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Abstract

Within the European H2020 CONCERT project ENGAGE, a dedicated work package examines stakeholder engagement in practice in three exposure contexts: emergency response and recovery, medical use of ionising radiation and indoor radon.

This report has the following objectives: introduce key concepts of participation theory; propose a research methodology operationalising the analysis of stakeholder engagement in practice; carry out an exploratory literature review of participation in radiation protection research and practice, and in related non-nuclear fields; and summarise key challenges and best practices revealed or recommended in relation to stakeholder engagement in the documents analysed.

Overall, results show the commonalities in the challenges, underlying principles, core values and global aims across fields. Key challenges and selected best practices are illustrated based on lessons learned from radiation protection fields, as well as from radioactive waste management and non-nuclear disaster preparedness.

However, a thick description through case studies is needed to reveal the meanings and practices of engagement in specific contexts. The results reported in this deliverable form the base for case studies for the three ENGAGE exposure situations which will be carried out within ENGAGE tasks 2.2, 2.3 and 2.4

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Executive summary

The ENGAGE project (November 2017- November 2019), funded under the H2020 CONCERT, aims at *ENhancing stAkeholder participation in the GovernancE of radiological risks*. ENGAGE seeks to identify and address key challenges and opportunities for stakeholder engagement in relation to medical use of ionising radiation; post-accident exposures; and exposure to indoor radon. In all these situations, stakeholder engagement is now widely considered a key constituent of radiological risk governance and the radiation protection of exposed individuals.

This report has the following objectives:

- a) *to introduce key concepts of participation theory;*
- b) *to propose a research methodology operationalising the analysis of stakeholder engagement in practice;*
- c) *to carry out an exploratory literature review, structured along the research questions identified in b), of participation in radiation protection research and practice and in related non-nuclear fields;*
- d) *to summarise key challenges and best practice revealed or recommended in relation to stakeholder engagement in the documents analysed in c).*

The review of main concepts in participation theory shows that participation evolved with time, from expert-centred approached towards more inclusive forms of participation that recognize the importance of due process to ensure the quality and legitimacy of results. Various typologies of participation have been developed, taking into account, for instance, the importance of power and control, the motivation for initiating participation or the interests at stake. These typologies serve as conceptual framings and illustrate models for participation; however participation is meaningless without contextualization. Hence, there is no “one-size fits all” best participatory practice or model. Beyond recognized criteria, such as representativeness, inclusiveness, fair deliberation, access to resources, transparency, among others, there is a need for research on grounded practitioners’ appraisal of the effectiveness of participation.

Looking at participatory practices in science and technology at *governmental* level, the emphasis on control and prediction of technological impacts has now shifted towards broad public involvement at an early stage of research and development, including policy makers, civil society groups, citizens, and other potential stakeholders. On the *non-governmental* level, various small-scale participation forms have emerged, such as ‘*dialogue events*’. Non-institutional forms continue to mature and develop, in the form of ‘citizen-led’ engagements, such as citizen science, and social movement, such as protests and activism.

The methodology proposed for the analysis of stakeholder engagement in practice centres on two overarching empirical questions:

How are the radiation protection communities responding to these pressures, mandates, demands, or expectations regarding engagement and how does this show in practice (e.g. specific cases)?

Which (other) real or potential forms and instruments of stakeholder engagement and public participation can be observed in radiation protection practice, showing no reference to existing requirements?

Following the literature review, the list of derived research questions was further refined and amended to include aspects of particular interest for the three exposure situations considered in ENGAGE. This revised form will be further used in the analysis of case studies.

As a general approach, the exploratory literature review included scientific peer-reviewed articles and reports, notably reports from EU funded projects, focusing on literature published after the year 2000. Other documents analysed included statements of radiation protection research platforms (e.g. strategic research agendas) and international organisations, and relevant grey literature (e.g. main conclusions from a workshop, statements of civil society organisations, websites). The review does not provide a comprehensive overview of the do's and don'ts of stakeholder engagement; rather, it assesses how stakeholder engagement is constructed in specific, context-dependent ways, through the dynamic interplay of engagement principles and practices. Key challenges and best practice identified from the documents analysed are summarised at the end of each section.

In the area of emergency preparedness, the participation landscape covers a wide range of processes and interactions aimed at opening spaces for dialogue, building capacities for response and recovery, and the co-development of robust and practicable restoration strategies. Such activities are initiated by mandated actors, researchers, international organisations, local communities or citizens. They provide for a mutual learning process regarding emergency management, on the one hand, and engagement, on the other hand. Main challenges and best practices are similar for nuclear and non-nuclear disaster preparedness, for instance working *with* local communities instead of planning *for* them; due attention to preparedness; consideration of stakeholders' differing levels of awareness about specific issues in the preparedness phase; ensuring sustainability of stakeholder networks; ensuring availability of resources; potential mismatch of expectations from stakeholder engagement. While the revised BSS requirements and amended Nuclear Safety Directive focus on public information and transparency, and do not prescribe stakeholder engagement directly, they open the door for broader stakeholder engagement with requirements such as „*Member States shall provide as appropriate for the involvement of stakeholders in decisions regarding the development and implementation of strategies for managing exposure situations*“ (BSS, Art. 102). In addition, there is a demand from non-governmental actors to involve local populations and interested civil society organisations in the development and validation of emergency response plans. Experience from non-nuclear hazards and resources management suggest that questions related to stakeholder engagement should be discussed with the relevant stakeholders for the issue in focus. This allows internal as well as external stakeholders to participate and contribute their opinions, concerns, aims, and views on the benefits and limits of engagement processes.

Concerning exposures to the medical use of ionising radiation, national and international professional organisations, as well as patient associations promote a new paradigm in medical healthcare, centred on patient's needs, values and preferences. Some studies suggest however that there may be a disconnect between values espoused by the leaders of professional communities concerned with the medical use of ionizing radiation and the practices in the field. Different hospital policies, lack of time, shortages of staff, patients' lack of information and attitudes of health professionals are seen as important challenges of enhanced interaction with the patients. An addition challenge is the lack of communication between different medical professionals involved in a patient's care. The need for guidance has been revealed, on how involvement – particularly informed consent - can be practiced by patients and health professionals.

In relation to exposures to indoor radon, past experiences showed that stakeholder engagement can lead to higher public awareness about the related risks, increased compliance with recommendations on protective measures, and improved building policies on national level.

Extensive research on stakeholder engagement in radioactive waste management brings valuable insights into best practices for engaging local communities. It also cautions that pragmatism is necessary: it is not always possible to directly involve all stakeholders (e.g. future generations, large stakeholder groups, certain vulnerable groups or the environment); this requires identifying and engaging representatives of these stakeholders. The reflection on the meaning of 'affected community' draws attention to the need to

understand and respect the ways in which people define their own communities, and what precisely may be affected.

Concerning stakeholder engagement in radiation protection research, researchers, industrial and institutional end-users, governmental organisations and research policy makers have been increasingly involved in the elaboration of strategic research agenda's and/or setting up research priorities. However, with a few exceptions, the involvement of other groups such as patients or civil society is not part of a comprehensive stakeholder engagement strategy clarifying for instance their influence on research policy decisions.

Overall, the literature review showed there is little reflection on the mutual influence between external prescriptions for engagement and participatory practice. The emphasis in case studies or guidelines on stakeholder engagement is rather on barriers and facilitators, and the formulation of recommendations on how to conduct or integrate participatory activities into risk governance. While there is broad awareness and recognition in the radiation protection community of the importance of stakeholder engagement, there is a need for more formal evaluation of engagement processes and their outcomes.

Forthcoming work will focus on two aspects: i) case studies in the three exposure contexts considered in ENGAGE; and ii) mapping institutional and non-institutional participatory practices in specific countries.

List of abbreviations

BSS	Basic Safety Standards Directive
CONCERT	European Joint Programme for the Integration of Radiation Protection Research
CONFIDENCE	COping with uNcertainties For Improved modelling and DEcision making in Nuclear emergenCiEs
CVO	Civil Society Organisation
ENGAGE	ENhancinG stAkeholder participation in the GovernancE of radiological risks
EP&R	Emergency Preparedness, Response and Recovery
EU	European Union
GMF	Group of European Municipalities with Nuclear Facilities
H2020	Horison 2020
HLW	High-Level Radioactive Waste
ICRP	International Commission on Radiological Protection
IRPA	International Radiation Protection Association
LC	Local Community
LILW	Low and Intermediate Level Radioactive Waste
NGO	Non-Governmental Organisation
NSD	Nuclear Safety Directive
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
RP	Radiation Protection
RRI	Responsible Research and Innovation
RWG	Radioactive Waste Governance
SE	Stakeholder Engagement
SRA	Strategic Research Agenda
TSO	Technical Support Organisation
WP	Work Package of a project

1. ENGAGE project overview

The ENGAGE project, funded under the H2020 CONCERT, aims at *ENhancing stAkeholder participation in the GovernancE of radiological risks*.

ENGAGE is a two-year project started on November 20th 2017 that seeks to identify and address key challenges and opportunities for stakeholder engagement in relation to medical use of ionising radiation, post-accident exposures and exposure to indoor radon. In all these situations, stakeholder engagement is a key issue for improving the governance of radiological risks and the radiation protection of the exposed individuals.

The project aims are:

- to assess why, when and how stakeholders engage in radiation protection;
- to develop novel approaches to analysing stakeholder interaction and engagement, and provide guidance to meet the challenges and opportunities identified in response to (a);
- to investigate the processes for enhancing radiation protection culture and their role in facilitating stakeholder engagement, and develop guidelines for building radiation protection culture; and
- to build a joint knowledge base for stakeholder engagement in radiation protection.

Through its research and innovation activities, ENGAGE will inform stakeholder engagement approaches to radiation protection in ways that all relevant stakeholders find meaningful and legitimate. It will contribute to improving radiological risk governance and radiation protection itself. Its beneficiaries are radiation protection researchers, policy makers, civil society stakeholders and wider publics.

The ENGAGE project is organized in four main work packages (WP) coordinated by the management WP, which interact to achieve the objectives as presented on the Figure 1.

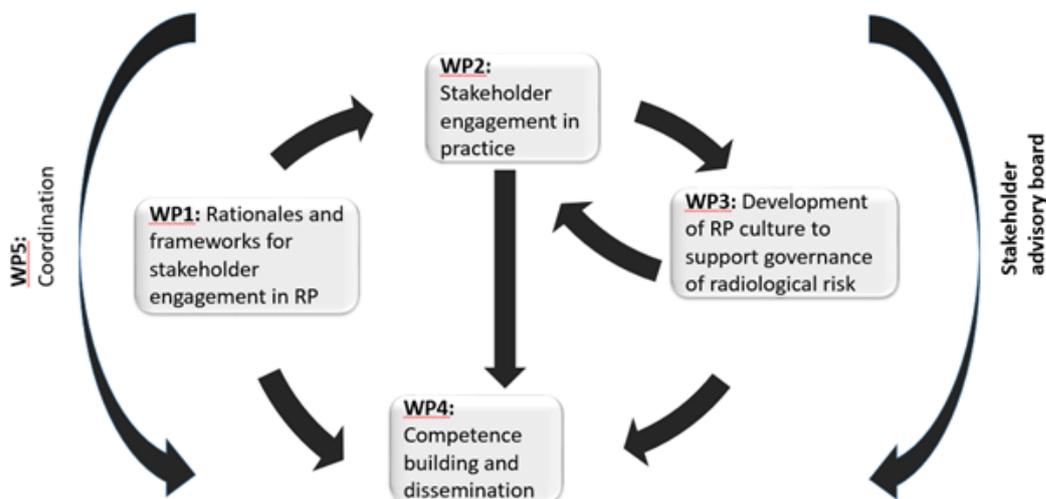


Figure 1 Interaction between ENGAGE work packages

ENGAGE is part of CONCERT. This project has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 662287.

2. ENGAGE Work Package 2: Stakeholder engagement in practice

2.1 Introduction

ENGAGE WP2 on “Stakeholder engagement in practice” investigates how are legal requirements, guidelines and recommendations for stakeholder engagement implemented in practice. Specifically, it analyses how radiation protection communities respond to the expectations and demands for stakeholder engagement, and what kind of engagements practice, forms and instruments can be found in radiation protection fields, with or without reference to existing requirements.

For this purpose, WP2 is informed by results obtained in WP1 “Rationales and frameworks for stakeholder engagement in radiation protection”, in which the rationales for stakeholder engagement in radiation protection and the related legal or contextual drivers are clarified (how is stakeholder engagement envisaged, who is involved and for what purpose?).

WP2 activities are structured along several tasks.

Task 2.1 “Methodology for analysing stakeholder engagement in practice”, provides a framework for analysing ENGAGE cases studies. Guiding research questions for analysing stakeholder engagement in practice have been developed and are described in section 2.2 of this report. The initial list of research questions formulated for WP2 was enriched based on the subsequent review of selected academic literature, radiation protection research projects connected to stakeholder engagement, current stakeholder engagement practice within radiation protection platforms, as well as past experiences of stakeholder engagement in the three exposure situations and, beyond that, international experiences in stakeholder engagement in radiation protection and connected fields. This review is summarised in chapters 4 and 5 of the present report.

In Tasks 2.2, 2.3 and 2.4, a deeper analysis will be carried out in the subsequent steps, on the practice and role of stakeholder engagement in the three exposure situations considered in ENGAGE: i) medical exposure to ionising radiation, ii) emergency and recovery preparedness and response, and iii) exposure to indoor radon. Current or recent practices, challenges and triggering factors for engagement will be studied specifically by means of case studies for each of these exposure contexts. Case studies will follow the guiding research questions summarised in section 2.3 and the methodology proposed in section 2.4.

The expected outcomes of ENGAGE WP2 are:

- 1) An evaluation of the impact of past or ongoing participatory activities in radiation protection decision making processes.
- 2) A comparative analysis of stakeholder engagement practice, identifying broader lessons that can be learned, as well as what is specific to each field and why.

2.2 Approach for analysing key challenges and best practice for stakeholder engagement

The concept of engagement can be found with different meanings in social science literature devoted to public participation. For instance, for Rowe and Frewer (2005), public engagement refers to a combination of three concepts: *public communication*, *public consultation*, and *public participation*, whereas, the methods intended to enable this combination being referred to as “*engagement mechanisms (generically) or engagement initiatives or exercises (specifically)*”. For Woolley et al (2016), participation, involvement and engagement are partially overlapping, yet distinct concepts describing public’s role in scientific research.

Recognising the plurality of engagement concepts and the continuum between formal and informal participation, institutional and citizen-led participation, lower and higher levels of involvement and influence on agenda-setting and decision making on environmental or science and technology issues, ENGAGE does not adopt a predefined definition of engagement. Instead, it traces the meanings, prescriptions and practices for “engagement” in the three exposure situations considered, and discerns the participatory practices associated (or not) with these prescriptions. It focuses on prescriptions for engagement (discourses) and the interactions between human actors, conventionally defined as stakeholders. It does not include for instance non-human biota, although this is currently considered in the development of environmental radiation protection policies.

In parallel to the historical trends (e.g., participatory turn in science and technology), stakeholder involvement has been increasingly in focus in the field of radiation protection in the last decades, notably in the areas of radioactive waste management, nuclear emergency management and environmental remediation. Direct or indirect references can be found in the foundations of radiological protection, e.g. the in the Core Ethical Values Underpinning the ICRP System (dignity, beneficence/non-maleficence, justice and prudence; ICRP, 2017), as well among radiation protection societies worldwide (IRPA, 2008). Extensive literature has been dedicated to the development of models, guidelines and principles for stakeholder engagement in these areas and the documenting of practical experiences. In addition, the identification of research needs related to stakeholder engagement in different exposure situations has been done by different associations and radiation protection communities, e. Bonn call for action in medical exposure situations (WHO and IAEA, 2012). In latest years, international organisations and networks (e.g. ICRP research priorities, CONCERT Joint Radiation Protection Research Roadmap, Strategic Research Agendas of technical platforms in the nuclear field, International radiation protection associations (IRPA, 2008) have brought stakeholder engagement and dialogue in focus as a research priority and practical need.

