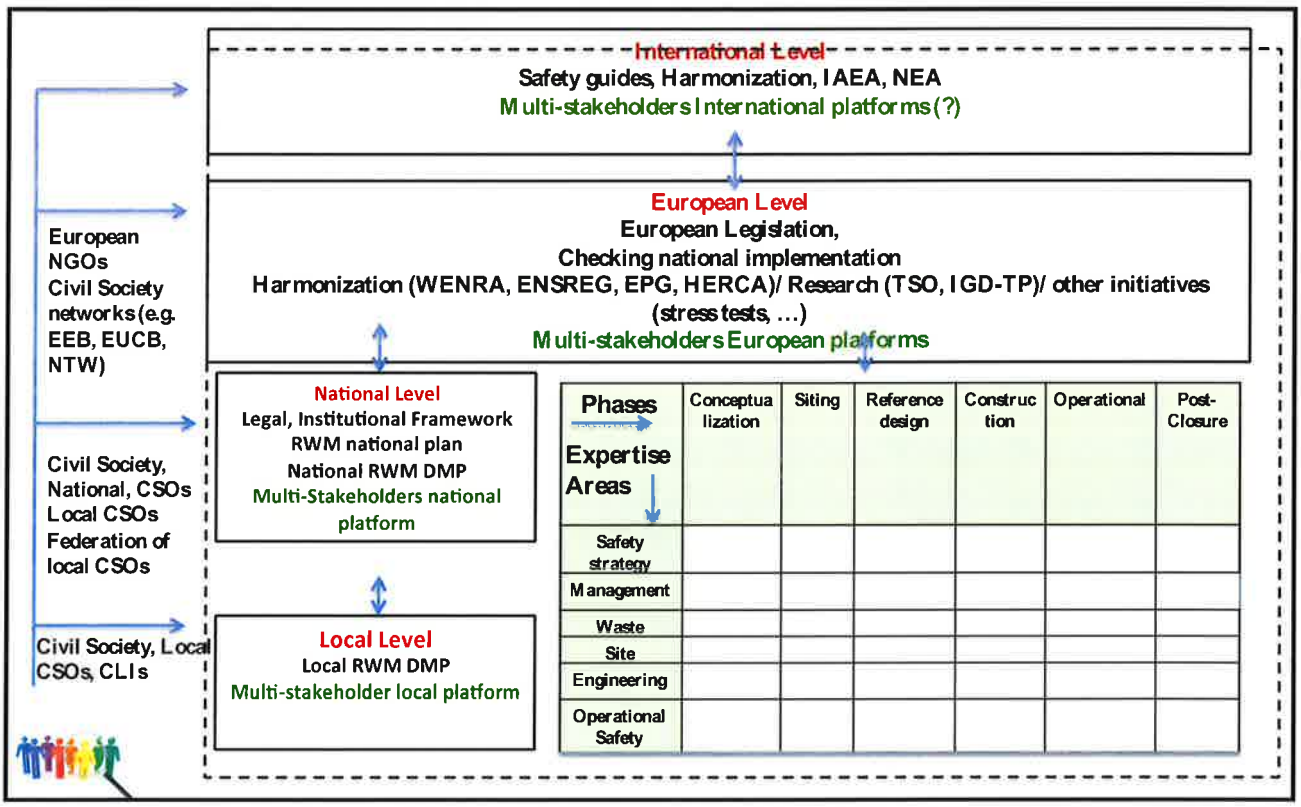


Figure 2: Possible multi-level contributions of CS along the decision-making steps of RW disposal Operating

In addition to the SITEX (2012-2013) conclusions, the INSAG 20 report[5] on "Stakeholder involvement in nuclear issues ", published by IAEA in 2006, establishes that "*the active involvement of stakeholders in nuclear issues can provide a substantial improvement in safety*". In addition, the section 2 of this document, focussing on "safety relevance of stakeholder involvement", argues that "*operators and regulators confronted with questions and concerns from stakeholders may have to re-examine the basis for previous decisions. [...] Investigating such questions provides clarity, prevents complacency, and may expose unforeseen problem areas*". It is also mentioned in this section 2 that "*experience in many countries has shown that such transparency can be an extremely effective enforcement tool to enhance safety performance.*"

[3] p12 of the Deliverable 6.1 of the SITEX (2012-2013), as above.
[4] See Annex 2 p.46 of the Deliverable 6.2 of the SITEX (2012-2013) Terms of reference (ToR) of the SITEX network, available here: www.sitexproject.eu
[5] A report by the International Nuclear Safety Group (INSAG) of the International Atomic Energy Agency (IAEA), Stakeholder involvement in nuclear issues, October 30, 2006, IAEA publication.

1.2 EXPERIMENTATION OF A DOUBLE WING MODEL OF INTERACTIONS WITH CIVIL SOCIETY

In line with these conclusions, the SITEX-II project has developed experimental processes of interactions between technical experts from institutions supporting the regulatory authorities (notably, Technical Safety Organisations - TSOs) and civil society (CS) in the perspective of the Aarhus Convention, in a R&D context. In the frame of the SITEX II project, CS is to be understood as a group involving representatives of Civil Society Organisations (CSOs) in the EU together with non-institutional experts engaged in the societal follow-up of RWM activities at national and/or EU levels. The SITEX-II project has developed and tested an original model of interactions with CS ("the double wing" model of interactions" – see hereunder Fig. 3) in the context of European R&D.

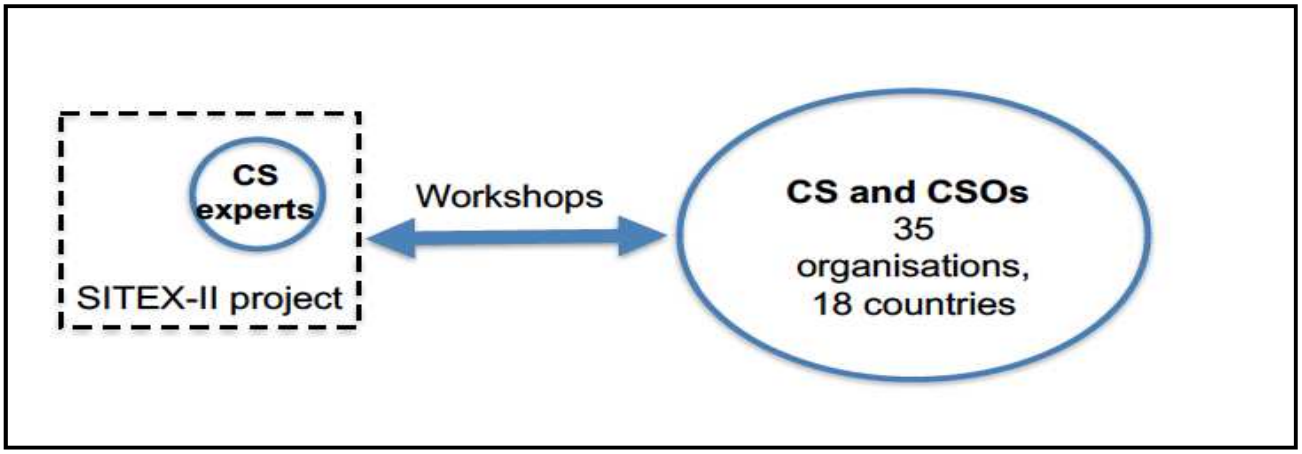


Figure 3- Model of "double wing" interaction with CS

A small group of research partners from CS (the CS experts) of the SITEX-II project (Energiaklub, MKG, Mutadis, REC, Symlog[6]) interacted all along the project with a larger group of CSO representatives of 35 environmental non-governmental organisations (NGOs) from 18 countries in Europe reflecting a variety of situations at national level. The list of organisations is available in Appendix 1. This larger group of CSOs was assembled under the auspices of the RWM Working Group of the Nuclear Transparency Watch (NTW) network that is co-ordinated by Johan Swahn from MKG. The CSOs participants in the network were not expected to represent NTW as one organisation but rather to provide a variety of European CSOs viewpoints. Strengthening and maintaining a high level of nuclear safety in Europe is a common concern for all members of this group without prejudice to their respective position vis-à-vis nuclear energy.

WP4, which involved SITEX-II institutional and non-institutional experts, interacted with the larger group of CSO representatives within dedicated workshops that were organised along the course of the project (see the agendas in Appendix 2 and a presentation of the outcomes of each workshop in Appendix 9.).

An inception meeting gathering some thirty WP4 partners and potentially interested CSOs was held on 28 August 2015 in Paris, at the beginning of the project. During this meeting, the SITEX-II project was presented to invited representatives of NGOs. The meeting was an opportunity to discuss their interest in the SITEX II project as well as the conditions (and concerns) for their potential involvement in the project. A discussion was also organised on the first draft of CS contribution to SITEX Strategic Research Agenda.

[6] MKG is the Swedish NGO Office for Nuclear Waste Review. REC is the Slovenian office of the Regional Environmental Centre. Energiaklub is an Hungarian CSO. Mutadis and Symlog are two research groups with a standing expertise on societal participation.

Three workshops organising exchanges between institutional experts and CS were also organised at three different locations:

- in Ljubljana for workshop No 1 on 22-23 February 2016,
- in Budapest for workshop No 2 on 28-29 June 2016 and,
- in Brussels for workshop No 3 on 15-16 November 2016.

During workshop No 1, the consolidated version of the CS contribution to the SITEX SRA, the first results of the questionnaire developed by task 4.2 and the literature overview developed by task 4.3 were presented and discussed together with the first principles of the PEP approach. This covered the elaboration and characterization of different pathways towards a situation of passive safety (several variants from IGD-TP vision implementation to deep borehole option). It also covered the identification of relevant criteria (in the view of CS) in the perspective of intergenerational governance of GD according different possible pathways.

At the second workshop, the final results of the task 4.2 questionnaire were presented, and the PEP game was played by all participants coming from different groups (SITEX experts, CSOs group). All the results from the process and content point of view were collected and recorded.

At the third workshop, the PEP results were presented. The discussion also entailed a review of the different requirements and provisions coming from legal framework and international conventions related to public participation in the context of RWM and four sets of issues related to intergenerational aspects were discussed.

Each task of WP4 had therefore the opportunity to bring its findings and to discuss them with the larger group of CSO representatives during these workshops. It gave the opportunity to report regularly to the CSOs group on the progress of the work of the different tasks, to collect additional inputs from the CSOs group in this work and to develop concrete interactions between institutional experts and representatives of CS (non-institutional experts and CSOs).

This model of interactions will constitute the basis for the organisation of the future SITEX network. It will also be considered for the potential involvement of CS in RWM European Joint Programming.

1.3 THREE THEMATIC TASKS RELATED TO INTERACTIONS WITH CIVIL SOCIETY

During the SITEX-II project, it was proposed to CS representatives (non-institutional experts and CSOs) to:

- Formulate specific technical and socio-technical R&D issues and concerns that CS expects to be included in the radioactive waste management (RWM) R&D programmes of TSOs;
- Determine the conditions and means for establishing fair and equitable interactions with technical experts from different countries along the process of safety case review of geological disposal (GD), that involves a long term intergenerational perspective.

In order to do so, the WP4 led by Mutadis developed interactions with CS representatives through three thematic tasks. Two of the three tasks were led by CSO representatives (MKG for task 4.1, REC Slovenia for task 4.3) and one by a regulatory authority (FANC for task 4.2), exchanging together all along the project.

- Task 4.1 formulated R&D key technical and socio-technical issues that civil society expects to be developed in R&D programmes on RWM. Interacting with the larger group of CS representatives, this task has actively contributed to the development of the SITEX Strategic Research Agenda (SRA), translating and channelling the CS perspective into the research matrix developed by the institutional expert community of the SITEX-II project. Task 4.1 has developed a methodology to support interactions with CS in the field of RWM R&D, as the concept of “Knowledge Sharing and

Interpretation". This concept is currently tested in the framework of EU project R&D BEACON (see section 2.1.2). One aspect of this input is regarding the need for including citizen sciences and social sciences in the SRA in order to better grasp the complex and holistic dimensions of RWM. As a result, socio-technical aspects of RWM have been reinforced into the SITEX SRA.

- Task 4.2 investigated how the notion of nuclear safety culture is understood by the different categories of experts as well as by civil society representative, in the perspective of establishing a common ground of dialogue without prejudice to the role of each party in the various phases of safety case review. A survey was performed on the basis of a questionnaire. It also involved interviews of different categories of actors involved in the RWM safety case review together with CS representatives. This task has identified commonalities and differences in the vision of safety culture in the context of RWM. It has gathered the expectations of the different categories of actors vis-à-vis CS engagement in the safety case review of GD facilities. On that basis, Task 4.2 has drawn conclusions on the conditions and means to involve CS along the safety case review process.
- Task 4.3 has first performed a desk review on intergenerational governance of RWM on the basis of available existing research of past and on-going international projects (Insotec, SITEX, MoDeRn, …). In addition, Task 4.3 moderated discussion to reflect on and challenge the provisions and requirements related to intergenerational aspects of radioactive waste (RW) and spent nuclear fuel (SF) management, as set out in different international treaties/conventions and other EU binding legislation. Task 4.3 has then investigated the possibility to develop specific tools and processes in order to support intergenerational engagement of CS in the context of RWM. It has conceptualised, developed and tested an innovative experimental exercise of participative and comparative assessment of different parallel alternative scenarios on long-term management of radioactive waste. This new approach, entitled Pathway Evaluation Process (PEP), is to be proposed as a kind of "serious game" to different categories of stakeholders in order to support structured discussions on the possible strategies for RWM, with a view to enrich their mutual understanding of the multiple dimensions at stake (scientifical, technical, social, financial, political, legal & political).

The following sections presented the main results of the different tasks and the synthetic results of the workshops.

2 Civil society interacting with research & development

2.1 INTRODUCTION

The SITEX-II project provides an opportunity for involved Civil Society Organisations (CSOs) to access information, to express expectations, concerns and recommendations vis-a-vis R&D on RWM and GD at the European level. In SITEX-II, the position of the larger group of CSOs described above is specific in the sense that they are not research actors but are involved in the perspective of the implementation of the Aarhus Convention[7]. The participating CSOs have a specific interest in the safety of RWM and, in this perspective, in the safety of GD (this is the very aim of the NTW RWM working group). CSOs have underlined the need to consider in the research programming the impact (externalities) of some decisions involved in the development of GD on the safety and radiation protection of RWM as a whole. Moreover, civil society (CS) representatives are not necessarily bound by any mandate related to GD or any other technical solution. The CS viewpoint is not based on a technical framework and it therefore enables broader qualitative inputs to be taken into account. However, participation of CS in R&D projects should not be limited to projects that are more specifically dealing with non-technical topics: it is underlined that CS should also participate in more technical activities. In any case, it should be noticed that a fruitful participation of CS on technical topics should entail the involvement of knowledgeable experts that are close to and entrusted by CS, that have the capacity to liaise with NGOs and the public in general to contribute to the Knowledge Sharing and to its Interpretation (KSI), developing a mutual understanding of how and to what extent a given research make sense and contributes to improving decisions.

2.1.1 Objectives of Task 4.1

Task 4.1 on "CS interacting with R&D" was devoted to review the SITEX strategic research agenda (SRA)[8] and provided inputs regarding topics (technical, socio-technical) relevant for CS that could be included in the SITEX SRA. A second issue was to think about the potential role of CSOs in the future SITEX network. The objectives of Task 4.1 were:

- to review the "R&D orientations for Technical Safety Organisations", Deliverable D3.1 of the first SITEX project (2012-2013) from a CS perspective;
- to review the first SITEX Strategic Research Agenda (SRA), to be developed by SITEX-II WP1, as well as, if possible other research agendas (such as for instance the IGD-TP SRA) and develop appropriate processes for CS to interact with experts along R&D development
- to identify the expectations of CS regarding R&D, both on technical and social science issues (safety analysis and criteria, siting criteria, alternative methods, long term governance, preservation of knowledge, ethics, etc.) and formulate R&D key technical and socio-technical issues that CS expects to be developed in R&D programmes;
- to investigate the conditions and means for CS to contribute to the framing and follow-up of potential Joint Programming (JP) of R&D in the RWM field, backing European discussions on Joint Programming on potential crosscutting areas.

[7] The full text of the Aarhus Convention is available online: https://www.unece.org/env/pp/treatytext.html

[8] The expert's SRA gathers and prioritizes the topics of Research and Development (R&D) that national expertise organisations expect to conduct at European and international levels. In the frame of the SITEX-II project, the R&D is focused on Geological Disposal issues but the focus of the future SITEX network that has to also be defined during the SITEX-II project could be broader. Civil Society contribution can influence this aspect.

2.1.2 Methodology of Task 4.1

Task 4.1 started its work by reviewing the documents "R&D orientations for Technical Safety Organisations", Deliverable D3.1 of the first SITEX project (2012-2013) as well as the IGD-TP SRA already finished during the summer of 2015. In parallel, a preliminary draft report for a CS input on the strategic research agenda was developed. The resulting draft document was prepared, presented and discussed at the first meeting with the CS network in Paris on August 28. After the meeting with CS and the possibility for workshop participants to provide written comments to the draft document it was finalised as the report "Civil Society Organisation review of European 'strategic research agendas (SRAs)' for RWM and input from CS into a European strategic research agenda"[9]. The report was submitted to Work Package 1 (WP1) in mid-September as a first CS input into the SITEX-II SRA development work.

Task 4.1 members continued to interact with WP1 during the autumn of 2015. When the first draft SITEX-II SRA was presented, it was analysed and an additional input as a response to the draft was developed. The work included an effort to place the CS interests into the research agenda matrix developed by WP1. The result was a report entitled "Comment on the possibility of CS input into the WP1 process to develop 'Possible R&D Topics' for a SITEX-II Strategic Research Agenda, SRA" that was sent to WP1 as a final CS input into the SITEX-II SRA development work in November 2015[10]. The report was also presented and discussed at the second meeting with the CS network in Ljubljana on February 23, 2016.

Further discussions were held with WP1, especially regarding the possibility of including citizen and social science in the SITEX-II SRA. During the spring of 2016 a separate citizen and social science platform in RWM was developed and was also introduced into the JOPRAD project. A short document on this issue, "Civil Society Research Questions Involving Social Science and Citizen Science" was compiled in March 2016[11].

During 2016 and 2017, work was also done on developing a concept of CS interaction in technical EU research projects on RWM. The concept was entitled "Sharing and interpreting R&D with society" and was introduced to be tested as a separate work package in the application for EU funding for the Beacon Project (Bentonite and homogenisation). The Beacon Project was launched in June 2017 with a specific Work Package 6 dedicated to "Civil Society Interaction"[12]. In the work package four representatives of CSOs (the environmental NGOs of MKG, NTW, WISE Paris and the Green Circle of Pésc) together with a technical expert chosen by them will follow and comment the project from their perspective. This will test a new model for CS interaction in technical projects. Hopefully the concept will also be used in the forthcoming European Joint Programming (EJP) R&D project on RWM.

2.2 FINDINGS

Much of the work of task 4.1 was carried out early in the project (June 2015-March 2016) as it was important to have a quick input into the SITEX-II strategic research agenda (SRA) that was also planned to be developed early in the project. The findings were split into the below three sections:

- General comments on civil engagement in RWM R&D issues and comments on previous SITEX and IGD-TP work on SRAs;
- CS input to the SITEX-II SRA, including on citizen and social science;

[9] The report is available on the SITEX-II website: **http://sitexproject.eu/index_2.html#deliverables_wp4**
[10] The report is available on the SITEX-II website: **http://sitexproject.eu/index_2.html#deliverables_wp4**
[11] The report is available on the SITEX-II website: **http://sitexproject.eu/index_2.html#deliverables_wp4**
[12] See http://www.beacon-h2020.eu .

- Moving towards a direct CS involvement in European R&D on RWM;

2.2.1 General comments on civil engagement in RWM R&D issues and comments on previous SITEX and IGD-TP work on SRAs

A few general comments regarding CS interaction in European R&D in RWM have come up in the project:

- The CSOs involved in the SITEX-II project, mostly environmental NGOs could provide an input from CS into the project, but they should not be considered as representative of the whole CS;
- Generally environmental NGOs are globally concerned with the development of a consistent RWM strategy that leads to the safest possible solution and many of them will work – if the conditions are right – for the safest long-term management options at the best sites;
- Environmental NGOs are open to other alternatives than the implementation of GD;
- The perspective of CSOs cannot be reduced to providing input for R&D on geologic disposal without any consideration of the overall RWM strategy;
- The overall priority of CSOs regarding R&D issues is not that one or the other is covered, but that comprehensiveness and consistency are guaranteed, i.e., the CS is reluctant in establishing its own priorities.

2.2.2 Civil society input into the SITEX-II SRA, including on citizen and social science

The input of the CS into the SITEX-II SRA through the CSOs can be divided into four parts.

Firstly, there were some technical issues that were explicitly covered -or understood by the CSOs to be implicitly covered- by some areas SITEX-II SRA:

- Characterisation of “historical” specific waste and potentially incoming waste (mostly ILW);
- Corrosion issues (long term behaviour of containers, interactions);
- Characterisation of phenomena related to waste possibly challenging safety conditions (e.g. gas generation from metallic containers);
- Microbiological processes (oxic / anoxic conditions);
- Reinforced assumptions regarding long term conditions (climate change, geological events…);
- Operational security and safeguard issues.

Secondly, there were technical or methodological issues that could possibly be covered by extension of some areas of the SITEX-II SRA:

- More comprehensive approach of possible waste inventory (in particular plutonium waste disposition issues);
- Strengthening and sensitivity analysis of geological, mechanical and hydrogeological modelling;

- Interaction between RWM strategy and development of the disposal (to be extended to a more strategic rather than operational level);
- Monitoring, including participation of CS;
- Retrievability and reversibility (from an operational viewpoint);
- Long term storage vs. disposal (touched from an operational point of view of decaying and optimisation);
- Long term security and safeguards issues.

Thirdly, some technical, most of methodological issues and almost all societal issues do not appear in the scope of SITEX-II SRA:

- Global balance of risks attached to a disposal strategy in the framework of a global RWM strategy;
- Methodological development regarding choice of site, geological structure;
- Comparison of various disposal concepts (GD, deep boreholes…) and designs (horizontal galleries, vertical pits…), respective merits of centralized vs. decentralized approaches;
- Methodological development through a comparison of different pathways leading to various combinations of storages and disposals ;
- Methodological development regarding the practical meaning of guidelines such as “precautionary principle” or “best available”.

Fourthly, in order to have a better understanding of the possibility to study societal issues using citizen and social science a separate effort was undertaken during the spring of 2016 to identify some specific subjects that would be of special interest:

- R&D knowledge transfer and interpretation;
- Uncertainty, epistemology and, social trust along RWM and GD implementation;
- Aggregating a diversity of people, unfold capacities of collective intelligence along RWM and GD implementation;
- Safety culture in the context of GD;
- Ontological and axiological commitments of GD stakeholders;
- Background democratic culture of GD implementation.

To read more about the issues presented in the above two sections we refer to the three Task 4.1 working reports previously cited.

2.2.3 Moving towards more civil society interaction in European R&D in RWM

A substantial effort was made for increasing CS engagement in the future in European R&D on RWM. The work of task 4.1 on the SITEX-II SRA was incorporated into the JOPRAD project and has also influenced the development of the work programme for the planned European Joint Programming (EJP) in RWM. The

implemented methodology for favouring interaction with CS in the SITEX-II project can be used also within the governance of the EJP.

As indicated in section 2.1.2, a CS interaction methodology is already being tested in the Beacon EU technical project, with a dedicated special work package on CS interaction.

2.3 CONCLUSIONS

The possibility for CS through the CSOs group to directly take part in the SITEX-II project and to work with the SITEX-II SRA has been successfully demonstrated. The work has provided a capacity for CSOs to take part in EU projects such as in the future projects of EU R&D on RWM through the EJP. The capacity-building as well as finding methods for working with CS will be useful in the future.

3 Civil society contribution to safety culture and safety case review

3.1 INTRODUCTION

For the past few decades, the need for a reinforced information and effective engagement of civil society (CS) in the decision-making process, notably on matters concerning the management of all projects with a strong environmental component, has become a topic of public interest for various research projects in the world. The results of the WP4.2 related to the interactions with CS along the safety case review process of geological disposal (GD) facilities are presented below. The main challenge of the WP4.2 was to propose compelling and objective approaches for closer interactions with CS in the field of Radioactive Waste Management (RWM). With the help of a questionnaire and workshops, the main commonalities and differences in the meaning of safety culture by institutional and non-institutional actors have been identified together with conditions and means necessary to engage CS along the Decision Making Process (DMP) regarding GD.

One of the core issues for the RWM is to build public confidence in the deep GD as a safe solution for radioactive waste. It notably involves fostering confidence in DMP and trust in the Expertise function. The WP4.2 approach allows different experts and interested parties to increase their understanding in terms of safety case review activities. Thus, close communication with CS on a large diversity of issues related to safety case during the review process is a main requirement to gain its confidence in long-term safety of the disposal.

Furthermore, one of the major outcomes of the SITEX project[13] is the need for a future SITEX network to enhance the quality of the Expertise function by developing closer relationship with CS via their deeper engagement along the safety case review process. Improved interactions with the Safety Case review will boost their competency in participation during the RWM DMP at different levels, i.e., local, national and international. The continuous engagement of CS along the DMP builds a way to enforce the merits of this process, as emphasized by the Council Directive 2011/70/EURATOM[14] as well as Aarhus Convention[15].

3.1.1 Objectives of task 4.2

The main objectives of the task 4.2 were:

- to investigate how safety culture can be shared by the different interested parties: regulatory body, implementers (waste management organisations), CS, etc.;
- to identify the appropriate processes and tools in order to enable experts' interactions with CS along the safety case review activities in the perspective of the Aarhus Convention.

[13] SITEX: Sustainable network of Independent Technical EXpertise for radioactive waste disposal http://sitexproject.eu/index_1.html

[14] CONSEIL DE L'UNION EUROPEENNE (2011). Directive 2011/70/EURATOM du conseil du l9 juillet 2011 établissant un cadre communautaire pour la gestion responsable et sûre du combustible use et des déchets radioactifs, http://eur-lex.europa.eu/eli/dir/2011/70/oj

[15] CONVENTION ON ACCESS TO INFORMATION, PUBLIC PARTICIPATION IN DECISION-MAKING AND ACCESS TO JUSTICE IN ENVIRONMENTAL MATTERS, Aarhus, Denmark, 25 June 1998, http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf

3.1.2 Methodology of task 4.2

To perform these objectives a questionnaire (see Appendix 3) was developed and a set of 27 personal interviews with various representatives of non-institutional (NGO's) and institutional actors in Europe (regulators, TSO's, researchers) was performed. The goals of this assignment were to identify the main commonalities and differences in the vision on safety culture in RWM and to investigate the expectations of non-institutional as well as institutional actors regarding the engagement of CS in the safety case review of GD facilities. The methodology applied to analyse the answers was first, to compare quantitatively, the most frequently used words and common expressions in the answers of the two interviewed groups and note the similarities and differences. Subsequently, the qualitative analyses included a systematic study of the interviewees' vision on the issues in question, so that the actual differences and commonalities in the perception and understanding could be fairly recognized (for more detailed information on the answers to the questionnaire, see Appendix 4 and 5). The workshops organised along the project helped to refine and clarify the results of the performed analyses.

3.2 FINDINGS

3.2.1 Scrutiny of the concept of safety culture. Reflections of interested parties on the concept

Deep GD facilities are complex sociotechnical objects that aim to achieve safe disposal of radioactive waste through a combination of technological artefacts, scientific constructions, natural entities and social and cultural constructions. Their safety relies on an operational phase that is likely to last at least a century and a post-closure passive phase in which safety does not rely on a human contribution anymore. As for German philosopher Niklas Luhmann[16], such complex systems entail risks of obsolescence associated to dynamics of compartmentalisation and fragmentation[17] which compromise the capacity of complex systems to adapt to changes, ruptures, and evolutions of the world that are likely to occur along the operational phase.

Safety culture is a framework to coordinate the various actors engaged in a hazardous activity (e.g. the active phase of a deep GD) around a common overriding goal of safety. Usual definitions of safety culture essentially focus on a given organisation (e.g. energy producer, waste management organisation, regulator, TSO), its management, policies and practices. However, in current times characterized by the development of horizontal exchanges and networks, multiple subcontracting, multi-level governance schemes and increasing complex interactions going through and beyond the limits of formal organisations and including non-institutional actors (NGOs, independent experts, …), a more systemic view on safety culture seems to be necessary. This researched definitions of safety culture should balance two requirements for complexity management over several generations: (i) the necessary differentiation of roles and (ii) the necessity to set up 'transboundary conversations'[18] to avoid obsolescence of the safety management system and favour transversality between specialised scientific and technical compartments on the one hand and between these compartments and society on the other.

A first generic definition of safety culture based on the performed literature review was proposed by SITEX-II project to the interviewees as "*a set of norms, attitudes, roles, and social and technical practices that a particular group of people share with respect to safety*"[19]. Further on, each of the interviewees suggested

[16] See Luhmann, Niklas. "Trust and power. 1979." John Willey & Sons (1979)

[17] See Guldenmund, Frank W. "The nature of safety culture: a review of theory and research." Safety science 34.1 (2000): 215-257

[18] See Kinsella, William J. "Being "Post-Fukushima": Divergent Understandings of Sociotechnical Risk." (2015)

[19] See Guldenmund, Frank W. "The nature of safety culture: a review of theory and research", opcit.

his own definition based on this definition. Despite some differences, a universal rationale converged towards '***a common set of values, principles and references governing safety*** '. The performed analyses led further to the investigation of what could be a shared safety culture between institutional actors (regulators, TSOs) and non-institutional actors (independent experts, NGO's).

The interviews show that for all interested parties, safety culture is crucial to ensure the adequate importance to safety. Therefore, some basic issues of safety culture (e.g. priority given to safety) has acquired a transversal dimension (see Fig.4) binding all interested parties notwithstanding that some differences in delineation of safety culture can exist between the considered groups (institutional, NGOs, group of citizens, …).

Historically, safety culture has mainly developed at the corporate level within institutional organisations (Regulatory Bodies, TSOs, implementers, …) according to international recommendations[20]. During the workshops, it appeared that some elements of this 'corporate safety culture' (namely, principles of optimization imposing to consider different options based on safety issues and to balance them, defence-in-depth requiring different levels of protection, …) are also shared by the other interested parties [21].

The discussion held during the project showed that it has to be recognized that there is no necessity for non-institutional CS and institutional groups to share 'corporate safety culture' as a whole. However, there is a need to identify elements of a 'societal safety culture' (set of values, references, through which the different actors of the society can assess together the degree of assurance that the safety objective is reached), which can be shared in order to achieve an effective collaboration along the DMP among the different parties organised around a common safety vision of RWM.

The results of the performed analyses show that while corporate safety culture and societal safety culture have a right to exist separately, the need to identify the elements that can be shared by both institutional and non-institutional actors, to assess together that the safety objective is reached, has become an important tool for improvement of the public engagement process.

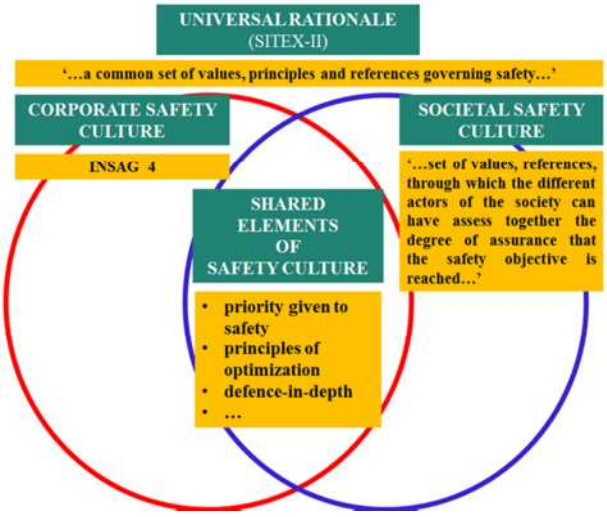


Figure 4. Transversal dimension of safety culture concept

[20] Safety Culture (International Safety Advisory Group, Safety-Series 75-INSAG-4) (1991). International Atomic Energy Agency, Vienna

[21] IAEA INSAG 4 report thus defines safety culture as "that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance."

3.2.2 Conditions for constructive engagement of the non-institutional actors along the safety case review of the geological disposal facilities

One of the main requirements for a constructive engagement of non-institutional actors and effective interactions between the interested parties driven by the consideration of safety as a common good is that CS must take part in the DMP from its inception. CS representatives participating in the DMP must be given clear information on the process and rules of participation during and in between the meetings and events lead by the organisers of the DMP. Some of the interviewees proposed to develop a concept of 'neutral body' that would perform a task of independent and impartial communicator between the interested parties (for example, between institutional and non- institutional experts).

The types of interactions can vary depending on the considered stage of the decision-making process. Additionally, the nature of the public engagement process should carry a deliberative character. The deliberative approach to public engagement- when a group of interested parties discuss, debate, learn and work out the solution together is a distinctive method to involve people along the DMP. Participants expect to be given sufficient time to consider relevant information and to discuss issues and options in depth and acquire their thinking together before they come to a considered view. A few tools have been named to be helpful to support deliberative character of the process. For example, a number of periodic interactive face-to face or through online technologies activities on the topic of RWM should be organised to encourage discussions between the participants from different interested parties. There activities must be designed in such a way that the participants would have adequate space and time to be able to benefit from new information and to discuss in depth the implications of this freshly obtained knowledge. Also, the participants of the CS workshops organised in the framework of SITEX-II project have emphasized the necessity to have an ability and capacity to work with a range of experts with different backgrounds, perspectives and fields of interests. These types of discussions give an opportunity to incorporate a diversity of views of people with different positions so that minority groups are not excluded and that discussion are not dominated by any particular party. The representatives of the non-institutional expert group underline that the experience has shown that public trust very quickly disappears if participants feel that they are being pushed in a particular direction. This trust should not be considered as a condition for the acceptability of a particular technical solution (like deep GD, for example) but as a condition for managing high complexity as shown by Luhmann's works (see Figure 5). The principles of the deliberative public engagement should rely on the transparency and integrity of the engagement process itself, the respect of the participants, effective two-ways dialogue and assessment of what has been achieved to review the future practice.

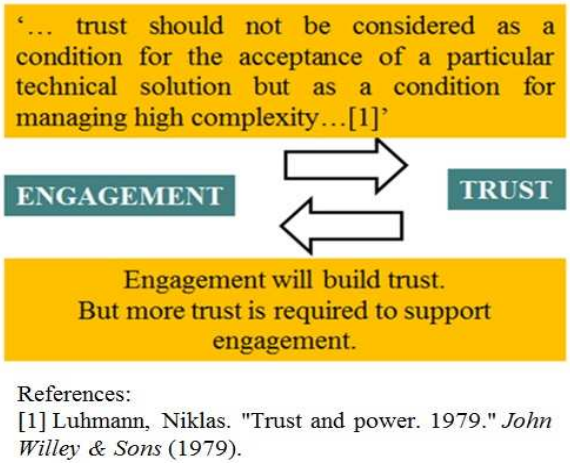


Figure 5 Trust as a condition for managing high complexity.

With the help of the questionnaire, personal interviews and a number of CS workshops, several fundamental conditions for public engagement have been pointed out. These are **transparency** (transparency of information, DMP, transparent reporting of participants' views) and **access to information**, to **justice**, to **resources** and to **expertise** (see Figure 6).

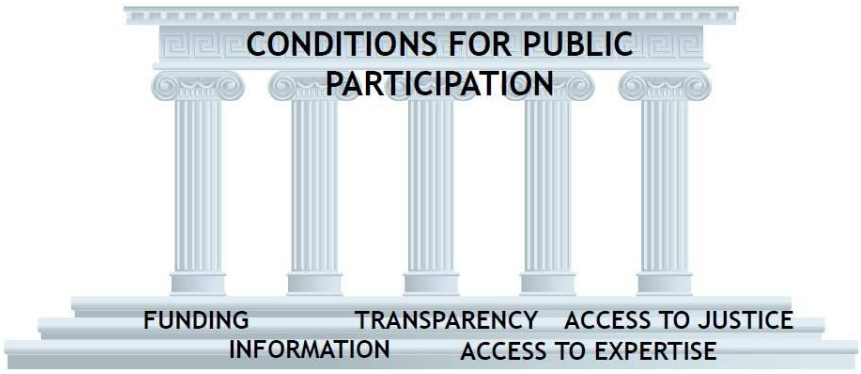


Figure 6 Conditions for public engagement

The participants of the project underline that the principles of "effective transparency" should be incorporated in all aspects and stages of communication on the RWM issues, as recommended by NTW[22]. The interviewees point out that such transparent information comprises:

- Information must come from clearly identified organisations and publications,
- Information should be carefully and purposely understandably drafted,
- The input from different interested parties must be included if appropriate.
- Access to information is one of the crucial points in the process of public engagement. CS expects access to requested information will be timely.
- One recommendation states that legal implementation of access to information can become effective only if a culture of openness to information collection and dissemination in the field of RWM is developed.
- One requirement is to underpin and ensure effective access to information and dynamic public participation as well as to guarantee that CS input is taken into account so that it may have impact on taken decisions.
- The scientific and technical aspects of RWM are complex, it follows that access to resources (notably funding) and access to expertise are important components to achieving a sustainable and constructive engagement process from the perspective of CS.
- Another major requirement is a clearly stated commitment of the organisers of DMP to take the process of engagement of CS seriously and to respect the contribution of the CS participants.

[22] Nuclear Transparency Watch (NTW). A first report from the Nuclear Transparency Watch. BEPPER project. Transparency in the Nuclear Waste Management. December 2015. http://www.nuclear-transparency-watch.eu/?s=bepper

- Resources also play a fundamental role in access to expertise and to a possibility to carry out an independent research if necessary. Broad public education will undoubtedly improve the interactions between the interested parties and, accordingly improve the quality of the DMP; therefore, it is incumbent upon the institutional expert groups to provide enough information to interested groups of non-institutional actors to pave the way towards effective CS engagement and collaboration. There are a variety of ways this can be achieved. For example, contributions from CSOs such as Cumbria Trust[23] proposed a website to foster public understanding of RWM.

3.3 CONCLUSIONS

A broader concept of safety culture that includes both the aspects of corporate and societal understanding of safety culture is proposed. The discussion held during the project showed that, it has to be recognized that non-institutional CS and institutional actors (TSOs, regulators) have specific visions of safety culture.

While sharing understanding of safety culture is recognised as a means to achieve powerful collaboration among the different parties, it is underlined that the corporate and societal understanding of safety culture does not necessary have to be identical (the parties have different roles and duties vis-à-vis safety review). However, the need to identify the elements that can be shared (namely e.g. principles of optimization, defence-in-depth) at the societal level is recognised as a key asset for establishing cooperation.

Identifying conditions and the means to involve CS along the DMP is a central requirement for constructive engagement of non-institutional actors; it will lead to effective interactions between the interested parties and will be driven by the consideration of safety as a “common good”. To that end CS must take part in the decision-making process from its inception. The nature of the public engagement process should carry a deliberative character. Participants expect to be given sufficient time to consider and to discuss each issue in depth before they come to a considered view. Several other fundamental conditions for public engagement were pointed out, namely transparency of information, of DMP and of reporting of participants’ views, as well as access to information, to justice, to resources and to expertise.

Although the qualitative nature of the methodology and the relatively limited number of performed interviews were not meant to be fully representative for the interested parties, the drawn conclusions based on the analysis of the questionnaire provided a comprehensive picture of the expectations of different CS actors in the context of conditions for interactions in the safety case review process. Better understanding of the current situation in the area of RWM leads to highlighting future milestones towards the improvement of DMPs, sharing of common elements of safety culture between institutional and non-institutional actors, and the reinforcement of the participation of CS in a long-lasting perspective is necessary to achieve broad intergenerational trust.

[23] www.cumbriatrust.org

4 Civil society contribution to intergenerational patterns of inclusive governance for geological disposal

4.1 INTRODUCTION

4.1.1 Objectives of task 4.3

The main objectives of task 4.3 on intergenerational governance of Geological Disposal (GD) are to provide inputs on:

- transparency of the Decision Making Process (DMP) over time within a long-lasting perspective of operation of GD facilities,
- consultations and interactions with interested parties in the DMP, especially with civil society (CS) and,
- interactions between the expertise function (regulatory authorities and TSOs) and CS in the perspective of the intergenerational governance.

4.1.2 Methodology of task 4.3

To achieve these objectives within the task on Intergenerational governance, the review of possible institutional and legal settings for implementing public interactions with the experts was performed, taking into account long term aspects along the foreseen phases of GD. The review was made by:

- taking advantage of available experience and processes of CS engagement in the context of RWM at local and national levels, and
- examining these processes of CS engagement in the perspective of the implementation of the Aarhus Convention.

The aim was to identify possible answers to the questions such as, what is understanding of RWM and GD, which issues are at stake, what are the time frames in the intergenerational governance of GD, are there any similar experiences, what are the results of the past and on-going investigations, what is the opinion, perception and expectation of different stakeholders, are there suggestions as to how to do it, what is important and are there possibilities for changes, etc. The issues of intergenerational governance primarily looked upon were concepts like vigilance, trust, institutional context, governance and decision-making for all different steps of disposal project (planning, design, commissioning, operation, closure, post-closure), as well as monitoring, reversibility and retrievability, stakeholder involvement, record keeping as well as memory.

Accordingly, Task 4.3 investigated:

- existing research related to intergenerational governance of GD via literature review (see appendix 6) and the ideas given by the technical experts and CS representatives on intergenerational governance during the successive workshops with CS,
- the on-going reflections of international entities (WENRA, ENSREG, IAEA, NEA…),
- interviews of a selected group of partners' representatives, of independent experts and representatives of broader CS organisations. The questionnaire (see appendix 7) for the investigation took into account:

- the EU RWM (2011/70) Directive, notably the existing feedback on the implementation of the provisions regarding public information and participation provisions in the Member States,
- other related conventions valid across the EU and recently performed work, taking advantage of the reflections and review of other national or EU organisations.

Based on the results of the literature review, an original tool of dialogue entitled Pathways Evaluation Process (PEP) emerged from the reflections of Task 4.3. Seeking to determine the conditions and means of CS involvement in the long-term management of radioactive waste, the PEP approach has been conceptualized as an exercise of participative and comparative assessment of alternative scenarios on long-term management of radioactive waste. This investigation takes into account the status of current research programs for managing radioactive waste, including geological storage projects, the long time needed for their implementation, and the conditions of engagement of civil society in monitoring these long-term management activities of radioactive waste.

In this perspective, the PEP objective is to identify, structure and discuss issues that would really matter for different types of stakeholders (especially civil society) and concerns all the steps of the different possible RWM "Pathways" that may, or should be considered over a timescale of several generations. It can be considered as a "serious game" involving a limited number of stakeholders for a duration of approximatively one day. It is an original process to engage a pluralistic discussion between different categories of stakeholders, enabling fruitful exchanges with all perspectives considered.

4.2 FINDINGS

The results on the intergenerational governance of GD are presented as summary in the following subchapters, although many more details are also referred to in other deliverables within SITEX-II[24], and they are divided in the following subchapters:

- Intergenerational governance in RWM: literature review and questionnaire on the implementation of legal setting related to intergenerational governance,
- Pathways Evaluation Process (PEP): synthesis report.

4.2.1 Intergenerational governance in RWM – literature review and questionnaire

According to the experts' opinion and further discussions with partners and representatives of CS, the following sources have been analyzed looking at different intergenerational governance aspects:

- Work performed within international organisations: IAEA and NEA/OECD,
- EU projects: Insotec, MoDeRn, Sitex, LAKA report,
- Work developed in North America: DOE, NWMO (Canada).

Summaries of findings related to intergenerational governance are provided hereafter: the detailed information on the review of selected documents, reports and developments is provided in Appendix 6.

In addition, the third SITEX-II workshop with CS addressed to the participants a questionnaire on the intergenerational governance challenges as basis of a moderated discussion. The objective was to reflect on and challenge the provisions and requirements related to intergenerational aspects of radioactive waste

[24] See the SITEX-II website: *at* **www.sitexproject.eu.** Here are available the minutes of the SITEX-II workshops, the presentation of the PEP, the minutes of the PEP exercise performed in Czech Republic with young people.

and spent nuclear fuel management, as set out in different international treaties/conventions and other EU binding legislation.

Summary of the discussion is provided in the last section of this subchapter. Additional information on the results is provided in Appendix 7.

4.2.1.1 IAEA DOCUMENTS

The international **IAEA** safety standards and other IAEA documents address the intergenerational aspects of governance in many documents. They provide formal principles of protection of people and the environment from harmful effects of ionizing radiation as well as describing the concerns and possible approaches in several related documents. Overall, the following can be summarized:

- Intergenerational governance can be connected to Principle 7 of Safety Fundamentals (IAEA SAFETY STANDARDS SERIES No. SF-1): Protection of present and future generations,
- Interdependence among all steps of RWM is required: compatibility and optimization is requested, but mainly on technical issues,
- Reversibility and retrievability (R&R) as a precautionary principle is introduced in some examples of GD development, but it is also recognized that it can increase public support,
- Benefits of stakeholder involvement throughout the life cycle of nuclear facilities are pointed out and basic principles are described, with a set of important factors (technical, structural, process, behavioural),
- IAEA Discussion is given on how to obtain public acceptability for implementation of GD and which elements are important. Focus is also made on stakeholders' engagement in all steps of RWM, including post-closure phase, and challenges which relates to the long periods.

4.2.1.2 NEA DOCUMENTS

The Radioactive Waste Management Committee (RWMC) of the OECD's **Nuclear Energy Agency (NEA)** reassessed the basis for the GD strategy from an environmental and ethical perspective. Some basic endorsed ideas included the following:

- confirm that the GD strategy can be designed and implemented in a manner that is sensitive and responsive to fundamental ethical and environmental considerations;
- conclude that it is justified, both environmentally and ethically, to continue development of geological repositories for those long-lived radioactive wastes which should be isolated from the biosphere for more than a few hundred years;
- conclude that stepwise implementation of plans for GD leaves open the possibility of adaptation, in the light of scientific progress and social acceptability, over several decades, and does not exclude the possibility that other options could be developed at a later stage.

The public involvement should also fulfil ethical basis:

- In current generations, there is a need to achieve an ethical approach to handling resource allocation and public involvement in DMP (intra-generational equity),
- Form of process/involvement will differ between countries/institutions/political systems.

- But the importance of public involvement in "key decisions, such as the timing of waste disposal actions, is clear".

NEA has from 2011 established an expert group on preservation of Records, Knowledge and Memory (RK&M) across generations and published the report, which emphasizes the importance of preservation of the information to be used for future generations, possible mechanisms for international cooperation that can foster RK&M preservation and the needs for formulation of regulatory aspects, markers and cultural heritage. There was also a work program endorsed to perform further investigation in this context.

4.2.1.3 INSOTEC PROJECT (2011-2014)

The EC supported project **InSOTEC** – International Socio-Technical Challenges for implementing GD addressed the long-term management of high level and long lived nuclear wastes as a socio-technical problem. Ideas like beyond a stepwise approach, recognition of the need for participation beyond organised forms, use the conflict to produce new R&D questions, overcoming disciplinary barriers, embracing flexibility and avoiding technological “lock-in“ were investigated. The objective was to generate a better understanding of the complex interplay between the technical and the social in RWM and in the design and implementation of GD and included:

- Reports from 14 countries: focus on situations and issues where the relationship between GD as a technology and its social environment is controversial due to a preferred solution;
- Socio-technical issues: make technical democracy real and public participation more meaningful.

Key messages from the project are:

- ‘Technological lock-in’ pre-disciplines innovation and imagination: InSOTEC proposes to approach the implementation of GD as a scientifically controlled, open-ended exploration towards a possible solution;
- Tendency to ‘purify’ technical questions: flexibility and adaptability have a greater chance of supporting democratic technological innovation than a strong emphasis on pushing for stability and closure;
- Safety is always a result of negotiation and development and not only the result of a scientific exchange among experts.