In order to identify key challenges and best practice or recommendations for stakeholder engagement relevant to the exposure situations addressed by ENGAGE, this report summarises main concepts and methodological issues in academic literature on public participation (chapter 3), as well as practical experiences and lessons learned so far from stakeholder engagement in the three exposure situations addressed by ENGAGE (chapter 4) and other connected fields (chapter 5).

As a general approach, the literature review included scientific peer-reviewed articles and reports, notably reports from EU funded projects in the respective areas, focusing on literature published after the year 2000. Other documents analysed included statements of radiation protection research platforms (e.g. on strategic research agendas) and international organisations, and relevant grey literature (e.g. main conclusions from a workshop, statements of CVO’s, websites). The literature review does not provide a comprehensive overview of the do’s and don’ts of stakeholder engagement; rather, it assesses how stakeholder engagement is constructed in specific, context-dependent ways, through the dynamic interplay of engagement principles and practices.

Each section concludes with a summary of key challenges identified and best practice or recommendations that can inform stakeholder engagement in radiation protection.

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2.3 Guiding research questions for analysing stakeholder engagement in practice

At the outset of the ENGAGE project, the research for WP2 started from the hypothesis that while stakeholder engagement and informed decision-making are nowadays recognized as essential factors for an effective governance of radiological risk, the practical implementation of policy and legal requirements for stakeholder engagement is confronted with multiple challenges. We must therefore understand better *why*, *when* and *how* stakeholders are engaged in radiation protection. This understanding is necessary to facilitate the development of guidelines and a knowledge base for a more robust stakeholder engagement in radiation protection.

ENGAGE defines stakeholders as: actors (individuals or groups, institutional and non-institutional) with a tangible or intangible (yet to be shaped or discerned) interest in the radiation exposure situation and the related radiation protection issues, directly affecting decisions, or affected by the formulation and resolution of a problem or challenge. In this perspective, stakeholders are constructed in interaction with actors, issues, contexts. Various publics are also (potential) stakeholders.

Identifying stakeholders might answer questions such as:

- Who is/will be affected?
- Who is directly responsible for the decisions?
- Who holds positions of responsibility/influence?
- Who can promote/obstruct the decision?
- Who has (not) been involved in the past in related processes?
- Who is involved in the implementation of actions or decisions?

ENGAGE uses the following questions and terms as *sensitizing concepts*; that is, constructs that sensitize us to possible lines of inquiry, and which can be adapted to the case at hand and the developments that ensue during fieldwork (van den Hoonard, 1997). These questions will feed into protocols of analysis to ensure comparable approaches and results across the tasks within the work packages.

While the overarching question in ENGAGE WP1 was what are radiation protection (RP) communities being asked to do?

That is, what “external” pressures, mandates, demands, and/or expectations have emerged in public venues commending the engagement of stakeholders (including wider publics) in RP?,

In WP2 we analyse what are RP communities doing?

- *That is, how are RP communities responding to these pressures, mandates, demands, or expectations and how does this show in practice (e.g. specific cases)?*
- *Which (other) real or potential forms and instruments of stakeholder engagement and public participation can be observed in RP practice, showing no reference to existing requirements?*

These research questions are loosely derived from the science policy research work of Erik Fisher (2007). The aim is to identify i) if and how the requirements are put into practice; ii) what can be observed in practice and if this is derived from the requirements or not; and iii) if there is an obvious link between prescription and practice.

The questions formulated above are empirical and will be answered by the accumulation and interpretation of researchers' observations. Responses to them will feed into a broader, more normative, debate within and beyond ENGAGE on where the challenges and opportunities lie for stakeholder engagement in radiation protection, and how to build a more robust participatory radiation protection culture (WP3).

In order to operationalise the overarching questions of WP2, these were further explicated in the following derived questions:

- a) What levels of awareness about external prescriptions of stakeholder engagement in radiation protection do researchers and practitioners reveal?
- b) How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?
- c) What were the rationales for stakeholder engagement, the final objectives? Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement? Have there been any guided improvement activities?
- d) What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?
- e) What are radiation protection actors and communities doing that may *de facto* count as stakeholder engagement (but are not necessarily labelled that way)?
- f) Are there any alignments/misalignments between case practice, on the one hand, and external conceptions and prescriptions, on the other, and if so why? Which challenges and opportunities do you encounter for stakeholder engagement in your specific case?
- g) What else have you found or should we be asking?

These guiding questions have informed the analysis reported in Chapters 3-5.

Following the literature review described below the following research questions were added to the ones mentioned above:

- h. What are the benefits of implementing stakeholder engagement processes (in the situation studied)?
- i. What are the lessons learned for the establishment of efficient stakeholder engagement processes?
- j. Can you identify in official documentation or discourses, or in secondary sources, any references to a "participatory turn" for your field or case? If so, please document and indicate how this turn is understood, why and when it came about.
- k. Can you identify in official documentation or discourses, or in secondary sources, any mention (explicit or implicit) of a shift away from expert-based or technocratic decision making to more inclusive, open, democratic, participatory decision making? If so, please document and motivate, and indicate why and when this shift came about.

- l. Is dealing with emotions one aim of engagement in relation to medical exposure to ionising radiation? And which kind of emotions play a central role?
- m. How can goals and ideals about patient centred communication in radiology be implemented into day-to-day academic and private practice?
- n. How to accelerate the process of bringing together the different disciplines which are necessary to start a stakeholder process in a certain radiation protection field?
- o. How to raise awareness of the need to engage among radiation protection researchers?

2.4 Methodology for case studies

The guiding research questions listed above will be further used for the case study analysis in the subsequent step.

The research methods (preferably at least three of the following per case) to be applied are: Interviews, participant and nonparticipant observation, collective discussion, ethnography, surveys, conversation analysis, website analysis. A case study research protocol will be drafted for each case study.

The data will include documents, field notes, interview/conversation transcripts. The data sources comprise: conversations, symbols, artefacts, observations, tools, procedures, measures, organizational/institutional infrastructures.

Case studies will be selected such as to cover a broad range of participation practices. Attention will be given to both *formal* and *informal participation*, whereby the former refers to formal institutionally organized formats of participation, such as stakeholder dialogues organised by a nuclear safety regulator, and the latter to institutionally independent engagement initiated by civil society or publics, such as patient associations and environmental movements. The distinction between both is derived from Wynne's conceptualization of invited and uninvited participation (2007).

Following Turner (1997) we also draw a distinction between formal rules-based democratic and market institutions (e.g., public authorities, research communities, businesses, mass media, and educational organizations) and informal institutions, such as non-governmental organizations, local communities, and citizen groups. These categories are however not fixed, as informal institutions could transform into formal institutions, and the opposite.

Non-institutional forms of participation will be identified through interviews with selected stakeholders and desktop research. The latter will use keywords that are domain related, such as "nuclear", "radiological" or "radioactivity"; application related, such as "emergency", "accident", "measurement"; participation-related, such as "participation", "involvement", "engagement", "action", "protest", "network"; and stakeholder-related, such as "stakeholder", "citizen", "population". This will help map different participatory practices in order to elucidate how "multiple forms of engagement interact as part of a wider ecology of energy participation" (Chilvers et al, 2017).

In addition to this, a study will be conducted in order to evaluate websites related to radon exposures from a stakeholder engagement perspective. The following guiding research question will be used: Do radon websites of national and local authorities EU-wide support engagement of radon stakeholders?

This research has the following objectives:

- To evaluate national and selected local communities' websites related to radon, as these are the most common interaction points between citizens and public services in many EU countries.
- To analyse the websites from the stakeholder engagement perspective, highlighting factors such as accessibility, responsiveness, dialogue, content and transparency/openness.
- To evaluate the role of stakeholder engagement as demonstrated on the website.

This study will use both automated and manual evaluation methods: a.) A meta-analysis of website evaluation literature (updating Karkin and Janssen (2014)) and b.) evaluating the websites of national and local authorities responsible for the radon issues using website evaluation metrics including indicators on stakeholder engagement by Coleman et al. (2008), and other indicators related to accessibility, responsiveness, dialogue, content and transparency/openness derived from the literature.

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3. Concepts, constraints, boundaries, forms of participation

3.1 The evolution of stakeholder engagement through time and place: concepts and models

Conceptualising stakeholder participation is not without its challenges. A multitude of diverging and overlapping terminologies, ranging from engagement to involvement, from consultation to co-management, from participation to co-decision making, exists; making the process itself and the conceptualisation complex. This complexity is highlighted by the notion that stakeholder participation is subject to contextualisation; both in time and place. In order to place stakeholder participation in a specific timeframe and identify how stakeholder participation has been conceptualised, it is important to understand what is meant with this timeframe. In this respect, we refer to the concept of Zeitgeist or "'Der Geist einer Zeit' [which] gives a unique stamp to each period and people, a common character pervading their state, laws, art, religion, philosophy

etc.” (Ross, 1969, p. 257; Abelshausen and Vanwing, 2016). It denotes ‘the spirit of the time’ or ‘the spirit of age’ as understood by Hegel (in ‘Phenomenology of Spirit’) and indicates “that one is aware of one’s time but reflects critically on it in order not to be asphyxiated by the spirit of that particular time and historical period” (Klikauer, 2016, p. 25; Abelshausen and Vanwing, 2016). In the subsequent paragraphs an overview is given of how participation has evolved throughout the last decades, starting in the 1960s when the term was first coined.



Fig. 2 French student poster (Arnstein, 1969)

Participation as a concept emerged in the 1960s and enjoyed increased attention in the following decades; currently being prominently embedded in social, political, economic and environmental processes and practices. The popularity of the concept has brought with it significant conceptual challenges. It has lost and gained power and clarity; it has been misinterpreted, misunderstood, misused, and even abused. A clear illustration of this was given in poster form¹ by a French student in the spring of 1968 explaining the student-worker rebellion (Fig. 2).

In the 1960s (and 1950s) participation emerged to express opposition to racial, ethical, ideological and political practices by the ‘have-nots’ (Arnstein, 1969); those on the outskirts of society, those that are marginalized or even oppressed. In an attempt to redistribute power, a “ladder of participation” was developed by Arnstein (1969) to conceptually outline what participation can and should look like (Fig. 3).

The popularity of the concept ‘participation’ resulted in it influencing political agendas. An evolution that made the implementation of genuine participation even more challenging. As Arnstein (1969) states “there is a critical difference between going through the empty ritual of participation and having real power needed to affect the outcomes of the process”. From this, it is noteworthy that citizen participation is directly linked to decision making, wherein participation emerged as a righteous claim to the power needed to co-decide. Participation without a redistribution of power was in this decade depicted as a frustrating and empty process by the powerless and as a means that allows the power-holders to claim that all sides were considered, while at the same time making it possible for only some of those sides to benefit (Arnstein, 1969). In response to this frustration and emptiness, the “ladder of citizen participation” emerged.

¹ The poster is one of about 350 produced in May or June 1968 at Atelier Populaire, a graphics center launched by students from the Sorbonne’s Ecole de Beaux Art and Ecole des Arts Decoratifs (Arnstein, 1969, pp. 224).

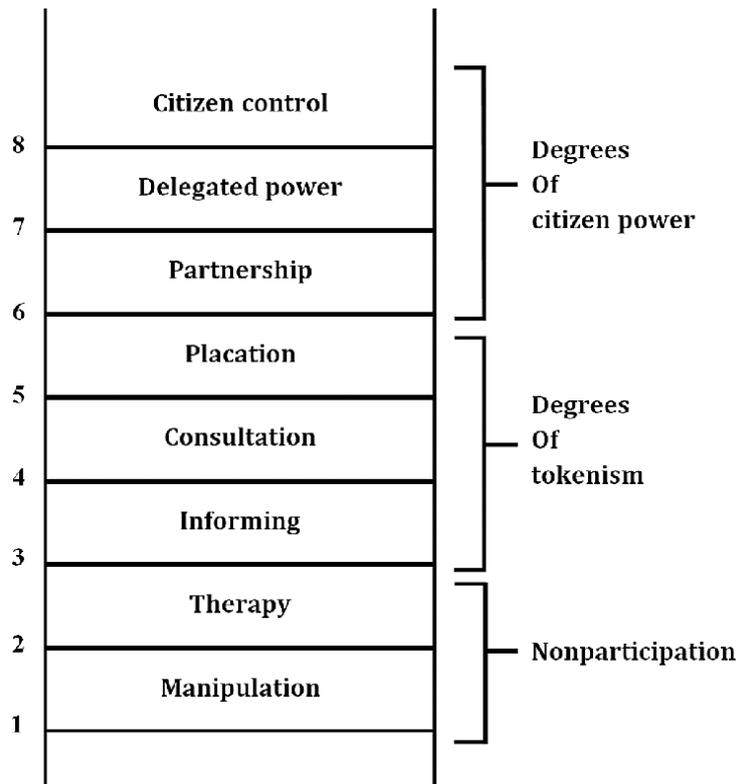


Fig. 3 Ladder of Citizen Participation (Arnstein, 1969)

Throughout the 1960s and the beginning of the 1970s, participation was highly influenced in the United States by the political turmoil resulting from the anti-Vietnam war movements and protests (Beck and Jennings, 1979; Abelshausen et al., 2015). This created a shift in participation, and dismissed the previously accepted directly proportional relationship between age and participation rate as the anti-Vietnam war movements were instigated by the young (Milbrath and Goel, 1977; Abelshausen et al., 2015). The shift that occurred due to participation was explicated in protest and demonstrations, signifying confrontation politics. As Abelshausen et al (2015, pp. 1715) point out, similar student revolts occurred in Europe questioning the traditional decision structures (Lane and Ersson, 1999). *“The 1970s were characterised by strong voices demanding changes in government policy and leadership (Lane and Ersson, 1999). Where in the 1960s and 1970s citizen participation was mostly linked with politics, a shift occurs in the 1980s when participation is framed more and more in the development theme and a clearer link is made with sustainability. In the mid-1970s, participation became more important for development agencies and by the 1980s participation became associated with the sharing of benefits by the poor (Cornwall, 2002). The era of the 1980s gave rise to the establishment of new local level institutions that continued to multiply over the following decades (Cornwall, 2002). Within the development literature less attention is given to political participation and more to social participation, citizen participation and participatory methods. Even though participation in the 1960s and 1970s was highly influenced by the political turmoil, it was located outside the state by those excluded from existing institutions. Whereas later, with less political turmoil, participation is framed in existing development projects and programmes (Gaventa and Valderrame, 1999). In the beginning of this century more attention is being paid to sustainability and the importance of all types of participation is recognised in order to achieve this. From the 1990s until now more focus is placed on the methodologies in participation than the conceptualisations. Participation has become more inherent in development literature and management, with a clear link to environment emerging in the 1990s. Already in the 1990s the Environmental Protection Agency (EPA) pushed to incorporate more citizen involvement into environmental protection*

programmes (Irvin and Stansbury, 2004) for which two tiers of benefits of participation are considered (process and outcomes) and two beneficiaries (Nielson and Wright, 1995; Beierle, 1999; Irvin and Stansbury, 2004).” (Abelshausen et al., 2015, pp. 1715).

Various typologies and models of participation exist and providing an exhaustive overview of these is neither possible nor desirable. As Cornwall (2008) states: “typologies [...] can be read as implicitly normative, suggesting a progression towards more ‘genuine’ forms of participation. When these forms of participation are contextualized, however they become more ambiguous.” The following figures provide overviews of varying typologies of participation. Whereas Arnstein (1969) showed the importance of power and control, Pretty (1995) argued that the motivation of those who implement participation is important, and White (1996) offered insights into the different interests at stake (Cornwall, 2008).

These typologies serve the purpose of conceptual framing and illustrate models for participation. It is important to note that these typologies do not represent a simplification of participation and should always be contextualized (Cornwall, 2008; Abelshausen and Vanwing, 2016).

Form	What 'participation' means to the implementing agency	What 'participation' means for those on the receiving end	What 'participation' is for
Nominal	Legitimation – to show they are doing something	Inclusion – to retain some access to potential benefits	Display
Instrumental	Efficiency – to limit funders' input, draw on community contributions and make projects more cost-effective	Cost – of time spent on project-related labour and other activities	As a means to achieving cost-effectiveness and local facilities
Representative	Sustainability – to avoid creating dependency	Leverage – to influence the shape the project takes and its management	To give people a voice in determining their own development
Transformative	Empowerment – to enable people to make their own decisions, work out what to do and take action	Empowerment – to be able to decide and act for themselves	Both as a means and an end, a continuing dynamic

Figure 4 White's typology of interests, as adapted by Cornwall (2008)

Type	Characteristics of each type
Manipulative participation	Participation is simply a pretence, with 'people's' representatives on official boards, but who are un-elected and have no power.
Passive participation	People participate by being told what has been decided or has already happened. It involves unilateral announcements by an administration or project management without any listening to people's responses. The information being shared belongs only to external professionals.
Participation by consultation	People participate by being consulted or by answering questions. External agents define problems and information-gathering processes, and so control analysis. Such a consultative process does not concede any share in decision-making, and professionals are under no obligation to take on board people's views.
Participation for material incentives	People participate by contributing resources, for example, labour, in return for food, cash or other material incentives. Farmers may provide the fields and labour, but are involved in neither experimentation nor the process of learning. It is very common to see this 'called' participation, yet people have no stake in prolonging technologies or practices when the incentives end.
Functional participation	Participation seen by external agencies as a means to achieve project goals, especially reduced costs. People may participate by forming groups to meet predetermined objectives related to the project. Such involvement may be interactive and involve shared decision-making, but tends to arise only after major decisions have already been made by external agents. At worst, local people may still only be co-opted to serve external goals.
Interactive participation	People participate in joint analysis, development of action plans and formation or strengthening of local institutions. Participation is seen as a right, not just the means to achieve project goals. The process involves interdisciplinary methodologies that seek multiple perspectives and make use of systemic and structured learning processes. As groups take control over local decisions and determine how available resources are used, so they have a stake in maintaining structures or practices.
Self-mobilization	People participate by taking initiatives independently of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Self-mobilization can spread if government and NGOs provide an enabling framework of support. Such self-initiated mobilization may or may not challenge existing distributions of wealth and power.

Figure 5 Pretty's typology of participation, as adapted by Cornwall (2008)

In the following paragraph an overview is provided of different participation models. As stakeholder participation is contextualized (or should be), models are differentiated as well, according to the context in which participation exists. Even though overlap exists between the different contexts, the models applied

are dependent on the normative values behind the models. For this reason examples of models within specific frameworks are provided.

The following list of participation models provides an overview of models that exist, starting with Arnstein's Ladder of participation, in the frame of (youth) participation. It was developed by Karsten (2012) licensed under Creative Commons to increase the amount of creativity available to the public for free. Although not exhaustive, it provides a relatively complete overview of the most prominent participation models:

- Ladder of citizen participation, Sherry Arnstein (1969)
- Ladder of children participation, Roger Hart (1992)
- Typology of participation, Sarah White (1996)
- Degrees of participation, Phil Treseder (1997)
- Wheel of participation, Scott Davidson (1998)
- Active participation framework, OECD (2001)
- Pathways to participation, Harry Shier (2001)
- Clarity model of participation, Clare Lardner (2001)
- Strategic approach to participation, UNICEF (2001)
- Triangle of youth participation, Jans & de Backer (2002)
- Youth participation in society, Jans & de Backer (2002)
- Dimensions of youth participation, David Driskell (2002)
- Seven realms of participation, Francis & Lorenzo (2002)
- Ladder of volunteer participation, Adam Fletcher (2003)
- Youth engagement continuum, FCYO (2003)
- Four Cs of online participation, Derek Wenmoth (2006)
- Power law of participation, Ross Mayfield (2006)
- Levels, spaces and forms of power, John Gaventa (2006)
- The CLEAR Participation Model, Lawndes & Pratchett (2006)
- Four L Engagement Model, Tony Karrer (2006)
- Participation 2.0 Model, New Zealand (2007)
- Spectrum of public participation, IAP2 (2007)
- Engagement in the policy cycle, Diane Warburton (2007)
- Online Participation Behaviour, Chain Fogg & Eckles (2007)
- Key dimensions of participation, Driskell & Neeman (2009)
- Matrix of participation, Tim Davies (2009)
- Pathways through participation, NCVO & IVR (2009)
- Changing views on participation, Pedro Martín (2010)
- Ladder of online participation, Bernoff & Li (2010)
- Online participation across age, Rick Wicklin (2010)
- Three-lens approach to participation, DFID-CSO (2010)
- Behavior Grid, BJ Fogg (2010)
- The Participation Tree, Harry Shier (2010)
- Typology of Youth Participation, Wong et al (2011)
- Six principles of online participation, Tim Davies (2011)
- The Yinyang Model, Shier et al. (2012).

Participation models are framed within the context they exist or are adapted to the public intended. The following list of models is therefore comparable to Karsten's (2012); it is however focused on public participation rather than youth participation (Hussey, 2017):

- Ladder of Citizen Participation, Sherry Arnstein (1969)
- Socio-economic Participation Model, Norman H. Nie et al, (1972, 1978)
- Connor's Ladder of Participation, Desmond M Connor (1988)
- Ladder of Children's Participation/Ladder of Youth Participation, Roger Hart (1992)
- Ladder of Participation for Waste Management, Peter M Wiedemann & Susanne Femer (1993)
- Framework for Participation, David Wilcox (1994)
- Typology of Participation in Development Programs and Projects, Jules Pretty (1995)
- Typology of Participation, Sarah C. White (1996)
- Rocha's Ladder of Empowerment, Elizabeth M Rocha (1997)
- Degrees of Participation, Phil Treseder (1997)
- Wheel of Participation, Scott Davidson (1998)
- Spectrum of Public Participation, IAP2 (2000, 2005, 2007)
- Strategic Approach to Participation, UNICEF (2001)
- Clarity Model of Participation, Clare Lardner (2001)
- Pathways to Participation, Harry Shier (2001)
- Active Participation Framework, OECD (2001)
- Seven Realms of Participation, Francis & Lorenzo (2002)
- Dimensions of Youth Participation, David Driskell (2002)
- Youth Participation in Society, Jans & de Backer (2002)
- Triangle of Youth Participation, Jans & de Backer (2002)
- Youth Engagement Continuum, FCYO (2003)
- Ladder of Volunteer Participation, Adam Fletcher (2003)
- Five Components of Participation, Robin S Smith (2005)
- Silverman's Citizen Participation Continuum, Robert Silverman (2005)
- Varieties of Participation, Archon Fung (2006)
- Four L Engagement Model, Tony Karrer (2006)
- The Clear Participation Model, Lawndes & Pratchet (2006)
- Levels, Spaces and Forms of Power, John Gaventa (2006)
- Power Law of Participation, Ross Mayfield (2006)
- Four C's of Online Participation, Derek Wenmoth (2006)
- Lundy's Model of Child Participation, Laura Lundy (2007)
- Online Participation Behaviour Chain, Fogg & Eckles (2007)
- Engagement in the Policy Cycle, Diane Warburton (2007)
- Participation 2.0 Model, State Services Commission, New Zealand (2007)
- Pathways through Participation, NCVO & IVR (2009)
- Matrix of Participation, Tim Davies (2009)
- Key Dimensions of Participation, Driskell & Neema (2009)
- Consumer Framework for Digital Participation, Communications Consumer Panel UK (2010)
- The Participation Tree, Harry Shier (2010)
- Behaviour Grid, BJ Fogg (2010)
- Three-lens Approach to Participation, DFID-CSO (2010)
- Online Participation Across Age, Rick Wicklin (2010)
- Ladder of Online Participation, Bernoof & Li (2010)

- Changing Views on Participation, Pedro Martín (2010)
- Six Principles of Online Participation, Tim Davies (2011)
- Typology of Youth Participation, Wong et al (2011)
- The Yinyang Model, Shier et al (2012)
- Kaizen’s Archetypes of Community Participation, Kaizen Partnership (2012)
- Bryer’s Model of Social Media Participation in Urban Infrastructure Projects, Thomas A Bryer (2012)
- Scotland’s Digital Participation Pathway, The Scottish Government (2014)
- IAP2 Australasia “Community Engagement Model” (2014)
- Capire’s Engagement Triangle, Capire Consulting Group (2015)
- Les Robinson’s Curiosity-Ometer, Les Robinson (2016)
- Canadian Union of Skilled Workers (CUSW) Participation Model, CUDW (2016)

The analysis above reveals that a generic “all-size fits all participation model” to be applied by institutions willing to initiate stakeholder engagement processes cannot be prescribed. Notwithstanding this, the main steps of an institutional participation process are similar (see e.g. Health Canada, 2000; Slocum, 2003; OECD, 2015).

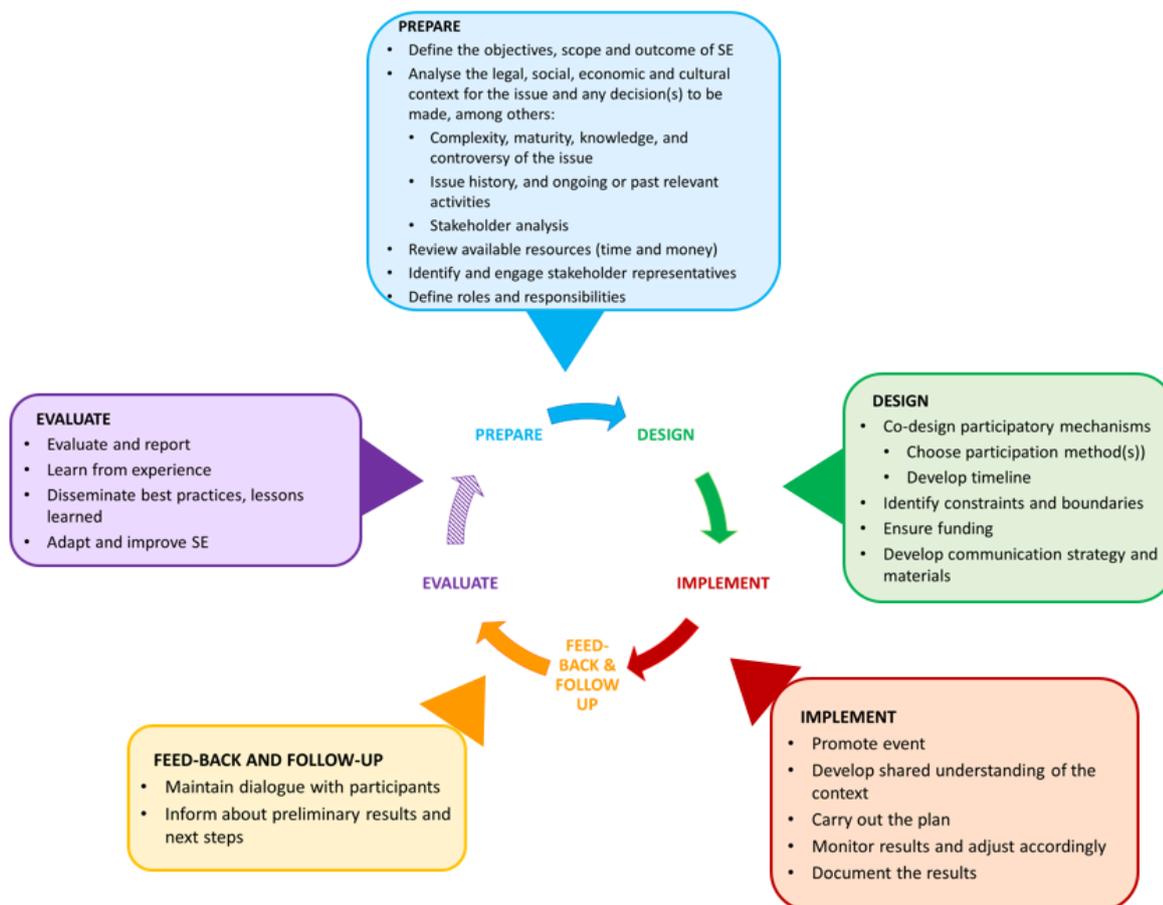


Figure 6 Main steps of an institutional participatory process

General principles of effectiveness of participation such as representativeness, inclusiveness, fair deliberation, access to resources, transparency, among others, have been proposed in the literature (e.g. Rowe and Frewer, 2000). Chilvers (2008) cautions however that there is a need for a deeper look into grounded practitioners’ appraisal of what constitutes effective participation, as this may reveal “*diversity, difference, antagonism, and uncertainties/indeterminacies*”. For instance, IRPA defines ten guiding principles

for stakeholder engagement aimed at informing radiation protection professionals, the last principle referring specifically to its code of ethics: “Apply the IRPA Code of Ethics in their actions within these processes to the best of their knowledge” (IRPA, 2008). IAEA puts emphasis on *accountability*, among others, as a principle for stakeholder engagement throughout the life-cycle of nuclear facilities: “Responsibility for the safe operation of a nuclear facility lies first and foremost with the operator.” (IAEA, 2011, pp. 5). SAFECAST, a citizen science initiative, uses in its code of conduct principles such as “always open, improving, encouraging, uncompromising, independent” (SAFECAST, 2016, pp. 12), which cannot be found in guidelines from international radiation protection or nuclear energy organisations. The underlying principles for stakeholder engagement in practice will be followed up in more detail in subsequent ENGAGE research.

Key challenges identified	Best practice / recommendations
Multiple participation typologies and models	Understand the hypotheses behind the typologies and the context in which they were developed when selecting a particular typology and model
No one-size fits all “best” model	Contextualisation of participation models
Potential misalignment between expectations of different stakeholders in terms of influence on decisions	Clarify / co-develop the objectives, scope and outcome at the outset of the process
Diversity of evaluation criteria for the effectiveness of participation	Studies of grounded practitioners’ appraisal of what constitutes effective participation

3.2 The participatory turn in science and technology

Since the 1990s, a new EU science policy discourse on participation has emerged, which insists on involving civil society and citizens in decision-making processes about science and technology. This discourse stresses the need for more representative or democratic ways of involving non-expert actors in science and technology (Jasanoff, 2003). It signifies a ‘participatory turn’ in science-society relations in so far as it:

- heralds a shift away from *technocratic* decision-making approaches in science and technology towards ostensibly more *democratic* approaches that seek to include all relevant stakeholders in the shaping of science and technology;
- moves from a deterministic reading of technology development to a social-constructivist reading; thus accepting the co-evolution or mutual shaping of technology and society.

The principles and aims it embeds are many; they invariably contain inclusion, openness, accountability, and responsibility, or forms thereof. Although there is some semantic unity about these principles and the meaning of ‘participation’ itself, a lot of conceptual ambiguity remains. For instance, ‘participation’ can be, and frequently is, invoked for divergent reasons: to anticipate problems linked to the development of technologies; to create flexible and adaptive governance systems that better manage scientific and social uncertainties; or to give citizens a voice in science policy-making. As described below, these varying motivations emanate from past and present public controversies over nuclear power plant accidents, food scares, widespread environmental pollution, and various other disputes dating back decades. They also coincide with the present-day crisis of modern structures, as governments cannot democratically control important scientific decisions and actions that directly bear on society, and the status of scientific knowledge is very much in question (Van Oudheusden 2014).

What is less in dispute is that ‘participation’ in science and technology is now a prominent, EU-wide discourse. It is firmly embedded in an EU-wide governance framework for European policies, as articulated in the European Commission’s 2001 White Paper on European Governance (CEC, 2002: 6) and the European Commission’s Responsible Research and Innovation (RRI) science policy strategy, which underscores the need to align R&D processes and outcomes with the values and concerns of society. Whether conceived of as consultation, dialogue, perception management, or even in terms of financial investment, there is widespread agreement that decision making in science and technology is somehow improved through the involvement of non-scientists and nontechnical issues (Cass, 2006: 3; 5). Some authors even claim that participatory and/or deliberative engagement is now a firmly established way of conducting policy and even irreversible features of modern-day liberal democracy (see e.g.: Geenens & Tinnevelt, 2007).

Evolution

As mentioned in the previous section, appeals to participation have their roots in the 1960s and must be understood within a broader context of cultural criticism that emerged at the time. In the USA, critical voices such as Rachel Carson’s spurred an environmental consciousness and ecological movement, and Ralph Nader publicly campaigned against the auto industry to make cars safer. In response to these pressures, the US government changed its national pesticide policy and the Congress created a federal agency devoted to automotive safety.