4.2.1.4 MODERN PROJECT (2009-2013)

Another EC supported project **MoDeRn** - Monitoring the Safe Disposal of Radioactive Waste was an exploratory engagement activity performed in three European countries and investigated difference in viewpoint between technical specialists in the field and the citizen stakeholders regarding monitoring. It focused on the development and documentation of the collective understanding of approaches, technologies and stakeholder perception related to repository monitoring programs and included:

- How monitoring can contribute to the safety strategy, the public trust and understanding of GD in overall RWM;
- Providing examples, guidance and recommendations.

Key messages from the investigations are:

- Monitoring should be a checking process rather than a confirmatory process: access to a clear information on how each aspect of repository performance is checked;

- Post-closure monitoring: being able to prepare for unanticipated events or evolutions;
- Monitoring can be characterized as a socio-technical activity and could contribute to building the confidence of public stakeholders in the safety of a particular repository project and maintain a watch over the repository performance.

4.2.1.5 SITEX PROJECT (2012-2013)

The **SITEX** project (2012-2013) – Sustainable network of Independent Technical EXpertise for radioactive waste disposal, also an EC supported project, focused on activities associated to the regulatory review process of deep GD with the view to characterize at national level the Expertise function activity devoted to the scientific review of the Safety Case with respect to the safety of the GD. Among the investigations was the interaction with CS to assure and support a robust and reliable expertise function in the field of safety of radioactive waste disposal. The objective was to complement initiatives focused on activities associated to the regulatory review process of DG disposal and to constitute a sustainable European and international cooperation in the area.

Three key messages are related to intergenerational governance:

- Ensuring sustainability of any decisions, agreements or interaction in such a long/term process means to develop very good tools for keeping records and distributing proper information to all actors;
- Historical experiences need to be researched looking at the needs of CS in terms of when, how and about what to interact;
- Interaction with stakeholders in the technical review in practice draw attention to improvement of expertise, improvement of decision-making, competence building, access of CS to information, long-term evolution of governance and intergenerational issues, like how to achieve consistency in the development of long-term strategies for RWM across generations (operation time 100 y) and how to deal in case of major changes.

4.2.1.6 LAKA REPORT

The Netherland's based **LAKA** foundation (environmental NGO) developed the report Social and ethical aspects of the retrievable storage of nuclear waste as an initial input to a discussion about the waste problem. Report worked out three themes: ethics, sustainability and risk perception. Content of report is strongly influenced by attitudes of environmental organisations to nuclear waste disposal in 90's with strict disagreement on underground disposal solution.

Key messages from the report related to intergenerational governance are:

- The possibility of controllability, voluntariness and trust in government are important for the public perception and public acceptance;
- Retrievability plays a central role and is considered ethically less unfavourable than final disposal. Retrievability influence risk perception – mainly factors of controllability and reversibility;
- Permanent retrievability means that information on the waste has to be handled over to generations – subject which is not sufficiently studied;
- Several propositions for further investigation: how well the ideas of citizens and technicians about risk perception of GD correspond, how to link more closely the technical research with social and

ethical aspects, the way of maintaining knowledge about nuclear waste, the marking for memory of storage/repositories sites.

4.2.1.7 NWMO WORK

Nuclear Waste Management Organisation (**NWMO**) in Canada also worked on an Ethical and Social Framework for the management of spent nuclear fuel. They engaged "ethical practitioners" and they produced (based on roundtable (2005) and workshop (2011)) an ethical and social framework within which to consider the management of spent nuclear fuel. The objective being to develop and implement an ethically sound management approach for spent nuclear fuel by defining a framework, developed through consultation with external practitioners, reviewed, and integrated (iteratively) into the ethical framework principles.

Key messages of the work are:

- Respect for future generations – but also for other species, the biosphere – and cultures;
- Intergenerational justice should be addressed;
- Fairness to all stakeholders, particularly minorities and marginalized groups;
- Sensitivity to those with different values –Issues central to the framework;
- Monitoring is central – verification, commitment to solving problems, and must be willing to engage reversal strategies if needed;
- Balance future risk vis a vis retaining access to material (future value);
- Consider whether future technology could be improved or could change the approaches.

4.2.1.8 DOE DOCUMENT

Also, the U.S. Department of Energy (**DOE**), responsible for implementing nuclear waste management strategies adopted the framework for a sustainable program that can transport, store, and dispose of used nuclear fuel and high level radioactive waste in the Strategy for the management and disposal of spent used nuclear fuel and high-level radioactive waste in 2013. The document also provides a basis for discussion among stakeholders on a sustainable path forward.

Key elements focus on:

- Processes based on Consent are necessary; prospective host jurisdictions must be partners.
- Public trust/confidence is paramount for addressing transport, storage and disposal issues.
- A new waste management organisation needs to be created for stability, focus, and public credibility.

4.2.1.9 RESULTS FROM QUESTIONNAIRE ON INTERGENERATIONAL GOVERNANCE

During the third SITEX-II workshop with CS, a moderated discussion took place to reflect on and challenge the provisions and requirements related to intergenerational aspects of radioactive waste and spent nuclear fuel management, as set out in different international treaties/conventions and other EU binding legislation. The following documents were reviewed and serve as inputs for the moderated discussion:

- COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (Waste Directive);

- Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management, 1997, IAEA;
- Convention on access to information, public participation in decision-making and access to justice in environmental matters (Aarhus Convention), 1998;
- Convention on environmental impact assessment in a transboundary context (ESPOO Convention), 1991 and
- The NTW BEPPER report on "Transparency in Radioactive Waste Management", 2016[25].

The questions structuring the moderated discussion were divided in set of four topics from A to D:

- Topic A focused on the availability of adequate funding as fundamental prerequisite for RWM, and GD establishment over the long-time periods. How to assure adequate funding by generators of RW and SF under unpredictable conditions or events, who should be involved in the decisions related to the present-day estimation of necessary funds, and how far in the future should such funding be available and properly managed and secured;
- Topic B addressed the transparency in views of information availability and effective public participation in DMP. How to organise decision-making in the process of GD establishment taking into account public participation, what kind of engagement procedures should be established in the long-time periods, how to support future generations, to what extent (and how) should information be restricted in the perspective of security (in view of EURATOM Waste Directive (Article 10 on Transparency);
- Topic C dealt with national programmes of RW and SF management as prescribed in the Waste Directive. How to organise participation of CS in the evaluation of the national programs? Is the foreseen review process sufficient and effective? Which other possibilities could be created?
- Topic D focused on general considerations on the governance aspects stemming from the Aarhus and Espoo conventions and how to assure the necessary technical competences of participants in the RW and SF management.

The moderated discussion pointed out some of the preconditions for effective and efficient two-way communication, following relatively new requirements from EC Waste Directive on transparency (information availability on SF and RW management and effective participation in DMP). The key issue in many discussions covered the way transparency is implemented. It was recognised that while several approaches and methods are available, their implementation is dependent upon political, societal, cultural and economic situations. However, it was stressed that an open and inclusive approach is needed from the perspective of managing uncertainties that are expected to be dealt with all along the GD process until closure and thereafter. The issue of long term availability of funding is considered as a main issue, as it is characterised by many uncertainties. The detailed results of the discussions are given in the Minutes from Workshop with CS in Brussels[26] and synthetized in Appendix 7.

In addition, a few opinions of different organisations and representatives of CS are also given in the Appendix 7. Whatever the position of interviewees, it was also clear that the discussion on the issues

[25] The basic information on the documents is given in Appendix 7.

[26] The minutes of the Workshop 3 are available here: http://sitexproject.eu/index_2.html#deliverables_wp4

related to CS involvement in the RWM and in particular to the GD should be continued, as this is the approach to strengthen trust.

4.2.2 Synthetic results of the PEP exercise

The Pathway Evaluation Process (PEP) has been conceptualized as an exercise of participative and comparative assessment of alternative scenarios on long-term management of radioactive waste. It can be considered as a "serious game" involving a limited number of stakeholders for a duration of approximatively one day. A PEP exercise is typically involving 5 to 6 persons around the same table while several PEP exercises can be performed simultaneously at the same place. It is an original process to engage a pluralistic dialog between different categories of stakeholders.

4.2.2.1 Generic Presentation of the PEP

The main features of the PEP are presented here (a detailed description of the PEP is available in Appendix 8). The PEP is based on two main concepts:

- The concept of "Pathways" defined as strategies retracing the successive steps of a possible evolution from the current situation of RWM as a whole to a final state of Safe Terminus (see below),
- The concept of "Safe Terminus" (ST) defined as a situation where the safety of all considered categories of waste do not anymore entail an active human contribution, after a period that does not exceed an order of several generations. To seek for a ST does not mean having a predetermined technical option in mind from the start.

In the context of SITEX-II project, the PEP objectives are to:

- Identify and structure issues that would really matter for CS (and other actors, such as TSOs, regulators, etc.) along the possible RWM Pathways considered over a timescale of several generations,
- Put into discussion different strategies that allow for reaching a safe situation for the long term,
- Allow discussions between different categories of actors, which have not the same vision of what should be the pathway and what should be the safe situation for the long term.

To summarize, the PEP exercise is not a predictive instrument or a tool to select the "best" technical option but a discussion tool. It is aiming at making explicit what is implicit. It is by no means a method to reach a consensus.

To engage in the PEP process in the context of the SITEX-II project, the participants have to agree on the following prerequisites:

- Adopting the objective of reaching a ST as a common target for long term RWM,
- Recognizing that the ST objective can be reached through different strategies according to various legitimate preferences of stakeholders regarding safety and reliability. These preferences cover a range of approaches that typically goes from open to oriented or driven approaches. Driven approach, on the one end of the spectrum, would concentrate efforts and resources to reach as soon as possible a given technical option of ST. Open approach, on the other end of the spectrum, would not choose from the start a specific technical option as ST. Oriented approaches would investigate, on a step by step basis, a given technical option while preserving a potential for other options as alternatives.

In order to implement practically the PEP approach, the following specific tools have been developed in the SITEX II project[27]: three sets of "board games", technical sheets presenting the boards, testing conditions cards, evaluation cards and evaluation grids.

- A set of "board games" is composed of three boards representing three basic "pathways" for a given typical inventory of waste. A pathway is defined by a combination of elements representing implementation of technical options and the three "pathways" integrate the different attitudes towards RWM issues presented above: open, oriented, driven. There are three sets of board games representing three typical inventories of waste based on different types of national situations among European countries: nuclear countries with reprocessing, nuclear countries without reprocessing, non-nuclear countries.
- The basic mechanism of the PEP exercise is based on "testing condition" and "evaluation criteria" cards. Each participant test the robustness of a pathway by choosing one Testing Condition card (TC) associated with one or two Evaluation Criteria cards (EC), positioned on a specific period described on the board: from now to a few decades, in hundred years (Mid-term), in few centuries (Long Term). Each testing card describes a specific situation challenging the pathway in a specific manner. Three categories of challenges have been identified: unplanned changes, disruptive events and decision-making challenges. The EC cards ask questions aiming at evaluating the robustness or, conversely, the vulnerability of the pathway with regards to the challenge it is facing. Three sets of questions have been developed: questions on management of risk and risk transfer, questions on governance quality, questions on values and ethics.

The approach proposed by the PEP is not a foresight exercise or an exercise aiming at selecting a technical option. The result produced by the PEP are a participatory analysis of "pathways" by the various participants, trough different sets of assumptions and criteria. In the end, the results of the exercise of PEP are twofold:

1) Evaluation elements expressed by the participants of the PEP exercise or in any case emerging out from a dialogue on different possible RWM pathways.

2) Elements of explicitation of the cognitive assessment framework specific to each participant that could provide a better understanding of each other's positions on RWM and on the participant's requirements regarding safety and confidence building in a context of uncertainty.

4.2.2.2 PEP EXERCISES PERFORMED DURING THE SITEX-II PROJECT

The PEP exercise was first tested internally with technical experts from IRSN and representatives of Mutadis on 25th, April 2016 (within a small group) and on 3rd, June 2016 (with IRSN specialists in a very large variety of risks and researchers). After these preliminary tests, the PEP was experienced at international level, three times in the frame of the SITEX-II project:

- During the second workshop with CS in Budapest, on 28 June 2016, the PEP was conducted in five small groups combining technical experts from the SITEX-II project and non-institutional experts and CSOs representatives coming from different countries in Europe.
- The PEP was then tested during the training session organised by SITEX-II in Kaunas (Lithuania) on 12-16 June 2017. All the trainees were technical experts coming from different countries in

[27] All the PEP material is available in the minutes of the second SITEX-II workshop (June 2016, Budapest) on the SITEX-II website: http://sitexproject.eu/index_2.html#deliverables_wp4

Europe. In the programme of the week, a session was dedicated to stakeholders' engagement[28] including a module entitled "introduction to Pathways Evaluation Process (PEP)". A social event was organised in order to concretely play the PEP with the trainees. The goal was to test the PEP as material for the future training sessions planned to be organised by the SITEX network.

- Finally, a CS representative from Czech Republic that participated to the SITEX-II workshop in Budapest sent a project proposal to SITEX members in order to further test the PEP as an "Interactive Education exercise" on RWM in the Czech Republic. The aim of this Czech project was to find out about possibilities to implement the PEP into the Czech education sector and social sphere. It took place on May 24, 2017 and the participants were coming from CS associations and Technical Support Organisation (Research Centre Řež & Nuclear Research Institute Řež).

4.2.2.3 SYNTHETIC RESULTS OF THE PEP EXERCISE

Detailed results are available on the SITEX website in the following documents: minutes of the Budapest workshop in June 2016, deliverable D3.4 of the SITEX-II project regarding the lessons learnt from the training session organised in Kaunas in June 2017 and the Olga Kališová report "Interactive Education of the CS on Radioactive Waste Management in Czech Republic" presenting the result of the PEP session held in May 2017[29].

In order to present the results of the PEP exercise one should keep in mind that the objective of the exercise is by no mean to achieve a consensus among the participants on the assessment of the different categories of RWM strategies that are discussed in the course of the game.

The results of the PEP methodology are therefore to be assessed according to their relevance and efficiency vis-à-vis the goal of creating the conditions for a multi-stakeholders dialogue including CS. A particular attention is to be given on the capacity of the methodology to allow discussions between different categories of actors which have neither necessarily the same vision of what should be the RWM strategy, nor the same idea of what should be the technical option for the long term. An important aspect concerns the capacity of the methodology to bring the participants into meaningful exchanges on different strategies despite the differences of their positions. The methodology is also to be assessed according its capacity to allow the mutual explicitation of what really matters for the different participants, while reviewing possible alternative RWM strategies over a timescale of several generations.

According to this perspective, the following conclusions can be drawn. As PEP is not a tool to choose between approaches, all approaches are worth considering and to assess accordingly as they apply to social and technical dimensions. The main aim is to allow a pluralistic discussion on the way to secure human safety and the protection natural environment through different options. That is why there are three different boards in order to try out different scenarios and test different criteria. This allows for discussing a broad range of issues and envisioning situations and solutions participants may not have thought of. The PEP discussions emphasize the importance of transversal elements (to have in mind in all the pathways), notably institutional structure and background, meaningful public participation, pluralistic expertise, availability of financial resources, monitoring and memory in long-term horizons. PEP allows discussing how social issues impact technical ones. RWM is considered here as a socio-technical issue, not only a technical one.

[28] See the deliverable D3.4 of the SITEX-II project, Lessons learnt from the pilot training session, available on the SITEX-II website: http://sitexproject.eu/index_2.html#deliverables_wp3

[29] All the reports are available here: http://sitexproject.eu/index_2.html#deliverables_wp4 and here http://sitexproject.eu/index_2.html#deliverables_wp3

The participants considered the PEP exercise as "*an existing tool enabling creative participation and fruitful exchanges between stakeholders*". It is a "*game allowing a structured brainstorming (…) through combination of cards*". The main points of the assessment of the different groups are the following:

- The PEP brings together stakeholders with the view to exchange on viable pathways to a Safe Terminus.
- It helps the players to grasp the complexity of RWM by enabling discussion and listening of the different understandings of each stakeholder.
- The plurality of views is a key dimension: it provides a general background understanding of the issues at stake: uncertainty, risks, what is known and unknown, dilemmas.
- The PEP allows emphasizing not only the objective, but the pathway as a whole. It contributes to move from polarized vision vis-à-vis a specific technical option, to a more nuanced vision of what is possible involving the pros and cons of each options.

Some suggestions have been made regarding the adaptation of the PEP tools and rules. It is to be noted that one group has creatively defined and adopted a modification of rules during the exercise. The PEP is to be considered as a plastic tool in order to enable a fruitful dialogue between stakeholder.

Reflections on the future PEP development

The PEP involves a specific governance framework that enables securing plurality of views. Future implementation of the PEP at EU and national levels should secure such conditions for plurality.

A first possible development is to use PEP as a permanent training tool in the context of the SITEX network. The SITEX association could take advantage of the PEP to set up a multi-stakeholder (such as TSO & CS) training in the future at EU level. The results of the first training session in Lithuania are encouraging to do so. The trainees assessed indeed the module of stakeholder engagement including the PEP exercise as excellent (by 12 out of 18 trainees) and good (5 out of 18 trainees). It is suggested to do PEP exercise after presentation on specific safety case reviews. In the near future, the training of the SITEX network could include training on interaction with CS along implementation of GD (interaction with R&D, intergenerational governance, social science, citizen science in relation to GD, etc.) accompanied by comprehensive experimentation of the PEP.

Addressing RWM complexity (considering technical and non-technical issues of the process) and confronting plurality of views in a non-polarized way, PEP constitutes also an original and intergenerational tool for safety:

- Then PEP is a mean to be confront technical experts with non-technical dimensions of RWM and to reinforce the safety system, overcoming "in silo" specialization;
- For CS representatives, it is an opportunity to learn about RWM topics and to bring external information and their specific points of views to experts;
- Improving mutual understanding is an important aspect of the considered interactions of experts with CS. In an intergenerational perspective, while contributing to create a common background of safety culture of RWM between experts and the public, the PEP is to prepare the cultural ground for intergenerational engagement in the safety case review.

The PEP could therefore be considered in the perspective of intergenerational rolling stewardship on safety at national level in the perspective of training successive generations. The PEP methodology could also support discussion among various stakeholders where national discussions are implemented. The prerequisites to enter the exercise could change according to the specific context.

- For Most Advanced Programmes (MAP), PEP could be developed by focusing on specific phases, for instance considering possible path for pre-licensing (inventory to account for, site selection, design options…) in the context of several technical options. It is also a way to avoid path dependency by broadening the views of the involved actors. In this perspective, some participants underlined that "*it is easier to perform the PEP in a country that have decided to stop constructing NPP like in Germany. (…) But, it could be a very interesting tool in dialog programme"*;
- For Less Advanced Programmes (LAP), PEP could constitute an opportunity to initiate the discussion without any constraints inherited from the past (as RWM programmes have not started yet). Therefore, PEP could be a tool preparing the ground for co-constructing the national programme and to allow skill improvement of the different actors.

Proposals have been made on some uses that weren't planned when the PEP was developed. Some of the proposals would necessitate some reshaping of the current PEP format and experimentations before to be implemented. While the PEP is not aiming at producing a consensus on RWM policies, it is however noted that the PEP could constitute a tool for preparing, at a later stage, further discussion and negotiation among stakeholders. However, the PEP could only be a preparatory tool.

Regarding the PEP as an educative tool for raising awareness of young people and students, the experimentation conducted in Czech Republic brought interesting results to be further studied. The PEP exercise in Czech Republic fulfilled its goal in that all participants joined a vivid conversation on the radioactive waste management and the more experienced facilitators and participants did their best to explain the issue to the representatives of the CS with much less knowledge on this topic. An exchange of information between the Czech experts and CS opened up a dialogue, which was a major goal of the pilot project. A suggestion merged from discussions. PEP in a form of board game is "hard to grasp" for the wider and young public. It could be interesting to adapt it further. PEP could be transformed in documentary movie/video game similar to www.fortmcmoney.com in order to approach young generation.

4.3 CONCLUSIONS

Regarding CS contribution to **intergenerational patterns of inclusive governance for GD**, the SITEX-II project brings several meaningful results:

A. The **conclusions of the literature review** from the extensive work developed until now in various partnerships show interesting harmonization on the intergenerational governance issues related to GD. Some of them can be pointed out:

- A focal point regarding intergenerational governance lies in the management of uncertainties that are expected to be dealt with all along the process until closure and after.
- Current practices show that the reversibility and/or retrievability approaches need to be addressed as response to public concerns.
- CS is to be involved in successive steps of RWM decision-making, including post closure phase; monitoring is an important tool in this perspective.

- Ethical basis for public involvement is agreed upon:
    - In current generations, it is needed to achieve an ethical approach to handling resource allocation and public involvement in DMP (intra-generational equity),[30]
    - Forms of process/involvement will differ between countries/institutions/political systems,
    - But the importance of public involvement in "key decisions", such as the timing of waste disposal actions, is clear.

B. **The Pathway Evaluation Process (PEP**) is recognized as an innovative methodology for organising pluralistic dialogues on RWM and GD, notably in the perspective of intergenerational governance. It provides opportunities for the future to develop new types of interactions between stakeholders and more specifically between technical experts and CS representatives. During the different tests, at national and international levels, the PEP exercise has demonstrated its capacity to enlarge the basis of understanding of the key issues at stake regarding long term RWM. It is also underlined that this kind of dialogue is allowing the sharing of elements of RWM safety culture between by experts and the public (without prejudice to their own position vis-à-vis GD). Future developments are considered in different fields, with different types of stakeholders and in different national context to accompany the discussions with the public around the safety case review. It could serve also as an element of the future training sessions that will be organised by the SITEX network. A main condition is to preserve the governance framework in order to ensure the plurality of views and to secure the participation of the different categories of actors (TSOs, Regulators, CS and possibly operators) that would not otherwise accept to interact. The SITEX network will develop methodological guidelines in order to implement the future PEP exercises.

[30] From Preambule of Waste Directive: "It s It should be an ethical obligation of each Member State to avoid any undue burden on future generations in respect of spent fuel and radioactive waste including any radioactive waste expected from decommissioning of existing nuclear installations. Through the implementation of this Directive Member States will have demonstrated that they have taken reasonable steps to ensure that that objective is met."

APPENDIX 1 - LIST OF MEMBERS OF CIVIL SOCIETY ORGANISATIONS' NETWORK

- AUSTRIA
  - ✓ Austrian Institute of Ecology (AIE)
  - ✓ Global 2000 – Friends of the Earth Austria
- BOSNIA AND HERZEGOVINA
  - ✓ Centre for Environment, Bosnia and Herzegovina
- BULGARIA
  - ✓ Environmental Association ZaZemiata
- CZECH REPUBLIC
  - ✓ South Bohemian Mothers Association
  - ✓ Calla
- DENMARK
  - ✓ NOAH
  - ✓ Sustainable-Energy, Denmark
  - ✓ Danish Network of Local NGOs in Radioactive Waste Communities
- GERMANY
  - ✓ BUND, Germany
  - ✓ Bürgerinitiative Umweltschutz Lüchow-Dannenberg, Germany
- FRANCE
  - ✓ Association Nationale des Comités et Commissions Locales d'Information (ANCCLI)
  - ✓ CLIS de Bure (expression of interest)
- FINLAND
  - ✓ Finnish Association for Nature Conservation
  - ✓ Technology for Life, Finland
- HUNGARY
  - ✓ EnergiaKlub
  - ✓ Green Circle of Pécs
- NETHERLANDS
  - ✓ Laka Foundation, Netherlands
  - ✓ WISE, Netherlands
- POLAND
  - ✓ Common Earth, Poland
- ROMANIA
  - ✓ TERRA Milenium III

- SLOVAKIA
  - ✓ CEPTA - Centre for Sustainable Alternatives, Slovakia
- SLOVENIA
  - ✓ Focus, Association for Sustainable Development, Slovenia
  - ✓ Regional Environmental Centre office in Slovenia
- SPAIN
  - ✓ Grup de Cientifics i Tecnics per un Futur No Nuclear
- SWEDEN
  - ✓ Milkas, Sweden
  - ✓ MKG, Swedish NGO Office for Nuclear Waste Review
- UKRAINE
  - ✓ National Ecological Center, Ukraine
- UNITED KINGDOM
  - ✓ CORE (Cumbrian's Opposed to a Radioactive Environment)
  - ✓ Cumbria Trust
  - ✓ Friends of the Earth Nuclear Network, UK
  - ✓ Nuclear Free Local Authorities, NFLA
  - ✓ Nuclear Consulting Group
  - ✓ Nuclear Waste Advisory Associates, UK
  - ✓ West Cumbria & North Lakes FoE

APPENDIX 2- AGENDAS OF THE MEETINGS/WORKSHOPS WITH CIVIL SOCIETY

SITEX_II meeting

28th August 2015

Agenda

Location : **Paris, 8 bis rue Choron, 75009 Paris**

8.30		*Arrival of participants*	
09.00	5 mn	Welcome of participants	Gilles Heriard-Dubreuil (Mutadis) & Johan Swahn (MKG)
		Presentation of the SITEX_II project	
09.05	15 mn	General presentation of the SITEX and SITEX-II project	Delphine Pellegrini (IRSN)
09.20	10 mn	General presentation of the WP4 of the SITEX-II project	Gilles Hériard-Dubreuil (Mutadis)
		Task 4.1	
09.30	20 mn	Presentation of task 4.1 on Research & Development and draft document on Civil Society inputs	Yves Marignac (Mutadis) & Johan Swahn (MKG)
09.50	55 mn	Discussion on the presentation	All participants
10.45	15 mn	*Coffee break*	
		Task 4.2	
11.00	20 mn	Presentation of task 4.2 on Safety Culture	Frederic Bernier (FANC) & Maryna Surkova (FANC)
11.20	25 mn	Discussion on the presentation	All participants
		Task 4.3	

11.45	20 mn	Presentation of task 4.3 on Intergenerational Governance	Nadja Zeleznik (REC)
12.05	25 mn	Discussion on the presentation	All participants
		Discussion on the SITEX_II project	
12.30	15 mn	Discussion on the opportunity for civil society to be involved Declaration of interest and repartition of potential participants by task	All participants
12.45		*End of the meeting*	

FEBRUARY 22-23, 2016 – LJUBLJANA (SLOVENIA)

SITEX-II WP5 WORKSHOP WITH CIVIL SOCIETY MEETING N°1

AGENDA

Location: National museum of Slovenia – Metelkova, Ljubljana, Slovenia

22 February

12.00	1 h	*Arrival of participants and lunch*	
13.00	10 min	Welcome and Agenda Presentation of participants	Gilles Heriard-Dubreuil, Julien Dewoghélaëre (Mutadis) Nadja Zeleznik (REC)
		Task 4.2	
13.10	30 mn	Presentation on task 4.2 on Safety Culture	Frederic Bernier (FANC), Maryna Surkova (FANC) & Koen Mannaerts (FANC)
13.40	1 h	Discussions in Working groups	All participants
14.40	30 min	Reporting from discussions	Reporters
15.10	*20 min*	*Coffee break*	
		Task 4.3	
15.30	1 h	Presentation on task 4.3 on Intergenerational Governance	Nadja Zeleznik (REC)
16.30	1 h	Discussion in Working groups	All participants
17.30		*End of the meeting day 1*	

22 February Dinner for all participants at 19.00

23 February

9.00		*Arrival of participants*	
9.00	30 min	Reporting from discussions	Reporters
9.30	30 min	How to continue	Nadja Zeleznik (REC)
		Task 4.1	
10.00	30 min	Presentation on task 4.1 on Research & Development	Johan Swahn (MKG)
10.30	30 min	Discussion	All participants
11.00	*30 min*	*Coffee break*	
		Concluding discussions	
11.30	1 h	Next steps	Gilles Heriard-Dubreuil, Julien Dewoghélaëre (Mutadis)
12.30		*End of the meeting -Lunch*	

JUNE 28-29, 2016 – BUDAPEST (HUNGARY)

SITEX-II WP5

WORKSHOP WITH CIVIL SOCIETY N°2

AGENDA

Location: **Hotel Benczúr, H- 1068 Budapest, Benczúr u. 35. Budapest**

28 June

12.00	1 h	*Arrival of participants and lunch*	
13.00	10 min	Welcome and Agenda Presentation of participants	Gilles Heriard-Dubreuil, Julien Dewoghélaëre (Mutadis) Nadja Zeleznik (REC)
		Task 4.2	
13.10	20 mn	Presentation on task 4.2 first results on Safety Culture	Maryna Surkova (FANC)
13.30	30 mn	Plenary discussion	All participants
14.00	20 min	Presentation on conditions and means to enable experts' interaction with Civil Society along the safety case review activities in the perspective of the Aarhus Convention	Maryna Surkova (FANC), Frederic Bernier (FANC), Koen Mannaerts (FANC) and Jean-Pierre Wouters (FANC)
14.20	80 min	Discussion in Working Groups	All participants
15.40	30 min	Reporting from discussions	Reporters of WG
16.10	*20 min*	*Coffee break*	
		Task 4.3	
16.30	50 min	Presentation on the Pathway Evaluation Process (PEP) exercise: Objectives, Prerequisites, Pathways, Testing Conditions and Evaluation Criteria	Gilles Heriard-Dubreuil - Yves Marignac (Mutadis)
17.20	40 min	Discussion on the objectives and prerequisites of the PEP	All participants
18.00		*End of the meeting day 1*	

28 June Dinner for all participants at 19.00

29 June

9.00		*Arrival of participants*	

9.00	3 h 20	Conduct of the PEP exercise in small groups: Discussion on the Three Pathways Comparative Synthesis Discussion	All participants
		Conclusive Session	
12.20	10 min	Next Steps	Gilles Heriard-Dubreuil, Julien Dewoghélaëre (Mutadis) Nadja Zeleznik (REC)
12.30		*End of the meeting -Lunch*	

NOVEMBER 15-16, 2016 – BRUSSELS (BELGIUM)

SITEX-II WP5

WORKSHOP WITH CIVIL SOCIETY N°3

AGENDA

Location: **Bel V, Walcourt straat 148, 1070 Anderlecht, Brussels, Belgium**

15 November

12.00		*Arrival of participants and lunch*	
13.00		Welcome and Agenda	Gilles Heriard-Dubreuil, (Mutadis) Nadja Zeleznik (REC)
		Task 4.1	
13.10		Civil Society interaction in the continued development of a research agenda in the proposed SITEX network. Possible Civil Society interaction and influence in future European RWM research including Joint Programming. Link to WP 1.	Johan Swahn (MKG) Gilles Heriard-Dubreuil, (Mutadis)
14.00		Plenary discussion	All Participants
15.20		*Coffee break*	
		Task 4.2	
15.50		Core message, summary and recommendations with regard to the results of the previous workshops/discussions/interviews on safety culture and conditions and means for public involvement along the safety case review process. Bottleneck points. Open- and close-ended questions. Link to the WP2.	Maryna Surkova (FANC), Frederic Bernier (FANC)
16.20		Plenary discussion	All participants
18.00		Presentation of the questionnaire related to the Intergenerational governance	Nadja Zeleznik (REC)
18.20		*End of the meeting day 1*	

15 November Dinner for all participants at 19.00

16 November

9.00		*Arrival of participants (coffee)*	
		Task 4.3	
9.00		Presentation on intergenerational issue through the development of a repository	Frederic Bernier (FANC)
9.20		Presentation on the PEP results	Gilles Heriard Dubreuil (Mutadis)
9.40		Plenary Discussion	Animation Gilles Heriard Dubreuil (Mutadis)
10.00		Working Groups session	Moderators
11.20		*Coffee break*	
11.30		Report of the Working Groups	Moderators
11.50		Plenary Discussion	All participants
		Conclusive Session	
12.20		Next Steps	Gilles Heriard-Dubreuil, Julien Dewoghélaëre (Mutadis) Nadja Zeleznik (REC)
12.30		*End of the meeting - Lunch*	

APPENDIX 3- WP 4.2 QUESTIONNAIRE

SITEX II

WP4.2 Civil society contribution to safety culture and safety case review

Questionnaire

Author(s): M. Surkova, F. Bernier, K. Mannaerts (FANC)

S. Baudé (MUTADIS)

Start date of project: 01/06/2015 Duration: 30 Months

1. Introductory information

Name of the organisation:

Mission of the organisation:

Type of organisation (Regulator, TSO, Implementer, NGO, …):

What role does your organisation have in the context of radioactive waste disposal?

What responsibility does your organisation hold in the context of radioactive waste disposal?

2. Questionnaire

2.1 What is the safety objective?

- What is long-term management of intermediate and long-lived radioactive waste according to you?
- What does the word 'safety' mean to your organisation with respect to the long term management of intermediate and long-lived radioactive waste?
- How would you define the safety objective of RWM?
- What does long-term safety mean to you with respect to geological disposal of the radioactive waste?
- How would you define the safety objective of geological disposal?

2.2 How can the safety objective be achieved in the context of geological disposal?

- How can the safety objective of the geological radioactive waste disposal be achieved?
- What are in your opinion the necessary requirements to fulfil this safety objective?

2.3 What are the actors involved in the decision making/aiding process?

- Who are the actors that have to be involved/ interested/ participate in the decision making/aiding process?
- What are their roles and/or responsibilities?
- In your opinion how do they have to interact with each other?

- How do you define the role of your organisation in the decision making/aiding process?

2.4 What is safety culture?

- According to you, what is 'safety culture' in the field of radioactive waste management? Can you describe it in a few words?

- The following generic definition of safety culture has been chosen within the framework of the SITEX 2 project. What is your opinion on this definition?

Set of norms, attitudes, roles, and social and technical practices that a particular group of people share with respect to safety.

2.5 Does your organisation have safety culture?

- For you, what is the role of 'safety culture' in achieving the safety objective in RWM? In geological disposal?
- With regard to the SITEX 2 definition of safety culture do you think your organisation has developed a safety culture?
    - If yes, what are the elements of the developed safety culture?
    - If not, with regard to your own definition of safety culture, do you think your organisation has developed a safety culture?
- If you think that your organisation did not develop safety culture, how do you convey safety values through your organisation?
- How would you assess your capacity to act in favour of safety? Of safety culture?

2.6 Conditions for interactions between institutional actors and civil society

- What are the most important issues to be considered for an efficient decision making/aiding process according to you? What are the conditions and means to make this process efficient?
- In the framework of SITEX project the following decision check points/steps of geological disposal were developed (see Fig.1).

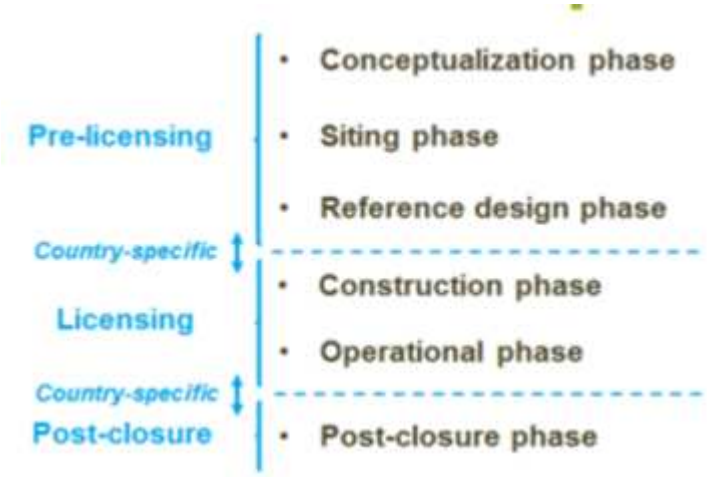


Fig. 1 Decision check points/steps of geological disposal (SITEX)

- Do they fully suit your vision of the decision process? If not, explain why.
- What are the conditions and means for information and participation of civil society actors in the process of the geological disposal in the perspective of the Aarhus Convention?
- What are the important check points/steps in which interactions between institutional actors (implementers, regulators, TSOs and government) should be developed? How?
- Do you think it is important to involve civil society during defining context, objectives and attributes to be reached at each development step in order to allow going to next phase?

2.7 How is your organisation involved in the decision framing process in your country?

- Does your organisation interact with other actors as regards RWM: implementer, regulator, TSOs, government, other civil society organisations, etc.?
- If yes,
  - When
  - What
  - With whom does the dialogue take place?
  - Where
  - How
- How do you assess your organisations' interaction with the other actors: regulatory body, TSO's, etc…?
- If some aspects are not satisfactory, what exactly would you like to change or to improve?

APPENDIX 4- ANSWERS COMPILATION TO WP4.2 QUESTIONNAIRE- INSTITUTIONAL EXPERTS GROUP

SITEX II

WP4.2 Civil society contribution to safety culture and safety case review

Answers to the questionnaire

Institutional Experts Group

Start date of project: 01/06/2015 Duration: 30 Months

It has to be noted that all answers are kept anonymous to comply with the personal requirements of the interviewees.

1. **Block 1.** **What is safety objective?**

   How does safety objective can be achieved in the context of geological disposal?

   What are the actors involved in the decision making/aiding process?

1.1 What is safety objective?

1.1.1 What is long-term management of intermediate and long-lived radioactive waste?

Exact answer	Key words
… Safe storage in proper way under proper controlled conditions until repository for SNF and long-lived radioactive waste will be build…	• Safe controlled storage
… Looking for a safe solution for these sorts of waste. That means that human and environment have to be protected from the danger of ionizing radiation in this case coming from the waste and in theory ideally there should be no danger and no burden for future generations…	• Safe waste management solution • Protection of human and environment from the danger of ionizing radiation • No danger for future generations • No burden for future generations
… There is a specific classification scheme which is followed. In our classification, intermediate-level waste contains long-lived radionuclides that must be isolated and contained for more than several hundred years. Ion-exchange resins are an example of intermediate level waste. The time frame over which radioactive waste (of any classification, low, intermediate or high) is based on the characterization of the source term and the longevity of the radionuclides. The waste management strategy and basis are laid out in regulatory documents which include guidance for developing a safety case based on the time frame needed for long term safety for long-lived radioactive wastes (whether intermediate or high-level)	• Isolation and containment of r/a waste • Regulatory guidance
… Application of “collect and contain principle” in managing of radioactive waste…	• Collect and contain principle
… Long-term commitment in order to develop solutions that can provide long-term management. It means steady and continuous improvement of methods, methodology taking into account costs and safety for the entire waste cycle…	• Long-term commitment • Steady and continuous improvement of methods for the entire waste cycle taking into account costs and safety • Steady and continuous

	improvement of methodology for the entire waste cycle taking into account costs and safety
… Intermediate and long-lived waste is recently stored at the nuclear facilities, integral storage facility for decommissioning and operational waste is under construction. It is intended to dispose this kind of waste into DGR (deep geological repository)…	• Integral storage • Deep geological repository
… Development of a temporary near surface repository and/or final deep geological repository, including design, construction, operation and closure…	• Development of a final deep geological repository (design, construction, operation and closure)
… Long-term management covers all different aspects and phases related to intermediate and long-lived radioactive waste from the very beginning of waste production, storage, handling, transport, disposal as well as closure and post closure of a disposal facility…	• All different aspects and phases related to intermediate and long-lived radioactive waste from the very beginning of waste production, storage, handling, transport, disposal as well as closure and post closure of a disposal facility
… Generally it means to us that we are able to isolate, manage and control the waste…	• Isolate, manage and control the waste
… The long-term management is a safe disposal, it is in a deep geological disposal- it is also included in the Energy law. And the Federal Government has to control this procedure…	• Safe disposal • Deep geological disposal • Governmental control
… Long-term management = Safe storage including disposal…	• Safe storage including disposal
… It is a management designed on a long term basis, such as to be able to ensure the safety and protection of people and environment from the radiological hazards during the necessary time scale…	• Ensure the safety and protection of people and environment from the radiological hazards during the necessary time scale
…To put in place measures to provide containment and isolation of the waste over timeframes compatible with radionuclide content half-lives so as to provide a reasonable assurance of safety and protection of people and the environment both now and in the future, without placing undue burdens on future generations…	• A reasonable assurance of safety and protection of people and the environment both now and in the future, without placing undue burdens on future generations • To put in place measures to provide containment and isolation of the waste over timeframes compatible with radionuclide content half-

	lives

1.1.2 What does the word 'safety' mean to you/ your organisation with respect to the long-term management of intermediate and long-lived radioactive waste?

Exact answer	Key words
… Application of national and international safety standards and principles; application of appropriate, defined in advance procedures for radioactive waste storage, treatment, conditioning (how, where to store, period of storage), risks assessment, preparation of mitigation measures and application if necessary…	• Application of national and international safety standards and principles • Application of appropriate, defined in advance procedures for radioactive waste storage, treatment, conditioning(how, where to store, period of storage) • Risk assessment • Preparation of mitigation measures and application if necessary
… Protection Risk Isolation Confinement…	• Protection • Risk • Isolation • Confinement
… It means that everything that is done revolves around the protection of the public and the environment. It applies directly to the management of radioactive waste. "Safety" really is the key word to everything we do. No operating license will be granted if safety cannot be demonstrated…	• Protection of the public and the environment • Operating license cannot be granted if safety cannot be demonstrated
… Responsibilities Behaviour Finance Regulations… … Safety is a protection of health and interests of people, integrity of protection of the environment now and in the future so that public confidence and trust can be gained in a decent way. Also the passive safety should begin as soon as possible…	• Responsibilities • Behaviour • Finance • Regulations • Protection of health and interests of people • Integrity of protection of the environment now and in the future so that public confidence and trust can be gained in a decent way • Passive way
… Via facility properties and safety procedures to ensure long term storage of waste minimizing radiation impact on workers, environment and public and keep it under regulatory limits…	• Ensure long term storage of waste • Minimization of the radiation impact on workers, environment and public keeping it under regulatory limits

… Safety with respect to the long term management of intermediate and long-lived radioactive waste means that during the whole management process all safety criteria and requirements of regulator are being fulfilled…	• During the whole management process all safety criteria and requirements of regulator are being fulfilled
… The main goal of safety of the radioactive waste is to protect human and environment from the danger of ionizing radiation and of course a responsible handling of the waste. The safety objective should include the IAEA principles, such as: protection of human health and environment, minimization of waste production, transparency of all actions and openness that would built trust, optimization, involvement of all interested stakeholders. Of course it is required that the safety regulations are met and the continuous improvement is present…	• Protection of human health and environment • Minimization of waste production • Transparency of all actions • Openness that would built trust • Optimization • Involvement of all interested stakeholders • Safety regulations are met
… The first words that come to my mind when I hear the word 'safety' are: risk and acceptability. Safety means normally that the risks with the operations or with something that you do are acceptable. So it involves two parts: risk- that is more objective – something that are able to calculate- and there is a subjective part- that everybody has to decide for themselves where those risks are acceptable or not.	• Risk • Acceptability
… Stomach feeling. It is based on process understanding. It is not a rational feeling…	• Process understanding • Stomach feeling • Not rational
… Ensuring that all facilities have a required level of safety…	• Ensuring that all facilities have a required level of safety
… It means that everything is made within the conception of a chosen solution to ensure the protection of people and environment at all times, even in a far future. It is strongly connected to passive safety, as far as long term is concerned…	• Protection of people and environment at all times, even in a far future • Passive way
… Sites well characterised and facilities well engineered and a reasonable assurance provided that no significant radiological / non-radiological risk associated with the facility will arise to people / environment now and in the future…	• Sites well characterised and facilities well engineered • No significant radiological / non-radiological risk associated with the facility will arise to people / environment now and in the future

1.1.3 How would you define the safety objective of radioactive waste management?

Exact answer	Key words
… To keep the RW isolated from general public and to condition it for disposal…	• Conditioning and isolation of the waste from general public
… To protect the human and environment No burden for future generation It should be not too expensive…	• To protect the human and environment • No burden for future generation • Not too expensive
… There are two sides to the safety objective: a technical side and a "public confidence" side. The technical side consists of demonstrating that the facility can be constructed, operated, and closed safely, and that the public and the environment will be protected. The "public confidence" side consists of including the public in discussions and addressing concerns that are expressed…	• Demonstrating that the facility can be constructed, operated, and closed safely, and that the public and the environment will be protected • Including the public in discussions and addressing concerns that are expressed
… Ensure that radionuclides are kept under control…	• Ensure that radionuclides are kept under control
… Protecting health and interests of people and protection of the environment now and in the future…	• Protecting health and interests of people and protection of the environment now and in the future
… To keep radioactivity in waste under control and isolated from public minimizing radiation impact on workers…	• To keep radioactivity in waste under control and isolated from public • Minimization of the radiation impact on workers
… The safety objective of RWM is to ensure that risks of the public will not exceed the risk levels as defined by the safety requirements of regulator…	• To ensure that risks of the public will not exceed the risk levels as defined by the safety requirements of regulator
… The main general objective is to protect men and environment from the ionizing radiation. Of course, the radioactive waste management should avoid unreasonable burden of men and future generations…	• To protect men and environment from the ionizing radiation • Avoid unreasonable burden of men and future generations
… The waste should be managed in a way that there is no unacceptable risk and danger to people and environment…	• No unacceptable risk and danger to people and environment
… At any time nobody should be hurt by radioactive ionization: the dose limits are defined. Safety should be guaranteed	• Nobody should be hurt by radioactive ionization • No unnecessary dealing with r/a waste • Safety should be guaranteed
… To make sure that nobody is suffering from radiation…	• Make sure that nobody is suffering from radiation
• Keep the waste to the minimum practicable	• Waste minimization

('waste minimization') • Volume and activity • Waste generated by an initial undertaking and the secondary waste resulting from the waste management activities • Recycle and reuse of materials and structures, systems and components • Reduce the waste at the source : the more efficient method • Careful selection of materials to avoid activation • Selection of design options for facility in order to minimize waste for decommissioning • Containment and packaging of radioactive material to maintain integrity overtime and contribute to reduce short and long term hazards • The operator should specify and evaluate a range of options for managing waste and should justify the preferred selection. Factors that should be taken into account include • The types, physical properties, chemical composition, volumes and • radionuclide content of existing radioactive waste inventories and • forecasts for the future generation of radioactive waste • The availability of appropriate processing technologies • The availability of appropriate facilities and disposal options • The regulatory requirements for authorized use, authorized discharges and removal of regulatory control • The authorized (or anticipated) acceptance criteria for radioactive waste for all management steps, including storage and disposal	• Volume and activity should be known • Recycle and reuse of materials and structures, systems and components • Efficient method to reduce the waste at the source • Careful selection of materials to avoid activation • Selection of design options for facility in order to minimize waste for decommissioning • Containment and packaging of radioactive material to maintain integrity overtime and contribute to reduce short and long term hazards • The operator should specify and evaluate a range of options for managing waste and should justify the preferred selection. • The regulatory requirements for authorized use, authorized discharges and removal of regulatory control • The authorized (or anticipated) acceptance criteria for radioactive waste for all management steps, including storage and disposal
… To provide reasonable assurance that no significant radiological / non-radiological risk associated with RWM facilities will arise to people and the environment both now and in the future…	• Provide reasonable assurance that no significant radiological / non-radiological risk associated with RWM facilities