Arguably, these movements developed as a criticism of ‘modernist’ practices of governing generally and of customary ways of managing technology specifically (Schot, 2003). Various governments sought to accommodate such criticism (environmental, feminist, antinuclear, etc.) by rendering decision making more transparent and communal. ‘Participation’ can thus be seen as part of a broader social and cultural countermovement, which incited a ‘participatory turn’ in government through demands for more open, transparent, and collective decision making (Jasanoff, 2003; Lengwiler, 2008). These demands were reinforced through a crisis of modern structures: due to the increasing complexity of contemporary societies, governments desperately needed new ways of dealing with new uncertainties, complexity, controversy, speculative risks, and so on (Delvenne et al., 2011).

Expert dilemmas

An example of increased complexity is found in the observation that scientists increasingly confronted one another, for instance in debates over what constitutes real versus fictitious environmental impacts, food safety, or the benefits and dangers of nuclear power. These ‘expert dilemmas’ illustrated not only the difficulty of predicting a technology’s likely advantages, costs, and health implications based on objective scientific analysis, but also undermined experts’ authority (Abels, 2007). Particularly as public concerns over new technologies amounted in the 60s-70s, new social and civil rights movements demanded a say in technological decision making. Scientific procedure itself became an issue of public contention and debate, resulting in disputes over what constitutes relevant knowledge and casting doubt over the very possibility of value-free science. What emerged instead among various publics was deep scepticism towards scientific practice; among some even a profound distrust of science based on an understanding that its activities are deeply politicized, as actors and institutions interpret, craft, and explain the facts in accordance with their views and interests in a given technology.

New social movements, as well as sociologists of science, therefore argued the necessity of broadening the spectrum of actors in technological decision making so as to escape the ineffectual government efforts of technocratic elites (Palm & Hansson, 2006). Many of these actors also invoked science participation on a commitment to *democratize* science and technology culture (paraphrasing Bijker, 1995), based on the right for all affected parties to have a say in decisions that could affect them personally (Cass, 2008: 6).

Thus, it is against a background of political and cultural contestation and broad recognition of the inadequacy of modern structures to deal with uncertainty that the emergence and maturing of ‘participation’ should be understood. These two mutually reinforcing factors help explain the participatory turn in the 60s-70s from technology *government* to technology *governance*, as well as the move from ‘expertocratic’ impact assessment towards more interactive, public-oriented science policies and decision-making forms.

After the turn

In recent years, participatory practices have proliferated into a number of broad categorizations (e.g., participatory technology assessment, stakeholder dialogues, consensus conferences), which are too numerous and diverse to mention here, particularly as governmental and non-governmental entities have adopted the participatory label in their own distinct ways.

On the *governmental* level there is now a stronger focus on integrating societal concerns and desires into technology development before development closes down or becomes locked in, thereby shifting the emphasis from control and prediction of technological impacts towards broad public involvement at an early stage of R&D (see e.g. technology assessment and upstream public engagement). From this perspective, more actors deserve to be involved in technology construction than is usually the case: rather than just scientists, engineers, representatives of industry, and a limited range of other experts, new formats extend a hand to policy makers, civil society groups, citizens, and other potential ‘stakeholders’ to have a say in science. Accordingly, these formats emphasize the interactive process involving a multitude of actors and their perspectives, as well as the use of participatory methods rather than the analytic product or outcome of a given format (Delvenne et al., 2011). The aim here is to develop a more integral technology concept; one that situates technological developments within their economic, political, and societal context, rather than treats technology as an isolated enterprise.

On the *non-governmental* level, various small-scale forms have emerged, such as ‘*dialogue events*’ that incite individual and small-group learning rather than institutional learning (see: Davies et al., 2009). A typical example of such dialogue events are the face-to-face discussions between visitors to science museums. In the UK, the London Science Museum has hosted a range of such discussions on science and science-related issues; in France, the Café Scientifique movement hosts dialogues about various scientific topics in a casual setting. These initiatives do not have formal ties to science policy and do not have a fixed agenda; yet they potentially incite intergroup learning about science in a broad sense (ibid). They can therefore be described as a process in which actors articulate different insights, viewpoints, and positions in relation to a technology or technological issue. Through the confrontation of different viewpoints actors learn about technology and sociotechnical issues, as well as the means, ends, and process of dialogue and discussion itself (Rip, 1986).

These non-institutional forms continue to grow and develop, in the form ‘citizen-led’ engagements, such as protests, activism, alternative social movements, and others (Chilvers & Kearnes, 2016: 3). These forms also comprise types of citizen science, broadly understood as scientific practices developed and enacted by citizens, typically with citizen volunteers collecting or analysing research data to tackle pressing societal issues, such as environmental pollution (Irwin, 1995).

Unfolding ‘participation’ today

Whereas the policy discourse on participation initially consisted of abstract, normative calls for more open and transparent decision-making processes, it now gravitates towards the translation of ‘participation’ into participatory toolsets, methods, and good practices, with due consideration of the broader institutional context in which ‘participation’ is embedded and of recent public controversies over sociotechnical issues (e.g. climate change, energy transitions, genetically modified organisms and radioactive waste management). A prime example is the EU’s ‘RRI Tools’ (<https://www.rri-tools.eu/>), which seeks to translate key guiding

principles of RRI into a collection of Best practice / recommendations to assist researchers and practitioners (Groves 2017). In the radiation protection field OECD (2015) has established, for instance, “A Short Guide to Issues, Approaches and Resources for stakeholder involvement in decision making”.

Building on Saurugger (2010), this gradual unfolding of ‘participation’ into multiple practices and approaches (translations) sustains the emergence of an EU-wide community of participatory practice. It also creates the necessary momentum for concerned actors (policy makers, civil society representatives, industry leaders, citizens) to accept participation as a new European norm, urging them to engage with one another. In these mutually reinforcing ways, the ‘participatory turn’ is institutionalized.

The analysis above suggests the following additional research questions to be addressed in WP2 case studies:

- Can you identify in official documentation or discourses, or in secondary sources, any references to a “participatory turn” for your field or case? If so, please document and indicate how this turn is understood, why and when it came about.
- Can you identify in official documentation or discourses, or in secondary sources, any mention (explicit or implicit) of a shift away from expert-based or technocratic decision making to more inclusive, open, democratic, participatory decision making? If so, please document and motivate, and indicate why and when this shift came about.

Key challenges identified	Best practice / recommendations
Crisis of scientific expertise and decision-making authority, due to agenda conflicts, scientific controversies, incentives to democratize science and technology	Broadening of science and technology <i>government</i> to <i>governance</i> , with due attention for the views and interests of civil society groups, citizens, and other previously excluded stakeholders
Proliferation of non-institutional participatory forms, which challenge formal institutional approaches	Development of partnerships between formal and informal institutional actors (e.g. citizen scientists); joint exploration of how formal and informal forms can positively influence or complement one another

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4. Lessons learned from the practice of Stakeholder Engagement in nuclear emergency and post-accident preparedness and recovery, medical exposures to ionising radiation, and exposure to indoor radon

4.1 Stakeholder engagement in the governance of emergency and post-accident preparedness and recovery

In emergency and post-accident preparedness and recovery (EP&R), manifold stakeholder engagement activities could be observed throughout the past years, from national or international stakeholder panels and dialogues in research projects addressing emergency preparedness, response and recovery (e.g. CORE, ETHOS, EVATECH, FARMING, EURANOS, NERIS-TP, PREPARE), to activities initiated by NGO's (e.g. the Aarhus roundtables initiated by the Nuclear Transparency Watch) or radiation protection experts (e.g. Villigen OECD CRPPH dialogues, the ICRP Fukushima dialogues), participation in emergency exercises, partnership approaches in the management of nuclear installations (e.g. local communities in Spain), the Group of

European Municipalities with Nuclear Facilities (GMF) and many other. In addition, after the accident in Fukushima, citizen-led initiatives have matured and continue to develop.

Such activities provided for a valuable learning process regarding emergency management, on the one hand, as they highlighted the complexity of nuclear accident preparedness, response and recovery, and engagement, on the other hand (e.g. Lazo, 2016).

In the subsection 4.1.1, a detailed review is made of lessons learned from and about stakeholder engagement in a number of European research projects dealing with emergency preparedness and response in the last 15 years. These projects contributed to enhancing preparedness for emergency response and recovery, creating stakeholder networks, and providing spaces for dialogue and collaboration. In addition they provide insights into the challenges, triggers and facilitators for stakeholder engagement and the sustained interaction between local and national actors.

Subsection 4.1.2 brings in the perspective from Nuclear Transparency Watch – a European network that promotes a citizen watch on nuclear safety and transparency, supporting participation in all activities of the nuclear cycle since 2013. NTW pleads for higher involvement of civil society organisations in emergency planning at local and national level in European countries. Moreover, NTW sees a lack of planned involvement of citizens in emergency and recovery management itself.

Subsection 4.1.3, summarises -based on lessons learned Chernobyl and Fukushima accidents- good practices and recommendations for stakeholder engagement in emergency preparedness, response and long term actions in the case of a nuclear accident, as derived in the SHAMISEN project. It argues for a holistic approach to emergency preparedness, response and recovery, aiming at minimising negative consequences on health and well-being in affected populations and involving all stakeholder groups in the co-development of sustainable approaches.

4.1.1 Lessons learned from the practice of stakeholder engagement in European research projects on emergency preparedness, response and recovery

The radiation protection research community active in the area of emergency and post-accident preparedness and recovery management has been a key promoter of stakeholder engagement in the governance of radiological risk. Experience from a number of nuclear and radiological events, whether major ones such as Chernobyl (1986) and Fukushima (2011), or less severe ones such as the Tricastin 2008 in France, clearly showed that social and psychological effects are at least as important as the radiological consequences (e.g. Allen, 1996; IAEA 2011). Lazo (2016) notes the shift in the role of the decision-makers, from *“making scientifically informed decisions based on their own concepts and judgments to making scientifically informed decisions with increasingly significant input from affected stakeholders and, to a certain extent, social and political views”*.

In addition, engaging stakeholders in post-accident preparedness and recovery was recognized to *“open (safe) spaces for dialogue”* between national and local stakeholders (Baudé et al, 2014), and to bring in specific knowledge and values and thus contribute essentially to the development of socially robust and practicable management options (Nisbet et al, 2005) and the overall quality of the rehabilitation process (Raskob, 2010). Not least, creation of stakeholder networks in the preparedness phase was deemed important for contingency planning and emergency response (Nisbet et al, 2005; Charron et al, 2015).

This subsection describes the stakeholder engagement experience from ~15 years of European funded research in emergency and post-accident preparedness and recovery management. The projects that will be

analysed in the following had various focus points and involved many European Member States in various combinations:

- FARMING: Food and Agriculture Restoration Management Involving Networked Groups (2000-2004)
- EURANOS: European Approach to Nuclear and Radiological Emergency Management and Rehabilitation Strategies (April 2004 - June 2009)
- NERIS-TP: Towards a self-sustaining European Technology Platform (NERIS-TP) on Preparedness for Nuclear and Radiological Emergency Response and Recovery (February 2011 - January 2014)
- PREPARE: Innovative integrated tools and platforms for radiological emergency preparedness and post-accident response in Europe (February 2013 - January 2016)
- EAGLE: Enhancing education, training and communication process for informed behaviors and decision-making related to ionizing radiation risks (August 2013 – August 2016)

The remainder of this section summarised general observations, formulated along the research questions outlined in section 2.3.

The overarching question for WP2 is:

How are RP communities responding to “external” pressures, mandates, demands, and/or expectations commending stakeholder engagement in emergency and post-accident preparedness and recovery management? And how does this show in practice (e.g. specific cases)?

The EU research and coordination projects provide some basic answers to these questions.

As shown by the analysis carried out in the NERIS-TP project (Baudé et al, 2014), participation in the context of post-accident preparedness and recovery takes place in various forms and venues: involving interactions between national stakeholders (governmental and non-governmental) and/or local stakeholders; in emergency exercises, seminars, decision workshops, panels, among others; and ranging from consultation to cooperation between local or national stakeholders and scientists.

Baudé et al (2014) note that such processes take place in various frameworks and range from one event up, to several encounters, to permanent processes (list below drawing on Baudé et al, 2014):

- Formal stakeholder engagement frameworks such as CODIRPA in France, where the regulator initiated processes for the co-design of post-accident public policies.
- European projects (e.g. FARMING, PREPARE, EURANOS and NERIS-TP) that created opportunities for stakeholder dialogue and collaboration on post-accident recovery tools and strategies (e.g. the European Handbooks for food production systems or inhabited areas, or policies for the management of contaminated consumer goods) , or “[experimented] *new types of interactions between various stakeholders in the context of post-accident preparedness and/or management*” (Baudé, 2014).
- Emergency exercises with participation from national and local stakeholders, initiated by nuclear safety authorities or TSO’s and including post-accident issues, (e.g. INEX 4 in the Slovak Republic), partly supported from research projects (EURANOS or NERIS-TP projects).

- National, permanent cooperation established between a recognized radiation protection actor (such as IRSN in France) and local actors (e.g. French Local Information Commissions – CLIs) or citizens (e.g. Open Radiation).
- Initiatives from local actors or networks of local actors, such as the permanent working group on post-nuclear accident management of ANCCLI in France, or the nuclear emergency working group of the radioactive waste partnership MONA in Belgium.

To the above the following should also be mentioned:

- The positive experience from stakeholder engagement initiatives in one particular country or in the framework of specific European projects was in some cases an incentive for other countries to follow the example. Creation of the FARMING stakeholder networks took stock of previous experience from the Agricultural and Food Countermeasures Working Group in the UK. In turn, the FARMING project led to the development of stakeholder networks in countries that had not participated to the project.
- The revised European Basic Safety Standards led to revisions of emergency plans or other legal framework for protection against ionising radiation in European Member States, including various stakeholder groups (authorities, researchers, local and national emergency managers, professional organisations) and, in some cases, public consultations (e.g. Spanish Royal Decree)
- Citizen radiation monitoring networks, triggered by the past nuclear accidents, particularly Fukushima, or safety related events in other nuclear power plants (e.g. e.g. <https://tdrm.fiff.de/>)

Which (other) real or potential forms and instruments of stakeholder engagement and public participation can be observed in emergency and post-accident preparedness and recovery management practice, showing no reference to existing requirements?

Several forms of participation can be mentioned, initiated by radiation protection scientists involved in European research on EP&R, that went beyond the existing requirements at that time. These activities have been developed on the background of a growing recognition at international level that *“stakeholder involvement is central to resolving many of the social and judgmental aspects of radiological risk management”* (OECD, 2007, pp. 8), and the lessons learned from past accidents.

Within **FARMING**, stakeholder networks were created in four European countries (UK, BE, GR, FR) in order to *“bring together the many and diverse stakeholders that would be involved in intervention so that acceptable strategies can be developed for maintaining agricultural production and safe food supply”* (Nisbet et al, 2005). The project aimed, among others, at establishing *“lines of communication with individuals and organisations who have not hitherto collectively considered the implications of contamination of the food chain”* (e.g. food safety authorities, consumer organisations, food industries, environmental NGO’s), and to *“assist in the development of robust and practicable restoration strategies”*. The stakeholder networks met several times during the project duration in order to bring forth their own knowledge, experience and values in the development of a countermeasure compendium and, in some countries, continued collaboration in other frameworks (e.g. EURANOS and PREPARE projects).

In the **EURANOS** project, the demonstration of the European Handbooks for the management of contaminated inhabited areas, food production systems and drinking water supplies in Denmark and Slovakia, provided a tool for stakeholder dialogue about decision-making on post accident restoration strategies. The aim was to investigate the *“appropriateness and applicability of [the handbooks] to support a stakeholder participatory process”* for decision-making in a post-accident situation (Nisbet et al, 2010b).

The participating governmental and non-governmental organizations committed to continue the process also after the end of the project, which is an important element, since stakeholder engagement was not part of decision-making in the two countries (ibid.). Participatory activities included (Duranova, 2016): testing, customization and use of models and tools; case studies; building a network and trust between partners within each country, and within Europe through EC projects; facilitated workshops, exercises, seminars and training courses; establishment of national panels and the EURANOS Handbooks User Group; and participation in the development of the EURANOS Handbooks for the management of contaminated inhabited areas, food production systems and drinking water.

Of particular importance is the establishment of the European platform **NERIS** on emergency and post-accident preparedness and management, which provides “*a forum for national bodies, expert organizations, universities and research institutes, as well as non-governmental stakeholders*” (Liland and Raskob, 2016). It plays an important role in setting up Strategic Research Agenda’s and advises international bodies on radiation protection policies. The mission of the NERIS Platform is to “*build confidence in [...] capabilities of the key players and the methods used in the management of nuclear and radiological emergencies in Europe*”; to encourage cooperation between authorities, TSO’s, industry, researchers, NGO’s, and other national and local stakeholders; and to “*facilitate access to expertise and technology*” (Mustonen, 2013).

As a follow up of EURANOS, and taking into account the lessons learned from Fukushima, the **PREPARE** project organised a reflection on the management of contaminated food and other consumer goods. Stakeholder panels were established in 10 European countries in order to “*contribute to the development of strategies, guidance and tools for the management of contaminated products, taking into account the views of producers, processing and retail industries and consumers*” in each of the participating countries, and the experiences provided by Japanese stakeholders (Charron et al, 2016).

The **EAGLE** project was a coordination and support action aimed at clarifying and improving information and communication strategies supporting informed societal decision-making related to ionizing radiation risks. EAGLE recognised stakeholder engagement, and the participative, citizen-centred communication as key factors in the governance of ionising radiation risks, including emergencies. EAGLE stakeholders (nuclear utilities, policy makers, general and specialized education institutions, medical institutions, technical support organizations, media, civil society) recognized that constant and effective communication between public and users of ionizing radiation is necessary for meaningful public involvement in decision-making. Based on results from project activities with stakeholders conducted throughout the entire project duration, EAGLE formulated recommendations supporting stakeholder engagement in nuclear emergency preparedness, response and recovery. The main goal of the interactions with stakeholders was to collect information, opinions and suggestions on how can communication on ionizing radiation and nuclear emergencies be improved, taking into account different perspectives: main information sources (RP professionals, regulatory authorities, nuclear expert organisations, medicine representatives, nuclear power industry), journalists (traditional and social media experts), municipalities with nuclear facilities, NGOs, civil society organisations.

Although the EAGLE project had communication as its main focus, the conclusions of the project and its guidelines recommend stakeholder engagement <http://eagle.sckcen.be/en/Deliverables>. Among, other, EAGLE made the following recommendations related to nuclear emergencies:

- Stakeholder engagement should be an integral part of a decision-making.
- Mutual learning and transparency among all stakeholders, including scientists and lay people, is vital.
- The converging values and differences among the different groups of stakeholders should be identified.

- Relationships with journalists should be developed through training and joint learning events (technical seminars, press trips, open door visits, and support for joint participation by journalists and sources in third party activities).
- The different perspectives, needs, and roles of participants in the communication process should be respected.
- Admit that a nuclear accident can happen, as this opens the way to dialogue and strengthens safety and risk culture on all sides.
- Experts should support and form partnerships with citizens scientists and citizens who are active communicators, and facilitate the activity of civil society organizations responding to citizen needs "on the ground". Authorities and nuclear and RP experts should be responsive to civil society volunteers, engage and support them with information, material resources, public-interest partnerships and events, including barcamps, hackathons, and other crowd-sourced endeavours.
- Engagement in ongoing dialogue among the professionals and public should be a routine procedure and not only a part of recovery.

What levels of awareness about external prescriptions of stakeholder engagement in RP do researchers and practitioners reveal?

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

As mentioned in previous paragraphs, there is wide recognition among researchers and practitioners in emergency preparedness, response and recovery of the need for stakeholder engagement in radiological risk governance since decades, notably after the accident in Chernobyl.

In what concerns engagement in practice in the preparedness phase, national and (a number of) local stakeholders are regularly involved in emergency exercises focusing on the release phase, in many EU countries. However, preparedness for post-accident recovery management (and related engagement processes) received attention only in latest years, notably in the aftermath of the Fukushima accident. Charron et al (2016) recommend that both institutional and non-institutional actors should be involved in dialogue, *"for instance about the clear allocation of roles and responsibilities, or the identification of local/regional/national vulnerabilities in case of an accident"*.

RP researchers have been actively involved in establishing national panels and stakeholder groups focusing on different issues in the area of the governance of emergency and post-accident preparedness and recovery management. *"They often play the role of facilitators and mediators of processes, developing skills and learning about engagement through practice"* (Baudé et al, 2014). In a synthesis of the PREPARE panels, Charron et al (2016) argue that *"it is important for the experts to be at the service of the population"* and work at the local level *"together with – and not just for – the population"*.

What were the rationales for stakeholder engagement, the final objectives?

The main goal of stakeholder engagement undertaken in the previously mentioned projects in the area of emergency and recovery management was to improve and strengthen the emergency preparedness, response and recovery management at national, regional and local levels, taking into account the complexity

of a nuclear accident situation (Duranova, 2016; Charron et al, 2016; Baudé et al, 2014; Nisbet et al, 2005). This entails various derived objectives, among others:

- to stimulate collective learning and establish lines of communication with *“individuals and organisations who have not hitherto collectively considered the implications of contamination of the food chain”* (e.g. food safety authorities, consumer organisations, food industries, NGO’s) (Nisbet et al, 2005);
- to *“build mutual trust and understanding between stakeholders”*, rather than promoting the acceptability of an accident: *“in such a situation citizens are victims”* (Charron et al, 2016);
- to develop *“robust and practicable restoration strategies”* (Nisbet et al, 2005; Charron et al, 2016)
- to create structures that would be able to react promptly in case of an accident (Nisbet et al, 2005; Charron et al, 2016);
- to identify, establish and creating a shared understanding of the roles, responsibilities and expertise in case of an accident (Charron et al 2016; Baudé et al, 2016; Marignac et al, 2016);
- to strengthen the preparedness at the local/national level by setting up dedicated fora, develop new decision-support tools (e.g. the European Handbooks) or adapt existing tools (e.g. RODOS Decision Support system) developed within the EU projects (Liland and Raskob, 2016);
- to share experiences about initiatives on emergency and rehabilitation preparedness and management throughout Europe, and to develop and apply participatory methods and models that enable and support stakeholder dialogue (Duranova, 2016; Nisbet et al, 2005);
- to contribute to the development of policy strategies and guidance, for instance for the management of contaminated goods, taking into account the views of producers, processing and retail industries and consumers (Charron et al, 2016).

Baudé et al (2016) emphasize that *“the capacity of local actors to build their response to crisis depends on their capacity to build new forms of cooperation among themselves and with other actors and relevant networks”*.

The experience gained from the establishment of the PREPARE National Panels (Charron et al, 2016), showed that such participatory activities also provide an opportunity for stakeholders to *“gain new knowledge on the topic of radioactive contamination and the national systems of radiological and nuclear emergency preparedness and response”* .

Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement?

The FARMING project carried out a detailed evaluation of achievements and challenges (Nisbet et al, 2005). The project attracted a *“large number of enthusiastic and committed stakeholders”*. The network established communication links between the relevant stakeholders and sharing of expertise, highlighted the importance of the national context, disseminated widely information about restoration strategies, attracted attention to the longer term post-accident management, promoted the establishment of stakeholder panels in countries not participating in the project, and contributed to knowledge on recovery strategies for non-nuclear contaminations (Nisbet, 2005). Furthermore, in UK the FARMING panel has been given an official role in providing advice on the selection of countermeasures and waste disposal options for contaminated foodstuffs. In Belgium, the activities and success of the stakeholder panel has led to the creation of a socio-economic cell in the emergency response organisation (currently replaced by another structure).

Charron et al (2015) report that the EURANOS and PREPARE panel meetings were generally considered successful, as representatives of the different institutions and organizations, directly involved in the management of contaminated food and consumer goods met for the first time in many cases, and became aware of the complexity of the situation and the need to work together on these issues. The panels contributed to enhancing the European handbooks for the management of contaminated food production systems, drinking water and inhabited areas; creating or strengthening the national stakeholder networks; and providing policy recommendations for post-accident management, disseminated both at national and international level. A critical review of the implementation of these policy recommendations has yet to be made. In Ireland, the national stakeholder panel active in case of an emergency was created due to the European project PREPARE and the involvement of the Environmental Protection Agency in the project and its inclusion of arrangements for stakeholder engagement in emergency plans. Some of the networks created in this FARMING and EURANOS were the basis of stakeholder panels in subsequent projects.

The observation of local-national interactions showed that these facilitated “*a shared understanding of issues at stake in the emergency and post-emergency field*”, but the continuity of engaging with local stakeholders is “*a necessary condition for keeping this “human capital”*” (Baudé et al, 2014). At the same time such interactions “*favoured the development of new types of roles and relationships*” in which “*local actors become partners in the development of post-accident preparedness*” at national or local (Baudé et al, 2014).

Another result of stakeholder engagement processes was the recognition of the need for a “*clear institutional and regulatory framework for post-accident preparedness and/or management*” providing for, among others, engagement of stakeholders, notably local actors (Baudé et al, 2014).

As a result of the previous panels and the interest in several countries to continue the dialogue, the recently commenced CONFIDENCE and TERRITORY projects within the CONCERT EJP foresee engagement of a wide range of stakeholders in panels, workshops, facilitated discussions and training courses.

Have there been any guided improvement activities?

The experience acquired in FARMING, EURANOS, NERIS-TP, PREPARE, EAGLE projects has been shared widely in the radiation protection research community and provided a means for learning from and about engagement.

The governance framework developed under the EURANOS project (Dubreuil et al, 2010), aiming at distilling “*favourable conditions for stakeholders (in particular local communities) to engage effectively and sustainably in the cooperative development of post-accident preparation or management strategies*” was used as input in further engagement activities in the NERIS-TP and PREPARE projects.

What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?

The example of Slovak Republic on stakeholder engagement and its development and change over time is given as first. The second example focuses on the development of the European NERIS platform. A third example refers to the ICRP dialogues conducted in Fukushima in close cooperation with the NERIS platform.

1) Stakeholder engagement experiences in the Slovak Republic

As analysed in previous work (Duranova 2016), the NERIS-TP project provided an opportunity for the development of the process for post-accident preparedness in the Slovak Republic involving a large group of actors at the national, regional and local levels: national and regional authorities, public and private research

organisations, academia, mayors of local communities, the army, first responders and operators, among others.

This process contributed to gaining insights not only into the complexity of the emergency preparedness and post-accident management, but also to a clearer understanding of *“the relations among different stakeholders, and their roles and tasks within the post-accident preparedness process”* (Duranova 2016). The process consisted of seminars, workshops, training courses and exercises and *“enabled a common language and a shared understanding of the challenges”* (ibid.).

Interestingly, the process led to changes into the framing of the emergency and post-accident issues, and the commitment to develop a *“decision-framing process that is inclusive and participatory, with open and two-way discussions, leading to relationships where issues can be identified, discussed and resolved, resulting in sustainable decisions”* (Duranova, 2016), which had been main of the engagement processes (Bohunova et al, 2016).

Furthermore, active participation in the organisation of training activities on the use of decision support tools (mainly RODOS) in decision-making on recovery issues resulted in better structured and more inclusive decision processes at national, regional and local levels; accurate information for the emergency and recovery stakeholders; and more efficient use of existing decision support systems and tools, with a focus real problems and solutions.

Additionally, a technical visit was organised of Slovak delegates in Belarus in June 2013 (Duranova and Averin, 2016). With this occasion, a workshop was held in Bragin in order to gain insight into the recovery situation and the state of the emergency response in the Bragin district, and comparing it with the system implemented in Slovakia. The exchange visit proved essential for the engagement of mayors from Madunice and Kalna nad Hronom Municipalities in Slovakia, which are members of the Group of European Municipalities with Nuclear Facilities (GMF). Beyond simply acquiring information, *“the visit has created a common understanding, relationships forged in the hardships of shared experience, commitments to new approaches and friendships as a foundation for future networking”* (Duranova and Averin, 2016; pp. S49). Averin (2006) suggests that initiatives to involve local stakeholders in post-accident management and emergency preparedness are most effective *“when they are part of global initiatives, and international programmes or projects, such as NERIS-TP”*.

2) Development of the NERIS platform

The European platform NERIS on preparedness for nuclear and radiological emergency response and recovery was created in 2010 with 57 organizations from 28 different countries. One of its aims is to *“establish a forum for dialogue and methodological development”*, including national bodies, expert organizations, universities and research institutes, as well as non-governmental stakeholders (Schneider et al, 2016). The Fukushima accident highlighted some key issues for further consideration in NERIS research activities, including: *“the importance of transparency of decision-making processes at local, regional, and national levels; the key role of access to environmental monitoring; the importance of dealing with uncertainties in assessment and management of the different phases of the accident; the use of modern social media in the exchange of information; the role of stakeholder involvement processes in both emergency and recovery situations; considerations of societal, ethical, and economic aspects; and the reinforcement of education and training for various actors”* (Schneider et al, 2016).

The NERIS Strategic Research Agenda is now structured along three main challenges, the last one making explicit reference to a *“trans-disciplinary and inclusive framework for preparedness for emergency response and recovery”* (<https://eu-neris.net/library/sra-1/156-updated-version-of-the-neris-sra/file.html>). This replaces a previous formulation as *“setting up a multi-faceted framework for preparedness for emergency response and recovery”*, and has increased focus on inclusiveness and trans-disciplinarity.

3) The ICRP Dialogues conducted in Fukushima in close cooperation with NERIS platform

The International Commission on Radiological Protection initiated a “*forum for dialogue with the parties concerned (ICRP Dialogue) aiming at supporting the rehabilitation of living conditions after the Fukushima nuclear accident*” (Ban 2016). It consisted of meetings involving a wide variety of participants including local residents, authorities, Non-Profit Organizations, experts, professionals, media and foreign representatives of countries formerly affected by the Chernobyl accident, including inhabitants of contaminated areas. The aim of the ICRP Dialogues was to “*share experience and promote the radiological protection culture in the affected areas*” (Ban 2016), particularly among “*local communities, and parties who are interested in specific aspects of their living conditions participate in the meetings*” (e.g. local farmers, distributors and consumers).

The Dialogues drew attention on “*the importance of co-expertise to support self-help protective actions*”, this understanding being considered “*essential for the development and implementation of a radiological protection strategy in the affected areas under complex situations*” (Ban, 2016).

What are actors and communities involved in the governance of emergency and post-accident preparedness and recovery management doing what may de facto count as stakeholder engagement (but is not necessarily labelled that way)?

One example is provided by the European Handbooks developed to assist national and local authorities in the management of contaminated food production systems, inhabited areas and contaminated drinking water resources (Raskob *et al*, 2010). The handbooks and the related customisation and demonstration activities support the establishment of stakeholder networks, the participatory development of local and regional emergency plans, and inclusive decision processes on recovery strategies following an incident (Nisbet *et al*, 2010a).

Actively participating in the international projects such as CONFIDENCE and TERRITORIES raises awareness that also other communities are working on the development and improvement of local, regional and national policies. Their responsibility to give feedback in both directions: to the local population they represent and to the international community as national representatives make that effort meaningful.

Which challenges and opportunities do you encounter for stakeholder engagement in the governance of emergency and post-accident preparedness and recovery management?

Stakeholder engagement in the research projects analysed in this section has taken place in a non-crisis situation, in the framework of preparedness for emergency response and recovery.