1.1.4 What does long-term safety mean to you with respect to geological disposal of radioactive waste?

Exact answers	Key words
… Assurance that radioactivity release from disposed	• Assurance that radioactivity

radioactive waste will not pose any harm on human health. Isolation of highly radioactive waste from human access and attenuation of radionuclides release (if any) to insignificant level…	release from disposed radioactive waste will not pose any harm on human health • Isolation of highly radioactive waste from human access • Attenuation of radionuclides release (if any) to insignificant level
.. A geological disposal is already a choice it is a way to achieve safety. It is a strategy to concentrate and isolate the waste from human and environment and in particular with the following safety functions: isolation and confinement…	• It is a way to achieve safety • A strategy to concentrate and isolate the waste from human and environment • Isolation • Confinement
… Preventing escape of radioactive and toxic species into environment by application of passive measures…	• Prevent escape of radioactive and toxic species into environment • Passive measures
… For geological disposal, mainly we have to deal with the long-lived isotopes so this requires some kind of management solutions, and the passive safe state has to be gained as quick as possible but it may require surveillance in the future which means that you have to have a regulatory institutional control therefore you need to allocate responsibilities, provisions should be made for technical and human resources, funding's on appropriate time scales…	• Regulatory institutional control • Management solutions
… To keep radioactivity in waste isolated from public and avoid release of radioactivity into environment; passive stability of waste isolation system for long time with predictable behaviour prevent unpredictable incidents…	• Keep radioactivity in waste isolated from public • Avoid release of radioactivity into environment • Prevent unpredictable incidents • Passive stability
… Safety of geological disposal of RAW means that the disposal facility is sited, designed, constructed, operated and closed in such a manner that during the whole life time of the facility the doses to the public will not exceed the regulatory criteria…	• The disposal facility is sited, designed, constructed, operated and closed in such a manner that during the whole life time of the facility the doses to the public will not exceed the regulatory criteria
… In a definition there are no much differences. To isolate, to manage and to control the waste so that there are no hazards to human and environment…	• To isolate, to manage and to control the waste so that there are no hazards to human and environment
… The long-term safety is difficult to estimate and therefore it is difficult to transport it into the public opinion. And therefore the other waste treatments/solutions are under discussion. This includes a new research on nuclear processes which are also not wanted by public. The natural analogues	• The long-term safety is difficult to estimate • Other waste treatments/solutions are under discussion

are needed. The long-term issues have to be put into the minds of people…	
… Long-term safety-> post-closure safety is a better word-> ensuring that geological facility is so designed that it protects humanity and environment…	• Ensuring that geological facility is so designed that it protects humanity and environment
… The overall safety objective is to site, design, construct, operate and close disposal facilities so that protection in the post-closure period is ensured, social and economic factors being taken into account, and a reasonable assurance is provided that doses or risks to members of the public in the long term will not exceed the dose or risk level that was used as a design constraint. For us it is not appropriate to voluntarily burden the future generations with an undue charge of risk control and surveillance, when a passive definitive solution, taking into account the unavoidable uncertainties of the future, can be implemented in a near future.	• To site, design, construct, operate and close disposal facilities so that protection in the post-closure period is ensured, social and economic factors being taken into account, and a reasonable assurance is provided that doses or risks to members of the public in the long term will not exceed the dose or risk level that was used as a design constraint
… Facility performs within the design intent and provides containment and isolation over the necessary timeframes. No significant radiological impact arises to persons and the environment now and in the future…	• Containment and isolation over the necessary timeframes • No significant radiological impact arises to persons and the environment now and in the future

1.1.4 How would you define the safety objective of geological disposal?

Exact answers	Key words
… Isolation and retardation…	• Isolation • Retardation
… Operational safety for the protection of the workers and the society; long-term safety definition; safety objectives defined earlier and protection of human and environment…	• Operational safety • Protection of workers • Protection of human and environment
… We come back to the same two sides of the safety objective: technical and public confidence. The added issue with geological disposal is that long-term safety must be demonstrated. The safety demonstration cannot rely exclusively on safety assessment (e.g. data and modelling), but has to rely on various additional arguments to support the safety, which can make the interaction with the public more complicated because it is hard to find ways to make these concepts accessible to the public. This is something that needs to be addressed	• Technical confidence • Public confidence • Long-term safety must be demonstrated • Safety demonstration not = only safety assessment • Interactions with the public

however, because it is a big part of our mission…	
… Ensure that radionuclides are kept under control…	• Ensure that radionuclides are kept under control
… We are always talking about nuclear waste. So, the main objective in the context of geological disposal is again to protect health and interests of people, provide protection of the environment now and in the future. And to reach this objective you should develop a strategy…	• Protect health and interests of people , provide protection of the environment now and in the future • Strategy
… Prevent release of contaminated material above radiation limits into environment for time needed to decay of radioactive species…	• Prevent release of contaminated material above radiation limits into environment for time needed to decay of radioactive species
… Safety of geological disposal of RAW means that the disposal facility is sited, designed, constructed, operated and closed in such a manner that during the whole life time of the facility the doses to the public will not exceed the regulatory criteria…	• The disposal facility is sited, designed, constructed, operated and closed in such a manner that during the whole life time of the facility the doses to the public will not exceed the regulatory criteria
… Compared to the other forms of waste- here we are dealing with the long-term time scale. It is not really a difference in a way that you have no safety objective but to achieve the safety objective of geological disposal practically is more difficult…	• Difficult to estimate
… If we are talking about the radioactive waste management, the short lived radionuclides can be safely disposed on a surface, for example, but when we are talking about long-lived radionuclides the idea of geological disposal is quite unrealistic with respect to the public opinion…	• Unrealistic
… To make sure that the waste is contained and safely isolated until it causes no danger…	• To make sure that the waste is contained and safely isolated until it causes no danger
… To provide containment and isolation of high level radioactive waste over timeframes necessary to provide a reasonable assurance that people and the environment now and in the future will not be subject to significant radiological risks…	• To provide containment and isolation of high level radioactive waste over timeframes • Provide a reasonable assurance that people and the environment now and in the future will not be subject to significant radiological risks

1.2 How does safety objective can be achieved in the context of geological disposal (facility)?

1.2.1 How can the safety objective of the geological radioactive waste disposal be achieved?

Exact answers	Key words
… Selection of suitable geological environment and compatible engineered barriers…	• Selection of suitable geological environment and compatible engineered barriers
… Technical means in the high level of safety functions that have to be fulfilled by the design (technical means). The safety functions- isolation and confinement- can be achieved by appropriate selection of natural barriers and careful engineered solutions. Management of safety- safety should be a priority for everyone and the person has to be trained appropriately/ return of experiment during every phase of the design of the facility	• Safety functions: isolation and confinement • Appropriate selection of natural barriers • Careful engineered solutions • Management of safety • Safety= priority • Trained people • Return of experience
… It can be achieved through technical capability, and public engagement. It is also very important to make sure that information about the project is disseminated. Providing information on a website is not enough. Outreach has to be done, to engage communities (and other stakeholders) who would like to learn more about the project, and about us as the nuclear regulator…	• Technical capability • Disseminated information • Engagement of the communities
… Via design, construction and exploitation of proven disposal system including engineering and geological barriers…	• Design, construction and exploitation of proven disposal system
… You need to develop a long-term strategy. The main points are defence- in –depth, optimization and passive safety. Those are the main principles. And everything should be done in a staged approach…	• Development of the long-term strategy • Defence-in-depth • Optimization • Passive safety • Staged approach
… Selection of engineering and geological barriers with appropriate properties…	• Selection of engineering and geological barriers with appropriate properties
… By involvement, interaction and close collaboration of all actors, including government and civil society…	• Involvement of all actors • Collaboration between all actors • Interaction between all actors
… One of the main requirements is that the radioactive waste and other polluters should be constrained and safely isolated. The geological disposal should ensure that the risk of radiation is negligible. The geological disposal must not endanger the specie diversities…	• Follow the requirements
… I think that if you look at it from the point of isolation, management and control it is a bit the balancing so you can store the waste in a surface disposal which means that you are able to perfectly	• Isolation • Management • Control

isolate, manage and control the waste and that you are doing a good job but the problem then is that on a longer time-scale you also need an active maintenance of the installations, for example, and that is of course causing a risk in a longer term because you may not be able to maintain the installation for very long time. If you are talking about centuries and thousands of years. And that is where the geological radioactive waste disposal comes in- which can take away the need for maintenance but there is a side-effect- that you give up some means of managing and controlling of waste…	
…One has to have a good idea about the site, the waste, the amount of it. The solutions to these problems should exist and they should be taken into account in the scenario's and analyses. The involvement of civil society is quite important, the problem is- how to involve the public who is out and asking for too many details of understanding. On my opinion it is important that you talk directly to people, privately or club-based because you are a trusted person and they trust you…	• Good idea about the site, waste and amount of it • Solutions should exist • Involvement of civil society
… It is necessary to have a well-designed regulatory structure and a clear vision of responsibilities…	• Well-designed regulatory structure • A clear vision of responsibilities
… By building a disposal guaranteeing that the facility and the various barriers set up between the waste and the surface ecosystems will be able to contain radioactivity, during operation and in the long-term. Basic principles for conception are passive means for the safety of the disposal facility, multiple safety functions, containment of radioactive waste, isolation of radioactive waste…	• Guaranteeing that the facility and the various barriers set up between the waste and the surface ecosystems will be able to contain radioactivity, during operation and in the long-term • Passive means • Multiple safety functions • Containment • Isolation
… Appropriate site selection, good site characterisation, appropriate design strategy and realisation, developing an understanding of the factors influencing safety by research and analysis, thorough safety assessment, application of management systems to assure the quality of all safety related work, management of uncertainties, design optimization, establishment of limits, controls and conditions for development and operation of the facility justified by the safety assessment, development of a peer reviewed safety case and good regulatory control throughout development	• Appropriate site selection, • good site characterisation, • appropriate design strategy and realisation, developing an understanding of the factors influencing safety by research and analysis, thorough safety assessment, • application of management systems to assure the quality of all safety related work, • management of uncertainties,

operation and closure…	• design optimization, • establishment of limits, controls and conditions for development and operation of the facility justified by the safety assessment, • development of a peer reviewed safety case and good regulatory control throughout development operation and closure

1.2.2 What are in your opinion the necessary requirements to fulfil this safety objective?

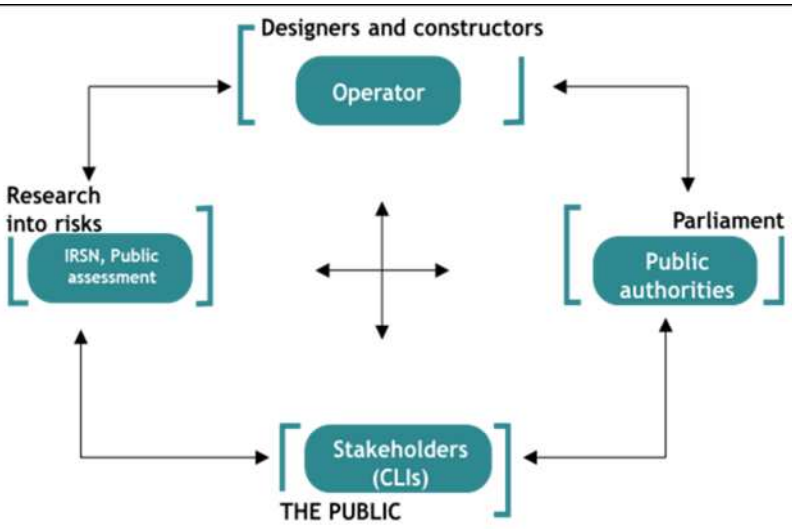
Exact answers	Key words
… Stability of geological formation; understanding of processes in geological and engineering barriers…	• Stability of geological formation • Understanding of processes in geological and engineering barriers
… The regulation has to exist and well-defined to really have an accurate safety objective. There has to be a demonstration of safety by the implementer and enough money/financial support, scientific confidence, uncertainties should be managed, return of experience should be taken into account, the regulator represents the civil society and we work for their protection-> there is a vigilance of civil society / SC wants to check if everything goes well…	• Well-defined regulations • Demonstration of safety • Financial support • Scientific confidence • Management of uncertainties • Return of experience
… On the technical side, there is a large amount of data needed: all of the baseline geological data (geosphere characteristics – geology, structural geology, groundwater, etc.) goes into building a site specific model. Different safety assessment models of how the site will evolve over the long term incorporate this information. As a project progresses, more data is gathered to test long term models of what will happen in the future (used to build what is called the safety case). The models are updated and improved as more site specific information and data is acquired. The first safety case is built (using information about the baseline geology, engineered barriers, and other information), but it is updated at different project phases as information is gathered, and models are tested and refined. To meet the safety objective, early reviews are set up to allow the regulator to follow what the implementer is planning before there is a formal license application (international best practice indicates this should be many years before a license application is expected).	• Technical assurance • Safety assessment models • Updated and improved models • Teste and refined models • Early reviews by the regulator • Independent research by the regulator •

Independent research by the regulator also is key to the verification process: it is not about redoing research that is already being done by the implementer but about sometimes filling gaps in areas important to safety, or doing independent modelling of key safety-related issues (that can be used to verify modelling done by the implementer)…	
… Understanding of all aspect of long-term performance of geological system; ability to build system respecting the previous requirement in the required quality…	• Understanding of all aspect of long-term performance of geological system • Ability to build system respecting the previous requirement in the required quality
… In that staged approach there should be a staged licensing process which means that the regulator is involved and could have a look at the design, construction, operation, closure and post-closure control. The safety objectives are mostly related to radiological properties and also non-radiological properties. I think that right from the start, when the waste even is not produced we should keep in mind the waste hierarchy so it means- avoid producing nuclear waste. Recycle, reuse if you can do it go as quick as possible to a passive state and then depending on countries, management plans- this waste should go to disposal. Also you should right from the start establish the necessary interactions with interested parties, could be civil society for developing in a decent way decision aiding process. Finance will be always a factor, see IAEA requirements…	• Staged approach • Waste hierarchy should be followed • Recycle • Reuse • Passive state as quickly as possible • Interactions with all interested parties • Finance
… Observe procedures and practices assuring properties of barriers; adequate research and geology survey to collect sufficient data, including modelling of safety case and testing of models…	• Research • Procedures • Sufficient data
… The requirements are defined in the national and international regulations, norms, safety guides, etc.	• National and international regulations
… One of the main requirements is that the radioactive waste and other polluters should be constrained and safely isolated. The geological disposal should ensure that the risk of radiation is negligible. The geological disposal must not endanger the specie diversities.	• Waste and other polluters should be constrained and safely isolated. • The geological disposal should ensure that the risk of radiation is negligible • The geological disposal must not endanger the specie diversities
… From the technical point of view, you can minimize the risks (during the site selection, designing and developing engineered barrier systems), but the	• Minimize the risks • Finance

other part of this is: will the risk be acceptable? And it is more difficult and there will be probably a societal or political process involved during which it is decided whether the remaining risks are still acceptable. So that there is way to say that 'if you do this and that, and these steps- then you can achieve safety or the safety objective', because the 'acceptability is more a societal process'. Also if you do not have money to store or to dispose the waste safely – there is a problem…	
… It is important to have a clearly defined roadmaps to reach the objective. The key is to clearly define the decision making process. The legislation must contain the necessary requirements to make it feasible. In general, if you have clearly defined the process – everybody would agree- and you will succeed. Also the 'process' should allow all the organisations (civil society) to participate…	• Clearly defined roadmaps • Clearly defined decision making process • The legislation should contain necessary requirements All the parties should be allowed to participate
… To assess the long-term behaviour of the system (natural, manmade artefacts and wastes) based on a strong research in order to comprehend this behaviour, and to assess the inherent uncertainties. Safety requirements are stated by the IAEA…	• IAEA safety requirements
… Appropriate legal framework, supporting infrastructure (education, research, standards laboratories, regulatory authorities etc.) and adequate funding. Setting of safety objectives and requirements. Competent siting, design, construction operation and closure. Development and maintenance of comprehensive safety cases for facilities and activities. Establishment and maintenance of management systems to assure quality of all safety related work. Competent, independent regulatory control of facility and activity development, operation and closure. National commitment to compliance with international conventions and standards…	• Legal framework • Adequate funding • Competent siting, design, construction operation and closure • Development and maintenance of comprehensive safety cases for facilities and activities • Establishment and maintenance of management systems to assure quality of all safety related work • Competent, independent regulatory control of facility and activity development, operation and closure • National commitment to compliance with international conventions and standards

1.3 What are the actors involved in the decision making/aiding process?

1.3.1 Who are the actors that have to be involved/interested/ participate in the decision making/aiding process?

Exact answers
… Waste management organisation; regulator; TSO; civil society; local communities; neighbouring countries; government; waste producers…
… Regulator and Ministry of Environment; implementer (Operator), TSO's, civil society organisations, NGO's...
… Regulatory body; waste management organisation (implementer); public - local municipality; scientific community; politicians at different levels…
… Anyone who can show they have an interest in the project is considered a stakeholder and allowed a say in the process. It means the implementer, the regulator/TSO, the government and its different branches that have to be involved, at a federal and a provincial level, the communities (municipalities, etc.), the aboriginal groups, the NGOs, etc.
… Authority in the field of nuclear energy; authority in the field of management of radioactive waste management, organisations - licentiates (producers of radioactive waste and specialized enterprises for management of radioactive waste) and authority state regulation of nuclear and radiation safety…
… Regulator and TSO; waste management organisation; public - local and regional municipality; scientific community; NGO…

… It depends on a policy defining responsibilities. The main actors are: waste producers; WMO; regulator; TSO's; interested parties: who has an interest in this kind of project: could be civil society, could be neighbourhood, could be NGO's…
… One of the most important actors is the waste management organisations (WMO). They have to be very clear about what their vision is on the waste. It is important there is a political process involved in which the society is actually becoming aware of the problem and possible solutions or the possible 'ways to go'. Civil society is also an actor. The regulators have to follow the political decisions so they are an actor but only in a political process. They have some kind of a fixed role. Then of course there are other parties like the Environmental organisations which are also once this is on a political agenda want to be involved and to give most of the time for reviews. When you

start siting you go also to the local parties that start being involved. What would be the goal of the TSO's in this process? TSO's are working for the authorities and actually they are a bit fixed of they can do here. The authorities together with TSO's have to follow the political line. The neighbouring countries have a right to make a decision of their own…
… Implementer: doing things; Government- establish rules/laws; Regulator: develop and more detailed regulations; Host municipalities: inform citizens…
… Implementer; regulator; authorities (Federal Office of Energy which leads the process of finding the disposal site); public (the total population of Switzerland has a right to vote 'yes' or 'no' to the chosen site- it is fixed by law in the very beginning)…
… Government (national/local), waste generators, disposal facility developer / operator, research community, regulatory authority (including technical support) and civil society…

1.3.2 What are their roles and responsibilities?

Exact answers
… WMO- have to find a solution for the LTM of waste and to implement it (R&D and the implementation work). They are responsible for safety and financial aspect; regulator- have to prepare the rules and make them clear to the implementer and other parties and they have to compliance with the rules and to control the work of the implementer; TSO's- they have to give technical position and independent from all the parties and to give advice to the regulator; civil society (NGO's and local communities)- their role is vigilance of the system/process to see that everything is right and indirectly the local communities they have a right to say something during the authorization; neighbouring countries- they control the work the safety case and they could influence the decision. They stay on the side of the regulator; government- they represent civil society and they can provide the financial support via the regulation; waste producers- they have to be in contact with WMO and they can provide a financial support…
… The roles and responsibilities of Regulator, Operator are defined in corresponding regulation documents. The role of the civil society organisations is to ensure openness, transparency and confidence of the society in the RAW disposal safe management…
… Regulatory body - to provide and define standards for safe construction, operation and closure of repository, standards and guidance for safety assessment during different phases, inspection of nuclear safety, reviewing of safety assessment report, etc. Implementer - to plan and implement repository, with careful application of safety requirements, provide justification of costs for repository implementation. Public - local municipality – to be actively involved in site selection process, communicate to local communities, to be involved in planning of activities during implementation, but should not be granted to stop repository implementation in the middle of the project (e.g. construction). Scientific community - to provide the consultancy on technical issues, based on scientific investigations. Politicians at different levels - government is responsible to set up the policy and assure the funding. Ministries – is responsible set up the policy supporting RW management strategy and for coordination of different activities to implement the strategy though providing funds for research, to communicate strategy, project to other actors, coordination of communication…
… The federal government is responsible for establishing policy and the Commission for regulatory

requirements. The staff of the regulator reviews the implementer's license application. It consults any involved party along the way (other federal departments, etc.). Aboriginal groups must be engaged. The project is then presented to the regulatory Commission during a public process of hearings which can last from several days to several weeks and during which members of the public can be heard (communities, aboriginal groups, etc.). The Commission then makes a decision on whether or not to grant the license, which can only be challenged in a court of law…
… Regulator - define requirements and verify their implementation; waste management organisation - collect all necessary evidence to develop and operate the facility; public - participate and advice in siting process; scientific community - provide scientific background to all other actors; NGO's - provide constructive opinion and proposals towards facility development…
… Public authorities take decisions. Operators are in charge of building and operating facilities and are responsible for the safety of these ones. TSO's technically assess the documents submitted by operators to the authorities, based on an independent research. CS should be able to participate to the decision making process (for instance during the public debates and the public inquiries), with respect to the Aarhus Convention…
… Waste producers: in general, they should be aware of the waste hierarchy triangle, but it depends on criteria set forward by the waste management organisations or the regulators. WMO has to manage the produced waste in the safest way possible and that safe management will be oversighted by the regulator. Regulator: it is there to have a look whether the people, workers and environment are well- protected against the danger of ionizing radiation. TSO's are mostly involved in technical aspects. The regulator can ask for assistance, they can be also involved in controlling activities on the sites, also waste management activities on licensing and they can give an advice if needed. The role of the civil society first brings the following questions: how the engagement of the civil society is understood? Different possibilities. There are different degrees of it: only information: will be their comment be taken into account? will they be allowed to do some more in the decision aiding process? but they do not take any decision. But they can be of help but it depends on how this process is organised and the context…
… WMO should be clear about their vision on the waste. Regulator should follow the political decision. TSO's usually work for the authorities and follow the political lines…
… Regulator is obliged to review of the application, information of stakeholders, review license activities. Municipalities have a legal obligation to inform citizens. Other stakeholders have no legal responsibility or obligations. However, they are allowed to participate in the process. The formal decision making is left to the government and regulator…
… Government has to establish and maintain legal and regulatory framework and supporting national infrastructure. Regulatory authority has to develop and maintain knowledge and awareness of safety issues, establish and maintain safety requirements, evaluate safety demonstration, set conditions of authorisation, assure compliance with requirements and initiate enforcement actions in situations of non-compliance. Waste generators and disposal facility developer has to develop and maintain necessary competences (human, technical and financial), develop and maintain safety cases, implement appropriate management systems, establish technical specifications and procedures for facility development, construction, operation and closure. They provide demonstration of compliance with safety obligations (law, regulations, licence conditions). Research community has to maintain awareness and knowledge and undertake research into disposal safety – fundamental aspects and facility specific aspects as required. Civil society has to be engage in decision making processes through political processes, public consultation processes and public interest activities…

1.3.3 In your opinion how do interested parties have to interact with each other?

Exact answer	Key words
… WMO has to give safety case to the regulator but they have to understand the regulation. WMO talk about tech issues with TSO who interact with Civil Society to explain their work. CS can ask Regulatory Body (regulator, TSO) and WMO for the explanation. The means of the interaction are: formal meetings, mail, presentations, public debates organised by WMO for example, workshops and forums where the technical issues are explained in a simple way. WMO should initiate the debates and spread the information…	• Formal meeting • Informative mail • Presentations • Public debates • Workshops • Forums • Information should be spread • Simple way of explanation of the problem
… With openness; transparency; fairness and respect to technical competence and expertise…	• Openness • Transparency • Fairness • Respect to technical competence • Respect to expertise
… Regular meeting to see the progress of project; systematic communication - different kind of means selected for particular target group of audience; press, media, regular meetings, movies, articles, booklets, taking example and comparing of various risks, possibility to involve communication experts…	• Regular meetings • Systematic communication between all interested parties • Press, media, promotional movies • Articles, booklets taking example and comparing of various risks • Possibility to involve communication experts
… First, most of the actors must interact with each other in some 'fashion'. For example, federal government departments coordinate their work, with our organisation as the central point of contact. Regulator is the central contact point, the coordinator. The information requests that are received are transmitted to the implementer which replies publicly (website). Every step of the process is transparent and has to be documented and traceable. No sneaky meetings! There is a process to follow when, for example, NGOs express opposition to the project – while this interaction can generate opposing points of view, it usually remains civil. Civil society plays a third party role. NGO's like can perform, for example independent studies that bring more data to the table. They sometimes take part to in hearings, where they can make submissions (that will go on the record). Our organisation also has a	• Interaction is a necessity • Regulator is a coordinator of the communication channel • The replies on the questions posed by public are published on the website of the implementer • Transparent, traceable way of documentation • CS plays a third role • NGO's can perform an independent study of the problem • Possibilities to fund stakeholders independent research exist

participant funding program for stakeholders…	
… According to rules set prior the project specifying roles, rights and responsibilities…	• Interested parties should interact according to the rules set during the project
… Transparently, flexibly according particular need of decision making process, according predefined rules and responsibilities…	• Transparency • Flexibility • Rules and responsibilities are predefined
… Knowledge should be provided by the other actors to civil society, so CS actors can assume their role and build their own capacity of expertise. TSO's should be independent from the decision maker and operators…	• Knowledge should be provided • CS has a role • CS can build its own capacity • TSO's are independent from the decision maker and operators
… Information: workshops, hearings, etc. If you want all the parties to be involved, you can do it via the workshops, hearings. It is always a question why, how, when and where and who. The decision maker has a responsibility to involve civil society and to organise the interactions…	• Workshops • Hearings • The decision maker has to involve civil society and to organise interactions
… The most common ways of interactions are: forums, workshops, debates, hearings…	• Forums • Workshops • Debates • Hearings
… We have a formal requirement- to interact with civil society. It is impossible to develop a legislation which is self-explaining- therefore the interpretation is needed. The interactions are organised is a very formal way- certain services are provided to the organisations, the documentation that has been submitted is public (including security issues, commercial issues). At the early stage in a licensing process it is required that a consultation process takes place. The implementer is in charge of this process. Also anybody who has interest is entitled to participate. We have municipalities that host a nuclear facility. They have members in the parliament. They organise meetings and hearing with civil society so that the municipalities have an overview and at local level everybody can participate…	• A formal requirement to interact with civil society • Formal way of interactions • Public submission of the documentation, including security and commercial issues • Consultation process takes place at the early stage • The implementer is in charge of the consultation process • Anybody who has interest can participate • Meetings • Hearings • Municipalities that host nuclear facilities get a regular update and overview
… The implementer has to inform the public. We are all considered as partners in this process. Examples, 'open days' for public when the implementer shows how the site works in this area, hearings between the authorities, implementers and research entities	• Implementer has to inform the public • 'Open days' organised by implementer • Hearings between interested parties

on certain scientific questions…	
… Through legally defined processes, through activities of professional and scientific bodies, through formal/informal liaison groups and through activities of public interest groups…	• Legally defined process • Activities of interest groups

1.3.4 How do you define the role of your organisation in the decision making/aiding process?

The following question was posed mainly to the non-institutional experts group to hear their opinion of their role in the decision-making/aiding process. The answers of the institutional experts group won't be presented in this summary.

2. Block 2.What is safety culture?

Does your organisation have safety culture?

2.1 What is safety culture?

2.1.1 According to you, what is 'safety culture' in the field of radioactive waste management? Can you describe it in a few words?

Exact answer	Key words
… Definition of safety standards, understanding and careful application by every actor involved in the process…	• Safety standards • Understanding of safety standards by every actor involved in the process • Application of safety standards by every actor involved in the process
… Safety culture is a perception of risk and how people behave with respect to risk and safety. The first words that come to my mind are: believe, value, perception, recognition of risk, high priority is given to safety…	• Perception of risk • Behaviour of people with respect to safety and risk • Believe • Value • Perception • Recognition of risk • High priority is given to safety
… It is a collection of practices and attitudes revolving around health and safety within an organisation: "conventional and operational safety". It is not specific to RWM or even the nuclear industry, but due to the potential impact of accidents in the nuclear field, it is even more important in the nuclear field…	• Collection of practices revolving around health and safety • Collection of attitudes revolving around health and safety
… Respecting legal requirements. Good practices…	• Respect of legal requirements • Good practices
… Safety culture is to me a part of safety climate where you have different people with different perceptions with different attitudes, more based on group behaviour, it holds safety related aspects, behaviour aspects, but also organisational aspects. Safety culture is also related to an organisation. So if there is no involvement of the management defining policies, if there are no produced procedures, the working people they won't have any safety culture, they would have a perception or an attitude and climate but safety culture is some kind organised within the organisations. You need the management, you need the organisation, you need the policy to do the job decently and safely… The first three words that come to my mind when I	• Safety climate • Perception • Attitude • Group behaviour with respect to safety • Policy • Behaviour • Actions • Two- way communication • Learning attitude • Leadership

hear the word 'safety culture' are: policy, behaviour, actions. There should be some indicators for a good safety culture: there should be a two-way communication, the workers should be engaged and involved in the whole system, they should have some kind of learning attitude and there should be some kind of leadership…	
… Good practices during any process associated to WM respecting legal requirements…	• Good practices
… To have a correct information and notion regarding the real risks of RAW disposal and to follow the safety regulations and requirements based on your own confidence…	• Correct information about the risks • Follow safety regulations and requirements based on your own confidence
… We have no exact definition but we are living it. The most suitable definition of safety culture for us has been found through wiki where safety culture is described as a character of the society with which it deals with the safety issues. The additional description of safety culture refers to the complex learning process where the common objective will be developed. The mentioned definition is as follows: "safety culture is in general a characteristic of a society, group or organisation how to deal with safety issues. It is subject of a complex learning process where common objectives, interests, norms, values and behavioural patterns emerge." All of these characteristics can be transferred to the issue of radioactive waste management…	• We are living it • A character of the society with which it deals with the safety issues • Complex learning process where common objective, interests, norms, values and behaviour emerge • Safety culture is a characteristic of the society how to deal with safety issues
… The first words that come to my mind when I hear 'safety culture' are 'dealing with risks but then in a sensitive way'. You can have of course 'bad' safety culture when you are taking unacceptable risks. If we restrict ourselves to the definition of 'good safety culture' then the definition might be the following: as an organisation, as a community you are aware of the risks and you work in a way that those risks may be acceptable…	• Risk awareness • Bad/good safety culture • Risk acceptability
… Be careful. Attitude. Do some education. Some defined procedures dealing with nuclear…	• Be careful • Attitude • Education • Defined procedures dealing with nuclear
… It is difficult to define safety culture. We have a feeling and it is not possible to prescribe good or bad safety culture. In general, safety culture is an attitude to do things in a good way. You should be:	• An attitude to do things in a good way • Trustworthiness • Credibility

trustworthy, credible, you should behave. In principle, you cannot have a direct indicator of safety culture. It is a difficult concept. It is about sharing an attitude and having it in common…	• Behaviour • No direct indicator of safety culture • Shared attitude
… Safety culture is defined in IAEA publications (*INSAG-4 "Safety culture", 1991; Safety report 11 "Developing safety culture in nuclear activities, 1998; INSAG-13 "Management of operational safety in nuclear power plants", 1999; INSAG-15 "Key practical issues in strengthening safety culture", 2002*). The concept has been extended to "risk culture" in other fields of activities. IAEA in 1991: "That assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance…"	• IAEA definition: That assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance
… At an organisational level; giving due and appropriate attention and resources to assuring a high level of safety. At an individual level; maintaining a questioning attitude, maintaining knowledge and awareness, avoiding complacency, engaging openly and honestly with all interested and affected parties…	• Organisational level: assuring a high level of safety • Individual level: maintaining a questioning attitude • Knowledge and awareness • Avoid complacency • Open engagement • Honesty • Involvement of interested parties

2.1.2 The following generic definition of safety culture has been chosen within the framework of the SITEX-II project. What is your opinion on this definition?

Safety culture is a set of norms, attitudes, roles, and social and technical practices that a particular group of people share with respect to safety

Exact answer
… Partially this definition reflects the definition of safety culture of our organisation. The definition has been taken from INSAG 4 where the definition of safety and the safety objectives are put together…
… The definition is very good…
… It corresponds to opinion of respondent, instead of "share" it could be stated as "set of norms, attitudes, roles, and social and technical practices that a particular group of people understand and apply in the same way to assure the safety"…
… Yes, it is broad but seems to capture the idea…
… This definition almost similar to the definition set out in our legislation…
… I do not agree, it should be application of the set of norms...

… Agree…
… It corresponds to the IAEA definition, stated more simply, but it lacks the "overriding priority" aspect while enhancing the normative side…
… Everybody should have a responsibility. What is lacking is a behaviour aspect…
… It is interesting to see that I was more focusing on the word 'safety' and not 'culture'. Here you have a definition which is more general which also defines what the culture is. But it doesn't say a lot what safety is. I think that the definition in itself is good but the you may use the word safety better- if you start a discussion about safety with 10 different people- you will get 10 different opinions and maybe if you start the discussion on what culture means.. well, I think you will come up with something that you have already had. I think here when you talk about safety in the definition of safety culture- it is a blind spot. So you talk about safety and you use that word without actually defining safety in that definition itself.
… There would be benefit in some qualifying statement, the norms, attitudes etc. could be inappropriate e.g. leave it to future generations…

2.2 Does your organisation have safety culture?

2.2.1 For you (or your organisation) what is the role of safety culture in achieving the safety objective of radioactive waste management? In geological disposal (facilities)?

Exact answer	Key words
… The role is to guarantee the achievement of safety objective, the same as for radioactive waste storage or operation of nuclear power plant…	• To guarantee the achievement of safety objective
… Safety culture has a direct impact on the safety objective. If safety is not a high priority within the organisation the safety itself cannot be achieved. People should have a questioning attitude…	• Safety is a high priority • Questioning attitude
… It creates the right atmosphere: one in which safety is the main focus. For example, since safety is the main focus and is perceived as such, the staff feels able and encouraged to express its concerns over the project. As a side benefit, this is something that the other stakeholders usually feel…	• Safety is the main focus • Staff should be encouraged to express its concerns over the project
… To guarantee, that disposal system is developed with elimination of external negative influences…	• To guarantee, that disposal system is developed with elimination of external negative influences
… Safety culture of radwaste deals mainly with attitudes: if you are on a site producing waste you will look if the waste hierarchy is respected, which means that the workers and employees should be aware that they should produce as less possible waste, but that should be taken into the policy of higher hierarchy, top management should define the policy, the workers should be aware the it is	• Attitudes define the level of safety • Waste minimization, segregation, recycling,… –aspects of safety culture that should be put into a policy by top hierarchy • Do the best • Safe conditions for workers

important to segregate waste, recycle things, that is an attitude- they should do their best to respect criteria. It is the same if you have a conditioning of waste- you have to look at your facility, your equipment should be OK, …The workers should work in the safe condition, but the product should be also as safe as possible at this particular moment…	
… To guarantee, that disposal system is developed with elimination of external negative influences…	• To guarantee, that disposal system is developed with elimination of external negative influences
… Very important role…	• Important
… Here the first question to answer is actually how would we assess the safety culture? Safety culture is always about an individual perception. It cannot be assessed in a quantified manner, it can be assessed in a qualified manner. The interpretation of safety culture is individual- it depends on a person…	• Individual perception • Safety culture can be assessed in a quantified and qualified manner • Individual interpretation of safety culture
… Sharing of safety culture by all the actors (within the staff, and promoted by the managers) is a necessary condition to carry out our role of expertise and thus achieve the safety objective…	• Achieve safety objective • Shared safety culture is a necessary condition
… Ensuring extensive focus on identification and understanding of aspects influencing safety, application of formalised safety assessment processes with independent peer evaluation, high quality characterisation work, formalised optimization / design review studies, extensive and high quality uncertainty management (identification, characterisation, quantification and elimination / reduction). Establishing and implementing good management systems that assure the quality of all safety related work…	• Ensuring extensive focus on identification and understanding of aspects influencing safety • Application of formalised safety assessment processes with independent peer evaluation • High quality characterisation work • Formalised optimization / design review studies • Extensive and high quality uncertainty management (identification, characterisation, quantification and elimination / reduction) • Establishing and implementing good management systems that assure the quality of all safety related work

2.2.2With regard to the SITEX-II definition of safety culture do you think your organisation has developed safety culture? If yes, what are the elements of the developed safety culture? Of not, with regard to your own definition, do you think your organisation has developed safety culture?

Exact answer	Key words

… Maintain and develop high-level technical expertise in nuclear safety and radiation protection. Promote mutual respect, honesty, loyalty and trust in human profession relations. Maintain our independence and impartiality as a TSO. Take up a questioning attitude and adopt a global, multidisciplinary and graded approach towards safety issues. Promote a learning culture and be open to new ideas and change…	• Maintenance of high-level expertise • Development of expertise • Honesty • Loyalty • Trust • Questioning attitude • Global, multidisciplinary and graded approach towards safety issues • Promote a learning culture • Open to new ideas
… Yes, safety and safety culture are embedded in our company's mandate. Everything that is done is focused on safety. Any training, any interaction is focused on expanding knowledge, towards an increased safety…	• Safety and safety culture are embedded in mandate of the company • Focus on safety • Expanding knowledge towards an increased safety
… Respecting norms. Open communication within the team. Control mechanism on place…	• Respect of norms • Open communication • Control mechanism in place
… It is one of our tasks to look whether safety culture has been developed within the licensees. How do you know that the safety culture is developed? As a regulator, you can have inspections, you develop procedures that have to be respected by the workers, you can go on not announced inspections. You need to train the people…	• Inspections • Procedures • Training of people
… Self-control and control mechanism in place; feedback; team work; QA system; quality of methodologies, resource information and results provided with validation from various sources; conservativism in assessments…	• Self-control and control mechanism in place • Feedback • Teamwork • QA system • Quality of methodologies, resource information and results provided with validation from various sources • Conservatism in assessments
… The researchers which are involved in the RAW disposal projects have safety culture more or less as define in the SITEX-II…	• SITEX-II definition
… Our organisation is still developing safety culture. It is aiming at direct risks: the direct risks of the radioactive activities going on sites, the risks for the people that work there and people who live in the neighbourhood…	• Aiming at direct risks
… Openness is an indicator of safety culture ('you are not afraid and you do not hide'). Safety is a priority. A number of reported incidents: workers are	• Openness • Safety is a priority • Presence of the reported incidence

encouraged to report the incidents=> good safety culture…	
… One of our departments is designed to develop the assessment culture with regards to risk control and interaction with CS. It addresses all technical staff…	• Specially created group to develop the assessment culture with regards to risk control and interaction with CS • Addresses all technical stuff
… Extensive effort on understanding the factors influencing safety. Emphasis on quality of scientific research and provision of expertise services. Willingness to engage interested and affected parties. Engagement in international information exchange, inter-comparison and harmonization activities…	• Extensive effort on understanding the factors influencing safety • Emphasis on quality of scientific research and provision of expertise services • Willingness to engage interested and affected parties • Engagement in international information exchange, inter-comparison and harmonization activities.

2.2.3How would you assess your capacity to act in favour of safety? Of safety culture?

Exact answer
… Question is not well understood…
… If I face a safety issue I will report that to the management or to the implementer. I will not stay silent. If I am competent enough I will perform the work myself but our work is always internally reviewed but other colleagues…
… Many mechanisms exist to increase safety. If a license is granted regulator carries out compliance programs. This includes inspections (announced and unannounced inspections) and also audits. The licensee is also required to demonstrate that they are in compliance with their license, by submitting documents such as annual and quarterly reports on various programs such as radiation protection, environmental protection, etc. Regulatory inspectors can also take samples to confirm compliance. If problems are detected the regulator's staff have a graduated compliance program to require problems be fixed. There are mechanisms by which the staff can make recommendations to the Commission, which can make decisions affecting the licensees. There are also different ways, less "dramatic": it doesn't necessarily go all the way to the commission, but can if required by the situation. Depending on the significance of safety, and inspector can shut a project down if unsafe. There are also administrative penalties. These mechanisms apply to safety culture as well: if gaps are identified, they need to be fixed. Regulator also continually monitors compliance, so it can be documented over a project lifetime…
… For respondent it is primary principle being applied…
… We have also to deal with the licensing procedure, we have to look if all the licensees respect the license conditions. We should always act in favour of safety- that is the main point!
…Primary principle applied in working process

… Good capacity with regard to the geological issues of RAW disposal...
… How would we assess our capacity to act in favour of safety? Our mission statements will answer this question. We have the highest scientific standards. The independency, objectivity and responsibility are the indicators of assessing safety…
… We are capable of identifying the risks, we are becoming aware of the consequences, and we are objective about statements about the risks, but if we are thinking about the acceptability of risks- it is something that is less developed…
… Different procedures. Certain procedures are checked by authorities. You have to have people on a certain competence level. You need educated people at certain positions. Unannounced inspections every year testing the organisation…
… Openness is an indicator of safety culture ('you are not afraid and you do not hide'). Safety is a priority…
… Broad scientific, technical, legal and regulatory experience in different organisations, regions and countries. Experience in safety review and regulation of NPPs, research reactors, nuclear fuel cycle facilities, waste management and disposal facilities. Experience of consultation and interaction processes with politicians, labour unions, local liaison groups, public interest groups and media. Experience with national and international professional and scientific societies and international organisations…

3. Block 3. Conditions for interactions between institutional actors and civil society

3.1 Conditions and means to involve civil society

3.1.1 What are the most important issues to be considered for an efficient decision making/aiding process according to you? What are the conditions and means to make this process efficient?

Exact answer	Key words
… If we consider the licensing process the regulator has to produce guides and to have a dialogue with the implementer and to make sure that there is a mutual understanding and that all the milestones are developed and they are clear. Civil society has to be included in the process as early as possible. The quality of the review can be more efficient from the side of civil society if the government foresees the financial support of their independent review…	• CS has to be included in the process as early as possible • Regulator has to produce guides and to have a dialogue with an implementer • To make sure that mutual understanding and milestones are developed • Financial support for the independent review of CS
…Civil society has to be involved in the overall decision- making process and just from the conceptualization phase…	• CS has to be involved in the overall decision-making process from the conceptualization phase
… Clear procedure for being involved in the process. Regular and systematic interaction between actors…	• Clear procedure of the involvement in the process • Regular and systematic interaction between interested parties
… Trying to be efficient by speeding up the process may be counterproductive: time has to be taken to discuss the project with the public and engage the communities. Otherwise, chances are it will fail. It is necessary to be able to identify the key stakeholders (including within the society), those the most impacted by the project, as gathering their views on the project is key to its success. Transparency and flexibility are a key: the process must be transparent (and documented), and it must also be flexible to accommodate discussion, allow to take into account new issues surfacing, etc. Public hearings are a key part of the process. They can be extended if necessary, if the Commission or the panel believes that not all stakeholder shave been heard or if some issues need to be explored further. It may not seem efficient, but it depends on when we want to apply the focus: speed or inclusiveness. Visibility on the timeline of the project itself and of the input the stakeholders can bring. On the website, you can see how many days to you have to give your opinion on a	• Time has to be taken to discuss the project with the public and engage the communities • Identify key stakeholders • Identify the most effected stakeholders • Transparency, flexibility of the process • Well documented process • Public hearing are a key part of the process • Visibility on the timeline of the project and input of the stakeholders • Website- communication platform

project…	
… Sufficient and verified inputs, qualified decision-makers, feedback to decisions made, established rules for re-evaluation and changing of decision…	• Sufficient and verified inputs • Qualified decision-makers • Feedback to decisions made • Establishment of the rules for re-evaluation and changing of decision
… Sufficient and verified input information, transparency and openness towards any actors leading to confidence, cooperation, purpose driven and coordinated process , long-term dialog without interruption, personal relationships and team spirit, clear priorities and competencies defined at the beginning and during the process, clear resources defined…	• Sufficient and verified input information • Transparency and openness towards any actor • Cooperation • Long-term dialogue without interruption • Clear priorities • Team spirit • Competence defined at the beginning and during the process • Defined resources
… It is important that CS is involved very early in the process, to bring out issues: if early enough, some issues can be included in the research agenda and in the expertise agenda. It is important that their role should be clearly defined and known. They should be able to participate in defining what can be expected of them…	• CS is involved early in the process • The role of CS should be clearly defined • CS should be able to participate in defining what can be expected from them
… Every step from political decisions up to design for example taking into account the time scales and evolution in science, process techniques should be well documented and certainly to me all the things that were not agreed about should be also documented and kept for the next generations so they can imagine why the certain decision have been made and under which conditions to just understand why the 'older' guys took those decisions. Because the society is evolving, industries, techniques, science so they should also keep up with the actual science, regulations, techniques, research…	• Every step should be well-documented • Problematic aspects should be also documented and kept for next generations
… I believe that all the involved parties should have equal positions in the process, all the relevant parties should be allowed to be involved in the process, it should be clear what will be decided and how it will be decided so how the process is going to work. One of the important issues is that the process should be legal. I think everything is more or less connected with the legal process…	• All involved parties should have equal positions in the process • All interested parties should be involved in the process • Legal process • Clear what will be decided and how the process is going to work

… Interact whenever the question is asked. Any paper submitted to the parliament is public. You have a right to access the information. Regulator is obliged to provide the required information without a delay. Openness and transparency are necessities…	• Interaction whenever it is asked • Documents are public • Access to information • Regulator is obliged to provide required information without a delay • Openness • Transparency
… Because it is a long-term management no efficiency can be defined…	• No efficiency for long-term management can be defined
… A defined process providing for meaningful input from all parties, serious consideration of issues and agreed mechanisms for resolution. What are the conditions and means to make this process efficient? Providing mechanisms for inclusive, respectful and meaningful interaction…	• Defined process for meaningful input • Serious consideration of issues • Agreed mechanism of resolution of the issues • Provide mechanisms for inclusive, respectful and meaningful interaction
… The process has to be performed in a step-wise approach. Those steps should be easily evaluated. The political confidence should be promoted. Transparency, clear definition of the steps, clear definition of the roles and responsibilities of each stakeholder- those are the main point that build confidence. The process itself should be transparent, open and participatory. Also the public participation is vital! To conclude, the following keys are the main breaks of the context of building confidence: clear strategy, flexible decision making process, commitment of the parties, well-structures process and plus: an adequate financial background…	• Step-wise approach • Easy evaluation/clear definition of the step-wise approach ladder • Political confidence • Transparency • Clear definition of the roles and responsibilities of each stakeholder • Transparent process • Openness • Participatory process • Public participation is vital • Clear strategy • Flexible decision-making process • Commitment of the parties • Well-structured process • Adequate financial background

3.1.2 In the framework of SITEX project the following decision check points of geological disposal were developed (see Fig. 1). Do they fully reflect your vision on the decision making process? Of not, explain, why.

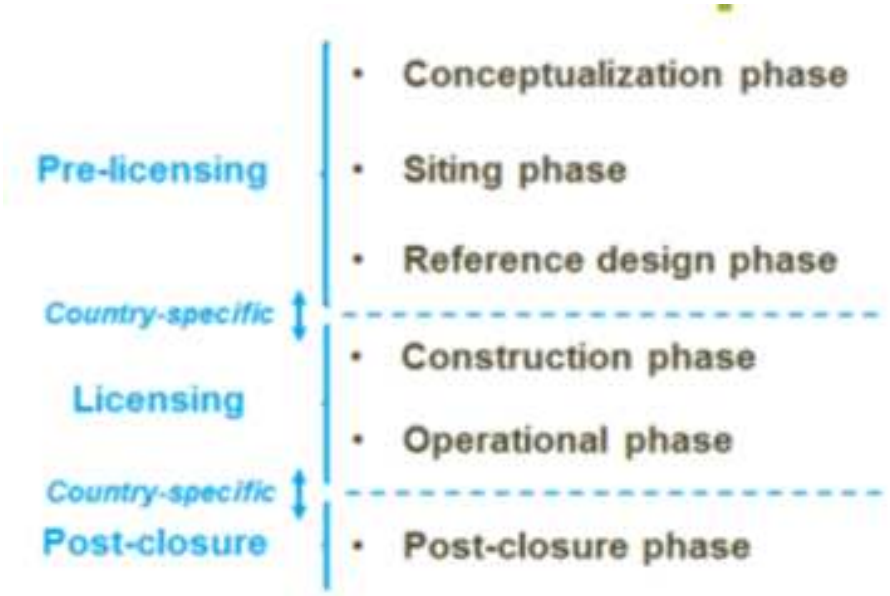


Fig.1

Exact answers
… Yes, it does…
… Yes, completely…
… Yes, they match pretty well what I understand of our process…
… No, our legislation requires siting permit and construction license for both steps with different requirement on documentation to be submitted. Pre- licensing phase should be divided in several steps: screening, candidate sites, final site identification, for each step different documentation is needed…
…In general yes, it is not clear what is included in siting phase, and if the EIA (Environmental Impact Assessment) process is considered as part of licensing…
… In our system we have also the closure phase: you won't close down from one day to another, you will close some tunnels but your facility is not closed down completely. You should go as soon as possible to the passive safe state. Conceptualization phase requires involvement of the WMO and regulators, mainly- you can have an input from some interested parties but at the beginning certainly not. Siting phase: you need public/civil society. After the cite is presented you need to deal with every interested party because if there is a positive decision on the site than you have to adapt your design and then you can take all the arguments and comments to cope with the desires and wishes of the interested parties. Civil society will be always involved but WMO will decide whom they will involve and how CS can participate in the process…
… The scheme is basically all right. Of course, if you look at it more thoroughly you will see that all possible refines can be added but as it is now- is good enough…
… Generally, yes but the pre-licensing phase needs to be elaborated in terms of formal regulatory interaction / control / approval. Most of the site characterisation and safety demonstration work is carried out at this stage and the quality of such work needs to be assured and independently confirmed…

… All the relevant steps are included. However the decision-making process should be somehow flexible, that smaller steps in implementation and for decisions can be included if needed…

3.1.3 What are the conditions and means for information and participation of civil society actors in the process of geological disposal on the perspective of the Aarhus Convention?