Among the challenges identified in relation to stakeholder engagement the following have been distilled from the analysis:

- Institutional stakeholders might not recognize the urgency or need for allocating resources or participating in a dialogue on the longer term phases (Nisbet, 2015);
- some actors might refrain from participating as they may see discussions on post-accident management as an endorsement of (safety of) nuclear energy (Nisbet, 2015) ;
- local actors generally lack the significant time and resources required for long-term engagement on post-accident issues (Baudé *et al*, 2014);

- sustainability of networks joining local and national actors depends on the “*capacity of some actors (public or private, local or national) to steadily mobilize resources and federate stakeholders*” and the existence of institutional or legal frameworks for engagement (Baudé, 2014);
- sustainability of engagement of local actors is facilitated by the availability of expertise and resources; the links established with other communities, particularly those affected by past accidents (Baudé et al, 2014); equal influence of different actors in setting up the agenda of the network; opportunities to develop specific knowledge and influence public policy decisions on post-accident management (Dubreuil et al, 2010);
- local actors in communities with personal experiences linked to nuclear (either in close proximity to a nuclear facility, or having been affected by radioactive contamination, or having radon issues) are more willing to engage in post-accident issues (Baudé et al, 2014);
- most stakeholders (even those having roles and responsibilities in case of a nuclear emergency) lack previous experience with post-accident issues and knowledge about radiation protection background (Nisbet et al, 2005; Charron et al 2016);
- nuclear accidents can have potentially wide-spread consequences at societal, economic, and political level, and involve multiple stakeholders and different approaches at each phase of the accident (emergency, transition, long-term) (Charron et al, 2016);
- roles and responsibilities in the longer term after an accident are not clearly identified (Charron et al, 2016), which hampers reflection about strategies to cope with a hypothetical accident;
- experts and media should be trained to communicate radiation-related concepts (Charron et al, 2016).

Considering opportunities, the inclusion of topics such as stakeholder engagement, citizen science and public information in the strategic research agenda of NERIS in the follow-up of the Fukushima accident offers an opportunity to revisit existing frameworks for public participation, reflect on improving the implementation of protection strategies. In this context, the NERIS objective is “*to further improve the strategies for ensuring appropriate stakeholder engagement, information exchange and dialogue between different actors in emergency and recovery preparedness and response*” (Schneider et al, 2016).

What else have you found or should we be asking?

The national stakeholder panels discussions within the PREPARE project (Charron et al, 2016) indicated communication among the different stakeholders as a critical point in case of a nuclear emergency. Involvement of relevant stakeholders (including the media) in the development of communication plans and in emergency exercises allows building interrelationships and enables effective communication that is attentive to “*the expectations and concerns of different publics*” (Charron et al, 2016).

Charron et al (2016) also suggest that the potential loss of credibility of the official information sources (government, experts, nuclear industry) inherently calls for engaging other actors in communication with stakeholders and wider publics, for instance medical staff, teachers, NGOs and elected representatives, local agencies for agriculture, trade unions.

The PREPARE project also concluded that the governance processes in emergency or post-emergency situations should recognise the need for “*mutual learning and transparency among all stakeholders*”; wider citizen involvement, including local communities, teachers, students, health professionals, mothers, volunteers; and create opportunities for people to monitor radioactivity by themselves (Perko et al, 2016) . Accordingly, communication should be based on understanding and anticipation of converging values and

differences among the stakeholders, and respect their knowledge, roles, practices, needs and objectives (Perko et al, 2016).

Training courses organised in the framework of research, assistance or coordination projects, with cooperation from radiation protection technical platforms (NERIS, ALLIANCE, EURADOS, MELODI), international organizations (IAEA, ICRP, UNSCEAR, European Commission, OECD/NEA and others) and communities experiencing the management of accidental or post-accidental exposure situations are considered essential for the creation and maintenance of critical capacities in the field of emergency preparedness, response and recovery (Turcanu *et al*, 2016). The continuous organisation of training courses and the changes in form and content reflect an increasing demand from a wide range of stakeholders extending, beyond radiation protection researchers and advisers, to decision-makers, first responders, journalists and NGO's, among others.

Key challenges identified	Best practice / recommendations
Not all actors with roles and responsibilities in emergency and post-accident management have specific radiation protection knowledge	Develop a common understanding of the issue Provide local actors with access to expertise: expert- local actors partnership Continued engagement of previously participating stakeholder representatives
Engaging local actors	Provide access to expertise on nuclear and post-accident issues (e.g. trainings, cooperative projects) Provide supporting resources. Engaging with existing structures of local actors
Engaging with non-institutional stakeholders	Inclusive governance structures of local-national stakeholder platforms, allowing all types of actors to influence the agenda and operation of the platform Employing a structured dialogue methodology
Availability of resources for local actors to engage in post-accident issues	Integrate nuclear in more general disaster preparedness and response frameworks
Sustainability of national stakeholder networks on preparedness for post-accident issues	Create institutional framework for engagement: national or international Include international actors and contacts with areas affected by actual post-accident situations (e.g. post-Fukushima or post-Chernobyl) Utilise tools facilitating interactions (e.g. accident simulation tools) Cooperation between local actors, and between local and national actors Balanced relations between participants and the capacity of local stakeholders to develop skills and effectively influence decisions
Ensuring basis for legitimacy	Establish a legal framework for public policies on post-accident management (e.g. CODIRPA) Local actors as initiators of process
Motivate stakeholders to engage in discussions of post-accident issues	Include post-accident issues in emergency exercises
Engaging with local stakeholders for preparedness to post-accident recovery	Inclusion of post-accident preparedness in large radiation protection programmes Collaboration with local elected representatives and local radiation protection experts Develop pluralistic network of local and national actors

Need for rapid action in case of an emergency	Create a community of local and national actors familiar with accident and post-accident issues in the preparedness phase Identify vulnerabilities in the preparedness phase Prepare communication with all types of stakeholders in advance (strategy and key messages)
Possible misinterpretation of the aim of stakeholder engagement (e.g. to render an accident acceptable)	Clarify the objectives of engagement at the onset of the process
Engagement with journalists	Creation of opportunities for collaboration in the preparedness phase e.g. round table discussions, radiation protection courses for journalists, stimulation of citizens journalism. Media strategy and training for experts
Low motivation to participate	Organisation of participatory events during different times of the day / week Engagement with schools and in exercises Supporting scientific research of motivations for participation

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4.1.2 NTW investigation on stakeholder engagement on EP&R in practice

The Civil Society Organization Nuclear Transparency Watch (NTW)² carried out an evaluation of the existing European and national EP&R provisions from the civil society point of view ("Report of NTW Working Group on Emergency Preparedness and Response (EP&R)," 2015). The objective of this exercise was to perform an investigation in Europe in as many countries as possible, such as to check the reality of nuclear off-site emergency preparedness and response, to inform the public on the findings and to provide guidance for further activities of the interested public. The investigation included an examination whether legally binding procedures and measures were actually in place and carried out with due diligence and also whether a conventional top-down approach to EP&R (i.e. dominated by state authorities) can adequately address the various challenges involved. This includes for example providing timely and trustworthy information, motivating and training key institutional stakeholders at local level and citizens to undertake best possible actions to avoid exposure to post-accident radiation and other potential negative consequences of nuclear emergencies and post-emergencies.

The information on EP&R provisions in Europe was collected and analysed based on a) desk work to review the national provisions and international requirements, b) interviews and questionnaires with representatives of responsible institutions and members of local populations, c) the organization of five trans-boundary roundtables involving the participation of responsible institutions and civil society, d) international seminars with expert institutions and international associations as well as e) the available results performed by the European institutions (i.e. the "Review of current off-site nuclear emergency preparedness and response arrangements in EU member states and neighbouring countries" study).

In the investigation different stakeholders were involved. Interviews and discussions were performed with the responsible authorities. This included representatives of civil protection authorities, nuclear safety and radiation protection authorities, responsible ministries, local authorities and operators of nuclear facilities. In addition, technical support organizations (TSO) to nuclear authorities were also involved, as well as representatives of academia and research institutions, firefighters and other first responders. Other stakeholders involved included citizens living near nuclear power plants, some interested members of the general public and environmental non-governmental organizations with the special status to represent public interest in environmental protection, which gives them the legal standing in case of access to justice. In addition, in a transboundary round table representatives of the media were also present.

The results of the investigation can be summarized in the following:

- Emergency drills – "NTW observes that many regional and local authorities are not really prepared for a nuclear accident. Sufficient dedicated staff, accurate evacuation plans and full scope exercises involving the local population are missing. Lessons learned from exercises and drills are not taken into account in new versions of plans, nor are they communicated to the stakeholders" (NTW, 2015, pp.4).
- Updating in response to social and technological change – "NTW identifies poor updating of EP&R plans regarding important recent spatial changes (new residential neighbourhoods, shopping malls, medical centres, schools, roads, etc.) and recent changes in technology (internet, mobile phones, new social media, availability of basic radiation measurement equipment among the broader population, etc.). During the Fukushima catastrophe, social media networks played an important role in how citizens gathered on-going information in Japan and beyond. This dynamic is not taken into account in national EP&R plans, nor are EP&R plans adequately addressing cross border issues and the multi-lingual, multi-national and multi-cultural character of contemporary European societies." (ibid., pp. 4)

² <http://www.nuclear-transparency-watch.eu/>

- Communication – “NTW notices that even during exercises and drills, the communication and notification lines for the responsible institutions are not entirely working. The contact data of involved personnel are sometimes wrong or out-dated. Some concerned administration services do not communicate between themselves, and for others, their communication is inadequate or delayed, or even both” (ibid. pp. 4). Communication in worst case scenarios (total electricity black out, no mobile services) is not taken into account.
- Food standards – “There is a need for clarification of food standards and their harmonisation especially in the post-accident context” (ibid.).

Based on the investigation of civil society in relation to the stakeholder involvement in EP&R in Europe the NTW concluded that “citizens are insufficiently informed” and involved, and “in most countries civil society can neither participate nor observe EP&R exercises” (NTW 2015, pp. 14). Current EP&R is in practice “at best a bureaucratic list of good intentions since plans are not realistic because the public is not involved and the requests of concerned citizens are not taken into account or simply ignored” and they are not tested with those for whom they are prepared. The NTW recommends that the top-down approach should be changed and the local populations and interested civil society organisations should be involved in the development of emergency plans. Public participation would also reduce limits of administrative handling that creates EP&R systems based on false or outdated presumptions and/or data and incapable for fast learning and overcoming of cross-border obstacles.

What levels of awareness about external prescriptions of stakeholder engagement in RP do researchers and practitioners reveal?

Based on the analyses of EP&R arrangements across the Europe it can be seen that responsible official institutions do not fulfil the prescriptions related to stakeholder engagement in EP&R. The COUNCIL DIRECTIVE from 1989 on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency, and later repeated in BSS directive 2013, requires:

- Member States shall ensure that the population likely to be affected in the event of a radiological emergency is given information about the health-protection measures applicable to it and about the action it should take in the event of such an emergency. This information shall be communicated to the population without any request being made and shall be regularly updated, circulated and permanently available to the public.
- Member States shall ensure that, when a radiological emergency occurs, the population actually affected is informed without delay of the facts of the emergency, of the steps to be taken and, as appropriate to the case in point, of the health-protection measures applicable to it.
- Member States shall ensure that any persons who might be involved in the organization of emergency assistance in the event of a radiological emergency are given adequate and regularly updated information on the health their intervention might involve and on the precautionary measures to be taken in such an event.
- The information shall also mention the authorities responsible for implementing the measures referred.

The NTW investigation suggests there were no systematic arrangements put in practice related to these requirements. The basic information on the approach, health protection measures and actions can be found in the national and local emergency response plans for nuclear and radiological accidents, which are available in many cases on web pages of institutions. However, there is in many cases no communication plan or other

arrangements for the transfer of this information to the population, there are no regular updates, at least they cannot be traced and there are limited arrangements at the local level in the municipalities within the emergency preparedness zones.

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

Based on the recent development across the Europe, also supported by the NTW work, some changes on the approaches have been noticed, like the discussion on EP&R plans in France with CLIs (Commission Locale d'Information), involvement of environmental NGOs in development of new Royal Decree on the Nuclear and Radiological Emergency for Belgium in 2018 revision and similar. In recently developed EP&R plans there is much more attention to the requirements set in the EU legislation. Nevertheless, the general trends in most of the EU countries are still not supportive to the engagement of local population, environmental NGOs or any other interested parties.

What were the rationales for stakeholder engagement, the final objectives? Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement? Have there been any guided improvement activities?

The investigation performed by the NTW in Europe revealed that stakeholder engagement related to the EP&R provisions started in different countries as a result of Fukushima Daichi NPP accident, the citizen science initiatives, such as for example SAFECAS, and the initiatives of different radiation protection associations, like Belgian Society for Radiation Protection, or NGOs such as NTW.

The NTW report argues in one of its findings that “neither nuclear industry nor nuclear safety authorities are organising public events on EP&R therefore this is a task of civil society, more EP&R round tables throughout Europe are needed”.

The Fukushima accident experience demonstrated, and this is according to NTW also the case in some European countries, that the emphasis of the nuclear industry (e.g. NPP operators) on the fact that NPPs are extremely safe installations and that the serious nuclear accident is practically impossible, creates contradictions with the need for emergency preparedness. NTW found this to be one the reasons why preparations for emergency are “paper plans” exercised by official authorities with almost no involvement of residents and other publics.

What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?

Only lately, from 2015 on, the NTW observed some changes on the EP&R approach in the countries. The NTW interviews with national regulatory revealed that there is an understanding among nuclear regulatory authorities that more interaction with civil society (and in particular with residents) should be organised. At the same time, for nuclear regulatory authorities it is not obvious how to do this interaction as the lead for EP&R are civil protection authorities or crisis management organisations. Therefore, the support of NGOs or any other civil society organisations is very welcomed.

In addition to this, the revised requirements of the European BSS are supportive of engagement with citizens, in particular with those living in the vicinity of nuclear power plants. Finally, the role of EC is very important in their evaluation of the successful transposition of requirements in practice.

What are RP actors and communities doing that may de facto count as stakeholder engagement (but are not necessarily labelled that way)?

Are there any alignments/misalignments between case practice, on the one hand, and external conceptions and prescriptions, on the other, and if so why? Which challenges and opportunities do you encounter for stakeholder engagement in your specific case?

The responsible authorities for EP&R involve a number of stakeholders in the preparedness for nuclear emergencies, but these are mostly limited to official responsible institutions and first responders. They do not involve, until now, members of the public and the population likely to be affected (definition of BSS). Experiences from Fukushima accident show that this could cover zones of population up to 40km from nuclear power plants. In some cases, across the Europe this would include major cities with dense population and also citizens from neighbouring countries. The responsible authorities would need to change the current approaches to fulfil the requirements from BSS and systematically implement the communication plans in order to provide information about the health-protection measures and other actions the population should take in the event of such an emergency.

Key challenges identified	Best practice / recommendations
Insufficient involvement of local population and non-institutional stakeholders in emergency preparedness	<ul style="list-style-type: none"> Full scope exercises involving local population Communication of lessons learned from emergency drills with a wide range of stakeholders Involvement of non-institutional stakeholders (e.g. local population, civil society organisations) in the development of emergency plans
Social and technological change	Accounting for social media in emergency plans
Effective communication with local populations about protective actions in case of an emergency	<ul style="list-style-type: none"> Testing effectiveness of communication with local populations about health protection measures in case of an emergency Regular updates of information Consideration of transboundary impact, e.g. providing information in multiple languages

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4.1.3 Lessons learnt from past nuclear accidents: SHAMISEN Recommendations

This section relies on insights generated from the [SHAMISEN project](#), which formulated recommendations for medical and health surveillance of populations affected by previous and future radiation accidents, based on lessons learned from experience with populations affected by Chernobyl, Fukushima and other nuclear emergencies. The approach developed aimed at including the role of various stakeholders groups (including the participation of the affected populations) to minimise the negative consequences of an accident and optimise both the preparedness and recovery.

During and after the Chernobyl and Fukushima accidents, emergency actions and evacuation decisions were entirely in the responsibility of the state and were mainly based on technical parameters, such as environmental doses and meteorological predictions for radioactive material dispersion in the nearest days. However, the experience of these accidents shows that, in addition to technical parameters other issues need to be taken into account, such as social aspects (e.g. health status of the population, psychological impact of long term evacuation), and the adequacy and readiness of facilities (in particular hospitals) to host and treat evacuees. Indeed early (related to displacement of severely ill and weak people) and longer term (including suicide, distress and mental and emotional problems) deaths could have been prevented if these factors had been taken into account through involvement of general public and other stakeholders groups into decision-making processes.

The remainder of this section addresses the ENGAGE WP2 research questions from the perspective of lessons learnt after the Chernobyl and Fukushima accidents.

What levels of awareness about external prescriptions of stakeholder engagement in RP do researchers and practitioners reveal?