Exact answer	Key words
… All the actors have to participate and their rights should be fully satisfied. Civil society has to have a representative who performs the communication role between the parties. Forums, workshops have to be organised. The process in general has to be as transparent as possible. The decision has to be justified. Civil society can give its opinion on any issues (regulatory and technical issues)…	• Participation of all interested parties • CS has a representation (communication) • Organised forums, workshops • Transparency of the process • Justified decision • CS can give an opinion on any issue
… Each RAW management project (including for disposal) starts only after approval Environmental Impact Assessment Report. An important condition for approval of this report is its public acceptance…	• Public acceptance • Approval of the EIA
… In addition to the ways explained above (submissions to RB, hearings, online comments, etc.), there are mechanisms that allow and encourage information and participation of the public. And the RB sometimes gest sued. There are public funds available not only to organised civil society but to anyone who can show a vested interest in the project. They must explain their intention in order to be granted the funds, but can get the m to perform independent analysis, sampling, independent studies, etc.	• Hearings • Online comments • Mechanisms allowing and encouraging information and public to participate • Public fund • Interest in the project • Independent analyses, sampling, studies
… Recently, public is involved in waste management issues only via EIA process for particular facility, via marking up process and following public hearings. Public in the vicinity of nuclear facilities is usually informed via local media and leaflets, some information is available on the WMO web page, but no information on DGR process…	• Involvement of public via EIA process • Public hearings • Information via local media and leaflets, web page of the WMO • No information on DGR process
… The Aarhus Convention has been implemented in our law...	• Aarhus Convention
… The process of information should be open and honest. It should be scientifically well- based and not too detailed but enough informative that most people can understand. There are specialists within interested parties so they could have a look at a	• Open and honest process of information • Scientifically well- based • Not too detailed but enough informative

more detailed information but as a process is moving on by organising workshops there will be more information available- it depends on the strategy on the participation/evolvement. But they will give an input, valuables- there is always a battle in-between science and values- the society is more based on values, whereas the whole process of conceptualization. It is more science and you should find some kind of decent equilibrium between them. But that process can be very difficult if it is not well organised. So you should always ask yourself: who, why, when, how and where (for every phase); you will organise that kind of information transfer: what type is it: a hearing, workshop, a leaflet – which would give you an understanding between the science and the values…	• Strategy of the involvement • Science and values equilibrium • Who, why, when, how and where • Organise information transfer • Workshops, hearings, leaflets giving the understanding between science and values
… NGO's should be involved in the licensing process (depending on the strategy of the license application)…	• Involvement of NGO's during the licensing process
… Ask the implementer on a certain topic. Mail. Phone. Debates	• Possibility to ask an implementer • Mail, phone • Debates
… It would seem that the EU Waste and Spent Fuel Directive provides a focused hard legal instrument for compliance with the Aarhus obligations…	• EU Waste and Spent Fuel Directive • Aarhus Convention • Obligation to application of EU Directive and Aarhus Convention
The following elements (means) are envisaged for public involvement: open councils, public dialogues, internet	• Open councils • Public dialogue • Internet

3.1.4 What are the important check points in which interactions between institutional actors should be developed? How?

Exact answer	Key words
… Trust. Transparency. Respect. Initiation of civil society by organising debates. TSO can give a training to the interested representatives of civil society- 'informative sessions'. Transparency can be achieved by making the documents available. A summary of the technical reports can be done in addition (vulgarization). The issue of trust is related to transparency. All the actors have to keep their word…	• Trust • Transparency • Respect • Debates to initiate CS • Training given by TSO's • Informative sessions • Availability of the documents • Keep the word
… Openness. Transparency. Fairness. Respect to	• Openness

interests of the others. Confidence in the technical competence and expertise…	• Transparency • Fairness • Respect to interests of the others • Confidence in the technical competence and expertise
… Transition points between phases of DGR development are important. In our case the conditions for interaction of mentioned actors within conceptualization and siting phase is not defined in national legislation yet. Interaction by presentation of EIA report.	• EIA report = interaction mechanism
… The interactions need to be developed right now between the implementer and the regulator, as the implementer NWMO transitions from a research oriented role to an implementation role. NWMO is a new organisation which has never been licensed and is not used to interact with the regulator. The transition is complicated and will require a lot of work. Interactions with the different branches of the government can be challenging as well…	• The necessity to establish interactions between the regulator and WMO • The transition of WMO from research- oriented to implementer-role is important
… National waste management strategy, licensing processes…	• National waste management strategy • Licensing process
… Legislation development and strategy/policy/plans for back- end of nuclear cycle - consultation with all actors; site selection - geological survey and site selection criteria development - common decision, consultation; predefining and agreement on competencies and responsibilities of all actors (including civil society) in particular project if development of DGR and decision making process; licensing process	• Legislation and strategy development need to be consulted with the public • Site selection is a common decision via consultations • Licensing process
… Besides the above phase checkpoints and steps, two other checkpoints are identified by our organisation: construction of shafts /ramps, pilot phase in order to confirm the concepts and design of equipment…	• Extra steps: construction of shafts /ramps, pilot phase and design of equipment
… Gain their trust and interest…	• Gain trust and interest between the actors
…Step by step regulatory process based on a well-developed safety case for the various stages of facility development; conceptualisation, siting design, excavation/construction, commissioning, operation, periodic safety review, closure and post closure provides the important check points. As indicated previously the pre-licensing phase (which may be country specific) would benefit from more	• Step-by-step regulatory process developed on safety case for the various stages of facility development • Country-specific pre- licensing process

formality and definition…	
… The important check points are the ones that are provided in the laws- they should be followed. There might be some additional check point/steps which can be defined during the process in specific phases. This depends on agreements between the involved stakeholders in the process. Furthermore, it is required to perform every 10 years safety reviews during the operational period of a disposal facility. The reviews induce interactions between the involved stakeholders…	• Check points= the ones provided by the law- they should be followed • Additional check points can arise during the process • 10 years safety reviews during the operation of a disposal facility • Those reviews induce interactions between the involved interested parties

3.1.5 Do you think it is important to involve civil society during the definition of context, objectives, attributes to be reached at each development step in order to allow to proceed to the next step?

Exact answer
… Yes, definitely…
… Yes…
… No, not in each decision point…
… Yes, it is very important. Civil society should be involved. I don't see how they could NOT be involved…
… Surely…
… Definitely, but needs to be distinguished on which level (national/regional/ local) and the rules for involvement have to be defined and respected…
… Yes, the earliest it is involved, the best it can be…
… Yes. The transparency should be guaranteed. But it depends on the country, system…
… Yes, it is important to interact with civil society…
… Yes, these are of high importance and if not well considered, clear and generally accepted by all parties problems will arise both in the regulatory and public acceptance processes. This does not preclude ongoing review and refinement/revision as necessary, nor does it have to imply all parties agree on all aspects…

3.1.6 Does your organisation interact with other actors?

Exact answer
… Implementer. Regulator…
… Yes, supporting regulator…

… We do. But in the case of disposal, the main organisational channel is provided by WMO but we have some information on the website also for the public but it is not detailed. It should be more elaborated but it is also tricky for the regulator…
… Yes, it interacts with the governmental organisations and WMO…

3.1.7 If yes, when, where, with whom in particular, how, on what issues, …etc.

Exact answer	Key words
… TSO's, implementer and regulator have a collaboration agreement. Meetings, mails are the means to interact with those actors…	• Meetings • Mails •
… 'What' – mainly on the siting issues, safety analysis. 'With whom' – mainly with operator, regulator, NGO's. 'How' – participation in expert councils, preparation of expert reviews, expert reports, etc.	• Siting issues • Safety analyses • Expert councils • Expert reviews • Expert reports
… Depends on the type of activity, might be involved in communicating safety analyses results with regulatory body, to present EIA report to public. Time and place of meetings depend on participating organisations and requests…	• Safety analyses • Presentation of the EIA report to the public • Time and place of meetings depend on participation organisations
… 'When': as soon as possible and as often as possible. 'What': review process, hearings, outreach. 'With whom does the dialogue take place?': all stakeholders…	• Review process • Hearings • All stakeholders are involved in collaboration
… 'When': constantly. 'What': consideration of issues in the implementation Radioactive Waste Management Strategy. 'With whom does the dialogue take place?': authority in the field of nuclear energy, authority in the field of management of radioactive waste management, organisations - licentiates (producers of radioactive waste and specialized enterprises for management of radioactive waste), TSO's and other regulatory authorities, other civil society organisations. 'Where': in the implementation international projects. 'How' : the development and review of regulations, the state examination of documents, issuance of licenses and permits and inspections, etc.	• Development of the review • Development of the regulations • State examination of the documents • Inspection permits
… Anytime - upon regulators request	• Upon regulatory request
… In general, the information is available on the website, during public information days, at the	• Website • Public information days

exhibition centre…	• Exhibition centre
… 'When': ongoing and at formal regulatory approval steps. 'What': all safety related and regulatory aspect. 'With whom': all the parties. 'Where': formal meeting and liaison forums. 'How': following defined legal processes or less formal structured interactions…	• Formal meetings • Liaison forums

3.1.8 How do you assess your organisations' interactions with the other actors?

Exact answer
… Very good interaction…
… Via contracts, working interaction on request…
… With the implementer, the relationship is evolving. It is a learning experience for them and it is a process that will take a while. The staff are reviewing the implementer's conceptual designs. Currently, our interaction with the implementer is set out in a signed service agreement, that defines roles and responsibilities in the early stages (for the used fuel concept). We have sought feedback from other regulators, on how they managed interactions during the pre- licensing phase. We carry out outreach activities with communities upon request, when those groups are interested in learning more about the regulator and how we are involved in projects. We have meetings and open houses in communities, and communities have visited our offices. Outreach in the community is one way to try to connect with people who don't want the project – but would like to know more about it. Our job isn't to promote a project, we try to make it clear that our jobs aren't about that but about determining whether it would be safe, or not. Outreach, at the very least, gives people the opportunity learn about the regulator, and even that it exists as a separate entity from the implementer, even if they don't want to hear about the project. It is necessary to go to the community as soon as possible to build a relationship with the people who would be impacted. At open houses, it is possible to talk with people one on one, which isn't always possible at more formal meetings, and it is very beneficial to us, as it allows us to find out what people are actually scared of/concerned about…
… Very well…
… Formal, via contracts. Informal -at events dealing with DGR development…
… Interactions are extensive, well-structured and serious…

3.1.9 If some aspects are not satisfactory, what exactly would you like to change or to improve?

Exact answer
… The way to transfer data between the implementer and TSO's can be improved. The transparency should be improved from the side of all the partners. The problem of independency might occur when you work too long and too close together…
… To be improved political acceptance and involvement of civil society in the decision making

process in such a way that their input is enlarging the sustainability of the solution…
… Establishment of interdisciplinary working group/core group to initiate and coordinate activities for DGR implementation is proposed…
… There is always room for improvement: better outreach tools, interactive tools. We have for example an online module that explains radioactivity. It is fun, but we would like to develop similar tools specific for repositories. We bring posters, so that if people are not comfortable talking to you, they can look at it and gather some information on their own. We will get better at interacting with civil society. We have programs that civil society can access get funding, to do for example) their own research…
… Improvement of professional skill employees and inspectors, providing them with sufficient financial and technical support…
… It could be more cooperative…
… Governmental authorities need to gain the trust and interest of public…
… Interactions appear generally good. Activities are well planned and carried out…
… It will be desirable to have a comprehensive involvement of the public…

APPENDIX 5- ANSWERS COMPILATION TO WP4.2 QUESTIONNAIRE- NON-INSTITUTIONAL EXPERTS GROUP

SITEX II

WP4.2 Civil society contribution to safety culture and safety case review

Answers to the questionnaire

Non- Institutional Experts Group

Start date of project: 01/06/2015 Duration: 30 Months

It has to be noted that all answers are kept anonymous to comply with the personal requirements of the interviewees.

1. **Block 1.** **What is safety objective?**

How does safety objective can be achieved in the context of geological disposal?

What are the actors involved in the decision making/aiding process?

1.1 What is safety objective?

1.1.1 What is long-term management of intermediate and long-lived radioactive waste?

Exact answer	Key words
… Inspired by a French working group on ethics and nuclear waste management set up by the bishop of Troyes in France, I organised a working group on the same subject with religious and non-religious members, politicians, philosophers and members of NGO's. We wrote an article in a newspaper and made a report and a back ground paper on the subject. In the group we talked a lot about the safety design, and we agreed that we must of course try to solve the problem with the radioactive waste, and take care of the environment and of the future generations. This could be done in the best way by a rolling stewardship that is by choosing a long term intermediate storage which offers the possibility of choice for further generations instead of burying the waste now and forget it. There is too much lack of safety for now in the Danish repository plan. Geology is not a predictive science, and mathematical models can be confirmed only after a long time. At first, the NGO's were ridiculed by the influential Danish newspaper Ekonomiken Politiken in an editorial. But the NGO's have learnt a lot about RWM and have shown that they are able to work on technical issues and propose alternatives like the COVRA concept (a long term intermediate storage for at least 100 years in the Netherlands). In this concept we can observe the barrels instead of forgetting them at 30 metres below ground level. The problem with the Danish final repository concept is that it is generic so DD can reject any criticism by saying that for the moment they ignore how the concept will be, they ignore if the repository will be in clay or in granite and they ignore what waste exactly will end up in the repository. DD has chosen to use a safety horizon "from" 300 years while assessing the safety of the facility. But the Danish waste is far from being short lived. The safety horizon should be 100.000 years. None of the Danish	• Must try to solve the problem with the radioactive waste, and take care of the environment and of the future generations • Rolling stewardship • Choosing a long term intermediate storage which offers the possibility of choice for further generations instead of burying the waste now and forget it • Too much lack of safety for now • Geology is not a predictive science, and mathematical models can be confirmed only after a long time • A long term intermediate storage for at least 100 years • Final repository is generic so far • Other concepts are ignored by the authorities

waste types decays to below clearance levels before 300 years, most of it only after 100 000 years. This criticism from Öko-Institut in Germany has been rejected by DD…	
… The most interesting is the intermediate waste. There is so much of it. There is now a concept. All disposals like WIPP are in an experimental phase. These materials need be isolated from the environment for so many millennia. There are concerns regarding the proposed tech. Especially concerning the bentonite and the copper canisters that are supposed to isolate the waste from the environment. There are concerns about the concept of a DGR. All remains unproven. In terms of science, the current R&D remains unproven. The notion that there is a need to dispose of nuclear waste is deeply problematic. The next resource would be to store high level and intermediate waste, and stop producing them…	• Waste should be isolated from the environment for millennia • Concerns about tech • Concerns about deep geological repository • Store ILL waste and stop producing it
…It is a process. Society I mean as whole, including institution, a country including its people as whole. This system is taking care of by-product of nuclear activity safely and in a responses attitude. It is a very critical issue in my view because nuclear waste is not the type of issues or problems that one can get rid of- it has a specific dimension which is intergenerational and in addition which brings human being into totally new problem and its novelty is linked to the back that it is not like living as we are things were gold it necessitate to foreseen to forecast on very long term. It is new to many people. It is a complex issue that entails technical aspects and issues like live vision of what human being is on this planet and how are they here it is a very ontological perspective. It necessitates to properly deal with this issue, necessitates to address its dimension-deep dimension-it is not only a technical issue, it entails the thinking why is it that we have this new situation which did not occur two hundred years ago? What have we done? What does it mean for our action. It has technical dimension and it has a safety dimension but it is questioning very much the essence of human being and their destiny…	• Societal process • System is taking care of by-product of nuclear activity safely and in a responses attitude • A complex issue that entails technical aspects and issues like live vision of what human being is on this planet and how are they here it is a very ontological perspective • Intergenerational
… Low and Intermediate Level Waste is radioactive for hundreds of years. In the Czech Republic, it is disposed in a surface repository of radioactive waste (ÚRAO) at Dukovany. LILW from industry, research and medicine is stored in two near-surface repositories Richard and Bratrství, partly in ÚRAO Dukovany and Nuclear Research Institute (ÚJV) Rez. Repository Hostim for LILW had been closed since 1965, filled with concrete from 1997 and	

hydrogeological effects have been monitored since the 1991. SNF, HLW, ionizing sources, part of institutional waste are going to be disposed of in GDF…	
… To apply special treatment to radioactive waste so that radionuclides become less reactive and transportable; to ensure isolation of the waste from the environment (biosphere, hydrosphere and from humans) for a timeframe that is in accordance with the half-lives of the radionuclides, and to perform long-lasting monitoring activities to make sure isolation still happens, as well as to provide proper measures to ensure that information is maintained and passed over to the next generations…	• To apply special treatment to radioactive waste so that radionuclides become less reactive and transportable; • To ensure isolation of the waste from the environment (biosphere, hydrosphere and from humans) for a timeframe that is in accordance with the half-lives of the radionuclides • To perform long-lasting monitoring activities to make sure isolation still happens, as well as to provide proper measures to ensure that information is maintained and passed over to the next generations
… We do not have a technical definition for that. But we have to be convinced that whatever the industry and regulator intends to do is safe. Claiming that it is safe is not enough for us. For example, as regards high-level waste, I am not convinced that we have safe solutions. It is a very long time span and we do not know how the waste develop. There is no guarantee. The AKM, the big project the German have, when it came up that the safety case for the geological disposal would have to be 1 million years. The Czechs seem to be considering 10 or 20 thousand years. So the figures differ from one country to another, and there is no explanation for that. So it is difficult to believe in figures like that. For RWM, there is no safety. There is a definition: to keep radioactive material contained in a manner that it does not endangers the environment or human health. But there seems to be no reliable method yet. We are so far away from a proof of safety…	• No technical definition • We have to be convinced that whatever the industry and regulator intends to do is safe
… At the view of NWAA is that we do not have a solution at the moment. We know that the nuclear waste operators and the government would like to dispose of it but we do not think at the moment that it is possible.	• No solution for the moment • Radioactive toxic waste kept away from the

Radioactive toxic waste kept away from the biosphere in a controlled way in order to avoid dispersion of radioactive material in the environment. RWM have to be managed on the long term. There is an incompatibility between the time frame of the decision-making and the time frame of the issue…	biosphere in a controlled way in order to avoid dispersion of radioactive material in the environment. • RWM have to be managed on the long term. There is an incompatibility between the time frame of the decision-making and the time frame of the issue
… As regards long-term management, what guides my reflection is the very long-term dimension and the awareness that the duration under what these materials should be kept safe is longer than the duration during which it is reasonable to think we can keep control of these materials. A central concept in long-term management is to let go of things: to have a management strategy that leads at one point in time to abandoner the waste. In SITEX WP4.3 reflections, we have introduced the concept of "safe terminus". The definition of "end state" according to the IAEA corresponds to this: the waste is left in a state that is sufficiently safe without any institutional vigilance on it. Long-term management is the progressive construction of a solution that allows reaching this situation. Safety is a central concept in this…	• Safe terminus
… Foremost: minimisation, that is, not producing more waste. Then, we have to take care of the existing waste, it has to be done in an environmentally safe way, but also in a way that the physical safety of the waste is ensured. There can be lot environmental harm if it would be used to make dirty bombs…	• Minimization= not producing more waste • Has to be done in an environmentally safe way • Physical safety should be ensured
… It is a process of a comparative analysis of all possibilities which has to be done in a slow step-wise approach. The following issues are very important for long-term management: independent rigorous research, independent control (this independent control has to be adequately finances), international cooperation, learning from mistakes…	• A process of a comparative analysis of all possibilities which has to be done in a slow step-wise approach • Independent rigorous research • Independent control • Adequate financing • International cooperation • Learning from mistakes
… The LTM must include the following steps to ensure safety of such waste: pure technical measures: ensuring that everything is according to the standards and	• Pure technical measures • Everything is according to

national legislation; organisational/administrative aspects; it is important that such activity (r/a waste disposal) is licensed and that during the licensing process the comments of the public are included and late on the approval/ acceptability of the public of such activity is gained…	the standards and national legislation • Organisational/administrative aspects • Activity (r/a waste disposal) is licensed • Comments of the public are included • Approval/ acceptability of the public of such activity is gained
… For human societies who have civil nuclear power and or research reactors they need to manage their N- Waste products in such a way as to prevent them from entering the biosphere. Since some actinides are radiotoxic for up to 30,000 generations, it follows there will need to be a rolling program of "intergenerational stewardship" so that future generations have the knowledge to safely manage their inherited waste. There may come a point in the future when scientific and technological innovations can provide solutions to solve the problem in its entirety…	• Prevent toxic radionuclides from entering the biosphere • "Intergenerational stewardship" • Future generations should have the knowledge to safely manage their inherited waste

1.1.2 What does the word 'safety' mean to you/ your organisation with respect to the long-term management of intermediate and long-lived radioactive waste?

Exact answer	Key words
… Safety is coming from the Latin word sinecure which means 'without worrying'- we can deal with the issue without worrying-this is the origin. It means: you take appropriate measures to deal with the existence of this waste without worrying, you feel comfortable with the idea that they are somewhere and they do not provoke consequences that you would worry…	• Sinecure=without worrying • Take appropriate measures to deal with the existence of this waste without worrying • Feeling comfortable with the idea that waste is somewhere and it does not provoke consequences that you would worry about
… Monitoring of repository as long as possible, monitoring of health of public living in the vicinity of repository site, to prevent incidents of leukaemia, genetic degeneration, negative impact on environment, especially water resources, preventing of impact of repository on public health, wellness, watchdogging of waste management in order to insure functional operation of repository in the long term…	• Monitoring of the repository, health of public • Preventing of impact of repository on public health • Watchdogging the waste management to insure functional operation of repository in the long term

… Safety starts with minimizing the problem, i.e. waste production. The more radioactive waste is produced, the more difficult to tackle the problem. Safety of already existing radioactive waste is a complex issue with a system approach: it means a well-organised system and infrastructure, where social/societal, scientific and technical questions are all addressed and treated properly, and which results in a management described at the previous question, where the major aim is the isolation of hazardous materials from the environment…	• Minimization of the waste production • Presence of a well-organised system and infrastructure, where social/societal, scientific and technical questions are all addressed and treated properly, and which results in a management • Aim: isolation of hazardous materials from the environment
… The interviewee understands safety as a systemic concept. It is not only the safe terminus that has to be the safest possible, but the whole pathway towards this terminus. This has strong implications on intermediary steps. The interviewee is extremely vigilant that the search of a long-term safety is not made at the detriment to short or middle term safety (it has consequences on the conditions of temporary storage of the waste). It entails also that one should have in view all implications on safety and on the whole pathway of each strategic choice. There is permanent interrelation between what we do now with the waste, the pathway and the final solution. E.g. vitrification of spent fuel is a strong closure of what we can do of it during the rest of the process. Safety means safety on the whole chain: maximum safety at all steps and safety in the interaction between short-term and long-term choices. It also includes radiation protection, protection of the environment and issues of security. The level of safety of a system is defined by the weakest point in the whole pathway. Therefore, it is not justifiable to reinforce the safety of a segment by highly weakening others…	• Systemic concept • Not only the safe terminus that has to be the safest possible, but the whole pathway towards this terminus • Safety means safety on the whole chain: maximum safety at all steps and safety in the interaction between short-term and long-term choices • The level of safety of a system is defined by the weakest point in the whole pathway
… Safety means that the management and final disposal has to be done in the most environmentally safe way but also in a way that makes difficult intentional human intrusion. You have to make it in a way that is difficult to retrieve waste…	• Management and final disposal has to be done in the most environmentally friendly way
… No radioactivity can get into the atmosphere…	• No radioactivity can get into the atmosphere
… R/a waste management is not a topic of primary consideration. The first words that come to my mind first when I hear the word “safety of the r/a waste geological disposal” are: no impact to the environment and human, trust, completeness (whole information: pluses and	• No impact on the environment and human • Trust • Completeness

negative points included)…	
… Continued containment until such time as the waste poses no/minimal risk to the biosphere (minimal being that which requires no intervention)	• Continued containment until such time as the waste poses no/minimal risk to the biosphere (minimal being that which requires no intervention)

1.1.3 How would you define the safety objective of radioactive waste management?

Exact answer	Key words
… To keep radioactive material contained in a manner that it does not endanger the environment or human health…	• Contained waste • No danger for the environment or human health
… Isolate any risks from the environment for the necessary length of time, which will vary depending on the nature of the waste. The Flowers report (a key report in the UK) stated that no more nuclear waste should be generated unless there is a clear and proven route for disposing them. Now, there is nowhere in the world a clear and proven route for high activity and long-life (HALL) radioactive waste. There is only a concept. Another issue is the storage of waste near reactors, especially in the context of global warming. It is clear that nuclear facility on coasts will be subject to increasing meteorological events (flooding, storms…). According to the UK institute of mechanical engineering, the nuclear power plants situated near sea are at particular risk…	• Isolate any risks from the environment • So far no clear route for high activity and long-life radioactive waste • Concerns about surface storage in the context of global warming
… Given a very long term nature of what is r/a waste as a whole the safety objective, you have two ways of achieving safety: Simply not worry- does not entail an active attitude. Situation that does entail an active attitude: because you have to do specific things in order to make sure that you shouldn't worry. We have a double perspective. We cannot avoid inactive attitude now. We would be very happy to find a way out of this situation where we are obliged to ask ourselves 'where is waste' and if 'it is properly managed?' We have a double goal which is ambiguous and contradictory at the same time: on one hand we have to achieve safety actively while at the same time we are thinking how we can get rid of this by moving to something that would be much more passive. This cannot be disconnected from the	• Active attitude

question of the waste production of today and in the future. Because the problem of waste is not disconnected from the question of production of waste. And it is also connected with the question –it will never be something which is without deep meaning. If we consider the idea of what we called a safe terminus option (terminus- you go outside) but it is not something which is not meaningless. If I decide to have a safe terminus option-it has a strong meaning Even if we are in a passive attitude- it will be there- it does modify. Even small amount of radioactivity changes the perception of your environment- something is different. Irreversibly r/a waste changed. Even if you achieved a safety objective it remains 'something'… I give you an example: Imagine somebody has a big accident: imagine, he was a champion in race. He cannot do it anymore. It is a terrible thing for him. It changed his life. And then he rebuilds himself and he has a new life. And he becomes a champion of chess, for example. And he is very happy of his new life. But his new life entails what has happened and it will never disappear…	
… Safety means setting such standards and rules, in order to prevent future leaks of radionuclides from the repository to the environment throughout the operation of the repository and after its closure. Minimizing waste and decreasing of production of new nuclear waste. Optimizing transit routes for SNF and HLW in order to prevent risk and significant effect (Article 6 of Aarhus convention) on population due to potential accidents…	• Setting such standards and rules, in order to prevent future leaks of radionuclides from the repository to the environment throughout the operation of the repository and after its closure • Waste minimization • Optimization of transit routes
… The safety objective is to create a system, which is able to address and avoid risks related to the management of radioactive waste, and avoid interaction of waste and the environment…	• Create a system, which is able to address and avoid risks related to the management of radioactive waste, and avoid interaction of waste and the environment
… To keep radioactive material contained in a manner that it does not endangers the environment or human health. It has to be proven…	• To keep radioactive material contained in a manner that it does not endangers the environment or human health.

	• It has to be proven.
… Make sure that the dangerous materials do not contaminate the environment or living creatures over a very long time frame…	• Make sure that the dangerous materials do not contaminate the environment or living creatures over a very long time frame.
… Find a critical pathway ensuring the best possible safety at each moment, reaching a final state of passive safety within a reasonable time…	• Find a critical pathway ensuring the best possible safety at each moment, reaching a final state of passive safety within a reasonable time
… To prevent nuclear waste to enter the biosphere, now and in the (far) future…	• Prevent nuclear waste to enter the biosphere, now and in the (far) future
…That would be to develop a system that actually meets these criteria. If it is not possible at the moment, we should wait and do more research. It is not acceptable to go ahead with systems that are currently present. Most of the present management disposal systems – it would be unlikely that it would provide long term physical safety against intrusions…	• Develop a system that meets the criteria to meet the objective of radioactive waste management
… A fair process, transparency, agreement, proof, the possibility to be heard are the important aspects of the management. The system of check and balance is one of the important objectives…	• A fair process • Transparency • Agreement • Proof • Possibility to be heard • System of check and balance
The safety objective should include: radiation protection of human, workers and environment in all aspects, limited impact (preferably no impact) on/within the legal system, optimization, ALARA principle, transparency of all actions: because I believe that this is the only way to pursue/how the public (even if they do not like the nuclear activity) to/could accept such activity (r/a waste disposal) in their country, openness, involvement of all interested stakeholders (not only official bodies, but also local representatives, for example): because such activity has a negative image in general public and you need to open the door to any kind of remarks and comments from the general public to gain and to achieve their trust and approval. Inclusion of the IAEA fundamentals such as: protection of human health (radioactive waste shall be managed in such a way as to secure an acceptable level of protection for human health); protection of the environment (radioactive waste shall be managed in	• Radiation protection of human, workers and environment in all aspects • Limited impact (preferably no impact) on/within the legal system • Optimization • ALARA principle • Transparency of all actions • Openness • Involvement of all interested stakeholders • IAEA fundamentals

such a way as to provide an acceptable level of protection of the environment), protection beyond national borders (radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will be taken into account), protection of future generations (radioactive waste shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today), burdens on future generations (Radioactive waste shall be managed in such a way that will not impose undue burdens on future generations), national legal framework (radioactive waste shall be managed within an appropriate national legal framework including clear allocation of responsibilities and provision for independent regulatory functions), control of radioactive waste generation (generation of radioactive waste shall be kept to the minimum practicable), radioactive waste generation and management interdependencies, (interdependencies among all steps in radioactive waste generation and management shall be appropriately taken into account), safety of facilities (the safety of facilities for radioactive waste management shall be appropriately assured during their lifetime)…	
… The safety objective should give rise to metrics that are adopted by all actors which lead to continued and sustained risk reduction to a point where management is minimal. Safety doesn't happen "overnight" there has to be an imbedded culture of continuous improvement…	• Give rise to metrics that are adopted by all actors which lead to continued and sustained risk reduction to a point where management is minimal • There has to be an imbedded culture of continuous improvement

1.1.4 What does long-term safety mean to you with respect to geological disposal of radioactive waste?

Exact answer	Key words
… To keep radioactive material contained in a manner that it does not endanger the environment or human health…	• Contained waste • No danger for the environment or human health
… Long-term safety with respect to the geological disposal of radioactive waste means for us to prevent the release of radionuclides from the repository to the	• To prevent the release of radionuclides from the repository to the

environment throughout the operation of the repository and after its closure…	environment throughout the operation of the repository and after its closure
… Long-term safety means always the same, be it geologic disposal or other means of management: a properly elaborated system of science-technology-engineering-humanities-governance-regulation. Geological disposal is a particular way of management, where certain elements need more consideration, emphasis and special treatment, such as: the studying of the physical environment, the selection and engineering of the underground site, long-term monitoring and the passing over of information to next generations…	• A properly elaborated system of science-technology-engineering-humanities-governance-regulation
… The rationale of geological disposal is because it is one of the options we have that enable us to consider this form of passive safety, and it is the only one that is discussed and investigated really today…	• One of the options that has to be discussed today • Geological disposal is an option/ form of passive safety that we consider
… No particular opinion. We're not in favour of any specific technical solution…	• Not in favour of any specific technical solution
… It is environmental safety for 1 million years. For physical safety, there is a big difference from spent fuel and reprocessed waste. The long-term predicament of the physical safety (weapons problem) is bigger with spent fuel. But the short term risks for physical safety with reprocessing is bigger…	• Environmental safety for 1 million years • Long-term and short-term safety
… The host-rock has to be solid, without any cracks (not in the case of granite). It has to be assured that within or nearby the disposal there is no water, no gas, no natural resources. This place should have an adequate dimension…	• Assurance of the solidity of the host rock formations • No water, no natural resources nearby the facility
… The geological disposal besides the great hazards coming from placing the highly radioactive r/a waste also brings several other issues which are uncertain: for example, there is no geological disposal in practice up to now, no practical experience with the functioning of one, there is an uncertainty about the management of the waste which has a very long period of activities/half-life, there is a certain unclearness present in the radwaste operators' management about how they are going to operate a geological disposal. Some of the countries (especially southern Europe) have no real plans. They are formally fulfilling the expectation of the IAEA. Some of the countries are already reducing the finances to maintain the geological disposal programmes which means that “nothing” is happening. So the countries are	• No geological disposal in practice up to now, no practical experience with the functioning of one • There is an uncertainty about the management of the waste which has a very long period of activities/half-life • There is a certain unclearness present in the radwaste operators' management about how they are going to operate a geological disposal

mainly extending the period to take the decision what to do with spent fuel for example to the future generations along with the reduction of the financing. And if you look from a distance to the IAEA standards- this is in a way allowed. As long as you collect enough money for the future activities- you are in a way prepared according to these international standards, but if you are not taking any actions plus you are reducing the amount of money- those are the negative sides which can definitely affect the term of safety in general. Also there is an idea to build a regional repository for all the countries that produce r/a waste (ERDO working group) and the situation is very similar there: they started already but now there is a problem with financing and with the idea "what to do" and the activity has been stopped from 2013. The result of their activity is a publishing some kind of the leaflet on the national language of all the countries included in the group. They have to start with the strategic research agenda or at least a "to do"- plan. The idea is very good but they have to start to work on it already now because the problem of r/a waste is urgent…	• There is an idea to build a regional repository but there is a problem with financing it
… Different geologies across nation states will require different engineering and technical solutions. In the UK the last previous attempt to continue the process to site a geo-disposal facility in in Cumbria relied only upon an acquiescent community (Copeland, which hosts Sellafield). In contrast other nation states across the EU and beyond are/have carried out ESA's and geophysical investigations to firstly determine where simple and predictable geology exists before asking for volunteer communities to come forward. This methodology is compliant with IAEA guidelines. The UK did this in the 1980's but it became publically and politically unacceptable. Post 1980's there have been a "retreat to the nuclear oasis", Sellafield and West Cumbria where in the 1990's geological investigations showed heavily fractured and faulted geology with the then nuclear executive unable to understand the results of its own investigations. Geological disposal should only proceed in the event the public are aware of all the risks. We have seen two failures at WIPP (Waste Isolation Pilot Plant, Carlsbad NM). The reasons given concerning the rupture of a canister (Wrong Cat Litter) don't imbue public confidence. The subsequent failure of the HEPPA filters designed to stop atmospheric actinide release will have had a similar effect on public confidence. Radiolysis in ILW will give rise to radiotoxic gases such as CH4 with the	• Different geologies across nation states will require different engineering and technical solutions • Geological disposal should only proceed in the event the public are aware of all risks • The reasons given (concerning the rupture of the canister) don' imbue public confidence • There needs to be far more detailed research completed to ascertain predictability • Currently the data falls short of portraying anything remotely convincing • The problem in the context of safety, as it relates to geo-disposal is the lack of scientific and technical understanding as to how a radiotoxic gas release

carbon atom being C14. Some modelling as to volumes and pathways exist but there needs to be far more detailed research completed to ascertain predictability. Currently, the data falls short of portraying anything remotely convincing. It is claimed by some that civil nuclear power generators release volumes of aerosolised tritium at times when reactors are refuelled. Some scientists concerned with epidemiology have demonstrated a statistical probability these releases are and have been related to clusters of adolescent leukaemia's In the UK the NDA are funding a research bursary for the detection of air-borne tritium. In the absence of knowledge as to when reactors were previously refuelled (The UK does not provide that data to its public, nor will it) I can only ask why. The problem then from a UK perspective and perhaps wider is the industry has "risks" and for the greater part society doesn't wish to understand the extent to which it shoulders them. So long as this attitude prevails then the industry has no incentive to change the status quo to one of public understanding and acceptance of risks. This attitude has prevailed since the inception of the industry and must change to sow the seeds of trust which in turn can only come through transparency. As a general comment civil society accepts risk from many industries and we understand these. A good example being the internal combustion engine with CO2 and NOX emissions; the trade off being motorised transport. I do not believe the civil nuclear industry is any different and, it shouldn't be difficult to mitigate what risks do exist with cooperation to near zero. What is required is the education of processes. - Tell it like it is! The problem in the context of safety, as it relates to geo-disposal is the lack of scientific and technical understanding as to how a radiotoxic gas release would/could occur, and to what extent it might have a detrimental heath effect on future exposed populations. – Implementers, TSO's indeed any actor cannot know with any certainty how and when gas will be released. A constant flow from vented containers, a sudden rupture releasing gas at one location placing some communities at greater risk than others (depending upon which way the wind happens to be blowing at some future point in time?). The same will be true for radiotoxic groundwater. Nevertheless, and providing the regulators guidance on acceptable levels of emissions comply with WHO guidelines then we should accept that providing we trust the regulators- and past experience leads me to conclude we are not there yet. There will be some both in academia and NGO's who will	would/could occur, and to what extent it might have a detrimental heath effect on future exposed populations • MORE R&D funding should be allocated • As a general comment civil society accepts risk from many industries and we understand these.

accept no risk whatsoever and their views should be heard for the reasons they give. We cannot wish away radioactive waste and moreover new nuclear may well be needed if the UK (and presumably other EU nation states) are to meet their Paris accord CO2 reduction commitments. Unlike most technological developments which undergo stages of evolution with the outcome of increased safety (passenger airliners, motor cars, electrical equipment, etc.) we won't get the chance post closure to make changes but what should happen with the adoption of new nuclear is that MORE R&D funding should be allocated /Kw generated. In this way we will be better able to manage both our legacy waste and wastes arising. A greater field of vision in research will lead to more desirable outcomes…	
… Long-term safety in geological disposal is a very complex issue. One of the related issues is to ensure that the public has sufficient rights, knowledge of legal and procedural issues, and finances (to enable access to knowledge reg. safety issues and analyses) that would enable it to sufficiently exercise the role of public control of all safety mechanisms planned to be implemented in geological disposal in Slovakia…	• To ensure that the public has sufficient rights, knowledge of legal and procedural issues, and finances (to enable access to knowledge reg. safety issues and analyses) that would enable it to sufficiently exercise the role of public control of all safety mechanisms planned to be implemented in geological disposal

1.1.5 How would you define the safety objective of geological disposal?

Exact answer	Key words
… To achieve the "safety of geological disposal," it is necessary to create conditions to prevent the release of radionuclides from the repository to the environment throughout the operation of the repository and after its closure and to provide protection of people close to the surface of the complex of GDF…	• It is necessary to create conditions to prevent the release of radionuclides from the repository to the environment throughout the operation of the repository and after its closure and to provide protection of people close to the surface of the complex of GDF
… To create a system, where the elements referred to above get special attention, otherwise (concerning other	• To avoid interaction of waste and environment

elements) it is a similar system to other waste management systems, where the main goal is to avoid interaction of waste and environment…	
… We would not contemplate geological disposal for the moment. There are too many uncertainties about long-term issues of safety. Example: corrosion problems with copper canisters. In the early days, there was an assumption that it would not corrode. But we have elements showing that it can corrode in a non-oxygen environment…	• Would not contemplate geological disposal for the moment: there are too many uncertainties about long-term issues of safety
… To prevent nuclear waste to enter the biosphere, now and in the (far) future…	• To prevent nuclear waste to enter the biosphere, now and in the (far) future
… For me, the long-lived and high-level waste brings very similar problems and therefore the safety principles should remain the same…	• Safety principles should remain the same
… Since we cannot know the future but we may take inspired guesses for doom e.g. Extinction events, wars with catastrophic environmental consequences, environmental/biological terrorism, irreversible climate change, natural contagions etc. Such thoughts you might judge to get as much of the waste beyond the reaches of such threats and in a timely way. On the other hand we have lived and largely prospered under the threat of such events and to place upon this generation a decision point towards geo-disposal with the lack of scientific and technological understanding to be as certain as we can be that we can even attempt to set a "safety objective" is I think not a good question to ask me but I think the Dutch position is eminently sensible. On the understanding our planet suffers no extinction event within the timeframe to which radio-toxicity may present itself in the biosphere and that human societies still exist to the extent their technological development is superior to that which we enjoy now then I guess the only definition of safety objective is to do the best we can with the knowledge we have and to devise an internationally agreed framework. However it is done it must involve as many from within civil society as possible. It cannot be ethically correct for civil society not to be engaged in a decision that will affect potentially 30,000 generations who will follow us…	• We don't know the future

1.2 How does safety objective can be achieved in the context of geological disposal (facility)?

1.2.1 How can the safety objective of the geological radioactive waste disposal be achieved?

Exact answer	Key words
… I am interested in nuclear power and in the waste problem. In Brussels, I have a friend who is an engineer in nuclear physics and some of my friends have worked in nuclear power plants or have constructed them. So I am used to discuss the nuclear subject. As a French teacher in the Danish secondary school I have worked together with physics teachers on energy sources. I have read about the Cigeo project in France, and also about the concepts for radioactive waste management in Sweden in order to understand what to do with the nuclear waste in Denmark. This is how I realized that putting everything together in the same repository at 30 meters below ground level with a security horizon "from" 300 years, is not a good idea. There are no requirements for barrels, canisters or containers at DD barrels DD is hoping that the nuclear safety authority will accept the barrels, the canisters and the containers for a long-term disposal, they have said. If I answer from the point of view of the 5 NGOs, the lack of safety means that we cannot accept neither a geological disposal or a sub-surface storage in Denmark. I attended a meeting in Brussels in November in the Representation of Lower Saxony. The Greens the European Parliament had invited a German and a British expert who argued that if the waste is to be there for a 100000 years, we have the time to wait for finding better solutions before burying the waste. What is worrying especially the 5 NGOs in Denmark, is the responsibility towards future generations. Future generations will have no choice unless the disposal is reversible. In France, the graphite waste will not be stored in the Cigeo geological repository. In Denmark the graphite waste will go together with 234 kilos spent fuel, 1130 tons tailings from uranium extraction tests on ore from Kvanefjeld, barrels with legacy waste, waste from decommissioning of 3 research reactors and a hot cell. Cadmium, beryllium, lead, bitumen and irradiated uranium, NORM waste and ore from Kvanefjeld. A small quantity, 5000-10 000 m3 or about 8000 tons. All buried together at 30 metres below ground level…	• The lack of safety means that we cannot accept neither a geological disposal or a sub-surface storage • Future generations will have no choice unless the disposal is reversible • '… That if the waste is to be there for a 100000 years, we have the time to wait for finding better solutions before burying the waste. What is worrying is the responsibility towards future generations...'
… There is not enough information to guarantee this safety objective can be achieved. The safety objective is based on assumptions. There are key problems with the	• Not enough information how safety objective can be achieved

science underpinning the concept of geological disposal. Nature, on 13th January, published a paper about safety assessment for WIPP, and this raises many questions about long-term safety and present safety assessment. The key message is that there is current limited capability to manage the inherent risks. There are many shortcomings for disposals, and operational failing (e.g. the recent accident in 2014). These questions of regulatory period of 1 000 years compared to the 24 000 years half-life (or even million years) of some radioactive elements. There are questions about the very concept of safety case for long-lived nuclear waste. We might not be able to dispose of nuclear waste. We may have to manage the waste, above ground. A key problem is it may be impossible to reassure the public that there will be adequate safety measures to ensure that IHL nuclear waste can be disposed of because of the known concerns about the science and technology. The assumption that nuclear waste can be disposed is simply an assumption…	• Safety objective is based on assumptions • Currently there is a limited capability to manage the inherent risks • It may be impossible to reassure the public that there will be adequate safety measures to ensure that ILL can be disposed • The assumption that nuclear waste can be disposed is simply an assumption
… I really see it as a social process. In the past years it has been seen as a technical issue. A solution with technical options. A the most tremendous lesson achieved is that we developed technical tools, scientific knowledge but as a whole it does not work, we do not address it properly as an issue for society. It means that we need people because people are the first '?' for this and in addition we need their intelligence. We cannot achieve it only by technical demonstration. You cannot have the butter and the money of the butter. You have to make a choice. And in addition there will be lots of uncertainties remains. So you will guess that it is working well. But it is an ontological issue: it has to do with human, it has to do with human destiny and human essence. So it is not an issue that can be dealt with behind closed doors by technicians saying 'we can now get rid of it'. And the sorry is that a lot of decisions have been made behind closed doors but one day 'they' had to go out and to put this waste somewhere. And they discovered 'oh, I am doing it for who? Ah, for them!'. Technicians say: 'how can we protect the disposal from the people?' It seems that it was all about protective the waste from human being. They forgot the initial issue. To achieve this objective, it necessitates to address the societal dimension…	• Make it a societal process • A solution with technical options • No decision should be made behind the closed door
… The safety of geological disposal of radioactive waste can be achieved in the future in this way: waste will not be displaced in the locality where tectonic and volcanic activities, ground water reservoirs and watersheds of the	• Waste will not be displaced in the locality where tectonic and volcanic activities, ground water

rivers occur, continual monitoring of containers will exist and their retrievability in the event of leakage of radioactive substances into the environment will be possible (see "rolling stewardship" - responsibility for DGF is transferred from one generation to the next). The lifetime of material for inner and outer layers of packaging super containers is demonstrated for thousands of years (in the case of copper, the lifetime is demonstrated for about two and a half thousand years on the basis of empirical experience). Information on the status and position of the containers will be preserved for future generations. Information on the operation of the repository will be available to public to ensure the supervision of the activities of state bodies at any stage of DGF lifetime…	reservoirs and watersheds of the rivers occur • Continuous monitoring • Possibility of retrievability • "rolling stewardship" • The lifetime of material for inner and outer layers of packaging super containers is demonstrated • Information on the status and position of the containers will be preserved for future generations • Information on the operation of the repository will be available to public to ensure the supervision of the activities of state bodies at any stage of DGF lifetime
… By the thorough elaboration of the elements of the complex management system. Identification of these system elements, working out aspects and requirements, both on scientific-technical and societal level is highly essential. Collaboration among different elements of the system is necessary, as all issues are interconnected. Proper site selection criteria, site research, design and engineering of the facility is just as crucial as developing appropriate legal, institutional, governing and organisational procedures, and engaging the society in the process. Quality management and risk assessment should be part of the system, as well as long-term surveillance and supervision of the physical and societal environment and trans generational information documentation…	• By the thorough elaboration of the elements of the complex management system. • Identification of these system elements, working out aspects and requirements, both on scientific-technical and societal level is highly essential. • Collaboration among different elements of the system is necessary, as all issues are interconnected. • Proper site selection criteria, site research, design and engineering of the facility is just as crucial as developing appropriate legal, institutional, governing and organisational procedures, and engaging the society in the process. • Quality management and risk assessment should be

	part of the system, as well as long-term surveillance and supervision of the physical and societal environment and trans generational information documentation.
… No one has proven safety of a geological disposal so far. There are many questions pending. For example: how to package spent fuels? You have to find a material that is at the same time containing the waste but also can evacuate the heat continuously produced by the waste. The answer seemed to be copper in some countries, but the problem is now how copper reacts in the environment. There are questions about corrosion. Other investigate bentonite and steel. But I do not see any convincing answer these days. I have the feeling that they kept down on safety. One million years was the safety case to be proven a few years ago, now it is scaled down to several thousand years. I see that in all programs…	• No one has proven safety of a geological disposal so far • I do not see any convincing answer these days
… It would be reached by the assurance that in the scenarios that we can reasonably imagine, under passive conditions, the discharge of radioactivity outside the disposal, coming from the waste in the geological disposal, would be kept under a threshold (or objective) to be defined. The demonstration of this depends strongly on the considered scenario, of the degree of conservatism, in the scenarios and the objectives we define concerning the radioactivity discharge. These 2 points should be the subject of a society debate. This is society that defines the level of reasonability of the scenarios we take into account and the acceptability of the objectives we decide as regards discharge…	• It would be reached by the assurance that in the scenarios that we can reasonably imagine, under passive conditions, the discharge of radioactivity outside the disposal, coming from the waste in the geological disposal, would be kept under a threshold (or objective) to be defined. • The demonstration of this depends strongly on the considered scenario, of the degree of conservatism, in the scenarios and the objectives we define concerning the radioactivity discharge • society defines the level of reasonability of the scenarios we take into account and the acceptability of the objectives we decide as regards discharge