No such external prescriptions existed by the time of the Chernobyl accident or Fukushima. Since in this case both countries (FSU and Japan) represent collectivist countries and in the specific historical moment the governmental position was predominant in emergency and RP issues, none of the other stakeholders groups were involved actively.

However, with time, due to individual initiatives (for example A. Goto in Fukushima) or with the help of international projects (CORE and ETHOS in Belarus), representatives of the general school system, local health system employees, teachers and local authorities became involved in radiation protection educational activities (in theoretical and practical respect). Working on local level with local people, though initially created resistance from the local residents, due to lack of trust in the central government and any taken initiative suspected to be from the government, finally converted in very useful practices (finding based on conclusions from the SHAMISEN WP2 workshop in Fukushima, March, 2017).

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

The awareness of those who started to work with local people on their own initiative (e.g. in Fukushima, Japan), the opening of a new university with specific focus on radiation protection (as ISIR in Minsk, Belarus), or the involvement of entire institutions (through research projects) in the risen radiation protection issues helped to derive good participatory practices in the recovery phases after the Chernobyl and Fukushima accidents.

Good practices in RP after the Chernobyl accident (recovery phase)

The EC funded *ETHOS* and *CORE* projects, conducted during the post-Chernobyl recovery phase, are important examples of activities to help local people in Belarus deal with living on radioactively contaminated territories, enabling them to measure environmental doses and radioactivity of food products.

Educating leaders in recovery from major nuclear accidents

In 1992, in order to mitigate the consequences from Chernobyl accident and to be better prepared, the International Sakharov Institute of Radioecology (ISIR) in Minsk, Belarus – higher education, university level, was created where specialists were formed and run multidisciplinary programme that included nuclear medicine, nuclear physics and chemistry; radiation protection and hygiene, dosimetry, sources of ionization radiation and their effects on health and other together with methodology of teaching on radiation protection issues and field works in the Chernobyl excluded zone and other affected areas. The foundation of this institution had attracted much attention on international level since it was unique at that time. Later, on its base, IAEA courses on radiation protection were hold. Currently, the institute ([ISEI-BSU](#)) embraces a wider scope including not only radiation, but also other environmental issues and more advanced training programmes on radiation control, radiometry, dosimetry and nuclear and radiation safety. The programmes of medical universities in Belarus were also adapted and widened their programs on radiation and radiation protection issues later after the accident.

Good practices in RP after the Fukushima accident (recovery phase)

Engagement of nurses to help patients from affected population

In Japan public health nurses received special training on risk communication with regards to a nuclear disaster. Special meetings were arranged with nurses and local populations in which nurses acted as intermediates between experts and affected populations. They listened to concerns of local residents, providing information and answer to parents' anxiety; and were organising discussions with affected populations so that they could come up with their own ideas and solutions and empowering them to take a role in their own RP and that of their families. In this way, a network of competent nurses in risk communication and radiation protection has been built to ensure confidence dialogues with affected populations (Goto, 2016)

Educating leaders in recovery from major nuclear accidents

In Japan, some education programs (for example Phoenix Leader Education Program from Hiroshima University) were developed to train future experts in recovery from major nuclear accidents. The overall objective of this program is to provide future leaders with basic knowledge on medicine, environment, engineering, science sociology, education and psychology to participate in different aspects of the management of radiation disaster recovery. Three courses were available in 2016: -Radiation Disaster Medicine; Radioactivity Environmental Protection; and Radioactivity Social Recovery ([Kamiya, 2016](#)).

Non-governmental initiatives on public involvement into dose measurements

Soon after the Fukushima accident, the SAFecast project was initiated with the aim of providing tools to the general population for measuring environmental doses at different places and while moving / traveling (Brown, Franken, Bonner, Dolezal, & Moross, 2016). This project works with open data uploaded to the cloud to provide real time maps of dose-rates based on the data gathered by the users of the SAFecast devices.

The *D-shuttle* project aimed to develop small dose rate measurement devices of use by the general public. It is used as a means to help residents returning to their homes after evacuation is lifted regain control of their lives, with the help of an expert facilitator who helps residents interpret the results. It was also used to

measure dose rate and cumulative dose in a study of high school students in four countries: France, Poland, Belarus and Japan (Adachi et al, 2015). It allowed involving adolescents to make own measurements and compare the results across four countries.

With the example of the association ETHOS in Fukushima, which works with residents of Suetsugi village (Ando, 2016) measuring radioactivity of locally produced and gathered food stuffs and discussing the results, we can see the importance of dialogue and meetings of residents to share their worries and learn together how to optimise RP in their daily lives to (to control the food consumption depending on the doses). Also this group of local residents produced manually their own maps of radioactive contamination and used them to avoid or reduce their own exposure.

What were the rationales for stakeholder engagement, the final objectives?

In the examples of real practices mentioned above, the main rationales were the individual drive and responsibility, and an altruistic determination to help others and their country recover better and faster from the consequences of the nuclear accident. In case of the first rector of the ISIR (Minsk, Belarus), Alexander Liutsko, a nuclear physicist returned from Far East region of USSR (Vladivostok) to help people with training on radiation and radiation protection after the Chernobyl accident. At that time, best scientists were working in Moscow or even abroad, but it was necessary to organize training for “Belarussian scientists to understand radiation safety and also how to overcome the public’s unnecessary fears” (Wilson, 2011, p.38).

A change in stakeholders engagement in RP was noticeable on a societal level since special funds and grants, covering programs such as CORE or ETHOS, were approved by research institutions and other relevant communities.

Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement?

The subjective positive assessment on engagement activities in radiation protection can be derived from the interest of people involved in those activities, as well as from the duration of activities and the socio-economic support for these.

An example of such indirect assessment can be seen for SAFECAST in the exponential growth of up-loaded data for sharing dose measurements that reached 40 million of data by 2016 (started in March 2011, after the Fukushima accident).

Have there been any guided improvement activities?

In countries affected by a nuclear accident, many activities were run at state and international level with the corresponding support. Optimizing and improving the measures taken is a continuous task, especially taking into account changes in technology, society and education. For example, the SHAMISEN project, a European project, aimed at issuing [SHAMISEN Recommendations](#) for optimal stakeholder participation for preparedness, emergency and recovery phases of a possible nuclear accident.

The output of the SHAMISEN project was 28 recommendations for preparation, response and long term actions in the case of a nuclear accident, aimed at minimising negative health and well-being consequences in affected populations and building radiation protection culture. There are general recommendations and more specific, related to one or several areas: Evacuation, health and medical surveillance, Epidemiology,

dose measurements, communication and training in different time periods: Preparedness (before the accident), During (Emergency) and After (Recovery Phase).

Each recommendation has a basis (WHY it is important), suggestions for implementation (HOW) and different stakeholders groups to be involved (WHO) as can be seen in the example of Recommendation 13, related to the preparedness phase on Communication and Training (Figure 7).

The basis of SHAMISEN Recommendations is to involve all relevant stakeholders groups, so that together they can provide better solutions and actions to deal with Emergency Situations and better recovery after a nuclear accident. This idea is expressed in the very first recommendation R1 reflecting the fundamental ethical principle of “doing more good than harm” or balancing the uncertainties in an optimal way. Reaching the best solution requires different actors or stakeholders groups to work together.

Communication and Training



R13

Foster participation of stakeholders and communities by engaging them in emergency preparedness, including planning for socio-economic health surveillance and, where appropriate, epidemiology.

WHY

The importance of stakeholder engagement is recognized across many areas of radiation protection, accident management and emergency preparedness (e.g. ICRP 109, 2009) and ICRP 111, 2009); IAEA, 2015a). Public engagement can be advocated by the fact that populations have a right to participate in decisions that impact on their lives, and is also supported by growing evidence that this leads to more effective and efficient risk management and health surveillance, and can improve public understanding of the consequences of nuclear accidents (see *ST1 and ST2 summary reports*). Involving a variety of different stakeholders in emergency preparedness (i.e., during “peace time”), helps to establish valuable contacts and a common understanding of issues and responsibilities.

HOW

Stakeholder engagement approaches range from only informing, to consulting, involving, collaborating with or even placing final decision-making in the hands of the public (Table 6). In the context of radiation emergencies, effective engagement should **involve as wide a range of stakeholders as possible during the preparedness phase** (i.e. by improving their knowledge on the consequences and management of nuclear accidents, see *R7*), with the intention of continuing to involve populations and other relevant stakeholders in early, intermediate and recovery phases. Stakeholder panels are common in many European countries within emergency preparedness (see papers in (Liland et al, 2016), and include a range of experts, representatives of national and local authorities, public health practitioners and NGOs. Although the actual involvement of local populations and communities can be limited in the preparedness phase, a **framework for involvement of the public in the post- accident phase** has to be prepared and adapted to the national specificities at this stage. Furthermore, experts should be prepared on how to include the population in post-accident health surveillance and epidemiological studies (see *R28*).

WHO

Radiation protection and health authorities, national and local authorities, public health practitioners, epidemiologists, radiation protection experts, key local NGOs and citizens' organisations.

Figure 7 SHAMISEN recommendation on stakeholder participation
(Source: Oughton et al on behalf of the SHAMISEN Consortium (2017))

What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?

The resistance or denial by state governmental stakeholders to include others in the beginning (at emergency and early phase) were due to own shocks and fears of what has happened since it was an unexpected and unexperienced case. Another issue was related to the attempts to keep it a secret to avoid panic in masses or not to lose the “good image” on international level, for example in the Chernobyl case (Liutsko et al., 2018, *in press*).

The situation has changed with time due to socio-political changes and growing awareness of the necessity to work with different stakeholders for the common goal: better recovery from a nuclear accident.

What are RP actors and communities doing that may de facto count as stakeholder engagement (but are not necessarily labelled that way)?

Different types of activities can be carried out with scholars or local people involvement. The examples listed below originate from the post-Chernobyl experience::

- Creating local museum on memories of the Chernobyl tragedy or people, local heroes who helped mitigate its consequences;
- Organising a competition for a short narrative or drawing on the topic “How can we restore our village”, “living with radiation” or about the Chernobyl tragedy (Stepanova, 2014)
- Organising dissemination or awareness supporting activities on radiation protection with varied communication material (books, leaflets, films) (Lutsko & Zajtzeva, 1992).

Are there any alignments/misalignments between case practice, on the one hand, and external conceptions and prescriptions, on the other, and if so why?

Existing mistrust between state (central government) and other stakeholders (NGOs, general public) is another barrier for working together on common well-being.

Which challenges and opportunities do you encounter for stakeholder engagement in the specific case of RP?

One question was and is how to start and motivate stakeholders’ engagement if they have different levels of knowledge and awareness of radiation protection issues? People from general public with practically no knowledge about radiation found it to be very difficult, since it was difficult to perceive what radiation means, or what the unit of radiation like 1 mSv/year means. In order to address this challenge, experts and managers should involve potentially affected people to work together on radiation protection issues prior to any accident, providing relevant knowledge, establishing two-way communication and a framework for participation.

What else have you found or should we be asking?

- What are initial mechanisms or drives to involve general public in RP issues?

Key challenges identified	Best practice / recommendations
Lack of capacities among local actors	Training programmes and academic organisations focusing on radiation protection and recovery aspects Educating leaders in recovery based on lessons learned from major accidents
Distrust in experts in a post-accident situation	Engaging with medical nurses to listen to the concerns of local residents and provide health related information, and act as intermediates between experts and affected populations.
Lack of sufficient, trusted, personalised information allowing affected citizens to make informed decisions	Supporting citizens' initiatives to carry out their own monitoring of radioactivity.
Having an active, operational stakeholder network at the time of an accident	Engage with stakeholders in the preparedness phase, in order to establish contacts and a mutual understanding of issues and responsibilities. Establishing a framework for engagement of.
Low knowledge about radiation protection	Develop relationships and dialogue with local populations in the preparedness phase

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Museums on the Chernobyl accident and recovery:

- Polyn museum in Chernobyl: <http://www.atomic-energy.ru/news/2018/03/15/84080>
- The Chernobyl National museum in Kiev, retrieved from: <https://www.meganstarr.com/chernobyl-museum/>

Contest of drawings and narratives among school children:

<file:///C:/Users/Svetlana/Downloads/N91zEKUzXD.pdf> (Chernobyl: a look through the years).

4.2 Stakeholder engagement related to medical exposures to ionizing radiation

In the medical field, stakeholder engagement related to use of ionizing radiation can take place at different levels and with respect to different issues involving the use of ionising radiation.

For instance, the International Atomic Energy Agency (IAEA) held the “International Conference on Radiation Protection in Medicine: Setting the Scene for the Next Decade” in Bonn, Germany, in December 2012, with the specific purpose of identifying and addressing issues arising in radiation protection in medicine. The conference was co-sponsored by the World Health Organization (WHO) and hosted by the Government of Germany. The specific outcome of the conference is the Bonn Call-for-Action (IAEA and WHO, 2012), which “*is an appeal for a holistic approach towards medical application of ionizing radiation which includes partnership of national governments, civil society, international agencies, researchers, educators, institutions and professional associations aiming at identifying, advocating and implementing solutions to address existing and emerging challenges; and leadership, harmonization and co-ordination of activities and procedures at an international level.*” The aim of the Bonn Call-for-Action is, among others, to “*help improve the benefit/risk-dialogue with patients and the public, by a) increasing “awareness about radiation benefits and risks among health professionals, patients and the public”; b) supporting “improvement of risk communication skills of health care providers and radiation protection professionals” (involving both technical and communication experts, in collaboration with patient associations, in a concerted action to develop clear messages tailored to specific target groups; c) “working towards an active informed decision making process for patients.*” Based on this Call-for-Action different stakeholder engagement organisations were established. For instance Image Gently aims at improving safe and effective imaging care of children worldwide (<https://www.imagegently.org/>), and Image Wisely for radiation safety of adult patients (<https://www.imagewisely.org/>).

In many countries, information and stakeholder engagement campaigns were launched. For instance, the Health Department of the Belgian Government in collaboration with Nuclear Safety Authorities FANC and a patient association launched a campaign in 2013 to increase the lay public’s awareness of medical imaging techniques and the potential risks involved (www.zuinigmetstraling.be).

For the purpose of the literature review as entry point, special emphasis was placed on engagement with patients, carers and helpers (as family members and close friends). Other aspects will be investigated in case studies conducted within ENGAGE task 2.2.

An exploratory literature review was carried out to answer the research questions of WP2 (see Section 2). The search was carried out by using the following key words, either single or in combination: patient, involvement, empowerment, informed consent, radioprotection, radiology interventions, radiation therapy, patients exposed to radiation, patient perception.

Only sources addressing these topics from the perspective of patients' involvement were analysed further. A deeper look will be taken within ENGAGE task 2.4.

4.2.1 Patient involvement approaches

A couple of studies have been carried out to date to identify possibilities for improvement of patient involvement (see below), notably in relation to the medical use of ionising radiation. These are summarised below.

What levels of awareness about external prescriptions of stakeholder engagement in RP do researchers and practitioners reveal?

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

In recent years, national and international professional organisations concerned with the medical use of ionising radiation, as well as patients associations promoted a new paradigm in medical healthcare, centred on patient's needs, values and preferences (e.g. Kemp 2017; EPF 2015; ESR 2017). Kemp (2017) argues for instance that “radiology leaders have made a compelling argument that if radiologists do not make a more successful transition to patient-centered care immediately, radiology as a profession will seriously decline over the long term” (pp. 7) and that adopting more direct patient engagement corresponds to contemporary standards of healthcare.

Selected world-wide examples of patient's involvement approaches are described below.

The **Radiological Society of North America (RSNA)** focuses on communication between patients and radiologist for more than a decade now. This view is embedded into a general shift in radiology in North America from a volume- to a values-based system. RSNA sees as core principle a continuum of patient care – from the discussion of the appropriateness of the test, through an explanation of the exam from the technologist and up to user-friendly radiology reports (Kemp et al., 2017). Accordingly, care aims at focussing on the patient's needs, values and preferences and one of RSNA goals is to bridge the divide between radiologists and patients (Kemp et al., 2017). Recognizing this shift in health care focus, the Radiological Society of North America and the American College of Radiology have individually led campaigns to help radiologists adopt a more patient-centred practice (Mangano, Bennett, Gunn, Sahani, & Choy, 2015). RSNA also provides literature on patient centred radiology on its website <https://www.rsna.org/patient-centered-radiology-literature.aspx>.