… This is not for us to decide…	• This is not for us to decide
… It is difficult. The question of environmental safety: we are very concerned about the problem of having artificial barrier systems (steel, clay, copper clay) when you have groundwater flows; it is the case in the KBS concept. It is possible that the environmental long-term safety of clay systems can be better in this context, because of the absence of groundwater flow. Regarding intrusion problems, we do not agree with these 400 m fortified mine systems. The only alternative we see so far is the use of deep boreholes where environmental safety is better and retrievability is more difficult. But the acceptability of irretrievable disposal is not as easy to achieve as with retrievable disposal. If deep boreholes are not found to be safe enough, we would have to reduce the activity of long-life isotopes before disposal. Necessary requirements are both isolation for a million years and high level of irretrievability…	• Difficult to achieve • The question of environmental safety • Intrusion problems • Deep boreholes might be an option • Necessary requirements are both isolation for a million years and high level of irretrievability
… The approach that is technical and socially based has to be applied. The high standard of research should be maintained. Openness is importance. The risk discussions should take place. The following requirements are important: check and balance approach, the independent organisation should be able to lead an adequate negotiation with implementer and regulator, for example: the third (neutral and trust organisation) should be established and have a defined influence…	• The approach that is technical and socially based has to be applied • High standards of research • Openness • Risk discussions • Check-and-balance approach • Introduction of a third neutral body
… The safety objective itself and their aspects we have discussed earlier. However, the main question is how to fulfil the safety objective aspects? Especially, the following ones: public acceptability/inclusion, transparency, trust and intergenerational aspects. In the northern countries, the public trusts the government, so they have a kind of acceptability but the problem with intergenerational aspects, for example, still remains unsolved. Another example is France, which has a rather serious problem of public acceptance. So in short, the safety objective can be achieved is all the aspects of this safety objective are fulfilled…	• The questions of public acceptability, transparency, trust and intergenerational aspects should be resolved

1.2.2 What are in your opinion the necessary requirements to fulfil this safety objective?

Exact answer	Key words
… The tools which are necessary to ensure the safety	• Transparency, traceability,

objective are transparency, traceability, verifiability and sanctions in case of infringements of procedures. The public will have an uncensored information on repository operation and will participate in safety supervision…	verifiability and sanctions in case of infringements of procedures • Public will have an uncensored information on repository operation and will participate in safety supervision
… To be able to see the complexity of the issue and to be able to deal with it. To be able to think in systems, to understand the implications of the very long timeframe and to be able to identify and manage risks. To apply knowledge in an interdisciplinary way (e.g. integrate social requirements into science and technology, as well as formulate regulations and governance based on sciences (natural and social) and engineering, …) …	• To be able to see the complexity of the issue and to be able to deal with it. • To be able to think in systems, to understand the implications of the very long timeframe and to be able to identify and manage risks. • To apply knowledge in an interdisciplinary way (e.g. integrate social requirements into science and technology, as well as formulate regulations and governance based on sciences (natural and social) and engineering, …).
… I cannot answer, and it is precisely because there are doubts on the answers to this question that the reason why there is no consensus on the choice of the solution of a geological disposal. In the current state of the art, geological disposal seems the best candidate to reach the long-term safety objective, but today, I do not know if best is in the sense of least bad among bad options or in sense of good performance. Of course, there are obvious criteria like stability of geological structures, their degree of permeability, of separation between these geological structures and the water resources, stability and robustness of the man-made structures, and long-term requirement of irreversibility. There is a need for reversibility on the short term and for irreversibility on the long-term. There are 3 time horizons: one that is within the scope of the generation that speaks (a few decades maximum), on which the society today can take engagements without relying on the actions of future generations; one that is between a few centuries and a few millennia, during which we can hope a continuation of the control of institutions and society over this object; on the longer-term, we should assume that the geological disposal would be abandoned. A key stake is	• Cannot answer-> there are doubts • There are obvious criteria like stability of geological structures, their degree of permeability, of separation between these geological structures and the water resources, stability and robustness of the man-made structures, and long-term requirement of irreversibility. There is a need for reversibility on the short term and for irreversibility on the long-term • ‘Tunnel effect’

to build the conditions to voluntary letting go of things in the second time horizon (because it is impossible in the first horizon), rather than having a forced abandon. Another type of critical conditions would be the sincerity and realism on the final inventory of radioactive waste. This is essential because one of the key risks that we can imagine is to be stuck in a "tunnel effect". If we progress on a geological disposal suitable for a certain type of waste and that we end up with other waste that we would be forced to put in the disposal although it was not foreseen and designed for, it could strongly degrader the safety…	
… Transparency, organised opposition, funding for contra-expertise…	• Transparency • Organised opposition • Funding
… Certain amount of money (definite financial support) should be present. Knowledge sharing is also important. Sufficient amount of experts present in the r/a waste management committee. Partnership (local and international) between different actors…	• Funding • Knowledge sharing • Sufficient expertise • Local and international partnership
The vision and mission of our organisation is to foster the view that 'effective public control', as outlined above, is one of the requirements whose role should not be considered and treated as minor or inferior role.	• Effective public control

1.3 What are the actors involved in the decision making/aiding process?

1.3.1 Who are the actors that have to be involved/interested/ participate in the decision making/aiding process?

Exact answer	Key words
… First, the representatives of the responsible Ministries. The nuclear safety authority. DD and the geological survey GEUS. A former expert who worked for the regulator in Sweden told me that the RWM is just as much an ethical as a technical problem. Philosophers, sociologists, theologians and lawyers should join the discussion. And what is also important is an independent assessment. We could ask for instance Johan Swahn from MKG to advice the Danish authorities. Other actors of course, are the citizens in the selected municipalities. Environmental NGOs and local and regional authorities. It is important to start a learning process, to construct knowledge of RWM, and to build mutual understanding	• Ministries • Safety authority • Philosophers, sociologists, theologians and lawyers • Independent assessment • Citizens • NGO's

and trust. Without trust the process will block and fail. In 1985, the Parliament decided that Denmark should not depend on nuclear power. Most people with knowledge in the nuclear field are dead or retired. So there is no place in Denmark where you can get independent l information on nuclear issues. There should be access to knowledge about nuclear issues…	
… Citizens certainly are, this is notably backed by the Aarhus convention: the European directive on the assessment of the effects of certain public and private projects on the environment (EIA directive); the European directive on the assessment of the effects of certain plans and programmes on the environment (SEA directive); the European directive on integrated pollution prevention and control (IPPC directive). What this means is that civil society, the public, and the local communities where any waste facility is planned should be considered formal stakeholders with a key role in decision-making. The question is what do you do when you do not what to do (i.e. a low probability and high impact risk like in the storage of nuclear waste). All academic literature says that you have to balance everyday knowledge against expert knowledge democratically. This entails participatory processes, citizen dialogue, … Under the key context that this involvement, engagement, consultation must be acknowledged to actually have an impact on the decision-making process. This is underpinned by the EU legislation. The other actors are (please note that there is no hierarchical taxonomy in the following): statutory actors: science advisory committees, governmental departments, nuclear regulators, nuclear operators, nuclear waste operators, environment agencies, local and regional authorities. The non-statutory actors: NGOs, academics, academic institutes research institutes, interested individuals that you have to reach out, the local communities and regional communities that could be affected by these decisions. I was key advisor of the Min Defence for the submarine-dismantling project. This was successful because we did it right. The key to this is trust and trust building. When you have lost the trust of people you can say goodbye. For being trustworthy you have to share information, be agnostic about outcomes, gather the necessary actors, be patient and take your time. We were very honest about the shared legacy our UK community have to deal with. The key problem in terms of public acceptance of nuclear waste management is it could be the public can be willing to discuss the legacy,	• Citizens • Statutory actors : science advisory committees, governmental departments, nuclear regulators, nuclear operators, nuclear waste operators, environment agencies, local and regional authorities • The non-statutory actors : NGOs, academics, academic institutes research institutes, interested individuals that you have to reach out, the local communities and regional communities that could be affected by these decisions • The key is trust • For being trustworthy you have to share information, be agnostic about outcomes, gather the necessary actors, be patient, take your time • You cannot say that the solution you propose is for the legacy while thinking it will serve for the future waste

the waste that is already here. But there is a distinction between this and any future waste that could be generated by further nuclear operations. This is a critical and important distinction. You cannot lie about this. You cannot say that the solution you propose is for the legacy, while thinking it will serve for future waste…	
… Before defining the actors we have to define the word 'democracy'. We can see democracy as a process when we are dealing only with our interests: we delegate people every ten years that deal with the problems of the 'common house'-let's say, you are interested only in your flat but those people are taking care of the roof, state of the building, etc. I believe that this definition of democracy is no more valid. We have to see democracy as a system with democratic culture: I am interested both in my problems and in the problems of the 'common house'. Let's say, in principle, my activity should be compatible and contributively to the common good. From this point of view since I am living in my country the issue of radioactive waste should be also 'mine'. I should be concerned. In this perspective, of course, I will organise myself, I will manage to have experts, I will manage to have institutions in charge of this. It could be that those institutions are on the market because after all a market is the way to organise, to coordinate ourselves. It is not a divine creation, we organise ourselves through the market if it is better for r/a waste management. It is not only the expert but also an underlying idea of what is democracy what is behind it…	• Democracy as a system with democratic culture
… State authorities. Waste producers. Local public in the sites. General public. Experts…	• State authorities • Waste producers • Local public in the sites • General public • Experts
… System managers, waste producers, regulators, national and local governments, civil society, academia and researchers, technical experts, social and human scientists…	• System managers • Waste producers • Regulators • National and local governments • Civil society • Academia and researchers • Technical experts • Social and human scientists
… Of course the regulator. I would expect them to be as objective as possible, which they usually are not. They should ensure that the public has a say in the decision-	• Regulator: as objective as possible, open, critical • Regulator should ensure

making. The Parliament are elected representatives. They have a different role and the Parliament and Government will decide at the end. The industry needs to get rid of the waste. Anyone who is interested is a stakeholder. In some countries, the government and the regulator are defending the interests of the industry. The roles in theory would be clear, who does what. The problem is that it is not really happening. Experts and TSOs have to support the regulator. And we expect them to be more objective, open and critical. In some national cases (e.g. Czech Republic) Instead of hiding safety reports, they should disclose them. In Czech republic, there was a programme of siting. The radioactive waste regulator, which is under the authority of the Ministry of economy, said that they will compare the sites and choose the best, but they had no criteria to do this. Now, last year, they have produced criteria. They did not present them formally. They said that they would ask foreign experts to look at these criteria, but it has never been done. There are no fixed milestones. In theory, any stakeholder should be given the opportunity to be involved. But in most countries, it is not happening…	that public has a say in the decision-making • Parliament • Government • Anyone who is interested is a stakeholder • The roles of the government and regulators should be clear • Disclosed safety reports • Criteria of the siting process should be formally presented • Any stakeholder should be given the opportunity to be involved
… The organisations that created waste in the first place: operators of nuclear safety, medical organisations using radioactivity. Other actors: elected politicians, regulators, community organisation, trade unions, local authorities, emergency planners. You have a variety of interested parties. They all play different roles in the process…	• Operators of nuclear safety • Medical organisations • Elected politicians • Regulators • Community organisation • Trade unions • Local authorities • Emergency planners
Waste producers. Waste managers, who will have the responsibility to 'mettre en place' the disposal. The authority responsible for control and its 'organismes d'évaluation'. The government that should ensure the coherence of the whole process. Society, locally and nationally. Expert organisations in all their diversity (including non-institutional experts). A point that is rarely addressed but is fundamental: the issue of transfer of responsibility between the waste producer and the waste manager. As what we do upstream with the waste is in strong interaction with what we can and will do in the geological disposal, it is important the one that will be in charge of safety in the end could interact as upstream as possible with the producer. There should be a strong separation between the waste manager and the organisation in charge of evaluating this management. Beyond this, it is essential that this evaluation process integrate the diversity of research and expertise,	• Waste producers • Waste managers have to put on place the disposal • Authority responsible for control and evaluation • Government should ensure the coherence of the whole process • Local and national society • Expert organisations including non-institutional ones • Important issue: transfer of responsibility between the waste producer and the waste manager- the one that will be in charge of safety in the end must

including on issues of articulation between technical issues and social sciences issues. This is essential. In parallel to the engagement of stakeholders, the assessment process should integrate the existing diversity of expertise in the assessment. This is key for providing the best possible elements of appreciation des decisions to all stakeholders…	interact as upstream as possible with the producer • Strong separation between the waste manager and the organisation in charge of evaluating this management • Evaluations process should integrate with the diversity of research and expertise, including the issues articulating between technical and social sciences issues
… Waste producers, governments, scientists, engineers, NGO's, citizens…	• Waste producers • Governments • Scientists • Engineers • NGO's • Citizens
… In Sweden, the government takes the final decision. The government will get advice from 2 formal legal actors: the Environmental Court and the regulator, SSM. They give advice according to different laws. Then there is a scientific advisory board to the government, which the government will ask for assistance; the nuclear waste council. In addition, the local community has a legal role and has a veto right. But the veto can be overthrown by the government under certain conditions. Environmental NGOs have a specific role in environmental court process. This has to do with the Aarhus Convention and the access to justice. Normally, environmental organisations can appeal court decisions. However, in the case of RWM, like in other infrastructure issues, this is somewhat limited, because the government has the final say, not the court…	• Government takes the final decision • Government gets advice from the Environmental Court and the regulator • Scientific advisory board • Nuclear waste council • Local community has a legal role and has a veto right • The veto can be overthrown by the government under certain conditions • Aarhus Convention • Access to justice
… Implementer, regulator, independent outside organisation, regional and host communities, representatives of social groups, representatives of NGOs and future generations. The parties that belong to the governance should have extensive negotiations. Veto-rights lead to steps back until an adequate solution, which is accepted by a defined percentage, has been found. The last decision has to be taken by the parliament…	• Implementer • Regulator • Independent outside organisation • Regional and host communities • Representatives of social groups • NGO's • Future generations

	• Governance parties • Veto-right • Last decision has to be taken by the parliament
… Officials: regulatory body, implementer, ministries, also the producers of waste. Local municipalities where the cite is going to be located and other stakeholders, such as NGOs with/without special status. Different interested parties from surrounding facilities (city council), and in principle anybody who has an interest: it can be on a local or even on an international level. For example, let's consider an international content. In case there would be a regional repository, all neighbouring countries will be also involved in the development of the repository and also according to the EURATOM decree all EU countries can be involved. It is a multilevel stakeholder problem that should be managed very carefully by not only by implementer who has an interest but it should be managed on an international level. With such a coordinator who should/would come from a not-interested party. It is important to recognize the need to choose a more neutral body that would communicate/unite/work/inform all the actors involved in the decision making process…	• Regulatory body • Implementer • Waste producers • Local municipalities • NGO's • City council • Anybody who has an interest: local and international level • Regional repository • Neutral body: communicate, unite, work, inform functions.
… Implementers, regulators (TSO's), academia, NGO's, central government, local government (at all levels), school children (by way of education to interest those who might wish to have a career in RWM) and as many in civil society who could know…	• Implementers • Regulators • Academia • Central government • Local government • Special education for school children • Civil society actors
… See IPPA project research activities in 2011-2013 (see: IPPA Deliverables 2.4 and 2.5)…	• IPPA project

1.3.2 What are their roles and responsibilities?

Exact answer	Key words
… First, the representatives of the responsible Ministries. The nuclear safety authority. DD and the geological survey GEUS. A former expert who worked for the regulator in Sweden told me that the RWM is just as much an ethical as a technical problem. Philosophers, sociologists, theologians and lawyers should join the discussion. And what is also important is an independent assessment. We could ask for instance Johan Swahn from	Representatives of the responsible ministries RWM is as much as ethical and technical problem Philosophers Sociologists

MKG to advice the Danish authorities. Other actors of course, are the citizens in the selected municipalities. Environmental NGOs and local and regional authorities. It is important to start a learning process, to construct knowledge of RWM, and to build mutual understanding and trust. Without trust the process will block and fail. In 1985, the Parliament decided that Denmark should not depend on nuclear power. Most people with knowledge in the nuclear field are dead or retired. So there is no place in Denmark where you can get independent information on nuclear issues. There should be access to knowledge about nuclear issues…	Theologians Lawyers Citizens Selected municipalities Environmental NGO's Local and regional authorities Start learning process Construct knowledge of RWM Build mutual understanding and trust Without trust the process will be blocked and fail Available independent information on nuclear issues Access to knowledge about nuclear issues
… WMO should not forget that they are working for people and all the parts of the technocratic system should be aware that it is not a question of let's say avoiding the complexity and uncertainty such a process but on the contrary to create conditions for the people to appropriate all those issues, to understand how and sometimes to worry about that and then to start adopting an attitude where they would say what are we going to do? It entails moving to something different. I see their role and responsibilities as looking at safe and responsible r/a waste management, I see this issue as an issue of common good for present and future generations…	• WMO should not forget that they are working for people • Create conditions for the people to appropriate the issue of RWM • WMO: looking at safe and responsible r/a waste management • Common good for present and future generation
Experts (scientists, journalists) should demonstrate independence, demonstrate expertise, cooperate with foreign leaders in the field, communicate their research results to the public impartially and with integrity. Public (residents, local government, associations) should assertively convey their opinions effectively, possibility to stop the process of building the repository at any stage, if unsuitability of geological conditions of the site is proven. State authorities should demonstrate responsibility for the safety of current and future generations, make decisions based on facts rather than transitory economic interests, collaborate with experts, respect the decisions of the public. Waste producers should provide funds for design, construction and	• Experts (scientists, journalists) demonstrate independence, and expertise, cooperate with foreign leaders in the field, communicate their research results to the public impartially and with integrity • Public (residents, local government, associations) should assertively convey their opinions effectively, possibility to stop the process of building the

operation of GDF, (ideally) eliminate waste and its production in the future…	repository at any stage, if unsuitability of geological conditions of the site is proven • State authorities should demonstrate responsibility for the safety of current and future generations, make decisions based on facts rather than transitory economic interests, collaborate with experts, respect the decisions of the public • Waste producers should provide funds for design, construction and operation of GDF, (ideally) eliminate waste and it's production in the future
… System managers: define and coordinate elements of the system. Academia, scientific research, technical experts: provide scientific background and basis, and maintain knowledge and information. Educate and train researchers and experts of the future. Civil society: express concerns, represent related social issues, engage in decision making. Regulators: define safety requirements, licensing, investigate and evaluate performance, check compliance with requirements and make actions in case when requirements are not met. Governments: providing national and local framework for safety management. Waste producer: Implement and comply with requirements, provide information on waste produced, manage waste and waste facilities…	• System managers: define and coordinate elements of the system • Academia, scientific research, technical experts: provide scientific background and basis, and maintain knowledge and information, educate and train researchers and experts of the future • Civil society: express concerns, represent related social issues, engage in decision making • Regulators: define safety requirements, licensing, investigate and evaluate performance, check compliance with requirements and make actions in case when requirements are not met • Governments: providing national and local framework for safety management • Waste producer: Implement and comply with

	requirements, provide information on waste produced, manage waste and waste facilities
… Waste producers: finance. Government: oversight, implementation. NGO: aid to citizen. Citizen: it's their backyard…	• Waste producers: finance • Government: oversight, implementation • NGO: aid to citizens • Citizens: it's their backyard
… The implementer needs to prepare all the paper work and also it is responsible for the construction, implementation, monitoring, etc. This is a very important role and it should be done with regard to safety. The regulatory body is a "controlling" body, it is responsible for licensing, it has to approve the safety report, for example. They need to assure that everything is according to the law and they have to ensure that the public is involved. The waste producers do not have a major role: they are involved in the process only. The local municipalities have to get an approval from public and to reach the consensus. They are usually financially supported by the government or other parties. They are also in a way responsible to their citizens because they are elected by them. So on one hand they should be supporters to the project (geological disposal in our case) because usually they are paid by the government but on the other hand they have to meet the interests of public. So they are an important link between the locals and officials. All the other interested parties (NGOs, for example) are the watch-dogs. The officials have to acknowledge this role and support them financially…	• Implementer: prepare paperwork, responsible for construction, implementation, monitoring • Should be done with respect to safety • Regulatory body is a controlling body • Regulators need to assure that everything is according to the law, to ensure that the public is involved • Waste producers do not have a major role • Local municipalities have to get an approval from public and to reach the consensus • Financial support of local municipalities • Local municipalities are an important link between the local and the officials • NGO's are the watch-dogs
… IPPA Deliverables 2.4 and 2.5…	• IPPA project

1.3.3 In your opinion how do they have to interact with each other?

Exact answer	Key words
… It depends on the situation. The authorities involved should organise a meeting with all the other actors and start from scratch to build trust. It is necessary even if it will take some time and each part has to make huge efforts. We hope that the studies on a long term intermediate storage could result in a consensus of what to do. My impression is that the 5 NGOs have a hope and are willing to collaborate in a constructive manner. The	• Meeting with all the actors • Start from scratch to build trust • Collaborate in a constructive manner

NGOs are very responsible…	
…Nobody knows how to do participation. We are inventing. The best examples of a success in this are 2 things: safe ground: a multi-actor network to look at radioactively contaminated land; the STP submarine dismantling process. Both ran for about 10 years. STP will take another year to conclude. The key to all of this is upstream involvement. You identify the stakeholders and get them together. You are not there to find a single right answer to the problem. You are here to bring and keep people together so as the best decisions can be made for the future. If people think you have an agenda, for instance if you say there will be a DGR somewhere, it will fail. The only way to look at a radioactive waste storage is to be agnostic about the outcomes…	• A multi-actor network • Upstream involvement • Identify the stakeholders and get them together • Bring and keep people together so as the best decisions can be made for the future • Be agnostic about the outcomes
…If we are talking about 'interaction' I see it as a complex system and situation and I would have to enter the topic of safety culture before answering that question…	• Interaction=complex system and situation
… From a technical perspective, the interaction between experts, public and government authorities should be based on the use of all available means of communication. From a safety perspective, the goal of their interaction should be to ensure long-term safety of the project GDF…	• Based on the use of all available means of communication (technical perspective) • Ensure long-term safety of the project GDF (safety perspective)
…Through the system management team, as well as through regulated processes, such as meeting of the different groups, where information, knowledge and concerns are exchanged…	• Through the system management team • Through regulated processes, such as meeting of the different groups, where information, knowledge and concerns are exchanged
… It would be important that they are put at the same level. Trying to put the independent experts and civil society organisations out should not be done. All these actors are working in a difficult environment. There is extreme pressure with deadlines. There is no sense in this because countries are then forced to restart the process again and again…	• Put all parties on the same level
… Usually in European countries, there is a law covering the participation process. In the UK, the main institutional actors in RWM are RWM limited, the Nuclear decommissioning authority (NDA), creators of the waste, like EDF and public sector companies. The Parliament has to agree with the policy details. You have a planning process that involves local community	• Agreement with the policy details • Planned process that involves local community organisations • Be open and transparent • Financial support

organisations, local workforce, and you have a national process where you will have a national inquiry. I think interaction will be précised in the next policy. Several times in the past decades, policies have been adopted then discarded. The owner has responsibility to deliver the radioactive waste management. We try to drive them to be open and transparent. You want them to be honest about what happens. It is also clear that the technical process to resolve the technical issues will take a long more than the political process. There is a clash between the 2 time frames. The politicians would like to say to the public that they have a solution, but there are still many unsolved issues. The NDA is funded by the taxpayers and there is a huge pressure to cut back on resources. NDA is under high financial pressure. The regulator is also under pressure. They have had a review (all regulators have been under review in the UK) and there is a process of cutting unnecessary regulations. The UK government tries to make the regulators more supportive of the money-making activities that they regulate. It drives them away from objective regulation. You have to recognise that the nuclear timeframe is very long. Because of that you have to have a different perception of how things need to be addressed than the one of the politicians. You cannot act under political pressure…	• Do not drive away from the objective regulation
… Clearly, to be efficient, the interactions should happen as upstream as possible and be as open as possible, and also have a discussion on principles. This was not done in many countries, including France. It explains in a great part our difficulties. We have skipped the step that would have consisted in building the geological disposal as an answer to all concerns of society. Instead, we have built it as a technical standard. But the experts can justify only by a technical reasoning the geological disposal, and this technical reasoning is incapable of integrating all concerns of society, notably ethical ones. There is the question of quality of dialogue and participation processes and access to information. It is indispensable to enable access to information at the right level, it has to be conceived in the appropriate direction: stakeholders defining what they need, provision of this information according to the Aarhus Convention, and justification by information owners of exceptions to this access to information (e.g. for justified reasons of security or industrial secret). There should not be a situation where the information owners keep control over what they deem communicable and interesting for	• The interactions should happen as upstream as possible and be as open as possible, and also have a discussion on principles • We have skipped the step that would have consisted in building the geological disposal as an answer to all concerns of society. Instead, we have built it as a technical standard • There is the question of quality of dialogue and participation processes and access to information • There should not be a situation where the information owners keep control over what they deem communicable and interesting for the

the stakeholders. The process of information should be steered by the needs of the ones asking for information rather than by the concerns of the information owners. Information processes should be open, well-built, under the responsibility of third-party guarantors. There is a specific issue in the case of geological disposal: interaction between local and national processes of dialogue. At the same time we should avoid that a local community is trapped by a national decision, and that the national decision would not be hostage of local unacceptability…	stakeholders • The process of information should be steered by the needs of the ones asking for information rather than by the concerns of the information owners. Information processes should be open, well-built, under the responsibility of third-party guarantors • We should avoid that a local community is trapped by a national decision, and that the national decision would not be hostage of local unacceptability
… In a friendly manner…	• Friendly manner

…This is different in different parts of the process. Originally 40 years ago there was only the government owning the whole nuclear system. It was a governmental effort to start the process to find RWM solutions. In the 1980's. The roles were defined legally and it was decided that industry would have the responsibility. Industry at that time was more and more private. Some bits are still government owned. But at least the companies have become legal companies, even those which sere state-owned. There was a special law for financing, setting up the nuclear waste fund. There was a law to regulate ownership and safety of the reactors. For RWM there was a decision that industry has the responsibility and has to produce every 3 years a R&D report. The report is taken by the regulator and the nuclear waste council and will give their advice to the government on the report, and the government decides if the report has the quality necessary to keep the licenses of the reactors. The report is also submitted for consultation. This procedure continued every 3 years until now. The siting process has been done by the industry to get local communities acceptance for siting. It is long and complicated processes. The siting is not a question for the government or the regulator until the licensing. Before the license is asked, there has to be a consultation process, which deployed between 2003 and 2011. There the environmental movement was able to participate from 2005 where funding came strongly. There has to be proper consultation. The role of the consultation is to provide the best possible Environmental Impact Assessment in the licensing process. The safety case document is something more between the regulator and the industry, while the environmental impact document is wider and includes issues like nature protection. In the process all actors were involved. The industry was doing the process and all were giving opinions on different issues of the industry. After 2010 it was stopped, and then the application was submitted for a repository. Decision on siting was taken in 2009 – this was an independent industry decision. In the legal process, everything becomes more formalised. The court and the regulator ask for opinion on the application. From 2011 to end 2015, the quality of the application was discussed, whether SKB has to do more for getting a proper application. SKB received lots of requests for improvements of the quality of the application, from the regulator, and to the regulator, SKB felt obliged to answer properly. The regulator asked our opinion in this process. In the Court we could ask the Court to decide if SKB has to do some additional work. The Council of nuclear waste was involved at this step. Mostly SKB ignored what was issued in

<table>
<tr><td colspan="2">the Court system. And the Court did not follow up what was done of the requests. So the application was marginally modified. The Court decided in December 2015 that it has no choice but to move on in the process. At that time the application is fixed, it is what it is. Now we argue on the merits and issues (last year we would say that more work should be done on copper corrosion, now we would say that there are safety issues with copper canisters)…</td></tr>
<tr><td>… Face-to-face meetings. The engagement should be a long-term one. There should be ‘enough time’, i.e. ‘go ahead slowly in a step-wise way’. The possibility to step back should exist…</td><td>• Face-to-face meetings
• Long-term engagement
• To step back possibility</td></tr>
<tr><td>… This “interaction” should be coordinated by a more independent body (a national body/committee, for example) which should assure that all the parties are involved “in the process” at all different steps of it. Definitely, during the environmental safety assessment, citing, construction license, etc. This national coordination body should organise the public hearings…</td><td>• Create an independent neutral body that would cooperate with all the parties
• National coordination body should organise public hearing</td></tr>
<tr><td colspan="2">… Currently not very well! I cannot speak of other nation states but historically in the UK the implementer has not behaved in a manner which would in the least give the public confidence. Having studied the UK politics of RWM and some associated scientific disciplines (geology and radiochemistry – The science is what it is!) on and off since 1982 I have countless examples as to how the politics of RWM has been manipulated by the executive and implementers. To give two examples: at the time of the NIREX investigations in the 1990’s a written policy note came to light suggesting that “local politicians should be groomed to our view”; in 2012, during the failed MRWS process I discovered that public consultation responses had been manipulated to demonstrate that local support existed. It transpired that a few hundred responses had arrived after the cut-off date and all together in two large brown envelopes. My suspicions at the time were that these originated from the Sellafield canteens and or the offices of West Lakes Science Park. I reported the incidence to the press with a covering letter explaining that this is exactly how Robert Mugabe won his elections! I understand it upset some local politicians and industry actors. I make this observation. If a process is to succeed (however you define success) it must firstly have merit and most importantly have the broad support of civil society. The industry will garner NO support if the tactics of the implementer are designed to mislead and deceive. I believe this is beginning to change albeit slowly. The process by which a healthy interaction can take place needs to be addressed with cooperation from all parties. We cannot wish away radioactive waste and the problem won’t solve itself, so we need to build a culture of cooperation. – I have previously suggested to the NTW group that a Web based IT platform could both speed up decision making and educate those members of civil society who would wish to discover more. – This isn’t rocket science but it does require active cooperation and the recognition that decisions concerning RWM should be taken with the support of the public as opposed to mistrust currently. I make this observation by way of ethics. When the history of RWM is written (and it will take the best part of 200 years if geo-disposal is preferred) it must ethically correct for those who will read it that civil society HAD an input and was as engaged as it could have been at the time. We should take these far reaching decisions together and with consensus. Unlike in the UK where I have demonstrated that academics (professor level) have deliberately misled their fellow professionals on some very basics facts. – I find this completely unacceptable in particular when the academic was appointed as a CoRWM member (Committee on Radioactive Waste Management) who are supposed to give clear guidance to government. I</td></tr>
</table>

have attached the email I wrote to the Professor. She has since resigned her position from CoRWM. What is needed is a trusted body of academics that are impartial and fully funded by government (us). I reason there needs to be no more than 6 in total in different scientific disciplines and a legal expert. These roles would attract the very best in their field and be well remunerated. (similar to that of a high court judge). This group of experts will be answerable to groups (NGO's) who represent civil society. A sustainable network of independent experts to which civil society can rely upon to tell it like it is…	
… This is a very complex issue. Our organisation is concerned about a lack of interaction of the Slovak geological repository development programme – state owned company JAVYS – with both the Slovak public and with the stakeholders involved in research of joint European research vision (i.e. the JOPRAD project)…	• A lack of interaction

1.3.4 How do you define the role of your organisation in the decision making/aiding process?

Exact answer	Key words
… Our organisation takes part in the administrative proceedings thanks to which our organisation has access to information and can influence the further direction of the decision- making process. We also provide information to public that strengthen their position in the participation process…	• Administrative proceedings • Access to information is possible • Influence the further direction of the decision-making process • Provide information to public that strengthen their position in the participation process
… Our role is to formulate opinions and questions and to frame concerns towards decision-makers (especially in an ongoing process), as well as to inform and organise concerned citizens and civil society organisations about issues of radioactive waste…	To formulate opinions and questions To frame concerns towards decision-makers To inform and organise meetings about issues of radioactive waste with representatives of civil society
… It depends on national contexts. FoE Europe works at the EU level, on policies. I am involved in the general discussions on implementation of the RWM directive. We are pushing strongly to have SEA for all the national programmes. In my understanding, the EC also wanted this. But most countries do not want to involve the public. So it is our role to get information between Brussels and the national programmes. The national FoE offices: in Austria, there is very little happening because the politicians are very scared. I tried to convince the Ministries that open discussion and transparency is	• Depends on national context • Involvement in general discussions on implementation of the RWM directive • SEA for all national programmes • Most countries do not want to involve public • Our role is to get information

beneficial. It is our role to watch this situation and facilitate sustainable processes of finding a solution. We also show the public and also decision-takers that there are no reliable solutions yet for high-level radioactive waste. The role of national NGOs working with government and parliament should contribute to shaping the process, informing the public and the stakeholders. This is a very unique political task, finding a site for a repository. It should not be done through classical decision processes. The role of national NGOs is also to shape this process. There are also local groups and initiatives that have they say around candidate sites…	• Transparency is beneficial • We watch the situation and facilitate sustainable processes of finding solution • We show public and decision- takers that there is no reliable solutions yet for high-level radioactive waste • National NGO's should contribute to shaping the process, informing the public • Political task- find a site- should not be done through classical decision process • Involvement of local groups and initiatives
… Contribute to the enlargement of the expertise basis considered in the decision-making process and, conversely, when this enlargement is not made, be in an external position and express the necessary critics on the decisions…	• Contribute to the enlargement of the expertise basis considered in the decision-making process • When this enlargement is not made - be in an external position and express the necessary critics on the decisions
… Currently only providing input to preparatory process. We will not exist anymore by the time a final repository will be implemented in the Netherlands (2130)…	• Providing input to preparatory process
… The role of MKG was to review the completeness of the application and suggest how it can be improved…	• Review the completeness of the application and suggest how it can be improved
… We do not take part in these interactions (due to historical reasons), however our role is a role of a watch-dog and we do have informal ways of communication…	• We do not take part in these interactions • Our role is a role of a watch-dog • Informal ways of communication
… According to our mission, I see our role as a knowledgeable watch-dog which could be involved on a national level to help to find the solution, to achieve not-technical objectives like transparency, gain trust, etc.	• I see our role as a knowledgeable watch-dog which could be involved on a national level to help to find the solution, to achieve not-technical objectives like transparency, gain trust
… The Role of Cumbria Trust is to inform our members about RWM though our website www.cumbriatrust.org	• To inform our members about RWM though our

and to expose wrongdoing/bad practices by the executive and other actors both nationally and internationally…	website • To expose wrongdoing/bad practices by the executive and other actors both nationally and internationally
To inform affected public via their local NGOs, and also national level NGOs and international NGOs interested in decision making/aiding processes in the nuclear back end, and to implement and/or support public control of decision making/aiding processes	• To inform affected public via their local NGOs and at the national level • To implement and/or support public control of decision making/aiding processes

2. Block 2. What is safety culture? Does your organisation have safety culture?

2.1 What is safety culture?

2.1.1 According to you, what is 'safety culture' in the field of radioactive waste management? Can you describe it in a few words?

Exact answer	Key words
… A proactive safety culture is extremely important both concerning a final repository and also concerning a long term intermediate storage. If we bury the waste as proposed in Danish the pre-feasibility study from 2011, we wash our hands too easily by forgetting the waste, because The Danish disposal will only be guarded by two men and a dog we have been told. A long term intermediate storage forces us to be proactive regarding the safety culture…	• Proactive safety culture
… European safety culture is very impressive. Normally safety culture in Europe is very clear in the operation and regulation of NPPs. There are concerns about Central Eastern European States notably the Ukrainian war zone, where safety culture can be slightly more lax. There are discussions around ALAP (as low as reasonably possible) and about probabilistic risk assessment (PRA). There were safety discussions around best practical environmental options, which have now been ruled out. That is a pity because many people were willing to die in a ditch to defend BPEO. We lost that very important battle. My opinion about consultation is that DAD (Decide Announce and Defend) has been replaced by UNCLE (unlimited consultation leading to exhaustion).	• Safety culture in Europe is very clear in the operation and regulation of NPPs

Involvement takes time and energy. You have to involve people right to avoid this…	
… I would define safety culture as a process where different categories of actors are concerned with their different roles. There is a history, there is a doctrine has been developed. This is a valuable concept which is based on a concept of safety with several layers. At first there is a responsibility of the waste producer and then of the waste manager and then of the authorities and then the experts attached to authorities. There are several circles, but I would see here that there is safety culture but there are also people and people are there both: political and epistemological reasons. Shortly, epistemology is a strategy to develop knowledge, to produce science. So basically these are different way and strategies to build knowledge: you can build knowledge with a procedure where you do not know what exactly to do, you start with something, you look at the effects, you think again and then you develop another action and then think again – this is an interactive way of thinking, of problem solving where you try, you think, you get knowledge, - you can call it a procedure role. And also you have a question that you are not alone and you have to take advantage of the rest of the people. You need in fact in complex words humanity, the reason why humanity is still there is that from the beginning humanity was social, they were behaving all together, they were developing a collective intelligence and distributing action for example, I will be a cook and you will do the safety, but to do that- you need their trust. It is not trust in a sense- I need you as a cook to trust you as a safety person. Trust means- it is a system which makes and mixes it and all together we will be very clever. This is not the way trust is usually understood especially in the nuclear area. I am saying that trust is a mechanism by which a society is organising itself to manage complex issues. A problem as I said earlier is a social problem- you can develop technics very fast – experts and technicians can go very fast- but they are alone and they missed the train-there is no collaboration, there is no collective understanding, there is no collective responsibility. So safety culture entails cooperation. Moreover I go to more specific contribution of non-technical people, I would say that modern society has a tendency to be more and more efficient to reach a goal and to try to be effective and they reduce complexity, they divide issues and they organise themselves separately. Yesterday I went to the	• Safety culture as a process where different categories of actors are concerned with their different roles • There is a doctrine has been developed and this is a valuable concept which is based on a concept of safety with several layers -at first there is a responsibility of the waste producer- and then of the waste manager- and then of the authorities- and then the experts attached to authorities • Safety culture entails cooperation • If you go alone- you go faster, but if you go together- you go further

conference of art. And there was a painter who said- I used to work alone and it is not very efficient to do this. It is much better to organise it with the collective of artists- to be more effective and to progress faster. There is a saying: if you go alone- you go faster, but if you go together- you go further. Therefore going back to safety culture we can say that we need people, we need their intelligence, we need the fact that they are not in the silo.	
…Difficult to answer…	
… The collective attitude and values towards safety within a group…	• The collective attitude and values towards safety within a group
… I think it would be transparency, open discussion and taking also critical opinions seriously. The current trend is to have a sentence saying deep geological repository is best. And what we say: how come? They say: that is the way it is. That is not safety culture. There is no demonstrated example of safe geological disposal existing yet. Critical research would be key for safety culture…	• Transparency, open discussion and taking also critical opinions seriously • Critical research would be key for safety culture
… Safety culture: you have to have the various stakeholders and operators to be involved in the decision-making process, agree on the method for assessing the hazards, the risks and agree on the strategy to manage them. NDA is funded by the taxpayers and there is a huge pressure to cut back on resources. NDA is under high financial pressure.	• You have to have the various stakeholders and operators to be involved in the decision-making process, agree on the method for assessing the hazards, the risks and agree on the strategy to manage them
… I have 2 ways of defining the term culture: culture in the sense of western culture or French culture for instance; culture in the sense of corporate culture. In both cases, it is a common set of values, principles and references. This is quite coherent with the SITEX-II definition, even if not expressed in the same terms. Safety culture for RWM is something that should be transversal to all organisations (including those who do not have an institutional role in the decision-making process). There is safety culture in the sense of the seriousness of application of safety in the operation of radioactive waste management (or assessment or control). This is operational safety culture. There is a wider meaning, which is a common set of principles, references (to other examples, practices, …) and that enables all actors to accorder on the fact that the safety objective will be reached: a societal safety culture. Non-institutional actors do not have to share operational	• Culture in the sense of western culture or French culture for instance • Culture in the sense of corporate culture • It is a common set of values, principles and references • Safety culture of RWM should be transversal to all organisations • Operational safety culture- culture in the sense of the seriousness of application of safety in the operation of RW • Non-institutional actors do not have to share operational safety culture

safety culture, but societal safety culture has a vocation to be shared by all. We need both operational and societal safety culture, but the latter one is underdeveloped. By building geological disposal as a technical object, we are in a situation in which we have an operational safety culture shared by institutional actors, and we are in situation in which they try to broaden this operational safety culture into a societal safety culture, but is does not work. We need conversely to have a societal safety culture that is translated in operational safety culture. The role of WISE-Paris is at the same time to contribute by its voice in the plurality of expertise sources, to get the operational safety culture out of its purely technical vision in order to inscribe it in a societal safety culture. Its role is also to contribute, notably through expertise and information dissemination, to the development of a societal safety culture. The role of WISE-Paris is also, by its capacity to enter into a dialogue of experts with operators, regulators and TSOs, to try making their operational safety culture integrate elements of societal safety culture. If we develop a societal safety culture, it will impact operational safety culture, that is why institutions do not wish to develop too much a societal culture because they do not want to modify their operational safety culture…	• Societal safety culture should be shared by all • We need both operational and societal safety culture • Societal safety culture is underdeveloped • Need to broaden operational safety culture to societal one in case of deep geological disposal • Societal safety culture needs to be translated in operational safety culture • Shared expertise and information dissemination contribute to development of societal safety culture • Institutional experts do not wish to develop societal safety culture because they don't want to modify operational safety culture
… An intangible concept…	
… A consensus on the goals for environmental safety and physical safety. We have such goal in our organisation. Other organisations have similar goal. But there is no common understanding in the whole system. Industry, regulator and NGOs have different ways of thinking. Politicians have also their way of thinking…	• A consensus on the goals for environmental safety and physical safety • There is no common understanding • Industry, regulator, NGO's have different ways of thinking
… Safety culture means to me: an open discussion on a procedure at the earliest step possible, a clear definition of the procedure, a clear and strict definition of rules, a step-wise approach done in a 'slow' thoughtful way. The information should be transparent and understandable. However, overflowing transparency is also not helpful. The possibility for independent research initiated by NGO's should exist. And of course- access to justice. You aim at the trustworthiness of the decision making process without leaving the divers interests out of the procedure…	• An open discussion on a procedure at the earliest step possible • A clear definition of the procedure • A clear and strict definition of rules • A step-wise approach done in a 'slow' thoughtful way • The information should be transparent and understandable

	• No overflowing transparency • Access to justice • Trustworthiness of the decision-making process
… On my opinion, it is a combination of all different measures that should ensure safety, for example, safety of the geological disposal should be fulfilled by all technical means, all organisational means, and some sort of "soft"-means: transparency, trust, intergenerational aspects, etc.	• A combination of all different measures that should ensure safety, for example, safety of the geological disposal should be fulfilled by all technical means, all organisational means, and some sort of "soft"-means: transparency, trust, intergenerational aspects
… Continuous reduction of risk…	• Continuous reduction of risk

2.1.2 The following generic definition of safety culture has been chosen within the framework of the SITEX-II project. What is your opinion on this definition?

Safety culture is a set of norms, attitudes, roles, and social and technical practices that a particular group of people share with respect to safety

Exact answer	Key words
… This is a reasonable definition…	• Reasonable definition
… We fully agree with this definition, which is so general that it encompasses the vast amount of information with regard to the current development process of siting and building of repository. Alternatively, we propose to develop a term "safety" into " safety of repository operation"…	• We propose to develop a term "safety" into " safety of repository operation"
… OK…	• OK
… It is a very meta definition. It is hard to be in favour or against this. You would have to go to sub-definitions to define what are the norms. Who should be involved? This is not a very practical definition…	• Meta definition • Not a very practical definition
… That definition is not bad. Safety is composed of the aspects of the hazards and the risks. You need some idea of an agreed time frame. This definition would work for many types of dangerous materials like chemical, but for nuclear, somehow the specific timeframe of nuclear should be also included…	• Safety is composed of the aspects of the hazards and the risks. You need some idea of an agreed time frame
… SITEX-II definition addresses more the societal safety	• Addresses more societal

culture, and today the issue is that there is no shared set of norms, etc.	safety culture
… It tries to make an intangible phenomenon tangible…	• Intangible phenomenon to tangible
… The norms and attitudes would be what frames the common understanding. It is a good definition. Safety culture also includes who does what and the necessity that there is a move forward. Different groups have very different attitudes of course, developed over a long time…	• Good definition • Safety culture also includes who does what and the necessity that there is a move forward
… This definition lacks the fact that there are different dimensions of roles and interests, opinions, different 'definition' of 'norms, attitudes, etc.' for every group. There is a danger of meeting 'contrary interests'. Therefore an external moderator is a necessity…	• Lack of different dimensions of roles and interests, opinions, etc. • There is a danger of meeting 'contrary interests'
… Agree…	• Agree
… While there is nothing wrong with definition below I cannot see as to how it could possibly "inspire" civil society. Can you? For me the definition below just describes a way of working, whereas it could describe a desirable outcome…	• This definition just describes a way of working, whereas it could describe a desirable outcome

2.2 Does your organisation have safety culture?

2.2.1 For you (or your organisation) what is the role of safety culture in achieving the safety objective of radioactive waste management? In geological disposal (facilities)?

Exact answer	Key words
… Not relevant…	
… Fundamental safety assumptions will provide you with your output. The problem is that assumptions are simply assumptions. When you look at the fundamental science underpinning nuclear waste management, there are enormous levels of uncertainty and complexity. At some point, these enormous levels of uncertainty and complexity are translated into regulatory certainty and simplicity. How is this magic trick done? There may be a problem in oversimplifying reality in regulation and operation of RWM. Uncertainty and complexity should be fully embraced. Having critical reflexion. Wondering "are we wrong?" Giving the decision stakes around that, the potential risk over many generations, it may be important to pay particular attention to decisions around	• Fundamental safety assumptions provide an output • Nuclear waste management= uncertainty and complexity • At some point nuclear waste management: regulatory certainty and simplicity • Uncertainty and complexity should be fully embraced • The role of safety culture is critical • Safety culture is based on

RWM. The role of safety culture is critical. Safety culture is based on earlier framing of risk. In other words, if earlier risks framing proved problematic, if there is presumption of safety for DGR, the safety culture does not matter as the fundamental assumptions are flawed. Out organisation is a research and analytical network. We do not need to develop the safety culture; we may construct theories and help with others in terms of their practical negotiations with safety and safety culture. We are not in the business of dealing with radioactive waste…	earlier framing of risk • If earlier risks framing proved problematic, if there is presumption of safety for DGR, the safety culture does not matter as the fundamental assumptions are flawed
… Putting safety first, before things like economy or politics, when making decisions on siting, construction, operation and maintenance, closure, post-closure (monitoring). Creating a working environment, where all factors (attitudes, communication, set of norms, …) point towards safety…	• Safety first • Creating a working environment, where all factors (attitudes, communication, set of norms, …) point towards safety
… Our organisations were created to address safety issues. I don't think we have a broad safety culture (e.g. in the nuclear sector at large). Notions of safety culture as a broader understanding. We developed our understanding specifically to deal with RWM issues…	• Notions of safety culture as a broader understanding. We developed our understanding specifically to deal with RWM issues
… Its role is fundamental. The safety objective needs at the same time to have its systemic global character and a part of relativism as regards the scenarios we are capable to imagine and as regards the criteria we choose (i.e. for radioactivity release in the passive phase of the geological disposal). Societal safety culture is what enables to have a shared vision of all safety tasks and therefore to build systemic safety ensuring the best possible safety on the whole pathway. And safety culture is also what will define for society the projections/scenarios it authorises itself and the criteria that will define the safety of the geological disposal…	• Fundamental • Systemic global character • Relativism • Social safety culture enables to have a shared vision of all safety tasks • Safety culture will define the safety of geological disposal
… I think I prefer strict government oversight, clear legislation and access to justice…	• Strict government oversight • Clear legislation • Access to justice
… We have the board of MKG, and the people we employ. There is quite a good understanding of the norms and attitudes. I would say that we have a safety culture in this sense. Social and technical practices are limited to influencing other actors and to partake in certain legal activities. We go back to the aims of the system: get the best environmental solutions. Being environmentally safe, and being safe regarding physical security. It is a question of the norms and attitudes. In	• The aims of the system: get the best environmental solutions-> a question of the norms and attitudes • The norms and attitudes are oriented towards long-term safety of solutions • No quick or cheap way • Ethical problem

order to exemplify here about this. The norms and the attitudes in MKG are oriented towards long-term safety of solutions, and not on doing it in the quickest or cheapest way. Our norms will be to focus on long-term safety. You will see of course the industry trying to develop norms. In reality of course they are driven very much by speed and implementation of industrial projects. But the y still try to say for example that this generation has to solve the problem (ethical argument) or that we have the waste and we have to take care of it. There is no surveillance needed of the repository because it is down here and nobody has to worry about it. Other groups also have norms. The environmental movement norms are very much focused on the long-term environmental and physical safety…	• No surveillance needed of the repository • Difference in norms of different interested groups
… On a personal level I do not believe we have sufficiently understood enough of the science and certainly the technology necessary to proceed safely with Geo-disposal. That is not to say it should not proceed, but it is to say "not yet". I have alluded to some risks as I understand them to be in my comments above but that said, oil and gas can be found in multiple geological types across the globe, laid down primarily in the Ordovician and Carboniferous periods - Some of these deposits have remained in situ for a few 100 million years which is well beyond the timeframe required for containment for some of the more radiotoxic actinides…	• No sufficient understanding of the science • Risk

2.2.2 With regard to the SITEX-II definition of safety culture do you think your organisation has developed safety culture? If yes, what are the elements of the developed safety culture? Of not, with regard to your own definition, do you think your organisation has developed safety culture?

Exact answer	Key words
… No. Just partly, as within our organisation we share the same views regarding safety, but we have no set of norms or particular practices. This question is not really applicable.	• Same views regarding safety • Different norms and practices
…It is not technical safety culture. It is an understanding that the public, civil society, independent experts are very important for safety. This requires transparency, otherwise it is not possible. There should be very concrete rules to ensure that. The regulators and implementers should be questioned more and should answer more, and not in vague answers like: we will find	• It is not technical safety culture • Understanding of the importance of the public for safety • Transparency • Concrete rules

a solution…	• No vague answers
… The rationale for creating NWAA was to address safety issues, so absolutely we have safety culture. This question is probably better directed to institutional actors having a specific mandate and role in RWM. We are an intervener trying to convince the owners and managers of the waste to do the correct things. We have the meetings, e-mails, engagement at high technical level. We look at different aspects and try to put people together to address the problems. Plurality is very important to solve all types of issues that arise in RWM. Different organisations will put different weight on this plurality criterion. Some want decisions to be taken on a purely technological plane…	• We are an intervener trying to convince the owners and managers of the waste to do the correct things • Looking at different aspects • Put people together • Plurality is important to solve the problem
… WISE-Paris has no operational safety culture as it has no institutional role in RWM. There is no shared safety culture (there is no societal safety culture now) but WISE-Paris brings a contribution to the building of such culture…	• No operational safety – no institutional role in RWM • No shared safety culture • Contribution to building such culture
… Difficult to say. However, we do have values that can be a part of safety culture…	• Values are a part of safety culture
… In so far as we are a group of people who carry out our function with no engagement with hazardous materials then in a technical sense we have no written safety culture. Where we have put on publically attended events by academics and others we always comply with all health and safety regulations and best practice…	• No written safety culture

2.2.3 If you think that your organisation did not develop safety culture, how do you convey safety values through your organisation?

Exact answer	Key words
… Safety values of NCG: pretty much so. There is a key discussion about facts and values. A key issue is: what do you do when you don't have all facts. In this context values are critically important. It is clear that we share a set of values and we work hard to communicate these values. The group is a network of high-level people and while we shared basic human values, the nature of our group means that differing individuals have differing core values. What is important for your work is this: to embrace the notion of differences not as a problem but as an opportunity. There would be different policy, energy landscapes, public and representative democracy	• Facts and values • We share a set of values • Importance to embrace the notion of difference not as a problem but as an opportunity • The idea to force an agreement on deep geological disposal is a problem- you need to accept the differences, identify them and work with them

landscapes we have to deal with in Europe. The idea to force an agreement on deep geological repository (DGR) is in fact a problem, and what you may need to do is to accept the differences, identify them and embrace the, work with them in order that further down the line, these different cultures and departments and states may be able to come to a consensual agreement. You really may have to go slowly to go further. The assumptions SITEX is making, that DGR is a practical reality, that in itself is a false assumption in scientific terms. If the initial assumption is that you have public engagement about geological disposal, it will fail, the reason being you already made an assumption that is very open to contestation. The only way to go about this is to consider the option of nuclear waste management taken in a holistic way. If anybody goes in saying that this is public involvement, dialogue, deliberation about nuclear management, then you have a chance…	• Go slow to go further • Holistic way
… My organisation is a very specific one. We developed expertise on governance, to make it specific, we are working on how safety culture can be improved (see above what I have tried to explain you). We develop research. And for me- what is the most interesting is that we are trying to develop citizen sites. One speaks of social science. We must introduce social science – because in order to grasp a complexity of the issues we need to address all the dimension and some dimensions are social, political, legal, societal, physiological, and in addition, we need citizen science- which is a social science. Citizen science means you bring the people in the knowledge production and it is different- what we are doing in SITEX is both- social science and citizen science. We are testing together new modalities of bringing people into the production of knowledge and decision making. For example, if we consider work package 4, the first task is 'bringing people' into the research, whereas in task 3 we are trying to look at the conditions of bringing people. I will give you an example: I want to involve you. And I, myself, I am on the road, I am trying to think in a large perspective. But you say- no, it is a narrower perspective. And I say- no, it is in an ontological perspective. And you say- no, it is a technical problem, it is a safety problem. We need all together. If we want to achieve something together we need to build a new meta issue, a question, we need to hybridize your initial question that was very narrow and technical, we need to bring a capacity of people to change this issue, to put it into a larger perspective, so this is- hybridization	• We are working on how safety culture can be improved • We develop research • We are trying to develop citizen sites • We are testing together new modalities of bringing people into the production of knowledge and decision making

which means- when you look at the r/a waste management, you give room to addressing complexity to all the correlated issues, and not only the narrow one which is the opinion of the waste operator. Of course, the technical safety is important, but if we want to bring the people outside (you know very often administration organises public debates and they bring a lot of people and they start to discuss and somebody raises the hand and asks his question and then the person who is in charge of the public debate says 'oh, thank you very much, but this is not in the scope of this debate') which means that the system is not well organise to give room to other issues, to hybridize issues. So our role as an organisation is to create a condition for public engagement…	
… Through moral codex of each individual…	• Moral codex of each individual
… We do not aim to convey safety values. We mostly express our concerns…	• No aim to convey safety values • Expression of concerns
… No radioactivity should be in the atmosphere. We are like watch dogs. We work through demonstrations, actions, conferences, press releases, panels, research activities, nationwide and international cooperation within the anti-nuclear-movement…	• Watch dogs • Work through demonstrations, actions, conferences…
… National legal requirements. International standards. Completeness of the information including the negative aspects. The value is about the trust. Respect of the opinion and try to meet the opinions. Transparency. Be in the position to change the approach if necessary…	• National legal requirements • International standards • Completeness of the information including the negative aspects • The value is about the trust • Respect of the opinion and try to meet the opinions • Transparency • Be in the position to change the approach if necessary
… As an organisation we don't say what safety values should be, either descriptively or numerically, where such metrics exist. We see this as the task of the regulators and health regulators. Clearly that position has to change if we are to "educate" our members and the wider public. It follows, an opportunity exists for regulators, and other actors such as NGO's to agree upon safety values and the metrics which underpin them and further, to promote them. This could be done simply by having a common point of access for EU citizens via an internet portal. I have previously outlined how this	• Task of the regulators- to 'say' what safety values are • Educate public

would be done…	

2.2.4 How would you assess your capacity to act in favour of safety? Of safety culture?

Exact answer	Key words
… Knowledge of the Hungarian situation (legal, institutional, regulatory framework), scientific knowledge about geological disposal, as well as the ability to organise consultations, events, meetings, where CSOs' and other civil society members can channel in their views and opinions. Also, participating in research projects, where, for instance, assessment of civil society contribution towards safety is assessed…	• Knowledge of the country situation • Scientific knowledge about geological disposal • Ability to organise consultations, events, meetings, where CSOs and other civil society members can channel in their views and opinions. • Participating in research projects, where, for instance, assessment of civil society contribution towards safety is assessed
… For us as for all other public and civil society organisations it is very important to try to understand the process, watch it, have critical views on it. The politicians are also very important. The regulators should have independent safety culture. It does not happen so often. National regulators very often defend their nuclear programmes. They are not critical enough. This is of course different from country to country. It is our role to push them to increase their nuclear oversight…	• It is important to try to understand the process • Ability to express critical opinion • Regulators should have independent safety culture • National regulators are not critical enough
…It is the very essence of WISE-Paris to act in the direction of the development of a societal safety culture…	• Development of a societal safety culture
… Who is against safety? Nuclear waste is per definition dangerous, and a technical solution will always have uncertainties, certainly with regards to the extreme long time horizons involved…	• Nobody is against safety • Technical solution will always have uncertainties • Technical solution has a certainty in a long time horizon
… Within the limitations of the DMP and of our resources, we feel that we have and can in the future influence the decision-making process. But there are limitations to this. One limitation is that industry has 500 times more as much money available as we have. With the funding that we have we still are able to take part in the process in a way that can make a difference. We	• There are limitations but we have and can influence the decision-making process

have the Swedish society for nature conservation, we can influence decision-makers, do lobby work. We use to work closely in the consultation process until 2011. It will increase again now as the licensing application makes it work through the system, it becomes closer to a government decision. So we tighten our cooperation with the Swedish society for nature conservation…	

3. Block 3. Conditions for interactions between institutional actors and civil society

3.1 Conditions and means to involve civil society

3.1.1 What are the most important issues to be considered for an efficient decision making/aiding process according to you? What are the conditions and means to make this process efficient?

Exact answer	Key words
… If a process is to be effective, we must provide first of all the information necessary to the public and to the local authorities. If we do not give clear and transparent information, people begin to distrust and it will slow down or block the process. In 2011, the authorities had never planned nor organised civil participation. It was just mentioned in the Decision from 2009. Regarding RWM and civil participation we should do what for instance Kjell Andersson did in the IPPA European research project. The Danish waste process has failed because the responsible imagined that they could come with a lot of waste and just dump it in a poor and remote province saying we leave this to you and you will have to live with it. People blocked automatically. The authorities have deeply underestimated the effect on local people or they know that they can do what they want. The government and DD should admit that they have made a failure and start afresh on solid foundations. My hope is that Denmark will get a long term intermediate storage for its nuclear waste, which will offer an opportunity to teach what radioactivity and radiation is to future generations. And the opportunity of course to observe the barrels and the canisters. During the lifetime of the intermediate storage, 100 years, research may hopefully come up with a method to transform long-lived isotopes into short-lived isotopes…	• Provide the information necessary to the public and to the local authorities • Give clear and transparent information • Plan & organise civil participation • Estimate the effect of local people • Admit a failure and start afresh on solid foundations • The country should offer an opportunity to teach what radioactivity and radiation is to future generations and the opportunity to observe the barrels and the canisters • Research should/may come up with a method to transform long-lived isotopes into short-lived isotopes
… The EU legislation is clear: public and local	• Bring people together on a

communities must be involved in the decision-making process. The articulation between participatory democracy and representative democracy is a complex issue. A key issue is scrutiny: how is the process formulated and managed, what are the underpinning assumptions, who is involved, there is a whole set of questions that need to be considered. The interaction between the involvement process and the decision-making process, and part of that is resolved in including statutory stakeholders (departments, regulators, industry and civil society) in the involvement process. If you run it properly you bring people together on a personal level and you generate trust and people come to speak to each other. You got a set of processes going. You cannot rush in you have to go step by step. Then you can integrate the participatory processes with the statutory decision-making process. The different steps will be different between Member States. They have different policy and public involvement patterns. But the general rules will be the same. They can be based on the STP submarine process. There was a previous process, which has failed. We identified those who we think should be involved. You have to include the "awkward bastard". There will always be problems and you have to cope with it. You will have to include people, from the start. You involve people at different levels. You do it way before any process you start, as a think tank. You run sets of pre-consultation meetings that could last years, in order to get people talking together, and understand the problem that we all share. Part of the issues is looking at negotiating expert and non-expert knowledge. You must include all types of knowledge in this discussion. Only in this way you can have any progress. Within this process you can have particular working groups on particular projects of problems. You have to be scrupulous in the reporting, the minutes. You have to be ready to be iterative, go back. And do not try to force a consensus. STP submarine dismantling process has been documented. Pre-involvement discussion must occur before the official consultation process. Pre-involvement is not a consultation; it is involvement before the actual legal consultation…	personal level • Generate trust and people come to speak to each other • You got a set of processes going. • You cannot rush in you have to go step by step. • You can integrate the participatory processes with the statutory decision-making process • Include people from the start
… It will be easier to explain what we do not need. You understand, that the concept of trust that have been used means that we are in front of people that need to develop their thinking, their understanding, and it is not in a way only the development of the information to trust me, because for many people, for many	• Concept of trust • A need to bring the people in process of knowledge production otherwise we will be trapped into the issues of acceptability

implementers delivering information- is trusting them. But No! we are in a democratic process, which means that people are in a process of investigating the need of information along this process- we need to create condition for people to self-enquiry and clearly address what is at stake for them. And also develop their own information and cooperate with the trustworthy and reliable information – so the information is situated in a societal context where we need to create conditions for people to have an access or to develop trustworthy information. The information has to be meaningful, trustworthy and it has to answer my question. So in order to do this we need to bring the people in process of knowledge production otherwise we will be trapped into the issues of acceptability…	
… A well set up legal framework; availability of exact and impartial information; awareness of any actor's potential to influence decision making process; sufficient access to independent national and international expertise for civil society…	• Well set up legal framework • Availability of exact and impartial information • Awareness of any actor's potential to influence decision making process • Sufficient access to independent national and international expertise for civil society
… Excellent organisation among the different elements of the system (described previously), a well-defined set of aspects and criteria based on which decisions will be made and a well-defined system of the different roles of actors. Cooperation from the very beginning is crucial, when no decisions have been made yet…	• Excellent organisation among the different elements of the system • Well-defined set of aspects and criteria based on which decisions will be made and a well-defined system of the different roles of actors. • Cooperation from the very beginning is crucial
… First I think there should be a change of culture and understanding for regulators, implementer, experts… That something criticising your work should not be discarded as useless. Open dialogue is still lacking. Social and technical questions should be discussed. The resource question is a big issue for us. We have very little resources. This should definitely be improved. In Sweden, the CSOs have been monitoring and contributing to the process, have received funding from the nuclear fund. This also could be done at the EU level. In research projects and platforms, it should be the same. The foal is pre-set: achieving a geological disposal. And the discussion is closed. There also should be	• There should be a change of culture and understanding for regulators, implementer, experts • Something criticising your work should not be discarded as useless • Open dialogue • Social and technical questions should be discussed • The resource question is a big issue-it should be

independent research on RWM organised and funded. When there is a research programme, funds should be safeguarded to independent research, sociology research… In order that the critical questions are well identified and answered. It is still the game that there is a research and this is done, we see the results and document on it but we are not taken seriously. Critical questions are not answered…	improved • Funds • Critical questions should be answered
… There is a capacity for the NGO stakeholders, they do not have the resources to engage in an unlimited extent. For example: it is impossible to read all reports. And it is impossible to take part to all the meetings you should, because of lack of time and lack of resources. The academics can support civil society but they need to be paid. And the proponents of nuclear projects have the means to hire academics to support their views. In the UK, we do not have technical safety organisations that are self-standing and independent. We have an implementer that is also a technical support organisation. What we would do in the British case, we would go to knowledgeable academics who have published in the field, and they would do the work that a TSO would do in another country. The best is if we make interactions at all stages. When we are framing the initial question, there should already be participation. Where you get a draft policy document. When there are local community dimensions. When you have a technical design. You have a single facility for a whole country; you should involve all communities on the transport route. The process will take much order than an executive order but it is necessary to reach an agreement. What is implemented from above, the local people do not like it.	• The need of financial and information resources • A possibility to ask knowledgeable academics to do the independent work as TSO's
… All previously-mentioned points: access to information, necessity to have a pluralistic expertise, separation of roles. In addition the issue of reversibility should be addressed. It is essential to conceive it as a process enabling to back and forth but with a form of limit in time. What worries the most in reversibility as it is defined today, is the absence of link with the notion of letting go of things. In all documents I have read on reversibility, I have read nothing on the conditions of exit from reversibility regime. There is no reflection on how reversibility should help us to take irreversible decisions. Second point, in link with the notion of systemic safety (at all steps): the conditions of robustness and resilience of the intermediary situations. Any situation in which a certain emergency pushes to act quickly poses a risk to jeopardise the level of safety we are able to maintain.	• Access to information, necessity to have a pluralistic expertise, separation of roles • Issue of reversibility should be addressed: a process enabling to back and forth but with a form of limit in time • In reversibility as it is defined today, is the absence of link with the notion of letting go of things • Conditions of robustness and resilience of the intermediary situations

Typically, we have stored waste in storages that are not conceived to last more than a few decades. We have to build sufficiently robust and resilient intermediary steps to carry on the process with serenity…	
… Democratic processes are by nature inefficient. Long term management of nuclear waste is in this matter a very complicated issue, which is very difficult to handle. I object to framing this process as something which needs (or can be) efficient…	• Democratic process is inefficient by nature
… It depends from environmental field to environmental field, from country to country. In most countries the environmental movement is not focusing as much on nuclear issues as on climate change for example. In order to have the environmental movement participate, resources are needed. In Europe, the lack of resourcing of the environmental movement generally makes it difficult for it to participate. Funding should be long-term. And opportunities to participate should be offered early in the decision process. It will bring new views of the situation, competence… It will improve the decision process. And unless there would be a real possibility to influence decisions, this is unlikely that the NGOs will participate. If they do not feel that they will have actual influence. They must be certain that their opinion would be duly taken into account and properly reflected in the decision-making process. This supposes a proper access to justice in environmental matters. In Sweden, the court will decide if the EIA actually takes into account remarks. Nuclear waste management in Sweden is not perfect in that way, as the Court can only recommend the government. The Court cannot reject the application, it only give advice. It is not only a question of participation, it is also a question of taking participation into account and having an independent justice system to enforce this. Also an early involvement is very important. The more the civil society is participating, the less risk there is of controversy…	• Depends from environmental field to environmental field, from country to country • In order to have the environmental movement participate, resources are needed • Funding should be long-term • Opportunities to participate should be offered early in the decision process • Public will participate if they feel they can actually influence • The more the civil society is participating, the less risk there is of controversy
… There should be present a minimum of standards The technical documentation should be prepared very well. The implementer should take care of it. There should be an organised process to ensure the participation of all parties. All the information should be available. The analyses of the negative comments. Good communication/stakeholders involvement. Respectful response on comments. It should be shown that all the parties are equal…	• There should be present a minimum of standards • The technical documentation should be prepared very well • The implementer should take care of it • There should be an organised process to ensure the participation of all

	parties • All the information should be available • The analyses of the negative comments • Good communication/stakeholders involvement • Respectful response on comments • It should be shown that all the parties are equal
… Nuclear Power, the management of legacy wastes and new wastes arising has a societal risk by way of radiotoxic contamination and for those living near a facility, a criticality event. The extent to which any decision making process concerning environmental burdens this generation might place upon future generations is ethically profound. Historically with CFC's/HCFC's and currently with the Paris accord on Co2 reduction emissions global leaders have acted when the evidence was laid bare. Moreover, they have done this with public support. A recent sudden uptick in global surface temperature points to yet further necessary research. An internet platform would allow for an educative process with the object that citizens come to understand RWM processes and hear alternative arguments. With effort and resource this could be accomplished within 2 years…	• An internet platform would allow for an educative process with the object that citizens come to understand RWM processes and hear alternative arguments
… There are many important issues to be followed. Out of them, CEPTA's activities are limited to (i) transparency, (ii) rights of the public to participate in decision making/aiding and (iii) related financial issues – however, in all these three fields, there are many conditions considered as inevitable, whose description would go beyond the capacities of CEPTA to respond to questionnaires (there are 10s of pages long studies on this issues, i.e. the BEPPER project report recently)…	• Transparency • Rights of the public to participate in decision making-aiding process • BEPPER project

3.1.2 In the framework of SITEX project the following decision check points of geological disposal were developed (see Fig. 1). Do they fully reflect your vision on the decision making process? Of not, explain, why.

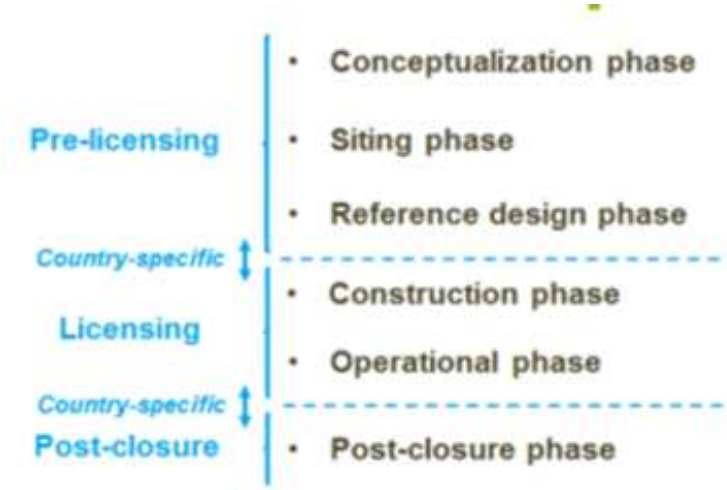


Fig.1 Decision check-points of geological disposal (SITEX project)

Exact answer
… The pre/licensing phase does not specify the step of giving permission to conduct geological surveys…
… In general yes, but doesn't contain many details. The conceptualization phase (or maybe the pre-licensing phase) is when the most decisions are made, this might be a little bit more elaborated…
… This is very much structured around the assumption that geological repository is possible. What is obviously missing is the checkpoints to check that it works. In these phases this questions should be asked in the beginning and in the end. Involve independent experts, involve the public, formulate open questions. Each of these phases, they might be ok. Each of these phases, before you go into the next one, there should be a presentation to the public and independent experts (with funding), not only putting things on the website. In order to check that it makes sense to enter in the next phase. What people say in EIA should be really taken into account. And their questions should be answered before you enter the next phase. It is also country dependent. Different country may develop different phases depending on their legislation. This identification of the steps is a good thing to clarify the process and agree on the rule of the game of this difficult process.
… In this scheme, there is one thing lacking: the issue of inventory of radioactive waste and its projection through time, which is a fundamental element for the technical sizing of the disposal, but also, politically, for societal debate about it. A more fundamental remark: this process should be articulated with a process that is upstream, to determine if geological disposal is the preferred solution. If this first process is not made correctly, those opposed to geological disposal are put aside – and consider that the issue of what type of solution for disposal was not decided by a democratic debate (with its conclusions duly taken into account). If we consider only the geological disposal as a technical object, the phases are the ones summed up in the scheme…
… We haven't developed a vision on this yet (only necessary end of this century)…
… What I would say is that for the conceptualisation phase, there is the phase of setting up the goals of the system. How safe should it be regarding environmental and physical safety. This discussion has to take place before the conceptualisation phase. What is important also is that

conceptualisation is made before siting. You shouldn't choose a site without knowing exactly what you will do there. In the post-closure phase, I will say that the work that is now being done in SITEX-II WP4.3 is the work that should be made before the conceptualisation phase. And in the operational phase you have to be ready to change all the time, you have to constantly assess your RWM system. Post-closure phase, there are different difficult issues: who is responsible? Who will pay for this? Who will communicate? Because this phase is so important, this should be taken into account in the conceptualisation phase…
…This scheme is in general OK…
… It is very well addresses for a well-developed process. However, if the problem occurs far in the future those steps should be reconsidered. For example, if we look at those steps they do not include the intergenerational aspects which are important, no public participation/acceptance steps. A step devoted to the principle of sharing and keeping of the already gained knowledge/information should be included…
… If it were the case that civil society had been engaged and involved in the decision making process and agreed that geo-disposal now, was the only viable option then the above time line would have merit because it would have support. Admirably, this is the case in some member states but not so in others where the process has been strategically mismanaged for political ends. Some nation states are prepared to involve their public in community engagement, others are not. If "policy" is to be driven without public engagement in any meaningful way then one of the most important decisions this generation may have to take will be decided by those who history will accord to having personal interests (The industry employs them) in securing a decision. – History will not look kindly on our generation if in the least we did not understand enough to participate in this decision…
… N/A (CEPTA has no vision of decision making process, but instead is interested to learn from the experience in the relevant EU member states with the most relevant experience in this field)…

3.1.3 What are the conditions and means for information and participation of civil society actors in the process of geological disposal on the perspective of the Aarhus Convention?

Exact answer	Key words
… Respondent is not involved directly in this issue, but she is aware of problems of application of AC in practice in Czech republic, e.g. Calla is involved in scoping stage of SEA procedure for Concept for Radioactive Waste and SNF Management or Atomic Act, etc., via providing comments and lobbing, chairman of Calla is member of Working Group for Dialog on GDF which is the tool for information and participation of civil society…	• Possibility to provide comments • Dialog groups
… For information, there is a need for a genuine approach of availability of information steered by the demand for information (rather than by the owners of information). Genuine access of	• A need for a genuine approach of availability of information steered by the demand for information • Genuine access of stakeholders to

stakeholders to the pluralism of expertise is also needed. And stakeholder engagement the most upstream possible in the decision-making process. We need skills building and development of a societal safety culture enabling to put all this into debate. Fundamentally, the most crucial point is that one can put into debate – in the meaning of the Aarhus Convention – the process of conception and development of a geological disposal only if one has previously validated – also in the meaning of the Aarhus Convention – the decision on the principle of choosing the solution of a geological disposal. This cannot be taken for granted in France, not for a lack of information and participation (there was a national public debate in 2006) but because the outcomes of the participation process were not actually taken into account…	the pluralism of expertise is also needed • Stakeholder engagement the most upstream possible in the decision-making process • A need of skills building and development of a societal safety culture enabling to put all this into debate
… Access to justice, expertise, to exist (re: long time frame)…	
… Early participation. Transparency. Participation with influence. Access to justice, enough and equal resources for the stakeholders. For us it is important that enough research is done. The international experience should be also included. The recognition of mistakes within the history of RWM in Germany is the precondition for taking part. It is important to have new institutions and to have a new start with new faces…	• Early participation. • Transparency. • Participation with influence. • Access to justice • Enough and equal resources for the stakeholders • Enough research • Inclusion of international experience • Recognition of mistakes within the history of RWM • Development of new institutions and to have a new start with new faces
… Financial resources. The axes of the convention should be followed…	• Funding • The axes of the Aarhus Convention should be followed
… The conditions should be that governments and all actors including NGO's who wish to agree a framework for open and honest communication between all parties. Currently and by way of example a retired London solicitor requested minutes of a meeting held in 2011 in Copeland. All 17 pages were redacted with the exception of a part page explaining that the local MP was a vegetarian. I requested information on the physical condition of B30 at Sellafield. While the	• Open and honest communication between all interested parties

surveyors report identified some obvious and worrying obstacles and algae growth, all the photographs were redacted.– Civil Society expects better than this!..	
… CEPTA is very much concerned about a very problematic, mostly formal implementation of the Aarhus Convention especially and in particular in relation to the nuclear sector information (an issue for rather long explanation in person)…	• Aarhus Convention

3.1.4 What are the important check points in which interactions between institutional actors should be developed? How?

Exact answer	Key words
… Lot of things have been tried in the past. And I can tell you that IGTP has tried hard to bring stakeholders. But civil society has moved outside because they were not happy how they were treated. For instance, in SITEX we are trying a new way where we have several levels where we have a group of 40 NGO's and we are trying to test a way to do it. Of course, the NGO's are not an ultimate goal because we need the whole society, but as a citizen I will involve myself in one-two issues but no more. I cannot address all the questions myself and I will probably rely all other questions on the NGO's. We have to find a way to bring all those people into a common system- this is something you cannot answer simply, you can try and you can give. Financial support is also one of the important conditions to allow different NGO's to create one team to do this. It should be considered at local and also national level and also at European level. For example, see the BEPPER report…	• Financial support • We have to find a way to bring all those people into a common system • BEPPER report
… Conceptualization has to happen with the participation of all members of the system. After the sets of aspects and criteria have been developed regarding decision making, check points should be applied at the main stages of development (siting, construction, establishment, periodically checking operation, closure and post closure)…	• Conceptualization-> all the members of the system participate • Check points should be applied at the main stages of development
…No particular views on this question. A good process of participation should enable answering	• A good process of participation • Necessity to organise this process

such issues. Hence the necessity to organise this process as upstream as possible. Between the mentioned actors, there are permanent interactions…	as upstream as possible • Permanent interactions between mentioned actors
…I already indicated that this should be continuous throughout the process. There should be a willingness to review and change things. This is extremely important that this would be done before the conceptualisation phase. The further down you get in the process, the more close will be the options for changing. If you do not keep people together, you will have problems and you will not reach a licensing decision with a good consensus of all the actors. This has been seen historically in RWM. The risks of having a project that will fail is much bigger if you do not have a proper decision-making system involving all stakeholders…	• Interactions should be continuous throughout the process • There should be a willingness to review and change things • If you do not keep people together, you will have problems and you will not reach a licensing decision with a good consensus of all the actors
Hearings, information platforms, information, consultations, negotiations, loop, back-and-forth approach. We have to be able to see how the comments from civil society influence the process – or why they are rejected. There should be enough time- no pressure…	• Hearings • Information platforms • Consultations • Negotiations • Back-and-forth approach • A possibility to see how the comment influence the process or why they are rejected • Enough time
… Ideally, a neutral committee should be created which would coordinate the inclusion of all stakeholders through for example public hearings. Financing is also an important check point. The recognition of the equality of all parties should be implemented…	• Neutral committee should be created • Funding • Equality of all the parties
… With a good ethos. Explain to civil society via an internet portal to which most of civil society can access, why RWM is important and matters to this generation…	• Internet portal
… CEPTA is concerned about a lacking, and/or very weak and hardly implementable European/Euratom legislation in this field. I.e. a very weak Euratom 2011/70 'Radwaste Directive' – see CEPTA's input to the BEPPER project…	• BEPPER report

3.1.5 Do you think it is important to involve civil society during the definition of context, objectives, attributes to be reached at each development step in order to allow to proceed to the next step?

Exact answer
… Involvement of civil society during defining the context, objectives and attributes at each development step is important because the civil society gets used to playing an active role in the process and will have a constant access to information. Otherwise, the civil society representatives would not keep a good overview of the entire process, and over time they could completely lose interest in trying to influence the process…
… Yes, just as it was said in the previous points: each member, including civil society, should be involved from the very beginning of the process, so that their concerns can be taken into account…
… It is a very big yes…
… Yes, obviously. This is not only important, but really essential…
… Depends if civil society organisations are willing to commit to participating in deciding where to store nuclear waste…
… Yes. How? Resource them and give them a possibility to be involved and to make a difference…
Yes, absolutely. They even need to be involved in the preparation of the energy plan where "everything begins".
… Absolutely, CEPTA consider this to be one of the most crucial conditions for achieving acceptable safety…

3.2 How is your organisation involved in the decision framing process in your country?

3.2.1 Does your organisation interact with other actors?

Exact answer	Key words
… We provide information through the media, the press (UK or international), publish writing papers. Prof Andrew Blowers was a member of the UK committee on RWM. He co-invented the concept of voluntarism (for local communities). I and other members are involved in stakeholder discussions with the Nuclear Decommissioning Authority (NDA) about decommissioning and RWM. But I have to say that the processes that the NDA run are not particularly successful. Anybody is a stakeholder. They could be statutory or non-statutory stakeholder. I and others work closely with regulators and industry, and NGOs and	• Information through the media and press, papers • Discussions with the Nuclear Authority • Anybody is a stakeholder

communities, and media and press. One needs to work closely with all. It is a very small community.	
… I am more specifically involved in Austria and Czech republic. We have contacts with all these actors. Sometimes useful ones, sometimes less useful. In Austria, we have FoE Austria (named Global 2000) is a big environmental organisations. We suggested a method how to organise the decision-making process. We want to be very active actor in this process. In the Czech republic, there are contacts with the RWM agency. But it does not make a big difference for them. I have to say that they are helpful when we need something, like information. The process is difficult, with many players. They are developing laws and procedures. I watch this closely. I discuss with experts who are directly involved in the process, and also with NGOs working in this field. The EU experience is exchange of opinions and develop them…	• Suggestion of the methods how to organise civil society • The process is difficult
… As individuals we interact all the time in knowledge gathering, networking, attendance at professional meetings, … this is all the time. As NWAA, only when we address RWM limited in this dialogue. We found that is the best way to use the limited resources we have. Lack of resources is a key issue for all NGOs. As individuals we are doing our work all the time. As an individual, with different institutional hats, we have interactions with all types of actors. We all do different things depending on our background…	• Knowledge gathering • Networking • Attendance of the professional meetings
… WISE-Paris is strongly engaged, as a stakeholder raking part in formal participation processes (e.g. Yves Marignac was one of the experts mobilised to produce a critic of the documentation prepared by the waste management organisation and the government during the national public debate on management of high-level and long-lived waste in France in 2006; he is also member of the expert group of the National Plan for Management of radioactive waste and materials). As an actor being part of the media and political landscape on nuclear issues, Yves Marignac may be solicited on these issues when they are reported on in the news; he may also be solicited by NGOs for advice, speeches during conferences, etc. Yves Marignac is also engaged in continuous dialogue on these	• Media • Advise • Speeches • Cooperation with local communities

issues with the IRSN and the National Association of Local Information Commissions (ANCCLI)…	
When: Recent What: Input into National program Euratom 2011/70 With whom does the dialogue take place? National Safety Authority ANVS Where: Netherlands How : Legalistic	
… In Sweden we have no TSOs. We interact with the regulator, with the government, with local communities and other environmental organisations. With the implementer we interact less. At the moment we are in a legal system, so much of the interactions are formalised on a legal basis. The interactions are largely through this R&D programme review. In the consultation process we interact with the implementer. But also during the consultation process, the nuclear waste council has a mandate to create different forums for discussing issues that were raised in the consultation process. There are seminars organised by the nuclear waste council. In licensing there is no dialogue, except you formally submit an opinion and get an answer. This is not a dialogue but a way to communicate your opinion. When the application is submitted, there is much less dialogue in the Swedish system. As the decision will be in the hands of the government there will be discussion in the society. The government will have to take into account the outcomes of the debate inside the society. If there is no debate the government will decide alone. Now there is a need for discussion that is separate from the legal system. We will see what happens…	• Interactions with the regulator (no TSO) • Less interactions with the implementer • Interactions are on a legal basis • Seminars • Possibility to formally submit your opinion
… Historically, in the beginning -37 years ago - we interacted with 'the other side' but it turned out, that the top-down process needed a tokenistic coat. We felt misused. We do not want to play a role in the show. So we don´t take part any more. The procedure should be open, transparent, robust, the rules should be clear and everybody should agree on them. If we are engaged only for the 'acceptance reasons'- we are not interested to have any interactions, however, if the situation changes we will take part in the process. We	• Failure of the 'top-down' process of interaction • Open, transparent, robust procedure • Clear rules • Agreement on the rules • Public has to actually take part in the process • Press-conferences • Open days, action days • Promotion of the increase of safety

interact with other parties only informally. We have, and we participate in the press-conferences, we send comments to the press (press-releases), we have open days, action days (like planting trees, etc.). We promote an anti-nuclear movement and we promote the increase of safety now and in the future…	

3.2.2 If yes, when, where, with whom in particular, how, on what issues, …etc.

Exact answer	Key words
… Calla affects other participants (implementers, regulators, technical support organisations, government, other civil society organisations) by communicating with them from the beginning of the process (since around 2001), via seeking information about the process and participating in the proceedings. Roughly for the last 10 years, Calla informs civil society representatives about the process via email list, organising events and publishing info material to motivate the public to pursue the RAW issue. Since 2010, Calla participates in meetings of the Working Group for Dialogue on DGF. Representatives of municipalities, associations, relevant authorities and government meet every 2 months…	• Communication with different interested parties • Seeking information about the process and participation in the procedures • Information of the civil society via e-mail list • Organisation of the events and publishing info materials • Participation in the meetings
When: mostly when there is an ongoing regulatory process. What: mostly on safety questions (but sometimes compliance with legal requirements as well). With whom: implementers, regulators, waste management organisations, other CSO's. Where: mostly in written form or formally organised forums.	
… So far in a past, this has always been the result of the own initiative of CEPTA (activities were stopped since 2011 due to CEPTA's key person involvement in the IPPA project as a University researcher) …	IPPA project

3.2.3 How do you assess your organisations' interactions with the other actors?

Exact answer
… We are on the forefront of this discussion theoretically and practically…

… Interactions are scarce, only when there is a particular issue (such as licensing)…
… As NWAA, interactions are good. We were able to make RWM limited change their minds on public engagement. As NWAA we also attend international meetings (ex. Meeting in Paris and Stockholm). We have wider interactions as individuals…
… There is a good level of interaction of WISE-Paris with the other actors in terms of exchanges and two-sides interactions. This interaction is useful as it enables WISE-Paris to fulfil its role of constructive critic. WISE-Paris has to understand what is the position of these different organisations and with which approach they progress in order to accurately position its critics so that the critic from WISE-Paris would be useful not only for civil society and NGs but also for regulators, operators and TSOs. WISE-Paris has all needed interactions to fulfil its role. But this is still insufficient as regards the limits imposed by available resources, capacity to fund work time, considering the role and importance of WISE-Paris…
… We have the task of developing positions backed with a good background. We have good respect in the system. They listen to what we say. This is due to the fact we have resources, and to how we work, in order to constructively take part in the decision-making process. We would not do this if we would not have the possibility to influence the decision-making. I think we get this possibility. We have a big concern concerning access to justice. We fear that the government could take decisions ignoring some of the concerns raised by civil society, but we did not see yet the end of the process…
… Lack of interest in CEPTA's inputs, with some exceptions (a complex issue needed to be dealt with in person)…

3.2.4 If some aspects are not satisfactory, what exactly would you like to change or to improve?

Exact answer
… There will always be problems. The only question is how you respond to them. You have to go in without mind set. The other problem is balancing the inequalities and power differentials between the government and the industry on one hand and communities and NGOs on the other hand. In real terms, they actually are similar in power, given the reality of democracy, of zeitgeist. This business about the importance of the word reflexivity (critical self-reflection) which is core to the management or low probability high impact risks, the deep problem with that is the "reflexive recursion", a sort of continual endless relativity. Ultimately, one of the theoretical ways of doing that is that you have to acknowledge that there will be a problem with any decision you make, but you have to decide (like if you are on bridge, see 2 people drowning and you can only jump to save one)…
… Regarding the unsatisfactory results in terms of interaction with other actors, we would like to influence or/and improve the efficiency with which state agencies respond to complaints from civil society…
…Interactions seem to be rather formal, from the side of the regulator. They mostly interact, when they are obliged by law, don't seem to take into account CSOs concerns. Interaction with the Hungarian waste management organisation (PURAM) is good, always willing to communicate, and take interaction seriously, but they are not the major decision makers…
… The bigger frame, the whole setup of the process is wrong. There is this will to push things

through, and any critique is not useful for this. This is how the process is set up and we are all stuck in it. I would not say that it is very satisfying so far. But these processes often crash and must be restarted all over again. Transparency is key. Some people understand it and some less. Some of our comments on the RWM directive were ignored 100%, and it was the same for comments made by the EU Parliament. There is this famous article 10 in the RWM directive. There is a trans boundary dimension. There are 27 countries sending all kinds of national programmes. There are many cases of misunderstanding, or lack of ambition. The EC is not recommending anymore an SEA on the national programmes. Many countries just do not want it for many reasons, and the commission does not want to insist. Some countries are going to do it anyway, others will not…
… The RB should be more independent from the nuclear industry. The TSOs opinion is directly influenced by the nuclear industry and this has to be changed. Some of the NPP's can refuse the comments if it does not suit their opinion…
… First of all, the Euratom legislation should not be considered superior to the EU Acquis (example where this was applied for Slovakia can be provided). Secondly, the Euratom Directives should not only formally mention transparency and public participation, but should be amended in a way that requirements for transparency and public participation would be very precisely defined, inclusive of the enforceable measures for cases when authorities fail to implement the Aarhus Convention etc.

APPENDIX 6: LITERATURE OVERVIEW

International organisations

IAEA

IAEA safety standards overview

The objective of the publication **IAEA FUNDAMENTAL SAFETY PRINCIPLES, 2006**, is to establish the fundamental safety objective, safety principles and concepts that provide the bases for the IAEA's safety standards and its safety related programme.

The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation. Measures for achieving this objective include control of the radiation exposure of people and the release of radioactive material to the environment, restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation and mitigation of the consequences of such events if they were to occur.

Among 10 safety principles, principle number 7- Protection of present and future generations can be connected to intergenerational governance: People and the environment, present and future, must be protected against radiation risks. In this connection, it is stressed that radiation risks may transcend national borders and may persist for long periods of time. The possible consequences, now and in the future, of current actions have to be taken into account a mechanism for judging the adequacy of measures to control radiation risks. In particular:

- Safety standards apply not only to local populations but also to populations remote from facilities and activities.
- Where effects could span generations, subsequent generations have to be adequately protected without any need for them to take significant protective actions.

It is required that radioactive waste must be managed in such a way as to avoid imposing an undue burden on future generations; that is, the generations that produce the waste have to seek and apply safe, practicable and environmentally acceptable solutions for its long-term management. But already now the generation having benefits are taking steps which include and involved future generations (just to have in mind long term storage of SF, in many countries for 50 to 100 years, involving at least 2 to 3 generations).

The older IAEA document on **safety fundamentals (IAEA, Safety Series No. 111-F, Vienna, 1995) on safety of radioactive waste and spent fuel management** also points of the Principle 8 on Radioactive waste generation and management interdependencies and requires that interdependencies among all steps in radioactive waste generation and management shall be appropriately taken into account.

This principle is incorporated in all basic steps of radioactive waste management processes as part of a total system from generation through to disposal as shown in figure A.1. It is recognised (IAEA) that decisions made in one step may foreclose certain alternatives in another step also from technical point of view, the radioactive waste safety standard programme at the IAEA emphasizes the importance of taking into account interdependences among all steps during planning, design, operation and decommissioning of radioactive waste facilities.

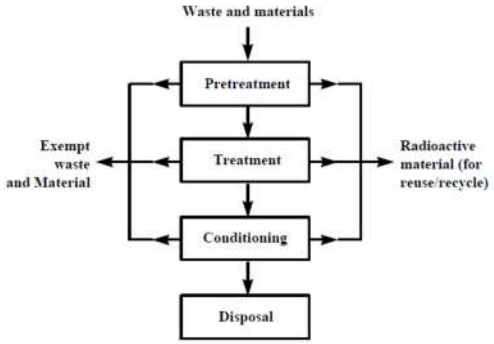


Figure A.1: Basic steps in RWM, IAEA 1995

In the **Predisposal management of radioactive waste, GSR no. 5, IAEA 2009**, there is a requirement (no. 6) on interdependences among all steps in the predisposal management of radioactive waste, as well as the impact of the anticipated disposal option, which shall be appropriately taken into account.

The explanatory text then describes further steps where interdependences can arise with the importance of compatibility between them. The main measures to achieve this are through governmental and regulatory requirements and approaches (like establishing WAC for disposal or anticipated for the most probable disposal option). There are two issues in particular to be addressed: compatibility (i.e. taking actions that facilitate other steps and avoiding taking decisions in one step that detrimentally affect the options available in another step) and optimization (i.e. assessing the overall options for waste management with all the interdependences taken into account). The use of well managed information of good quality is key to both aspects.

As the concept of interrelationships and interdependencies of technical decisions are even more relevant to the social, societal and governance dimension of decisions related to the RWM, the investigation of the intergenerational governance for geological disposal should be opened and include also relevant possibilities of RWM which influence the final decision of geological disposal.

IAEA, Geological disposal of radioactive waste: technological implications for retrievability, Nuclear Energy Series no. NW-T-1.19, 2009

The possibility of retrieving spent nuclear fuel or high-level waste placed in geological repositories is an issue that has attracted increased attention during the last decade, not only among technical experts but also among politicians at different levels, environmental organisations and other interested representatives of the public. As an argument for retrievability, it is often stated that a repository programme will need to respond flexibly to:

—New technical information regarding the site and design;

—New technological developments relevant to nuclear waste management;

—Changes in social and political conditions and acceptance;

—Changes in regulatory guidance and its interpretation, or in basic safety standards.

The technological implications of retrievability in geological disposal concepts are explored in the report. Scenarios for retrieving emplaced waste packages are considered and the report aims to identify and describe any related technological provisions that should be incorporated into the design, construction, operational and closure phases of the repository. This is based on a number of reference concepts for the geological disposal of radioactive waste (including SNF) which are currently being developed in states with advanced development programmes. The main conclusions of the study are that:

- Several Member States are incorporating reversibility and/or retrievability provisions in their development plans for geological repositories, largely in response to public concerns.
- The timescales for when retrieval is likely to be practicable on technical grounds is of the order of hundreds of years.
- Retrieval of waste from a repository may be feasible during repository operations or following closure. Depending on the concept, however, waste retrieval is likely to become progressively more difficult during the operating life of the facility and beyond.
- Waste retrieval may have a negative impact on both conventional and radiological safety. Any potential deleterious effects could be reduced by appropriate provisions, especially by incorporating the provision for retrievability as early as possible into the design process.
- Any retrievability provision must not have a negative impact on the long-term safety of the disposal system.
- There may be significant additional costs associated with retrieval provisions.
- Many disposal concepts have inherent provisions for retrievability (e.g. long-lived containers, removable backfill) and some concepts include specific design provisions (e.g. waste package handling facilities that are designed for both emplacement and retrieval). Retrieval of waste from repositories without specific provisions is also possible, but may be more difficult and costly.
- Suitable monitoring would be required to ensure that waste package retrieval remains possible.

The report also discusses some of the non-technical aspects which have a bearing on retrievability and is based largely on relevant considerations in a number of states. If there is an insistence on retrievability throughout the operating life of the repository, there is a potential prospect of an uneasy compromise between the technical requirements of the safety case and any prevailing socio-political pressures. The solution may involve an acceptance that retrievability is limited in time, and that retrieval will become progressively more difficult during the operating life of the facility and beyond. The public may favour a particular waste management strategy if there is an effective and transparent possibility for control and corrective intervention in the event of unsatisfactory performance. The retrieval of waste from a geological repository may be considered to be the ultimate remedial action in cases where control measures indicate shortcomings in compliance with performance expectations or may allow the future retrieval of a perceived resource.

Transparency is generally considered to be an important aspect relating to public acceptance of disposal. It is essential to provide all requested information and to openly demonstrate radioactive waste emplacement methodology and repository operations to foster public confidence in the safety of geological disposal. Providing public access to surface or underground facilities and demonstrating the transport and handling of waste canisters (including their retrieval) may be an essential feature in this regard. Stakeholder

dialogue is an important aspect. It is important to ensure that the safety case is openly available and communicated in such a way as to be understandable to stakeholders.

Long term protection of human health and the environment is central to repository development. The precautionary principle, arising from the 1992 United Nations Rio Conference on the Environment, states:

"…in order to protect the environment, the precautionary approach shall be widely applied by States according to their capability. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation".

Retrievability is considered as a possible means of implementing the precautionary principle in certain countries. It could be the expression of a cautious attitude for dealing with the uncertainties related to the very long lifetime of the waste. However, the timescales over which provisions for retrieval are maintained are likely to be short in relation to the timeframes that are considered in post-closure performance assessment.

In the context of retrievability, the precautionary principle also raises issues in relation to intergenerational equity. For example, leaving the repository or emplacement areas open may impose an undue burden on future generations (e.g. through associated negative impacts on short and long-term safety, cost implications, etc.). A balance is required to ensure that adopting a precautionary approach does not compromise intergenerational equity.

Ethical arguments for and against retrievability may be concept and site-specific issues. In Canada, the Nuclear Fuel Waste Management Organisation (NWMO) carried out public consultations to establish an acceptable management approach for the long-term care of used nuclear fuel. The approach has to be socially acceptable, technically sound, environmentally responsible and economically feasible. In 2005, the NWMO recommended that Canada proceed in a deliberate and collaborative way to isolate the spent fuel in a deep underground repository where the waste would be safely and securely contained by engineered barriers and the geosphere. It would be monitored and remain retrievable over time until a future generation decides to close the repository. The NWMO considered the technical implementation method to be crucial. An informed and willing host community would be identified and the process would be phased and transparent with explicit decision points where citizens are provided with genuine opportunities to influence the progress and outcomes.

The Swedish National Council for Nuclear Waste (KASAM) looked extensively at the question of responsibility to future generations. Two lines of reasoning were developed:

- Our generation, which has had the benefit of nuclear power, must also take full responsibility for the radioactive waste (nuclear waste and spent fuel), and not leave an undue burden on future generations. This also means that the long-term safety of a repository shall not be dependent on continued monitoring or maintenance by future generations;
- In a world where knowledge is increasing with time, and where value judgements are changing, future generations shall be given the freedom to make their own decisions with regard to the utilization of resources for safety and long-term protection. Furthermore, a repository should not

be designed so that it unnecessarily impairs future attempts to retrieve the waste, monitor or repair the repository.

In France, the 1991 Radioactive Waste Act prescribed three fields of research, namely partitioning and transmutation, deep geological disposal and long-term storage. The Act also set a 2006 target for review and decision. The main output of the public debate in this respect is that the next Act should:

- Deal with all radioactive waste and not only HLW and ILW-LLW;
- Regularly update the waste inventory and the National Plan for radioactive waste management;
- Underline the importance of timeframes: delay for research, for the decision-making process and a lack of public confidence with regard to very long-term assessments. As a result, possible deadlines could be one to several decades in the short term, and possibly 100–150 years for the medium term;
- Maintain a choice between various solutions, i.e. an underground repository as the reference solution and/ or durable storage facilities to await another long-term solution;
- Develop information and dialogue with the public at the local and national scale, and for having a broader independent review by experts in order to increase confidence;
- Request justice, equity and balance between generations, and also between territories (from the very local communities to the whole country).

Based on the public debate the new Act confirms the underground repository as the reference solution, states that the minimum period for which reversibility guaranteed shall not be less than 100 years, and describes the procedure to be followed before licensing the construction of a deep geological repository. This procedure will comprise, among others, a public debate before the licence application, and a new Act, to be debated and voted by the parliament after the licence application, which will prescribe the relevant reversibility conditions. Once the Act is promulgated, the licence to build such a facility may be granted by State Council decree after holding a public debate on the issue.

In another **IAEA-TECDOC-1982,** Issues relating to safety standards on the geological disposal of radioactive waste, Proceedings of a specialists meeting held in Vienna, 18–22 June 2001, also reversibility and retrievability[31] are mentioned, but in the context and as a reflection on the need to reassure stakeholders that actions taken now can be rescinded and with warning not to have negative impacts on the overall safety of facility. Therefore, the reversibility and retrievability are more the tools to achieve the public confidence.

IAEA NUCLEAR ENERGY SERIES No. NG-T-1.4STAKEHOLDER INVOLVEMENT THROUGHOUT THE LIFE CYCLE OF NUCLEAR FACILITIES, IAEA, 2011

Underlying successful stakeholder involvement in nuclear activities and related decision making are a number of basic principles that should be borne in mind and incorporated in all activities. Stakeholder involvement is not about blindly following a standardized procedure that may have been suitable for another organisation or situation, but rather to be flexible and varied according to different national laws,

[31] Hodgkinson et all: NEA/OECD/RWMC, "Reversibility: denotes the ability to reverse one or a series of steps in repository development at any stage of the programme; Retrievability: denotes the possibility of reversing the action of waste emplacement."

norms, and cultures. Given the key steps of decision making processes on national and organisational levels, a stakeholder involvement plan should be developed in consideration of relevant norms and standards. Stakeholders will differ from country to country; e.g. the title of 'statutory' stakeholders is based upon law and regulation while 'non-statutory' stakeholders can declare themselves as such. Therefore, national differences are always to be considered when implementing stakeholder involvement. The basic principles are:

- Exhibit accountability
- Recognize the purpose of stakeholder involvement
- Understand stakeholder issues and concerns from the beginning
- Practice openness and transparency
- Recognize the evolving role of and methods for stakeholder involvement

The decision-making process is in this document among the most important issues and relates to all stages associated with nuclear facilities development (and including geological repository). In all stages stakeholder involvement is required:

(1) Introduction of nuclear power programmes or new nuclear facilities;
(2) Operation of nuclear facilities;
(3) Expansion or extension of nuclear facility operation;
(4) Planning and implementation of nuclear facility decommissioning

This sequence reflects the now well accepted principle of 'stepwise decision making' being adopted in most countries with regard to nuclear facility development, during which involvement may take the form of sharing information, consulting, dialoguing, or deliberating on decisions. In many states, the process was originally developed as a way of fostering stakeholder involvement in siting and operating waste disposal facilities. It is now being applied to all nuclear facilities, with public involvement an integral part, beginning with listening more to the public and their concerns.

Exactly who the decision makers are in each stage will vary from country to country depending on national legislation, regulations, and norms. However, often the main decision maker in the first phase is the national government, whose task it is to introduce a nuclear power programme and establish a regulatory body. While the last three phases, encompass a number of decision makers, government ministries, the operator/owner operator, and the regulatory body. Even local authorities may, in the second phase, be regarded as a decision maker, though; normally it is rather one of the main stakeholder groups. All of the above-mentioned bodies should continually interact with stakeholders and appropriately involve them in the decision-making processes.

The issue of waste management actually transcends all of these stages in that it causes concerns whenever nuclear facilities of any kind are proposed. The slow progress in developing final disposal facilities in most states means that stakeholder discussions will need to address radioactive waste disposal. It should be noted, that while most nuclear facilities have a life time of less than a century, repositories are designed to carry out their function from several centuries to tens of thousands of years. Thus, with regards to stakeholder involvement, these activities require different justification and communication.

The report then discusses the differences between different stages of nuclear facilities development and also provide some recommendations and special issues on development of a strategy for stakeholder involvement, the plans for implementing of strategy, how to ensure that the capacity to effectively implement these plans are available, some inputs how to implement these plans and continually monitor the effectiveness of these actions in order to improve the approaches.

IAEA-TECDOC-1566, Factors Affecting Public and Political Acceptance for the Implementation of Geological Disposal, IAEA 2007

The report focuses on a geological disposal approach that consists of isolating radioactive wastes deep underground in a mined repository. It is not suggested here that geological disposal is the sole strategy that may be chosen or carried out by a country for managing high level radioactive waste, long lived waste or spent nuclear fuel. However, the geological disposal approach is favoured in principle by many countries for it is seen to offer advantages in terms of safety and security of this category of radioactive materials, and as a way to address ethical concerns. The review of factors that may affect whether a programme to develop and implement geological disposal strategy gains (or does not gain) societal support is given based on national examples. The level of public and political acceptance that is needed to go forward with a programme will depend on the legal and institutional frameworks and cultural traditions. In democracies, there is great demand for the views and preferences of the public and their elected representatives to be taken into account in decisions potentially affecting health and the environment

The main objective of the report is to identify conditions which affect public concern (either increase or decrease) and political acceptance for developing and implementing programmes for geologic disposal of long-lived radioactive waste. It also looks how citizens and relevant actors can be associated in the decision-making process that their inputs can enrich the outcome towards a more socially robust and sustainable solution. Finally, it aims at learning from the interaction how to optimise risk management addressing needs and expectations of the public and other relevant stakeholders.

The repository development and implementation process is divided in six stages: waste management policy development, establishment of legal and institutional framework, disposal concept elaboration, performance of underground investigations and assessment research, site suitability analysis and realisation (design, licencing, construction, operation and closure) of the repository itself. Historically, the dynamics from one stage of this process to the next has seldom been smooth. Technical feasibility as well as public and political acceptance issues had to be addressed continuously in an integrated way. Political decision making at different levels (national, regional, and local levels) interacted, also the stakeholder groups vary. These circumstances caused significant delays in many states and sometimes even caused an abrupt halt of programmes.

A set of four groups of factors — technical, structural, process, and behavioural — are proposed and discussed in the report. The technical factor incorporates considerations having to do with the properties of a site that might be selected for a repository, the details of a design that might be adopted and associated feasibility aspects and the requirements for the safety case that might be advanced to build confidence in the projections of repository performance. The structural factor incorporates considerations related to the framework under which the geological disposal programme is implemented. The way in which the ground

rules for siting and licensing procedures are established and the responsibilities among the different organisations involved are part of this structural factor. The process factor incorporates considerations having to do with how, when and why decisions are made in the course of implementing programmes for geological disposal. Issues such as the role the public plays in the process or the benefits and incentives offered to local communities that may host a repository are discussed as part of this factor. Finally, the behavioural factor incorporates considerations related to how those individuals representing the implementing and the regulatory organisations interact with interested and affected members of the public and other stakeholders.

Experiences show that a feasible solution has its technical dimension but that “an acceptable solution” will always have a combined technical and social dimension. The importance as well as the constraints and limitations of public involvement are demonstrated in numerous cases with differences and similarities with regard to other states. All conditions set have a price and have inconveniences that need to be distributed.

Below, general propositions about the effect of each factor on acceptance are derived from empirical records. In the course of carrying out this analysis, it became clear that acceptance typically took on a different meaning in first three stages of the process than in the last three stages. The first three stages mainly involve generic considerations, dialogue, and debate. The deliberations surrounding these stages are not site-specific and, consequently, decisions most often are made by policy level between authorities and affected stakeholders. Members of the general public and representatives of local communities tend not to be involved. The last three stages are, by their very nature, site-specific. Members of the general public and representatives of local communities recognize that they have a clear stake in the outcomes of decisions and almost always seek to have their views taken into account by the policy “elites.” At the generic stages of the process, political acceptance seems to be the key issue. At the site-specific stages, both public and political acceptances seem to be crucial.

Technical factors:

- As a programme moves through the stages of the development and implementation, considerations associated with the technical factor increasingly influence public and political acceptance.
- Decisions about adopting a generic technical concept appear to be more acceptable when relevant natural analogues can be referred to for supporting claims about repository performance.
- Decisions about a generic technical concept also seem to be more acceptable when there is broad agreement among experts.
- Uncertainty about repository performance drives public concerns that can arise during the site-specific stage of the process. Considerations highlighting robustness can mitigate those concerns thus increasing public acceptance.

Structural factors:

- Failure to establish an effective framework in the global context of energy production seems to reduce public acceptance once the process enters the site-specific stage.
- Ensuring the independence of the regulator from the implementer appears to be the structural factor with the largest effect on increasing public acceptance.

- Clear responsibilities and competencies and adequate coordination at the appropriate level is needed. Negotiations at different levels are further required to get a fair and balanced distribution of (dis-)advantages in a community and to agree upon transfers of responsibilities to the next generations.
- The broader debate over energy policy and sustainable development, and especially the role of nuclear power, is a complex issue for political or public acceptance of a programme for developing and implementing a geologic repository.

Process factors:

- Reassessment can become necessary because past decisions were not reached through a socially acceptable process.
- Lessons learnt from failures followed by broad public involvement can allow to improve social robustness of proposals and can result in added value.
- The rationale for using a "step-wise" process is that it allows society to move forward or to reassess at a comfortable pace. If this rationale holds, then public acceptance may increase.

Behavioural factors:

- Implementers and regulators are requested to be open, transparent, respectful and fair.
- Technical competence remains condition sine qua non for acceptance.

The major challenge however, remains to build confidence in a technology without definitive demonstration, as we are dealing with geological time scales. Further, the time period, largely exceeding the time scope of human civilisation, confronted the technical nuclear science community with other value judgements in society. In this context acceptance cannot be obtained through a technical process only. Experience has shown that a feasible solution has its technical dimension but that "an acceptable solution" always will have a combined technical and social dimension.

NEA/OECD

The Environmental and Ethical Basis of the Geological Disposal of Long-Lived Radioactive Waste

At its Special Session in March 1995, the Radioactive Waste Management Committee (RWMC) of the OECD's Nuclear Energy Agency reassessed the basis for the geological disposal strategy from an environmental and ethical perspective. After a careful review of the environmental and ethical issues, the members of the RWMC:

- consider that the ethical principles of intergenerational and intragenerational equity must be taken into account in assessing the acceptability of strategies for the long-term management of radioactive wastes;
- consider that from an ethical standpoint, including long-term safety considerations, our responsibilities to future generations are better discharged by a strategy of final disposal than by reliance on stores which require surveillance, bequeath long-term responsibilities of care, and may in due course be neglected by future societies whose structural stability should not be presumed;
- note that, after consideration of the options for achieving the required degree of isolation of such wastes from the biosphere, geological disposal is currently the most favoured strategy;

  - believe that the strategy of geological disposal of long-lived radioactive wastes: takes intergenerational equity issues into account, notably by applying the same standards of risk in the far future as it does to the present, and by limiting the liabilities bequeathed to future generations; and
  - takes intragenerational equity issues into account, notably by proposing implementation through an incremental process over several decades, considering the results of scientific progress; this process will allow consultation with interested parties, including the public, at all stages;
- note that the geological disposal concept does not require deliberate provision for retrieval of wastes from the repository, but that even after closure it would not be impossible to retrieve the wastes, albeit at a cost;
- caution that, in pursuing the reduction of risk from a geological disposal strategy for radioactive wastes, current generations should keep in perspective the resource deployment in other areas where there is potential for greater reduction of risks to humans or the environment, and consider whether resources may be used more effectively elsewhere;

Keeping these considerations in mind, the Committee members:

- confirm that the geological disposal strategy can be designed and implemented in a manner that is sensitive and responsive to fundamental ethical and environmental considerations;
- conclude that it is justified, both environmentally and ethically, to continue development of geological repositories for those long-lived radioactive wastes which should be isolated from the biosphere for more than a few hundred years; and
- conclude that stepwise implementation of plans for geological disposal leaves open the possibility of adaptation, in the light of scientific progress and social acceptability, over several decades, and does not exclude the possibility that other options could be developed at a later stage.

This opinion has been endorsed by the IAEA and the European Commission.

EU projects

INSOTEC PROJECT

The overall aim of International Socio-technical Challenges for Implementing Geological Disposal (InSOTEC) was to analyse the interplay between technical and socio-political challenges for implementing geological disposal. The point of view taken is that the implementation of geological disposal should be seen as a means to attain a safe long-term management of radioactive waste. The socio-technical challenges for implementing geological disposal were therefore looked at within the broader context of how radioactive waste management strategies are defined and how geological disposal fits into these strategies. InSOTEC wished to contribute as 'critical experts' reflecting on the development of technology and its governance. InSOTEC research focused on situations and issues where the relationship between geological disposal as a technology and its (future) social environment is still unstable, ambiguous and controversial, and where negotiations are taking place in terms of problem definitions and preferred solutions.

Reports from 14 countries were prepared (Belgium, Canada, Czech Republic, Finland, France, Germany, Hungary, Netherlands, Slovenia, Spain, Sweden, Switzerland, UK, USA) by analysing how national programmes integrate societal 'boundary conditions' with the environmental, technical and regulatory

boundary conditions for geological disposal facility design. Science and Technology Studies (STS) methodology were used by InSOTEC.

Some Definitions:

Socio-technical: used to characterise the combined social and technical nature of RWM and geological disposal.

Socio-technical combination: analytical tool to consider social aspects of a particular technology or to understand how a technology tries to respond to a particular societal demand.

Socio-technical problematisation: defining a problem related to technological project, its probable causes and possible solutions in terms of technical modifications. This concept aims to make technical democracy real to make public participation and social science research related to technical activities more meaningful.

Main results:

Mapping remaining socio-technical challenges for implementing geological disposal

Main researches on RWM conducted by organisations in the nuclear policy sector has so far mainly focussed on participatory processes and less effort has been dedicated to describing and analysing the socio-technical content of such processes. The deliverables in InSOTEC focus on participation as a means to enhance the political legitimacy of the process and to foster social acceptance by demonstrating that the decision-making process meets social expectations of fairness and inclusiveness. When participation is elaborated to also include the phase of problem definition, knowledge building, and the identification of potential solutions, more socio-technical aspects come to the foreground. Emphasis is on the influence of the technical in shaping the social in the certain direction, for example towards creating positive symbolism and cultural associations around geological disposal. Social aspects are important, but they are often considered as distinct from the technical basis for safety, which always takes priority.

The issues of safety were found to be the primary socio-technical challenge addressed by geological disposal. The country reports show how the search for and selection of sites by national governments, following recommendations from the techno-science community, has triggered extensive public opposition wherever attempted. Everywhere governments have found themselves forced to accept a more active role for local communities affected by geological disposal. Identification of the long term as a socio-technical challenge. Geological repositories will need governance structures to enable democratically acceptable decision-making over a transgenerational timescale from siting through construction to the operational, closure and, potentially, post-closure stages.

Developing a better understanding of socio-technical combinations

The case studies learned that in the case of complex socio-technical challenges, flexibility and adaptability have a greater chance of supporting democratic technological innovation than a strong emphasis on pushing for stability and (problem) closure. Separation of the technical and the social lead to the divide which influences the social sciences understanding of technological development, which often blackboxes the working of technological objects, leaving the delegation of responsibility almost entirely to technical experts. The tendency to 'purify' technical questions in order to move them away from the public domain and into the field of technical experts remains strong. The nuclear field is one where the social and the technical dimensions have traditionally been most distinctly separated, where the search for 'pure' and definitive technical solutions has been the ultimate goal and delegated to technical experts alone. The research focused on several topics:

- Topic 1: Reversibility & Retrievability (R &R): Understand the origins and emergence of reversibility or conversely, why this theme has not emerged. R &R can be perceived as a threat to the 'closure potential' of Geological Disposal as a demonstrable safe and definitive solution for radioactive waste. 'Technological lock-in': technologies may start to exhibit a sort of irreversibility due to the legacy of former expectations which seem to pre-discipline the imagination and due to institutional and financial commitments which seem to pre-discipline the potential for innovation.
- Topic 2: Siting: The notion and the practice of siting in fact implies fundamental socio-technical tensions. The Finnish case study shows how technical criteria concerning the repository outweighed some other arguments, such as those related to national interests and political appeals to dialogue and cooperation. Complexities are practically made manageable by means of various simplifications and purifications.
- Topic 3: Demonstrating safety: Safety is always a result of negotiation and development, whether this is part of a societal dialogue or – less preferably – 'only' the result of scientific exchange among experts. The regulatory requirements of safety play an important role in the lengthy planning and implementation process associated with GD. The role of actor groups and actor networks turned out to be great importance for the definition of and discourse on demonstrating safety. The behaviour and engagement of external actor groups motivated the implementer to present additional safety arguments.
- Topic 4 – Technology transfer: Technical solutions, political and governance mechanisms, such as novel forms of stakeholder involvement, are being treated as transferable objects between different national waste management programs.

Addressing the interaction among the producers and users of socio-technical knowledge in RWM

IGD-TP: this approach seems to fall mostly into a model between the public education and public debate models. The experts involved seem to come from similar disciplinary backgrounds. Stakeholders, such as NGOs, local communities, regulators, are either not involved in the platform or are only involved on a very limited scale. In some cases, R&D programmes are self-named 'interdisciplinary' but the problem is mostly framed in techno-scientific terms and social sciences remains a tiny part of a whole programme dominated by technical concerns, impeding the possibility to challenge technical solutions.

Extending dialogue on the social and ethical dimensions of the technologies with other scientists, including policy-makers and regulators in a two-way direction, before the technology becomes relatively 'locked in', could be one way to facilitate this socio-technical integration.

Practical recommendations to address implementing geological disposal as a socio-technical challenge

The social-technical divide is the dominant view in modern society. Rethinking what is social and what is technical implies researches on the following points:

- The influence of disciplinary thinking and working;
- The delegation of responsibility to technical experts or political decision-makers;
- The need for long-term governance has to be considered as one of the specific challenges of nuclear waste management.

Going a step beyond stepwise: What is understandable from the point of view of an implementer or a decision maker wishing to reduce step by step the amount of issues that need a (technical, societal or political) solution can become a major obstacle when a large part of technical issues are excluded from public discussions and public participation is reduced to selected parts of the process.

Recognising the need for participation beyond organised forms: Invited and organised dialogue risks to exclude parts of the public and to prevent them from contributing to the development of the proposed technology.

Changing the approach of conflict: Conflict can be useful, seeing it as an informal assessment of the problems raised by a technology solution. To take advantage of this opportunity means to organise a learning process that can lead to re-problematize at least some of the technical features of the project.

Overcoming disciplinary barriers: The complex socio-technical problem of geological disposal cannot be solved through a system of compartmentalised scientific knowledge.

Embracing flexibility and avoiding technological "lock-in": The 'one solution' that facilitates the 'perfect' and reflective way of approaching long-term radioactive waste management of course does not exist.

Key messages

1. More explicitly invite concerned societal actors, such as citizens in potential host communities to participate in the technical debate.
2. InSOTEC calls for a different approach in dealing with uncertainties and proposes to approach the implementation of geological disposal as a scientifically controlled, open-ended exploration towards a possible solution.
3. Continuation of research programs as an integral part of the implementation process.

MoDeRn project

Monitoring During the Staged Implementation of Geological Disposal (MoDeRn) considered how monitoring can contribute to the safety strategy and engineering design of GD facilities for long-lived RW, as well as contribute to public understanding of, and confidence/trust in, GD of RW. The overall objective of the MoDeRn Project was to develop and document the collective understanding of repository monitoring approaches, technologies and stakeholder repository monitoring programmes.

The MoDeRn project was initiated by the MoDeRn partners to further develop the understanding of the role of monitoring in the staged implementation of GD with the aim of providing examples, guidance and recommendations that may be useful. This has been achieved through the following activities: generic structured approach to the development and the implementation of a monitoring program (Workflow and Framework); developing the understanding of monitoring technologies; describing a range of illustrative monitoring programmes that show how integrated repository monitoring programme can be developed to address specific programme objectives; evaluating the potential role of stakeholders within repository monitoring programmes and considering how the views of stakeholders on repository monitoring may affect the development of a national repository monitoring programme.

The opinion that monitoring should be a checking process rather than a confirmatory process was expressed by many stakeholders. Monitoring programmes are therefore likely to be viewed by some stakeholders as being more trustworthy if clearly communicated that they are designed from the perspective of challenging that repository behaviour is as expected, and if stakeholders are able to access clear information on how each aspect of repository performance is cheeked. Some public stakeholders do have expectations regarding post-closure monitoring, mainly in view of being able to prepare for unanticipated events or evolutions. Communication of the understanding of remaining uncertainties and preparedness to allow options for monitoring to evolve and to respond to changes in the expected evolution of the repository could be beneficial.

Monitoring can be characterized as a socio-technical activity and could potentially contribute to building the confidence of public stakeholders in the safety of a particular repository project, though not by itself. Many factors play a role in building stakeholder confidence: approach to decision making, level of public and stakeholder engagement. Monitoring can maintain a watch over the repository performance, and if there is transparency about the limits of monitoring, including what could realistically be expected in terms of evolution in monitoring techniques.

SITEX PROJECT

In 2012, the EURATOM FP7 SITEX project (2012-2013) was launched in order to complement various initiatives (ENSREG, WENRA, NEA/RWMC/Regulator Forum, IAEA/GEOSAF and GEOSAF2) focused on activities associated to the regulatory review process of deep geological disposal with the view to characterize at national level the Expertise function activity devoted to the scientific review of the Safety Case with respect to the safety of the geological disposal. The general objective of the SITEX is to constitute a sustainable European and international cooperation in order to support a robust and reliable expertise function at national level in the field of safety of radioactive waste disposal. SITEX function is defined in four key points: training and tutoring, review of Safety case, R&D implementation and Interaction with Civils Society.

Main results:

Regulatory expectations and needs

Overview of Existing Technical Guides and Further Development where comparison among various documents and national approaches are given and as a result topics for harmonization and particular need were identified, such as: Time-frames associated with retrievability and reversibility (level of retrievability for each step of the facility development), Preservation of records and knowledge, Responsibilities until termination of the license, Information that shall be gathered during construction, Period after Closure & Institutional Controls, Compliance for (very) long timeframes.

The main key technical issues that must be assessed by the regulatory body at the different stages of repository development were identified with the expertise and technical support needed to perform this independent assessment.

Development of TSO's scientific skills

The common vision of technical safety organisations on the scientific and technical knowledge needed by experts for supporting the regulatory review of the safety case and assessing properly the key safety questions that will arise from the development of Deep Geological Disposal (DGD) project has been described. These needs are classified based on three main axes:

- the quality of the data on which rest the safety demonstration;
- the understanding of the complex processes which may potentially influence the long-term safety of the DGD;
- the assessment of the future evolution (in spatial extent and intensity) of these potential processes, as well as the assessment of their impact on the DGD safety.

The framework for developing and implementing the scientific research needed by the expertise function in order to developing at the appropriate level the skills and independency of the experts in charge of reviewing the safety case is provided.

Technical review method and competence building

The conditions for developing common technical review methodologies so as to seek for harmonization of the review methods and make as far as possible the expertise function consistent through the member

states is developed. Expert profiles needed for technical reviews and R&D and various activities associated with the different profiles of technical experts are given with proposition of main features of the SITEX training program.

Conditions for associating stakeholders in the process of expertise

Recent approaches for stakeholder involvement in decision making and development of geological disposal were compared and analyzed. Further, also various case studies of interactions between experts and civil society were analyzed with objective to investigate practical implementation of interactions between experts, in particular TSOs, and stakeholders in Europe in the last 15 years and to draw general lessons about the conditions and means of interactions between experts and civil society in the field of radioactive waste management (RWM). In the considered cases, interactions between civil society and experts have led to outcomes of four different types:

- improvement of expertise,
- improvement of decision-making,
- competence building and
- access of civil society actors to information.

As regards improvement of expertise, the interaction processes have led in different cases to an improvement of the quality of the expertise process and its results (e.g. better definition of reference groups, of exposure scenario taking into account local ways of life). This includes development of new processes and methods for performing expertise with local actors and civil society. Interactions between experts and civil society also improved trustworthiness of the results of the expertise process, in particular in cases where experts of various backgrounds and sensitivities are involved in the expertise process.

As regards improvement of decision-making, the interaction between experts, decision-takers and civil society has led in different cases to improve the quality and trustworthiness of the decision-making process. This includes identification of commonly agreed solution between civil society, local actors and decision-makers but also adaptation of the decision-making process to allow the different stakeholders to contribute to the quality of decisions. This also include the development of better mutual understanding between experts and decision-makers on the one hand and local actors and civil society actors on the other hand, notably the development of a common language between the different involved stakeholders.

Very often, the considered interactions between experts and civil society have contributed to reinforce skills of the considered actors. On the one hand, local actors and civil society actors have developed their capacity to address technical issues in connection with issues and questions of prime relevance for local actors and civil society and to become permanent actors in these issues. On the other hand, TSOs and experts have also developed their capacity to interact in a relevant and fruitful way with local actors and civil society.

Finally, these interaction processes have most often resulted in a better access to information of local actors and civil society actors, in connection with their questions and needs. In particular, the work of technical mediation carried out by experts from NGOs and experts close to civil society appears in particular are a key factor for fostering effective access of civil society to information on issues such as radioactive waste management, which involve a high degree of technicality.

Contribution to a longer-term evolution of governance: interaction processes as “change incubators”

Taking a step back and looking beyond the strict scope of the various interaction processes, we can see that they almost all fit in a longer-term process of evolution of the governance of radioactive waste management (and also of nuclear activities in general) towards a greater openness to different stakeholders, especially civil society. This is a long-term process of co-evolution between expert bodies and

civil society. In this process of co-evolution over a long time, the interaction processes between experts and civil society, limited in time, space and in the scope of considered issues, can be considered as "change incubators". Indeed, they open, usually off the usual system of governance, a bounded space where the different actors (especially civil society actors and TSO's) can safely experiment with new types of interactions and enter in a process of collective learning. If favourable conditions are met, the improved mutual understanding of actors, the experimentation of new roles and the new formulation of issues resulting from the interactions may contribute to changes in longer-term relationships and mutual positions of the actors, which contribute to a process of longer-term evolution of the governance of radioactive waste management (and, more generally, nuclear activities).

LAKA REPORT

The LAKA report on **Social and ethical aspects of the retrievable storage of nuclear waste** was intended to give initial inputs to a discussion about the waste problem. Report worked out three themes: ethics, sustainability and risk perception. Content of report is strongly influenced by attitudes of environmental organisations to nuclear waste disposal in 90's with strict disagreement on underground disposal solution.

Main results

The discussion about the existing waste problem often links to the discussion about nuclear energy in general. For instance, with a subject like ethics, the question is raised whether (past) production of waste can be justified. Also, from the interviews with the environmental organisations, it appears that the production is important as a theme.

Instead of the utilitarianist reasoning (ethical reasoning with weighing of happiness and sufferings, burdens and profits), the ethics of justice have been chosen. It is "core ethics", a bundle of elementary ethical standards. On this basis, future generations shall be taken into account and discounting is not done. Given the ethics of justice, future generations should have the same possibilities and should carry as much weight as the people of today. *Justice* means that we are willing to have a responsibility for the consequences of our actions. For nuclear waste, it is a long-term responsibility. In exchange for the burden of nuclear waste, there is electricity from nuclear power plants that would not be necessary in a different societal choice. This fact makes the justification of the production of nuclear waste difficult.

In chapter 4 "sustainable development" is discussed; this means that *satisfying* the present generation's needs may not compromise the *abilities of future generations.* For satisfying their needs, each generation must be able to appeal to the natural environment and may not be in a worse position than we are. Sustainable development is therefore in fact an ethical concept. In this way, sustainable development is linked to the ethics of justice.

A list of eight criteria for a sustainable energy supply is mentioned: **clean; safe; efficient; reliable; affordable; available for the long term; not obstructive; not discriminating**.

A list of 14 factors that influence the acceptance of risks was derived:

1. Possibility of serious disasters.
2. Small accidents are a signal that things could go wrong.
3. Distribution over time, and justice: no risks should be passed on to future generations.
4. Globality: the more people that can be victimized, the more unacceptable.
5. Involuntariness: one does not accept risks imposed by government or by industry.
6. Trust in government and in science is of overriding importance in storage plans.
7. Persistent beliefs: after having formed an opinion, it is not easy to change it quickly.
8. Familiarity with the risk: as almost no one is familiar with nuclear waste, a resistance against storage plans is the result.

9. Personal controllability and reversibility: people have the feeling that they are unable to control a nuclear waste storage, and accidents are irreversible when things go wrong.
10. In the perception of risk, there is no difference between aboveground and underground waste storage.
11. In people's judgement, the risks of nuclear waste, nuclear energy and nuclear weapons are closely connected to one another.
12. Stigmatization: the fear that because of nuclear waste, a community will acquire a bad reputation and will suffer economic damages.
13. Possibility to avoid the risk: for the perception of risk, there is a difference between the discussion about produced waste from closed nuclear power plants and the discussion about ongoing production from nuclear power plants in service or under construction.
14. The idea that insufficient money is being reserved for future storage costs.

The possibility of controllability, voluntariness and trust in government are important for the public perception and public acceptance.

What is the significance of priorly set theoretical frameworks in relation to retrievability? Chapter 7 starts with the history of retrievability in foreign countries. In the Netherlands, we observe that no clear form has yet been given to the concept, especially concerning the period of retrievability. We have chosen for permanent retrievability. We conclude that retrievability can prevent the release of nuclear waste and becoming uncontrollable. Control, repair and re-containing remain possible. Retrievability requires, at the same time, more efforts to keep the storage intact. Retrievability has the advantage that one can change the storage concept at a later time. With non-retrievable storage, final disposal and other options are excluded.

The idea of retrievability is in theory ethically less unfavourable than final disposal.

It is observed that permanent retrievable storage in salt or clay is less obvious, because of physical properties. This pleads for aboveground retrievable storage as the least ethically unfavourable choice.

The working out of the ethically least unfavourable option raises some questions, in particular on the question of stability of institutions that have to manage the waste. There is a threat of contradictions in the argumentation. On the one hand, the human factor is a risky uncertainty. On the other hand, retrievability means **trust i**n the risky human factor for years to come.

All organisations cooperating on the study want **permanent retrievability;** for most of them this means aboveground storage. Considered important are the possibilities for access, control, re-containment and eventual processing into non-hazardous waste. There are doubts on the possibilities of permanent underground retrievability.

In the **risk perception** of the nuclear waste problem, the factors are distribution over time, globality and the possibility to avoid risks are important. Voluntariness, trust in government, controllability and stigmatization play a role in more specified storage plans.

Controllability is the main factor in judgement on future plans and policy. **Distrust** in government influences the discussion about the nuclear waste problem.

Other conditions necessary for a discussion about the storage of nuclear waste:

- In the starting phase of a discussion, participating parties should make clear their values, ethical principles and criteria for the judgement on nuclear waste storage.

- From the beginning it should be clear that ethical and societal factors play a full role in the discussion. All groups that have an interest in the issue should have the possibility to join the discussion.
- When the discussion starts, conclusions should be open. A discussion to legitimize decisions already taken has little value. A discussion has to deal with general questions about storage and not about the suitability of locations on a prepared list of locations.
- A discussion will not automatically succeed, because of different ethical principles and different judgements about risks. The various parties have to get used to each other and learn from one another. This process, also called social learning, which require both time and guidance.
- Since it has taken a clear side in history, government is not the best appropriate authority to organise the discussion.
- An independent authority has to be established for the organisation of a discussion. It could follow the recent Canadian discussion which was chaired by the Environmental Assessment Panel, composed of independent civilians. This Panel gave, besides attention to technical aspects, attention to questions about responsibilities to nature and environment, and obligations to future generations.
- Those who are critical of storage should be given funds to develop their arguments. Among the different parties, there should be no financial inequality.
- Good information and communication is important. It is of importance to give clarity about where the parties agree or disagree. Deeper study is often needed, followed by a confrontation of different arguments.
- Discussion is possible only on the basis of a clear definition of the amounts of waste that are involved. Consistent with the basic assumption of CORA research programme, it is waste from existing nuclear power plants in The Netherlands and that no new nuclear power plants would be built. Given the fear that a discussion is used by government to build new nuclear power plants, government should give guarantees. A possibility is that government only makes a decision to build new nuclear power plants only after a binding referendum.

Key messages

Retrievability and ethics

Retrievability can prevent the release of nuclear waste becoming uncontrollable. At the same time, the necessary efforts increase because we have to keep the storage intact: retrievability means that future generations will be duty-bound to maintain and control and it will cost more.

Retrievability also has the advantage that one can later decide to store the waste in another way.

With non-retrievable, definitive storage, another option is cut off once and for all.

It is our view, therefore, that the idea of retrievability is ethically less unfavourable than final disposal. An important condition is the reservation of sufficient money to pay for future storage costs.

Permanent retrievable storage in salt or clay formations is less obvious, because of its creeping properties. Thus, permanent retrievability cannot be guaranteed. Therefore, we conclude that aboveground retrievable storage is the ethically less unfavourable choice. However, this calls into question the stability of institutions that have to control the nuclear waste and the durability of buildings and location. There remains a dilemma without any real solution.

Retrievability and sustainability

Production of nuclear waste is said to be consistent with sustainability because it would be in small amounts. But small amounts though these may be, they constitute a higher level of danger.

According to the principles of sustainability, this waste has to be stored in a way that future damage is prevented. In principle, retrievability can fulfil this, when the retrievability is permanent. Retrievability on its own is no reason to call the production and existence of nuclear waste in harmony with sustainability.

Retrievability and risk perception

From literature, we found 14 factors to be of influence in judging the risks. The factor controllability and reversibility will be influenced positively by retrievability. Besides, we mention that the 13 other factors influence the risk perception. The factor "possibility to avoid" still plays an important role in the judgements, because of the ongoing use of nuclear energy.

Retrievability and marking

Permanent retrievability means that information on the waste has to be handed over to generations following ours. On the basis of available literature, we conclude that little consideration has been made on this issue.

Retrievability and environmental organisations

From the interviews with the environmental organisations, we conclude that almost all of the formulated factors influence risk perception of nuclear waste. Especially the factors distribution over time, globality and possibility to avoid determine the negative judgements on storage of nuclear waste in general. The factors voluntariness, trust in government, controllability and stigmatization are of influence in specific plans for a storage.

Work developed in North America

NWMO

Nuclear Waste Management Organisation (NWMO) is Implementing waste management organisation in Canada. Tasked with developing a plan to manage Canada's used nuclear fuel, the NWMO developed a plan called "Adaptive Phased Management" (APM) which involves soliciting interested communities on a volunteer basis, to consider hosting a deep geological repository for used nuclear fuel. The site selection process began with 22 communities interested in learning more about the process. Currently (February 2016) 9 communities are continuing in the APM process. The selected site for the used nuclear will eventually be selected on the basis of technical safety and social considerations / community support.

Ethical and Social Framework, March 2005 and Ethics Framework Review Workshop Report 2011 (reviewed together)

Developed by external (to the NWMO) "ethical practitioners", the purpose of these documents is to summarize the roundtable (2005) and workshop (2011) activities. Participants developed an ethical and social framework within which to consider the management of spent nuclear fuel.

The ethical principles within the framework include:

- Respect for life in all forms, including minimization of harm to humans and all sentient creatures
- Respect for **future generations** of human beings, other species, and the whole biosphere
- Respect for peoples and cultures
- Justice – across groups, regions and **generations**
- Fairness to everyone affected, particularly to minorities and marginalized groups
- Sensitivity to the differences of values that different individuals and groups bring

Main results:

The goal of RWM is to find and implement an ethically sound management approach. The link is made, that an ethically acceptable option relates to the management of already-existing spent fuel. New spent fuel is another matter altogether.

The initial **2005 roundtable** developed a series of questions around the elements thought to be important for both procedure, and other particularly relevant for ethics – this was prior to the implementation of the NWMO's APM approach. These form the basis of the ethical framework. The **procedural elements** include: open, inclusive and fair (transparency) process; impartial – no conflict of interest; can those who wish to make their views known do so effectively (forms of assistance). NWMO must base decisions on best practices for science, social science, aboriginal knowledge, and ethics; justify decisions; use a precautionary approach; in accordance with informed consent – fully consult stakeholders. The **key ethical elements** include: respect for life; fairness, and ultimately, provisions to protect future generations.

To support the framework, the following issues are central:

1. Monitoring, remediation and if needed, reversal:
- verification of whether waste management is working as designed,
- if a problems occur, that provisions exist to resolve them,
- if something goes wrong, reversal should be taken into consideration as a resolution option.
2. Risk reduction vs. access:
- identifying the appropriate balance between reducing risk to the greatest extent possible and retaining access to materials for remediation or to recover (future value concept).
3. Permanent vs Interim:
- consideration of whether future technology could offer improvements / diminish harm.
4. Lessons learned – what lessons can be learned for the future of managing spent nuclear fuel.

In 2011, a workshop was organised to review the ethical framework from the perspective of the siting process that by 2011, was well underway. The workshop examined the framework to identify any emerging concerns, issues or gaps. They note that the logic of the ethical framework has been integrated into the siting process. The challenge being to demonstrate this is an ongoing process, requiring long-term commitment and dedication over all dimensions into the indefinite future. On its website, the NWMO states that it periodically reviews and builds on the framework to assess performance (published in annual and triennial reports, not reviewed here).

DOE

U.S. Department of energy (DOE) is responsible for implementing nuclear waste management strategies. (The environmental protection agency (EPA) sets environmental safety standards.

The U.S. Nuclear Regulatory Commission (NRC) is the regulator / licensing authority).

Strategy for the management and disposal of used nuclear fuel and high-level radioactive waste, DOE, 2013.

Purpose of the document is to provide the framework for a sustainable program that can transport, store, and dispose of used nuclear fuel and high level radioactive waste. The following needs were addressed:

- the policy highlighting the importance of addressing the management of UNF and HLW,
- the design of the system to address UNF/HLW management,
- Addresses the Blue Ribbon Commission recommendations,
- Basis for discussion among **stakeholders on a sustainable path forward.**

Report is based on previous work in the physical and social sciences, national and international.

Strategy includes a phased, adaptive, consent-based approach to siting and implementing a management and disposal system. Strategy endorses a pilot interim storage facility, a larger full-scale interim storage facility, and a geological repository. Time frame is an issue – must demonstrate federal commitment to addressing the nuclear waste issue. Basis for geological disposal: "best known" method for permanently disposing of used nuclear fuel and high-level radioactive waste without putting a burden of continued care on future generations

Strategy elements

System design integrates (e.g. Figure A.2) consent-based siting principles and has the following elements:

- Pilot interim storage facility
- Larger interim storage facility
- Permanent geological repository for UNF and HLW

Objective: implement a flexible waste management system incrementally, to ensure safety and security, gain trust/confidence among stakeholders, and adapt operations based on lessons learned.

The consent-based siting process offers the promise of **sustainable decisions** for storage and disposal facilities.

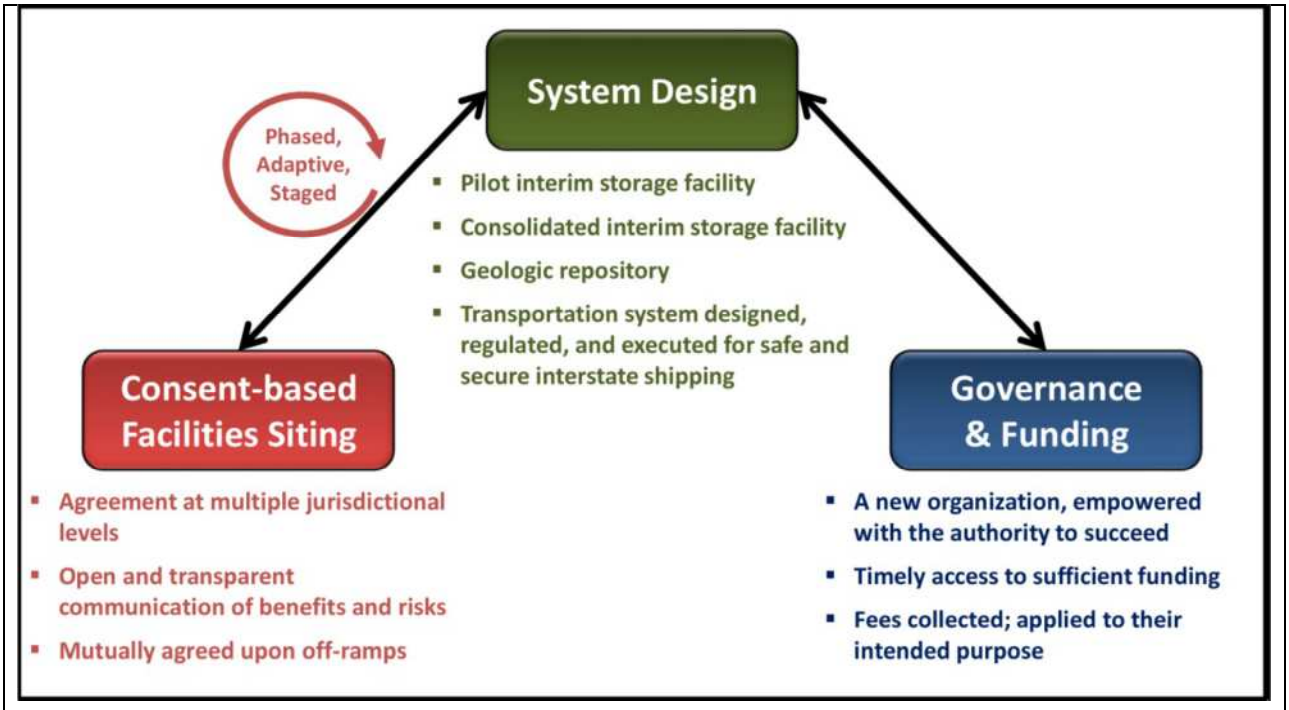


Figure A.2: Illustration of possible pathways for developing system facilities and capabilities. U.S. DOE strategy element, 2013

Issues relating to transportation

With respect to stakeholder engagement – outreach and communication are equally in importance with route analysis and emergence response planning activities.

On retrievability

Ability to retrieve is an ongoing issue. Most waste (according to Oak Ridges National Lab analysis, as cited in the doc being reviewed) states that 98% of commercial used nuclear fuel inventory by mass can proceed to

permanent disposal – based on economic viability. However, does not preclude decisions about future fuel cycle options – indicates that retrievability is not necessary for purposes of future reuse.

Strategy implementation

Critical elements:

- Consent-based process. Prospective host jurisdictions must be recognized as partners. Public trust and confidence is a prerequisite – public perception must be addressed concerning transport, storage and disposal. Focus is on protection of public health, safety, security, and environmental protection
- Management and Disposal – a new waste management organisation is needed to provide stability, focus and credibility to public trust and confidence
- Funding

Activities over the next 10 years (directly from the document):

- Active engagement in a broad, national, consent-based process to site a pilot and full-scale interim storage facilities, and to site and characterize a geologic repository;
- Siting, design, licensing, and commencement of operations at a pilot-scale storage facility with an initial focus on accepting used nuclear fuel from shut-down reactor sites
- Significant progress on siting and licensing of a larger consolidated interim storage facility capable of providing system flexibility and an opportunity for more substantial progress in reducing government liabilities
- Development of transportation capabilities (personnel, processes, equipment) to begin movement of fuel from shut-down reactors
- Reformation of the funding approach in ways that preserve the necessary role for ongoing discretionary appropriations and also provide additional funds as necessary, whether from reclassified fees or from mandatory appropriation from the NWF or both
- Establishment of a new organisation to run the program, the structure and positioning of which balance greater autonomy with the need for continued Executive and Legislative branch oversight.

APPENDIX 7: QUESTIONS FOR MODERATED DISCUSSION IN WORKSHOP WITH CIVIL SOCIETY

Introduction

The objective of the moderated discussion during the third workshop with Civil Society in the SITEX-II project (November 2016) was to reflect on and challenge the provisions and requirements related to intergenerational aspects of radioactive waste (RW) and spent nuclear fuel (SF) management, as set out in different international treaties/conventions and other EU binding legislation.

The following documents were reviewed and serve as inputs for the moderated discussion:

1. **COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (Waste Directive)**

Worldwide, the management of spent fuel and radioactive waste is governed by national legislation and international conventions. Within the EU, this is supplemented by an EU Waste Directive which provides binding legal force to the main internationally endorsed principles and requirements in this field. The Waste Directive aims at ensuring a high level of safety, avoiding undue burden on future generations and enhancing transparency. It supplements the basic standards referred to in the Euratom Treaty as regards the safety of spent fuel and radioactive waste without prejudice to the Basic Safety Standards Directive.

§24 of the Waste Directive says "*it should be an ethical obligation of each Member State to avoid any undue burden on future generations in respect of spent fuel and radioactive waste including any radioactive waste expected from decommissioning of existing nuclear installations. Through the implementation of this Directive Member States will have demonstrated that they have taken reasonable steps to ensure that this objective is met.*"[32]

2. **Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management, 1997, IAEA**

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was adopted by a Diplomatic Conference convened by the International Atomic Energy Agency at its headquarters in September 1997. Its preamble recognizes "*the importance of informing the public on issues regarding the safety of spent fuel and radioactive waste management and desiring to promote an effective nuclear safety culture worldwide*". Article 4 on General Safety Requirements states that *"[e]ach Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards. In so doing, each Contracting Party shall take the appropriate steps to [...inter alia] strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation and aiming to avoid imposing undue burdens on future generations."*

3. **Convention on access to information, public participation in decision-making and access to justice in environmental matters (Aarhus Convention), 1998**

[32] Note that the end of the English language text is ambiguous; the French text, for example, may be translated: "***When*** *implementing this Directive, Member States* ***will*** *demonstrate that they have taken reasonable steps...".* In other words, it is indeed a requirement to show which reasonable steps have been taken. The English wording *stricto sensu* states that the mere fact of implementing the Directive constitutes a demonstration of such reasonable steps.

The preamble of this UNECE treaty lays out the logic of this legal instrument:

"*Recognizing that adequate protection of the environment is essential to human well-being and the enjoyment of basic human rights, including the right to life itself. Considering that, to be able to assert this right and observe this duty, citizens must have access to information, be entitled to participate in decision-making and have access to justice in environmental matters, and acknowledging in this regard that citizens may need assistance in order to exercise their rights,*

Recognizing that, in the field of the environment, improved access to information and public participation in decision-making enhance the quality and the implementation of decisions, contribute to public awareness of environmental issues, give the public the opportunity to express its concerns and enable public authorities to take due account of such concerns.

Acknowledging that public authorities hold environmental information in the public interest."

4. **Convention on environmental impact assessment in a transboundary context (ESPOO Convention), 1991**

This UNECE treaty states in preamble:

"Aware of the interrelationship between economic activities and their environmental consequences and affirming the need to ensure environmentally sound and sustainable development. Also determined to enhance international co-operation in assessing environmental impact in particular in a transboundary context. With this convention, a process of notification to the affected parties is defined in view of possible transboundary environmental impacts and opportunities for participation in the environmental impact assessment procedure are given."

5. **The NTW BEPPER report on "Transparency in Radioactive Waste Management"**

During 2015 an effort of NTW produced a report on transparency in radioactive waste management (RWM). Transparency in this context includes processes for public information and communication and public participation and engagement in decision-making.

The report reviews the present transparency regimes and describes ways forward for effective transparency in RWM.

Responds on questions for the SITEX-II Civil Society Workshop n°3

The relevant elements related to intergenerational governance from the international conventions and EU Waste Directive were transposed into questionnaire. It was than discussed during the third workshop with civil society. The results are presented in the minutes of the workshop but the main elements of the discussion are synthetized below:

- A few years ago, the issues of GD went somewhat along the scheme that as soon as the declaration/ the authorization is given by the nuclear authority, the process would go linearly with step by step approach to the implementation. But it is thought now that the regulators have to find some milestones where they will consider re-examination of the decisions;
- There are two principles that are usually applied in the current system for RWM: the 'polluter pays' principle and intergenerational equity. That means that on one hand there is the ethical pillar and the requirement for the polluters to build up financial means and on the other hand

intergenerational equity which says that every generation that benefits from nuclear power should honour its responsibilities and should deal with RW in a manner that protects humans and environment;

- The legal basis has also to be considered. There should be three characteristics applied: sufficiency for the funds (contributions should be in line with the total fund collection period), availability of the funds (period review should be vital) and again this fund should be used only for RW;
- Time should be given to make the necessary provisions for funding and adapt to all changes due to different RWM pathways. It is difficult to evaluate what funding is needed if what is going to be designed for operation is not known or still imprecise, so periodical updates are needed;
- The regulator could say to the government – 'we're not going to give a license to that facility. We judge the financial provisions are insufficient';
- A good funding system should assure that such funds are indeed sequestered and fructified – to cover unbudgeted expenses which will nonetheless appear likely;
- The reasons why the CS has a say into the funding availabilities is that sometimes no legal requirements are respected to provide sufficient funds. If the producer has to increase the price for electricity, the CS is going to pay;
- In some countries (e.g. Sweden) the funds are available, regularly recalculated and adopted to the needs of the GD establishment, what is lacking there is uncertainty evaluation.
- Another well-known example - Hinkley Point NPP: government issued a funding plan; producers said "we cannot cover this", so State accepted this and said that the State would take the shortfall – which means that present-day tax payers at any given (future) time will absorb the burden;
- There is no coverage for the RWM in the circumstances involving release of radiation, like accidents like Chernobyl and Fukushima, and the costs of the clean-up of the radioactive waste;
- There is a need to have an external evaluation of the costs needed for RWM and it has even been proposed that waste generators pay in advance based on the real costs and not in proportion to generated energy;
- An important issue is where the provisions are secured. In many countries, it is just in the accounting of the waste producers. The questions are: where is the money? What is the scrutiny of how it is managed? Who has the money?
- The request for transparency given by Waste Directive is a good thing for the CS involvement, because the implementer has now to listen more carefully to public opinion and has to manage the siting process by consultation of the public on its decisions;.
- There are many models of how to organise public to be involved in decision-making process on RWM: examples of Local Information Commission model in France at each nuclear facility as in France, with national federation ANCCLI or The Cumbria Trust in UK with true presence are considered credible discussion partners by officials;
- It is very important that CS be involved with a goal to advocate and backup the regulators and TSO's should they consider that some aspects have not been properly taken into account;

- Some tools, like the PEP exercise, can be seen as a way to give an opportunity to the newcomers to appropriate the whole story. Considering very long periods of 100 years, can we imagine that people coming in will take for granted all the previous decisions;
- A Europe-wide "engagement" (or actually information) taking the form of a web platform has been proposed by a member of NTW, where users could select a language and choose topics of interest. The questions then rises on who 'feeds' this site, who manages it, how is interest created, and what are the opportunities afterwards for each citizen; nevertheless such a platform would raise public awareness concerning RWM and, with agreement from industry actors offer a mechanism for continued CS engagement.
- It can be thought that some governments may see in transparency a way comparable to propaganda enabling to give the public a small amount of information with no consultation. In most cases the regulators are not strong enough to say that it is not acceptable. The only way to circumvent this is to continue to demand that there should be a resourced fund for critical appraisal of the project. One good model is the MKG model: the waste producers have to create a fund and they don't have any control how it is used though it can be used to contradict them and their plans or even interrupt their plans;
- The legislation has to be updated in the countries where the Waste Directive has not been translated yet. The example of the MKG model should be taken into account and if possible implemented in every country;
- It has been pointed out that the tasks of the regulators have to be reconsidered in order that one of their priority task should also be to engage the public;
- The process needs even more transparency with an obligation to publish national reports and programs. The programs should be published and the question becomes then to evaluate what level and amount of information is pertinent;
- What role should non-institutional experts play? How does the process take into account their concerns? The national RWM plan which exists in France is reviewed with CS, so experiences exist;
- The importance of the involvement of CS needs to be recognized at the national and institutional level in order to make the necessary resources and funding available for CS participation.

In addition, some representatives CS and SITEX-II partners from the third workshop have further responded in written to the questioned raised. In total 6 participants answered, and the responds were recorded as they were given below.

All responders did not provide the answers to all questions. The following LEGEND applies:

- Blue - NGO
- Red - NGO
- Light brown – Research institute
- Green - NGO
- Violet -TSO – Research institute
- Orange – TSO

The number of answers is very low, so the results provide just the information about different positions and have no general value. In black the original questions are written.

- Member States should ensure that adequate funding is available for the management of spent fuel and radioactive waste, the costs of the management of spent fuel and radioactive waste shall be borne by those who generated those materials.
    - Questions:
        - How to assure (technically, financially, politically...) adequate funding by generators of RW and SF under unpredictable conditions (bankruptcy of the responsible generator, ….)?

One way to attempt this is to have guaranteed securities that are set aside and that can be used in case of bankruptcy. However, such securities likely have to be set aside not by the actual reactor operator company that has no holdings except for the reactors that have no value if there is an economic problem. The reactor operating companies are, however, often owned by larger energy companies that have to supply the securities.

There should be a protected fund held by the state and not accessible to current budgetary needs. There could be European oversight to ascertain that the money is not spent on other dossiers. However, it must be recognized that the sums needed to construct and operate a repository or other installations are astronomical, in the many billions of euros. It is unreasonable to imagine that producers will accept to create short-term reserves for the full sum in their current budgets – they could just as well declare bankruptcy immediately. The estimation of sums in view of budgeting by producers, the choice of discount rates, and the payment plan becomes the object of a difficult technical-political negotiation. This is unavoidable and it should be conducted in full transparency with an independent authority in oversight. In countries where the safety authority is too tightly tied to producers or is the servant of the current political power, another (international) oversight must be arranged. When considering this financial landscape it becomes necessary to envision a larger direct contribution by electricity consumers to RWM; to present a transparent analysis of the economy of nuclear power and RWM, to show where the state and other actors in the past have not clearly identified accounts, and to show where the banking industry and shareholders have pocketed (if it is the case) the fruits of investment for RWM; and also to make a transparent analysis of the overall energy economy to ascertain where and whether the charges represented by RWM are handicapping the development of renewable energies.

Basically, it is good when the state (e.g. the Czech Republic) is in charge of setting aside financial resources to cover the costs of radioactive waste management. Countries that rely on the savings of nuclear power plants' operators risk that the resources will not be available. However, if the state authorities set the amount of savings low, as in the Czech Republic, they endanger future tax payers who will have to pay for the difference.

Each RAW and SF producer has to contribute to fund from the beginning of the nuclear facility operation. If the facility will be stopped for some reason, the needed money will be provided by one who decided to shut down the facility.

The only reasonable way is to create a fund controlled by the state (with limited chance of the government to retrieve the accumulated money) collecting fees from waste generators.

- Who (regulators, Technical Support Organisations (TSOs), Civil Society (CS) representatives…) should be involved in the decisions related to the present-day estimation of necessary funds?

Decisions should be taken by political bodies (Government/Parliament), regulators should provide decision-making documentation, there should be a wide consultation process, including also the civil society, in developing the decision-making documentation.

All, with the provisions for independence and transparency mentioned above. We should not ignore that producers have to be involved in the decisions too and that politicians will be very active in designing tradeoffs.

In a way, all parties mentioned should be involved in decision-making process. Regulators, who represent the state, play the key role. So do the operators of nuclear power plants, who (as producers of RW and SF) must be able to quantify / estimate the amount of funding needed in the future. And also, politicians. The whole process should be controllable by the public as the public will have to pay the difference if the financial thresholds are set low. The financial resources required must be calculated in correspondence to the amount of RW&SF from current nuclear power plants. These calculations can't rely on that more and more NPPs will be built and that electricity generation profits from new NPPs will pay for the disposal of existing RW&SF. Because if the reactors are not going to be built in the end, a large deficit would remain, which again would have to be paid by taxpayers.

The estimation of the cost of RAW and SF management is currently best realized through the TSO and also estimation of necessary fund.

It should be a state institution (does not matter which), but its estimates should best be independently assessed (might be a TSO or CS controlled team).

- How far in the future should such funding be available? How should funds and institutions be managed that the future value of funds intended to be paid out over the long term is not greatly discounted?

Funds should be created to allow all work for decommissioning, management of radioactive waste and final disposal. This means the fund has to be constructed to be available for up to one hundred years. Enough money has to be collected into the fund to have a good margin for future cost increases and surprises.

I would say until such time as an independent science and technology committee advising civil society came to the conclusion (and could demonstrate so) that all the acknowledged Science and Technology gaps have been adequately understood then funding should continue to be provided.

Whatever the reply, it is clear that the fund must be constituted immediately and that a clear set of rules for its investment and sequestration must be established. I don't know what the legal landscape already foresees in this area.

How far into the future should the funding be available? At best, the financial resources must be secured not only for phases of construction, operation and sealing the repository. How should the funds be managed, so that they are not devalued? Certainly, the financial resources cannot be managed in a risky way, such as trading on stock exchanges, and so on. Therefore, it is important to have money under control and to separate them as much as possible from the money used for the normal use from public funds. For example, not to pay the state's debt with the money, because then the money would be unavailable.

Financing should be available throughout the life of RAW and SF. The funds should be controlled and administered by the state and on the financial market should behave as financial institutions.

Depends on national legislation (terms and conditions of the institutional control of the closed facility); in any case, the period shall extend the planned operational period of the facility.

- With respect to the Transparency Article 10 in the EU Waste Directive it is required that Member States, in keeping with their national legislation and with international obligations, ensure a) necessary opportunities for the public to participate effectively in the decision- making process and b) provisions for information (to the extent that this does not jeopardize other nationally or internationally designated interests such as, inter alia, security).
    - Questions:
        - How to organise decision making in the process of geological disposal establishment (for example in medium term periods of 20 to 40 years) taking into account public participation?

Civil society must be allowed full information transparency into the decision-making process. Not only to the work of the government and regulator, but also to the work of the implementer. Civil society must be involved and consulted very early in the decision-making process and throughout it. Civil society should be resourced so that it can contribute fully. In the decision-making process due account must be taken of the input from civil society. That this is so must be secured in a system for legal access to justice, all the way up to a decision in government.

I will say, the only way CS can be adequately informed is by way of the internet. I have said this passionately since the Paris meeting in August 2015. Additionally, I have given a vision statement on what I believe to be deliverable. – I also believe there is enough good will in most Nation States by all actors to fully engage with such an initiative. “After all the risk is to CS and it follows it is ultimately a CS problem to solve”.

Integrating public participation has to be undertaken immediately in every country where it may be lacking or insufficient, with an experimental attitude so that errors or difficulties do not result in cancellation of the efforts. The cross-cutting international best practice fora like those under the OECD Nuclear Energy Agency, European FP6 & FP7 programmes like Cowam, RISCOM, ARGONA and IPPA, the Aarhus Convention and Nuclear roundtables with the support of the UNECE, and now the new and diverse experimentations under SITEX, Nuclear Transparency Watch, and future Joint Programming should be brought to the attention of all state actors in a positive way. As institutional heavyweights, the EC should call on IAEA and OECD together to brand such experiments as valuable to society and create a culture in which all Member states expect meaningful public participation in RWM, lend help to their neighbours who may have difficulties in implementing it, and finally name and shame countries who lag behind for false political and financial reasons.

If public participation is to be effective, the right of veto must also be included in the decision-making process. Otherwise, a fair debate about RW&SF management is really needed. WMOs should not try to buy the public's consent (as Czech RAWRA does), but they should discuss the problem with individual municipalities and refrain from promoting the location for the repository if they encounter disagreements among municipalities AND/OR if the geology turns out to be unsuitable. WMOs should not only mention benefits, give bribes (called "incentive contributions" in CZ), but they should talk fairly about the risks with the municipalities. And the discussion cannot be limited only to the affected municipalities because the repository will have an impact on the wider region, so it is necessary to involve other inhabitants as well.

Via group of decision makers – representing various stakeholders and experts.

There are 3 main decision makers: operator (technical decisions), government/parliament (decision in principle), regulator (licensing). The CS shall be involved in the first two areas; its representatives should be included in teams preparing inputs for decisions. CS shall be informed transparently about licensing decisions, but it shall not be included in this process (the process is specified legislatively, there is no space for considering "opinions" of any external body.

- In your opinion which types of public participation opportunities should be ensured in priority? What is your justification: because they are most efficient, most fair, most feasible under current law, or for other reasons?

There should be general participation and information process set up early in the process, following the whole decision-making process and at a high level of decision-making. All stakeholders should be included (also civil society organisations). Communities and civil society organisations should be resourced. There should also be a long and fair consultation process for each project. Due account is to be taken of civil society input and there should be access to justice to ensure this. Both types have to be developed simultaneously. The first type may be easier to develop early in a RWM programme, but there may be local cultural problems to overcome.

The internet platforms allow for CS engagement.

In order for public participation to be effective, a decision-making process must be allowed from the start and at all stages. And the broadest debate must be supported. The debate cannot be avoided today like that there is nothing going on, because then will turn out that there is a lot at stake in some sites and then the state will no longer want to back out of/abandon those sites. So the debate must be open from the very beginning and include the widest possible scope of possibilities. Our NGO lacks a debate on various waste management methods (alternatives to DGR), and on the fact that nuclear energy produce RW&SF. When some people call "we want new reactors," it also entails having another thousand tons of RW&SF to deal with. However, such a public discourse is not going on at all at the moment. The debate on the national program takes place only formally (currently, we keep waiting for the SEA process to be finished with a public hearing that has been postponed since autumn 2016).

It depends on the decision stage:

- For strategic decision on solution and initiation of siting process – deliberation meetings and conferences at the national or regional level should be kept. In this stage national and local committees are considered as the most efficient, which can guarantee sustainability and long term confidence. The rules for participation and competencies can be set very simply.
- For long term participation I would recommend local partnership.

Further to EIA/SEA (legislatively ensured participation), the CS shall take part in feasibility studies: this is the most effective tool for searching consensual solutions.

- Some decisions taken in this period are not reversible: does it mean that the future generations are represented by current generations? Can this eventuality be properly taken into account by the decision-making process?

All decisions will affect future generations. As long this is acknowledged then it should not pose a problem. Special care has to be taken with irreversible decisions, which anyway will be more difficult to make and therefore naturally will be paid more attention.

Perhaps a threshold should be set as to reversibility – i.e. will it or is it likely that something could be reversed by a future generation should it be shown that a bad/wrong decision had been made. It's just a thought and I don't know how to develop it further, but it seems to me reasonable that future generations should have the opportunity to correct a mistake.

The decision to produce nuclear power alone is irreversible as waste is generated. The same is true of new nuclear reactors, which mean the irreversible decision to create additional RW&SF. So yes, the decision of today's generation of people shifts the responsibility onto the next generations. If we focus on the construction and operation of the DGR within the next two generations, then once again we shift our responsibility for today's decision on these generations when by saying: "There is only the possibility of a final deep geological repository." And the next generations will have to deal with it somehow. (For example, they will find out that this approach is not entirely right, or it may be otherwise). However, the same risk is also posed by a decision "we have no solution, and we will keep RW&SF in the intermediate storage". And that leaves the next generations with the decision to tackle this problem. How to take this into account by the decision-making process? Not sure. To acknowledge it at least is the start to do something about it.

This generation is asked to take responsibility for solution and not to leave burden on future generation. So the future generation has to be represented by current generation. If we will discuss the proper solution for too long time it can happen that decision will never be done. We are not able to avoid every mistake and at any stage we have to accept that mankind is not perfect. If decisions are made, consensus should be reached and record on consensus reasoning should be reported for future generations.

Every decision is reversible; future generations are for sure represented by the current generation (I do not see any other option).

- How could the participation in long term after closure of repositories be transformed into stable long-term forms to assure intergenerational representatives.

This is likely very difficult. It may be possible to establish a system of "rolling stewardship" but it should also be connected to another activity such as a nature reserve or an archive system, preferably an archive system broader than just the repository.

Perhaps it would be good to have a committee or a group of people living in a wider area, which would involve all generations, i.e. trustworthy people, whose opinion is respected by others, of all age categories: young, adults, elderly. They should form an ethics committee at the site of the final repository. However, if we do not have the selected final site yet, this scenario can not quite work. This ethics committee should not be even confused with a group of mayors and others which serves just for money distribution, e.g. games on the security commission, which are not independent security committees as near the Dukovany NPP (www.obkjedu.cz) or near the former uranium mines of Dolní Rožínka. This is not the way. It is a short-term solution that more or less serves to buy consent of municipalities and create the impression that someone controls / oversees the process without actually doing so.

Under the current conditions, where there are several potential sites considered for DGR, there is a need for a truly independent body at the national level, which should include representatives from those sites and other truly independent / impartial experts. Experts, such as historians, sociologists who will oversee the ethical side. Not the technocrats. This is also related to memory restoration, which is difficult to consider within the next 100 years and beyond. However, it is clear that there must be some information

on how to manage RW&SF in some form. In terms of effective hazard warning, e.g. http://www.constructing-memory2014.org/ (presentation at https://www.oecd-nea.org/rwm/rkm/constructingmemory/).

Important is to keep records on decision, records has to be publicly available, to be connected to local community which needs to be involved, via local municipalities, regional associations of municipalities, connection between responsible state institution (regulator etc.) and local government, this has to be institutional level, to keep long term interest of future generation on closed repository they have to hold some "stake"/interest to keep memories. E.g. environmental monitoring is long-term interest.

By establishing proper knowledge transfer mechanisms and memory keeping principles.

- Is there any other possibility to take on board future generation in decision-making (also having in mind that the reversibility and retrievability in some management programs are developed only to obtain public acceptability)?

The broader the participation (age, gender, education, social status) the better the input should be. A special focus on long-term thinking could perhaps help.

Again, I point to the possibilities of the Internet. If taken seriously as an educational awareness model and also assuming that previous generations had been exposed to Internet technology then it follows a future generation will fully understand and be familiar with whatever their current knowledge status is. It would seem reasonable to me that just as we study points in history so will a future generation. Database technology allows us to explain in detail as to why previous generations took the decisions they did and with reversibility/retrievability in mind. As to management programs designed only to achieve public acceptability, I am uncertain if they will succeed for this reason: If a nation state or group of nation states implemented a CS orientated information and CS engagement platform in an open and transparent way then others who had not done so would be driven by their own CS to do so. Aspiration to excellence is a natural human condition.

It is important to integrate a female element (more than today) into the decision-making process, because women tend to look more thoroughly into the issue from perspective of their own children, and people with a long-term relationship to the place (who have got their roots in the site). Both groups tend to look more responsibly towards the future, compared to people living on the site only 10 or less years or just one generation. Again, there is a connection with keeping memory records (RK & M). This should happen irrespectively of the method you choose, see reversibility and retrievability. It's hard to judge today, but it's basically good when retrievability is possible considering technology that's going to work in about 50 years ahead because we cannot imagine now what technological progress awaits us later.

However, clinging to the scenario today that RW&SF are going to be sealed with concrete in the repository, is somewhat short-sighted. From the point of view of today, the possibility should be seriously considered for the future in about 70 years ahead, and public control should strive for this option to be taken seriously, not just as a PR. It is difficult to say this in the context of those long timeframes and in a situation where there are no more advanced technologies than they are today. Therefore, future plans should also consider R&D into technologies that would be capable of ensuring the retrievability and safe repackaging of RW&SF, for example.

It seems to be counter-productive to keep some kind of flexibility for future generations on one hand and on the other hand not to leave burden on future generation.

R&R principle was developed exclusively to gain the public acceptance, it may even contradict long term safety of the facility. As every facility can be retrieved (the only question is regarding cost optimization) future generations are on board: their position could be enhanced by designing disposal facilities which will not complicate potential retrieval operations.

- Which information could in fact jeopardize security, confidentiality, etc.? Should these limitations be reviewed today? Which concerns are justified, which appear unjustified from the point of view of public participation now and in the long term?

Information about plutonium content and isotope composition in spent fuel in a retrievable geologic repository is problematic. As all planned repositories are more at 500 m depth and are more or less retrievable this issue will not go away and has to be dealt with in the forwarding of information.

More research into Plutonium deposition must be undertaken as a priority. At the moment, fears of jeopardizing the security and the escape of information are not justifiable, because there is nothing to conceal. In the future, they may and will need to discuss this. And the debate about this will evolve depending on the development of the surrounding society. It will reflect on whether risks increase or not. Again, there a connection with keeping a long-term memory and how to do it with today's knowledge so that it also works in an unimaginably future ahead (e.g. transferring know-how from generation to generation?). It will always be necessary to resolve the contradiction between information on warning of the disposal of hazardous waste and preventing unauthorized people from getting access to it (such as terrorists ..).

Every information enhancing unauthorized access to waste /SNF.

- The content of national programmes is prescribed in Waste Directive, foreseeing many obligatory chapters in which the whole RW and SF management approach should be explained with significant milestones and clear timeframes for the achievement of those milestones, concepts or plans, technical solutions for spent fuel and radioactive waste management from generation to disposal and post-closure issues including knowledge preservation. Among others there is also the responsibility for the implementation of the national programme and identification of the key performance indicators to monitor progress towards implementation.
  - Questions:
    - How to organise participation of Civil Society in the evaluation of the national programs, especially in view of monitoring key performance indicators and actual implementation of the programs?

Continuing consultation processes on a higher-level taking due account of civil society input.

Firstly, civil society should have the opportunity to participate in the formulation of the concept / national program. See debate in section B.), which is not currently taking place in the Czech Republic. Rather, it is nearing towards its authoritative top-down enforcement by politicians and officials. So civil society has only the possibility to check whether implementation of the directive is in progress. We are not certain of how this can be achieved.

Civil society can draw attention to possible noncompliance with the national programme, but it should have media support to help build constructive pressure on politicians (which is not really the case today). Officials of the European Commission would have to build pressure from the top. However, this is really not happening so well these days because it feels as if the Commission is reluctant to deal with the issue honestly, that it wants to accomplish its task formally, but does not want to irritate the Member States in

the field of nuclear energy, it promises everything to everybody, that it creates an appearance that it has things under control, but in fact it does not deal consistently/thoroughly with the problem. Therefore, we as a Czech civil society organisation, we do not feel fully supported by the Commission. It also depends on whether the CS will take the debate about RW&SF seriously and then it is possible to talk about control, monitoring and enforceability, but at this moment it's a bit of science fiction.

The first question is – if there is a civil society who is interested in the evaluation of the national program. Often there is no. At least participation of various stakeholders from various governmental institutions should be guaranteed, in addition involvement of independent experts. There is very limited capacity of national civil society to follow and participate at evaluation of the national program, especially in small countries.

Through the parliament: the programme is formulated by a responsible ministry and its activities are to be controlled by the parliament. However, the control mechanisms should entail also independent technical support commissions involving also the CS representatives.

- Is the implementation review process as foreseen in the Waste Directive (and carried out in parallel with Joint Convention process) sufficient and effective?

The review process with the EU commission should be entirely transparent.

At this point, it is not enough and effective. The Czech Republic does not have an updated national programme approved by the Government at this time (see infringement procedure[33] against CZ since April 2016, for failure to notify the national program for the implementation of spent fuel and radioactive waste management policy.) Implementation of the Directive is not effective at all. Public participation (as requested by the Commission itself) is only briefly mentioned without real examination of its true situation in the countries. The evaluation of public participation in the Member States is superficial in the report and also in the staff working document on the progress of implementation.

No, recent process reviews only paper work, does not review real dedication of the country (e.g. personal resources and budget dedicated to related research and other activities, real support of research).

In principle, it is: Directive's main goal is to establish efficient planning system in all MS's, regular reviews are just tools for its keeping alive.

- Which other possibilities may exist or should be created to participate in the review and monitoring of national programs, their content and implementation?

Civil society organisation comments on the review should be invited both on the member state and EU level.

Of course, there is still the possibility for active civil society associations that will be using their own initiative, independent of the state, regulators, and they will do monitoring and issue reports on the implementation. In each country, the CSOs work to monitor the state's activities in relation to RW&SF management. However, these organisations experience a problem with a lack of funding. At national level, there is usually no willingness to pay for any independent criticism. Nor is it feasible to get paid money from the state when the state is subject to a control. So there should be an opportunity to get independent

33 http://ec.europa.eu/atwork/applying-eu-law/infringements-proceedings/infringement_decisions/index.cfm?lang_code=EN&r_dossier=&noncom=0&decision_date_from=&decision_date_to=&active_only=0&EM=CZ&DG=ENER&DG=NEAR&title=radioactive+waste&submit=Search)

financial resources from the European Commission, which means that the EC would have to adjust the funding rules so that even smaller organisations that do not have financial budgets large enough so that they could do co-financing, pre-financing of the EC financial support, etc.

Independent criticism from CSOs can give the state insight into why something really does go wrong. CSOs should not act like the groups that just slap the state institutions on the back. In order to monitor the implementation of the EC, CSOs can issue independent views and contributions. We do not see much demand for these outputs at the moment from the Czech media, but there should be demand from the EC if the EC thinks seriously about implementing the Directive. Thus, the creation of this constructive criticism from CSOs should also be financially supported by the EC. Financial support at national level could also work in the form of grants from state-independent agencies in order to allow civil society to flourish, as it can give valuable feedback to the state administration. And this can help speed up the implementation process when there is co-operation on both sides.

Some kind of international civil society team/group should be organised, which should be able to compare and review programs and its implementation.

Creating partnership mechanisms between operator and CS (see Belgium, Hungary) and establishing parliamentary negotiator's function to interact with ministry regarding principal decision making (see France).

- General considerations on the governance aspects stemming from the Aarhus and Espoo conventions:
    - Questions:
        - How to assure the necessary technical competences of participants in the RW and SF management:

Technical competence is not sufficient: most of decisions are based on RD&D investigations which require highly specific and costly equipment/facilities – this cannot be practically provided by the CS.

- Example of Swedish approach with independent dedicated CSOs funding (communities and NGOs) to allow following of topics continuously,

Yes, just make sure that the funding is controlled by an independent body (regulator?).

Such financial support has a great value if its duration is ensured even if the CSOs are unpleasantly critical of NRAs / WMOs. If not, then it's not okay.

- Relying on the TSOs and Regulatory Authorities to represent the CS,

Definitely not enough, civil society input is needed also to make sure the regulator does its job properly.

Definitely not.

These two options shall be combined.

- Establishing a European CSO organisation (e.g. NTW) specialized in the independent evaluation of RW and SF management and obtaining direct resources from the European commission (EC),

Yes, also!

Theoretically, it's a good idea. It would be nice to see more interactions between NTW (2013) and CSOs in the EU member states in a way that NTW would not try to solve CSOs' issues without them but would allow CSOs financial participation in projects, thereby enhancing CSOs' activities from which NTW would benefit as well.

This one seems the most appropriate for the small programs, but it has to be assured, that efficient representatives of each country will take part.

No, it cannot be effective as each facility and national legislation are specific and it is impossible at EU level to provide an objective and detailed assessment. Furthermore, methodology is well described and is available at NRA's and TSO's. This issue shall best be solved at a national level.

APPENDIX 8: DESCRIPTION OF THE PEP EXERCISE

Context surrounding the Pathway Evolution Process (PEP) tool

The "Pathways Evaluation Process" or PEP is a tool that emerged from the reflections of the SITEX-II European research project ("Sustainable network of Independent Technical Expertise for radioactive waste disposal - Interactions & Implementation") engaged in June 2015 as part of the European Commission's research program Horizon 2020 for a period of 30 months.

SITEX-II project aims at implementing in practice an Expertise network expected to ensure a sustainable capability of developing and coordinating joint and harmonized activities related to the independent technical expertise in the field of safety of deep geological disposal of radioactive Waste. These activities are connected to the four major functions identified during the SITEX project (2012-2013). This project involves the participation of various civil society organisations (CSOs) as full partners. It must allow précising the different interactions between expert institutions but also with outside organisations (operators, civil society). SITEX-II tasks include the definition of the Strategic Research Agenda (SRA), the production of a guidance on the technical review of the safety case, the development of a training module for generalist experts involved in the safety case review process (including the implementation of a pilot training session), the commitment of civil society (CS) in the activities mentioned above and the preparation of the “administrative” framework for a sustainable network, by addressing the legal, organisational and management aspects.

In the framework of the Work Package working on the interactions with Civil Society (WP4), the task 4.3 aims at preparing recommendations on intergenerational dimension of CS contribution along the operational phase of geological disposal. The first objective of the task 4.3 is to determine the conditions and means of CS involvement in the long-term management of radioactive waste. It is in this perspective that the PEP approach has been conceptualized as an exercise of participative and comparative assessment of alternative scenarios on long-term management of radioactive waste.

This investigation takes into account the status of current research programs for managing radioactive waste, including geological storage projects, the long time needed for their implementation, and the conditions of engagement of civil society in monitoring these long-term management activities of radioactive waste.

Objectives of the PEP exercise

In this perspective, the PEP objective is to identify, structure and discuss issues that would really matter for different types of stakeholders (especially civil society) and that concerns all the steps of the different possible RWM “Pathways” that may be considered over a timescale of several generations.

The proposed methodology is based on the concept of “Pathways”, which describe strategies, or future visions, retracing the steps of a possible evolution from the current situation of radioactive waste management as a whole (including waste already produced and potentially waste to be produced) to a final state called “Safe Terminus” (ST), defined as a situation where the safety of all considered categories of waste do not anymore entail an active human contribution, at least after a period that does not exceed an order of several generations. The perspective of reaching an ST is proposed, in the frame of the PEP exercise, as the ultimate goal of radioactive long-lived radioactive waste management (RWM). The objective to seek a ST does not require having a predetermined solution in mind from the start. Several options could potentially be considered as soon as the objective of a safe terminus is accepted. In any case, a safety demonstration will be required at some point of the process.

These considerations are coming into play without prejudice to the fact that geological disposal (GD) is presently the ST that has been mostly investigated, while less consideration has been given to other potential STs.

The different steps of the PEP

The methodology of the PEP exercise is based on a step-by-step approach whose practical application is presented below. This first version of the exercise is a "learning" version and possibilities for players will be extended in a later version of the PEP exercise.

Introductory phase of the PEP exercise:

1. Clearly setting the objectives of the work proposed,
2. Discussing prerequisites posed by the PEP on the shared concerns and the legitimacy of different approaches regarding RWM,

Preparatory phase of the PEP exercise:

3. Presenting the three representative inventories of radioactive waste, selected as possible starting points to the various "pathways" to be discussed by the group,
4. Presenting the three "pathways" constituting the basis for discussion and made from a combination of technical options,

Conduct phase of the PEP exercise:

5. Assessing the robustness of the "pathways" by using “Testing conditions” (disruptive events, unplanned changes, decision making challenges) and “Evaluation Criteria" on governance quality, management of risk and values & ethics.

Comparative Synthesis phase of the PEP exercise.

Preparation of the PEP

The different phases of the practical organisation of the PEP exercise are detailed below.

The Introductory phase aims at discussing with the participants of the exercise objectives and prerequisites posed by it.

1. **Clearly setting the objectives of the work proposed**

The proposed approach is to discuss and make explicit the different preferences and values that matters for participants when assessing different “pathways” of RWM from the present situation. The review of the “pathways” by all the participants of the exercise, through testing conditions and evaluation criteria allow scanning collaboratively concerns of the whole group.

The exercise takes place in small groups of 5 or 6 participants and is implemented by a facilitator in charge of enforcing the predefined speaking time and of transcribing the key issues arising from the discussion.

2. **Discussing prerequisites posed by the PEP**

The participation to the PEP also implies a number of prerequisites:

- The participants agree to engage in the exercise in the perspective of identification of a “Safe Terminus” or ST,
- The exercise is based on mutual respect. The different opinions and attitudes of participants

are thus recognized as potentially being able of legitimately addressing in a reasonable and responsible manner the issue of LT management of radioactive waste and the way of building safety and trust in a context of uncertainty.

- These attitudes would cover a range of approaches that typically goes from open to oriented or driven (and all intermediate positions), depending on structural factors:
  - The predetermined choice or not of a ST and the strength of that choice. For example, GD can be considered from the start of the "pathway" as the only technical solution to be considered but it can also be seen as the most appropriate technical solution among existing ones, or not to be seen as a relevant solution in the current state of knowledge or even not be considered as a relevant solution at all.
  - The balance to be found between moving forward quickly enough toward a ST considering the risks associated with radioactive waste and being cautious not to be trapped in a ST whose safety could ultimately not be demonstrated.

The facilitator leads the discussion on the prerequisites; each participant is required to give its opinion on the concept of ST and the legitimacy of different approaches and attitudes towards RWM. The time allotted to this discussion is approximately a quarter of an hour.

Once the prerequisites have been discussed, the preparatory phase of the PEP is to present the inventories and the "pathways" that will be subject of discussion.

3. **Presenting the three representative inventories of radioactive waste**

The PEP exercise itself then begins. The inventory that will be the starting point for the "pathways" that will be discussed is selected among the three inventories representing different types of national situations among European countries (nuclear countries with reprocessing, nuclear countries without reprocessing, non-nuclear countries).

This choice among representative inventories may be predetermined before the exercise, chosen randomly or after a discussion within the group.

4. **Presenting the different “pathways”**

Once the inventory representing the starting point of the pathway has been selected, the three basic "pathways" are presented to the PEP participants by the facilitator. These three "pathways" are defined by a combination of elements ("paving stones"), representing the logical implementation of various technical options according to their relevance to each phase of the implementation of a “pathway” and in the different waste categories to consider. The three "pathways" integrate, as far as possible, the different postures towards RWM issue considered in the prerequisites (open, oriented, driven) in order to reflect the preferences of the various stakeholders regarding safety and confidence building.

They combine various technical management options for different categories of waste, which involves taking into account successive time steps: now, in the near future, in the long term (on the scale of several human generations).

These technical management options also include issues related to the implementation of local or centralized facilities, dry or pool storage, surface or sub-surface facilities, long-term surface storage or geological storage (that can be converted into geological disposal), geological disposal, etc ... for each technical option considered, particularly the ST options, the successive phases of conceptualization, safety demonstration, implementation, operation and closing are taken into account.

The exercise itself is to initiate discussions between the participants around testing conditions challenging the technical options of a pathway and to assess the response capacities of the "pathway" challenged

through one or two assessment criteria selected by a participant.

5. **The Testing Conditions**

The "pathways", as described in the previous phase of the PEP, only describe potential technical itineraries. The implementation of an appropriate strategy to bring waste management at a ST is not limited to follow different technical steps of a "pathway". In practice, waste management is more like a journey along this itinerary (from here and now to a future situation), combining both preferences regarding travel conditions (resistance, safety, speed, etc.) and occurrence of unexpected events.

This is why the PEP offers a series of test conditions defined as disruptive events challenging the sensitivity of the "pathways" to various factors (change of initial conditions, time constraints, etc.), their ability to deal with governance challenges and their capacity to manage the consequences of unexpected events.

After the presentation of the "pathways", the facilitator presents to the participants the different testing conditions available for exercise.

During the PEP exercise, each participant will choose a testing condition to initiate a discussion assessment. The testing condition occurs during one of the three time periods of the "pathway": now, in the near future, long term as presented above (see 4 presentation of the different "pathways").

6. **The Evaluation Criteria**

The evaluation criteria are developed to make explicit preferences of the evaluators in each context (a "pathway" examined from the assumption of a "testing condition").

The PEP exercise offers a set of evaluation criteria covering the technical field of risk management, issues related to the governance quality and questions related to ethical and societal values. The aim of the methodology is not to engage a detailed and in depth discussion on each criterion at every implementation of the PEP exercise. It is rather aiming at identifying the most relevant criteria for participants in the evaluation of each "pathway" (in the context of one testing condition), through the selection of the criteria by the participants and through the group discussion that follows this selection.

It is proposed to each participant to combine with the condition test the previously selected one or two evaluation criteria. The group then discusses these criteria in the same time than the condition test.

Conduct of the PEP

From these elements, the planned conduct of the PEP exercise is the following. It could be evolved according to the feedbacks given by the participants of the first sessions of the PEP exercise.

The three basic "pathways" (see step 4 of the PEP exercise) generate three successive times of discussions during which taking turns, each participant is asked to select one testing condition combined with one or two evaluation criteria (see step 5 and 6 of the PEP exercise) to evaluate the robustness of the discussed "pathway". The facilitator notes choices made by the participant in the reporting grid.

A 10 minutes discussion then engages with all participants. Group members are invited to comment on the behaviour of the "pathway" in relation to selected testing conditions and evaluation criteria. The facilitator reports key elements of the discussion in the evaluation grid.

At the end of the discussion, the next participant is required to do its own selection of one testing condition combined to one or two evaluation criteria and a new discussion of 10 minutes starts, and so on until all participants have proposed testing conditions and evaluation criteria on the first "pathway".

Then follows a synthesis discussion of five minutes where everyone is invited to speak on the considered "pathway" as well as on the testing conditions and the evaluation criteria under discussion. Again, the

facilitator reports the key elements of the discussion on the evaluation grid.

Then, the facilitator proposes for discussion the second "pathway" to which the same procedure is applied. Then the process is repeated one last time for the third "pathway".

Once the three "pathways" have been discussed, a general discussion of a quarter hour begins. It aims to draw conclusions from the exercise on results and also on the tools of the PEP.

PEP results

The approach proposed by the PEP is not a foresight exercise or an exercise aiming at selecting a technical option. The result produced by the PEP are participatory and comparative analysis of "pathways" by the various participants, trough different sets of assumptions and criteria.

In the end, the results of the exercise of PEP are twofold:

1) Evaluation elements shared by the participants of the PEP exercise or in any case emerging out from a dialogue on different possible RWM pathways. These elements are recorded in the evaluation grid
2) Elements of explicitation of the cognitive assessment framework specific to each participant that could provide a better understanding of each other's positions on RWM and on existing attitudes toward the question of safety and confidence building in a context of uncertainty. These elements could be provided by an analysis of the grid-report.

APPENDIX 9: MEETINGS WITH CIVIL SOCIETY ORGANISATIONS

Within SITEX-II project, the opportunities for effective and continuous interaction with CSOs have been established. Around 30 participants coming from 13 countries and representing 15 CSOs and experts' partners from SITEX-II were involved in the activities, but information was sent regularly to even broader community of 35 CSOs from 18 countries, also by using established relationships of NTW[34]. In total 4 meetings were organised, one as part of preparatory meeting and 3 other workshops as part of the SITEX project, with minutes from meetings, delivered as Milestones for SITEX-II project (Milestone n°M5.1[35], Milestone n°M5.2[36] and Milestone n°M5.3[37]).

The following meetings with CSOs as well as project partners were organised:

- First inception meeting 28 August 2015: discussion on the opportunities, conditions and means of potential involvement of CS in the project;
- Three workshops with exchanges between institutional experts and CSOs: All three activities of WP4 were presented, discussed and commented during the workshops with CS but focus on certain topics:
    - Workshop No. 1: February 2016, Ljubljana – CS contribution to R&D, first results of the questionnaire on safety culture, literature overview and first principles of the PEP approach;
    - Workshop No. 2: June 2016, Budapest – final results of the questionnaire on safety culture, PEP exercise with a pluralistic group of participants (NGOs, institutional and non-institutional experts);
    - Workshop No. 3: November 2016, Brussels – Results of PEP exercise, requirements coming from legal framework and international conventions related to public participation in the context of RWM and moderated discussion base on four sets of issues related to intergenerational aspects.

The detail reports from individual meetings and summary of presentations and discussions are given in separate documents of which is only presented here a summary of main information provided. The agendas of the meetings/workshops are available in Appendix 2.

Based on the consultation with CSOs during the first preparatory meeting the participants recommended to look also at following issues related to intergenerational aspects of governance:

- The intergenerational governance brings the issues of rolling stewardship, especially in the view of planed options like reversibility after the end of operational period of 100 years,
- The question of ethical issues should be raised and approached, the investigations from dedicated studies should be explored,
- Some countries have already prepared good material, for example US DOE which provides a lot of useful information related to the information, necessary to support the stakeholder engagement,

[34] Nuclear Transparency Watch – NTW is a European network created in 2013 to develop transparency in nuclear activities. It involves more than 45 member organisations and individuals from 20 countries.

[35] The minutes of the Workshop n°1 are available here: http://sitexproject.eu/index_2.html#deliverables_wp4

[36] The minutes of the Workshop n°2 are available here: http://sitexproject.eu/index_2.html#deliverables_wp4

[37] The minutes of the Workshop n°3 are available here: http://sitexproject.eu/index_2.html#deliverables_wp4

- The question of availability of finances in the future RWM – insurance sector to cover uncertainties of expenses, including the financing of passive safety,
- Work on the DMP and develop the approach where voices of all, also of future generations, should be incorporated,
- Special attention should be given to younger generations and dedicated approaches should be established for such involvement and collaboration.

During the first Workshop with CS in Ljubljana the themes which were central to the WP4 were presented and opened:

- to assess the SITEX Strategic Research Agenda that was elaborated since August 2015 and to agree how the inputs prepared by CS are to be integrated;
- to present and discuss the results of the interviews with experts inside SITEX partners (regulators/TSO) and NGOs on their views of the concept of "safety culture";
- to present ad to discuss first review results from literature review and discuss different pathways together with criteria upon which the pathways would be evaluated.

Outcomes from first discussion were promising, and also established the conditions for future good exchange between technical experts and representatives of CS:

- Start of new ideas for CS Sciences and ways to integrate them in the R&D SRA;
- Definition of principles of the PEP approach: first some differences between CSOs representatives and representatives of regulatory body and TSOs, but after discussion it turns out that there is clear need for basic definitions;
- Participants pointed out that safety culture means a broad context which needs to be understood holistically. But was also soon clear that the views were not so different.

Photo 1: 1st Workshop with Civil Society - Ljubljana

During the second Workshop with CS in Budapest the discussion was focused on the following themes:

- to continue the discussion on the commonalities and differences in understanding of safety culture;
- to perform the PEP exercise with several groups in the concrete steps and necessary conditions how to involve CS along the process of safety case review of the deep GD in particular.

The outcomes from the meetings showed that the topic is demanding and requires a lot of energy, but also there are different perceptions among the actors which frame the attitude:

- The results obtained during the investigation of "safety culture" indicated that a lot of commonalities (e.g. about basic safety objective & safety principles) in the understanding/perception were found however the 'vocabulary' can be different;
- The Pathway Evaluation Process (PEP) has been conceptualized as an exercise of participative and comparative assessment of alternative scenarios on long-term management of radioactive waste:
    - Can be used for bringing new ideas, especially under the uncertainties and possible new evolutions related to GD establishment, and broader to RWM;
    - Can stimulate open discussion on divergence opinions, challenging different views under more neutral conditions;
    - Can support and initiate the contact and connections between different actors, which could be difficult to be established.

Photo 2: 2rd Workshop with Civil Society – Budapest

The third Workshop with CS in Brussels focus on the continuation of already opened themes and additionally investigated norms and requirements from international conventions and EC EURATOM directives related to intergenerational governance:

- CS interaction and influence in future European RWM research including Joint Programming,
- Core message, summary and recommendations with regard to the results of the safety culture discussion,
- Questionnaire related to the Intergenerational governance, based on adopted requirements with moderated group discussion.

Outcomes of the third Workshop with CS are the following:

- New SITEX CS knowledge sharing and interpretation to be used also in the future European Joint programming on RWM and Waste Disposal.
- The international conventions and EU directives set the legal frame for RWM, including intergenerational governance, like requirements for funding, transparency, indicators to monitor progress towards implementation of national programmes, competences for governance.
- The CSOs provided their response to the questions; basic ideas are:
    - CS must be involved and consulted very early in the DMP and throughout it;
    - It may be possible to establish a system of "rolling stewardship" but it should also be connected to another activity such as a nature reserve or an archive system;
    - The broader the participation (age, gender, education, social status) the better the input should be.

As a summary, there are some basic conditions and means for public participation, like:

- CS takes part in the DMP right from the start or actually should be part of the justification of practice already,
- The aim should be to integrate the general public into the process as legitimate partners,
- The type of participation can vary depending on the stage of the decision making process,
- Deliberative nature of the process itself, with discussions between participants at interactive events, designed to give sufficient time and space to enable participants to gain new information and to discuss in depth the implications of their new knowledge in terms of existing attitudes, values and experience,
- There is time to consider and discuss an issue in depth before coming to a adopted view,
- No pushing in a particular direction,
- Conditions for participation should be fulfilled (information, participation in decision making, access to justice, expertise and resources).