In 2011, the RSNA Board established a Patient-Centered Radiology Steering Committee. Its mission was to develop an awareness campaign promoting the need for, and benefits of, patient-centred radiology (<http://www.rsna.org/Radiology-cares/>). From RSNA view, practicing patient-centred radiology means not just talking to patients and not just the delivery of results. It means especially considering the patient

experience overall, from scheduling through the imaging examination itself to reporting, billing, and future communications.

To gain insight in radiologists' attitudes and practices regarding direct patient communication, RSNA conducted a survey with its members (N=694, response rate 12%). The aim was to investigate their general attitudes and experiences concerning patient-centred radiology, with specific attention to radiologist-to-patient communication. Results showed (Kemp et al., 2017) that the majority of respondents agreed that it was important to be available to patients for questions immediately following the procedure or exam (71%) and to communicate with patients prior to their imaging procedure or exam (60%). Fewer respondents agreed that conveying imaging results to patients in person (41%) or interacting with patients by using social media (32%) were important for the current practice. When asked how often they perform corresponding activities, fewer respondents said to actually practice what they stated as being important. The survey found some significant differences between respondents working in an academic vs private practice, and between specialties with more vs. less patient interaction. Respondents working in an academic practice or having more interaction with the patient evaluated the importance of communicating with the patients prior to examinations, providing them with reports of imaging results and being available to patients after examinations higher than those working in a private practice or having few interactions with the patients.

Time and workload were seen as the most important barriers to patient interaction. As most likely motivators for more communication with patient respondents mentioned the personal sense of satisfaction and, not less relevant, reimbursement and compensation. Overall, the survey revealed an important gap between values and practice – values defined by radiology associations and values and practices in the field, i.e. found in the community of radiologists. It should be noted that these results cannot be directly transposed to Europe, given the difference in healthcare systems in comparison to U.S.

Similar to RSNA, the **European Society of radiology (ESR)** expresses in its “ESR paper on value-based radiology” (European Society of Radiology, 2017) the need for a stronger consideration of diagnosis as a part within an entire episode of care, and not merely a cost. The work of diagnosticians, amongst them radiologists, should have an active role in the change from volume based to value based healthcare (European Society of Radiology, 2017).

ESR pleads for a healthcare system that changes from organisation-centred to centred on the patient and his or her needs. For this, involvement of a network of general practitioners (GPs) and specialists working outside of the hospital is required, to ensure longitudinal follow-up of patients with chronic diseases and evaluation of the final outcome of the care provided.

However, there is no evident focus on communication with the patients, or at least it could not be found on the website <https://www.myesr.org/>

Approach of the European's patients forum (EPF)

EPF is “an umbrella organisation that works with patients' groups in public health and health advocacy across Europe” (<http://www.eu-patient.eu/>). In EPF's plan 2014-2020, Goal 4 deals with Patient Empowerment “*To promote the development and implementation of policies, strategies and healthcare services that empower patients to be involved in the decision-making and management of their condition according to their preference, whilst raising awareness about their rights and responsibilities*” (European Patients Forum, 2015). Empowerment is defined as “*process that helps people gain control over their own lives and increases their capacity to act on issues that they themselves define as important. (...). Aspects of empowerment include health literacy, shared decision-making and self-management*” (<http://www.eu-patient.eu/whatwedo/Policy/patient-empowerment/>). A critical reflection is made in the same document on the meaning of “patients' responsibilities”, which could be understood with a positive or a negative

connotation. EPF decided to refer to this issue by “*emphasising the positive elements and linking it to the empowerment concept and ensuring that patients’ rights can never be challenged on the basis of their alleged responsibilities.*”

EPF sees fragmentation of care as one major problem for patients. “Fighting the system” just to get the care they need hinders meeting the patients’ needs adequately. As major challenge is seen that “*chronic disease requires a fundamental shift from disease-centred to patient- and family-centred approach.* Self-management in the community has to be combined with professional support. To meet patients’ needs more effectively, it requires the involvement of patients at every level in the health system, in policy-making and in co-designing of care services (European Patients Forum, 2015).

EPF distinguishes between **empowerment** and **involvement**: “*For example, when a patient gains all the knowledge s/he needs to understand her/his condition, her/his life goals and the benefits and risks of different therapeutic options, s/he can reflect what therapeutic choice will be most suitable in her personal situation (empowerment), and participate actively in the therapeutic decision-making process with her/his doctor (involvement)*” (European Patients Forum, 2015). Involvement is seen as means to improve empowerment.

For the **European Union Network for Patient Safety and Quality of Care, PaSQ Joint Action**, (*PaSQ Joint Action*), involvement has both an individual and a collective dimension (in: (European Patients Forum, 2015): Individually, patients and their families (or caregivers) participate in decisions related to their condition, through shared decision-making or self-management. Through their specific experience as patients, they can contribute to organisational learning. Collectively, patients’ representative organisations are involved in health care policy-making and thus contribute to shaping the health care system. Patient involvement (individually and collectively) can take place at different levels. At the micro level through shared decision-making and self-management; at the meso level, level of organisations, by being involved in quality improvement initiatives e. g. at hospitals; and at the macro level, patient organisations can participate in shaping health policy (European Patients Forum, 2015).

At the basis of the EPF approach is the **Alma Ata declaration**, where civic involvement in healthcare is defined as both a right and a duty: “*The people have the right and duty to participate individually and collectively in the planning and implementation of their healthcare.*” (Alma Ata Declaration – Principle IV. 1978, WHO) “*Meaningful patient involvement*” as defined by EPF is based on the premise that patients have a *specific expertise* derived from simply being patients, which is a valuable source of *experiential knowledge* (European Patients Forum, 2015).

In the **project EMPATHiE: Empowering patients in the management of chronic diseases** (European collaboration in patient empowerment), “*Empowerment interventions aim to equip patients (and their informal caregivers whenever appropriate) with the capacity to participate in decisions related to their condition to the extent that they wish to do so; to become “co-managers” of their condition in partnership with health professionals; and to develop self-confidence, self-esteem and coping skills to manage the physical, emotional and social impacts of illness in everyday life.*” (EMPATHiE Consortium et al., 2014).

EMPATHiE identified five clustered aspects that have high priority for creating change in Europe, being facilitators and barriers for empowerment and involvement:

- 1) The healthcare professional has enough time to communicate with the patient;
- 2) The healthcare professional has a holistic view of the patient;
- 3) Healthcare is well coordinated;
- 4) The patient feels responsible for his/her own health;
- 5) Healthcare professionals work together.

It is suggested to i) focus on better education of patients and public, ii) improve education of healthcare professionals in holistic thinking and communication, iii) restructure healthcare delivery, providing a central common electronic record accessible by patients as well as professionals. Scenarios for empowerment are (EMPATHiE Consortium et al., 2014):

- 1) “The informed patient”, focusing on ensuring that patients and citizens have easy access to information and health literacy covering all aspects of health, including prevention, treatment options, evidence-base for different treatments, and lifestyle advice
- 2) “New professional skills, knowledge and attitudes”, focusing on ensuring that health professionals have the right skills, knowledge and attitudes to practice patient-centred healthcare and providing an enabling context for patient empowerment.
- 3) “Self-management supported by technology”, focusing on eHealth solutions, such as telemedicine, electronic health records, remote monitoring, etc. becoming part of mainstream healthcare.
- 4) “Transparent quality data for patient choice”, focusing on facilitating patient choice through making available transparent and comparable information on quality of care.

The **Canadian Partnership for quality Radiotherapy (CPQR)** committed itself to improving quality and consistency of care. They identified the need for a set of national level guidelines that radiation therapy centres can adopt to ensure successful integration of patient engagement. Brown et al (2016) conducted a comprehensive literature search to evaluate the current national and international practices in radiation therapy patient engagement (Purificacion, Brown, Anne-Davis, & French, 2016). Eight key concepts of patient engagement in radiation therapy were identified: educational resources, patient communication and informed consent, disclosure of adverse events, patient feedback, evaluation of services, patient-reported outcomes (PROs), barriers and utilization rates.

The process followed in Canada is a good example of involving stakeholders in the development of guidelines on involvement.

The **Royal Australian and New Zealand College of Radiologists’ (RANZCR)** has also published a set of standards that support this thorough consenting process (see for example <https://www.ranzcr.com/whats-on/news-media/162-updated-faculty-of-radiation-oncology-guidelines-for-informed-consent> or <https://www.ranzcr.com/search/medical-imaging-consent-guidelines>).

The UK’s Royal College of Radiologists published a set of standards for patient consent, which are specific to radiology. In this document, the college recognizes the importance of fully involving patients in their treatment and care decisions and communicating information effectively as a key component of the consent process (Purificacion et al., 2016).

The **UK’s Department of Health** has recommended that healthcare programs have an effective process for monitoring and evaluating patient and family perspectives on the quality of services received. Evaluation results can feed into designing new programs, facilities, or services that are centred around the needs of their users (Purificacion et al., 2016). Service evaluation outcomes have to be shared with other relevant members of the care team. Good examples for programs that allow patient evaluations to be shared at a national level are provided in (Purificacion et al., 2016).

The **United States** has implemented the **Consumer Assessment of Healthcare Providers and Systems (CAHPS)** Benchmarking Database as a national database for surveys, which allows patients to provide recommendations for quality improvement. This provides input for decisions in program reconfiguration and development (Purificacion et al., 2016).

What were the rationales for stakeholder engagement, the final objectives? Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement? Have there been any guided improvement activities?

Several evaluations have been carried out, or at least considerations of the state of the art of implementation of patient-centred healthcare.

RSNA email survey of radiologist found out that there is a gap between values of radiologists' associations and the values and actions of practitioners. Attitudes regarding patient-centred care have shifted in radiology, but practices lag behind. Radiologists stated that **time and workload** are the biggest barriers to a wholly patient centred care. A **personal sense of satisfaction** was seen as potential motivator to communication more directly with patients. But above all, **changing reimbursement schemes** was seen to help mitigate these barriers (Kemp et al., 2017).

The project **EMPATHIE** came to the conclusion that stronger **evaluative work on meso and macro level initiatives** is needed (EMPATHiE Consortium et al., 2014), because research is always very specific and transfer of results to other settings it not so easy (Dong, Butow, Costa, Dhillon, & Shields, 2014). Similar interventions yield different results depending on multiple factors such as specific components of the intervention, targeted condition, patient and provider characteristics, contextual factors and outcome measures. Accordingly, success and failure factors have to be analysed for each practice (EMPATHiE Consortium et al., 2014).

Shared decision making is seen as one of the highest potential levels of patient involvement (EMPATHiE Consortium et al., 2014). The medical model has to shift from paternalistic to a collaborative model. For this, all health professionals need to develop the **necessary skills and attitudes** to adapt to the new patient role. For instance it is essential to teach healthcare professionals in patient education and information (Bibault et al., 2016). Comparable to the RSNA email survey, also in EMATHiE key barriers for stronger involvement were **lack of time, shortages of staff, patients' lack of information. Above all, attitudes of health professionals** were seen as most important barriers by all stakeholders (European Patients Forum, 2015).

The preferences of patients regarding the receipt of radiologic examination results directly from the radiologist have been explored in the literature, which indicates at least some demand for involvement of the radiologist in communicating results. Some studies showed positive results for the question, how delivering results to patients may improve the overall patient experience and understanding regarding the role of a radiologist. However, a specific methodology how patients can meet with radiologists to review imaging studies and to address questions and concerns, has not been developed yet (Mangano et al., 2015).

Regarding patients' involvement in patients' safety, patients as well as health professionals seem to share the openness towards involvement. However, a more active facilitation and specific guidance on how involvement can be practiced by both parties is needed (Martin, Navne, & Lipczak, 2013).

What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?

Generally, from an organisational point of view, the shift from volume-based to value based health care, as well as the topic patients' involvement in the whole care process, is widely accepted. However, patients' involvement is mostly seen as one part of the whole care cycle. This has implications for the role of patient

centred communication and the role of radiological aspects in patients' care, as the change seems directed to a more holistic rather than patient centred approach to medical care.

On a practical level, the necessary shift in attitudes seems not to have taken place yet. Several barriers and facilitators have already been identified, and of course, when carrying out more often evaluative investigations other aspects may surface which might encourage communication and involvement.

One difficulty appeared in dealing with own expectations regarding therapist – patient communication and dealing with expectations from others. Radiation therapists felt it was not part of their role to elicit, explore and facilitate further expression of patients' feelings, ideas and expectations. Also it is patients' task to be aware of own psychosocial issues related to expectations about information-focused sessions (Dong et al., 2014).

What are radiation protection actors and communities doing that may de facto count as stakeholder engagement (but are not necessarily labelled that way)?

The following concepts related to patients' involvement and communication with patients could be identified so far:

- **Patient-centred communication:** communication with respect for the patient's view and understanding patient's perspective of the illness. It involved empathy, listening, exploring the patient's feelings, ideas, and concerns.
- **Patient centred care (PCC):** care that is responsive to patients' wants, preferences and values, and is widely advocated as the gold-standard for high-quality health care. Problem: A lack of consensus over how to measure PCC has led to inconsistent findings regarding outcomes of PCC.
- **Empowerment:** Empowerment is considered as a "process of communication and education in which knowledge, values and power are shared" (Bibault et al., 2016);
- **Value-based health care, value based radiology:** the contribution of patients' views and experience for a patient-centred-care oriented not only to his/her health care, but also to the patient's values and preferences;
- Better **patient education** is seen as a prerequisite for patient engagement. When patients have more information about their conditions and treatments, they can play a meaningful role in their own health. Additionally, well-informed patients are better prepared before procedures.
- **Health literacy:** Good, easily understandable information is considered as a tool towards improved health literacy (European Patients Forum, 2015).

Are there any alignments/misalignments between case practice, on the one hand, and external conceptions and prescriptions, on the other, and if so why? Which challenges and opportunities do you encounter for stakeholder engagement in your specific case?

Some main challenges will be mentioned which form the basic room for obstacles or, conversely, preconditions for engagement.

Often, health professionals in radiotherapy departments place importance on specific information regarding treatment-related issues that does not match with patients' perspectives. Information provision is accordingly not rated as consistent with patients' needs (Dong et al., 2014). Conversely, patients often are less willing to ask questions that could be perceived as challenging the clinical abilities and competence of

staff. Patients will often engage in certain behaviours if they are encouraged by staff and if they feel that such interactions do not threaten staff's professional identity.

A main challenge for involvement is seen in the art of grasping the view of all parties concerned: those who want to be involved and those who are asked to involve others. Involvement requires changing behaviour, changing attitudes, changing roles.

Working under pressure is a serious challenge as patient's involvement may be perceived as imposing on already tight time constraints. Patient's involvement in stages of serious illness poses specific difficulties.

The case studies carried out in the next step of ENGAGE WP2 will give attention to general views on involvement, and their interpretation as "educating", "empowering", "involving". These do not only imply different philosophies at an organisation level and different consequences for clinical practice. The perception of the different terms related to involvement will also have implications for behaviours, expectations and norms on the patient-radiologist level.

What else have you found or should we be asking?

- There is a complex range of related terms used to describe patient-centredness – for example as socio-emotional behaviours, verbal attentiveness, displays of concern and affective tone with a coding system focused on the ratio of socio-emotional exchanges. Correspondingly, a diversity of coding schemes quantifying patient-centred behaviours exists (Dong et al., 2014).
- Experiences with different forms of engagement exist. To gain a better overall view on the role of engagement, a potential comparability of term-related evaluation-schemes has to be discussed. Of course, analysis of engagement should take into account different terms and approaches pointing into the same direction.
- As Kullberg et al (2015) state, knowledge is a prerequisite for true patient participation in person-centred care. For joint planning and decision making, health care professionals have to acknowledge patients as true partners and provide possibilities. However, it is not about just offering more information, but ensuring exchange of information and attention to patients' needs (Kullberg, Sharp, Johansson, & Bergenmar, 2015).
- Inclusion and exclusion in engagement: Only those who are able to access required care can give feedback on information, and feedback for improvement. It is important to provide cancer care for all members of the public, even if they are difficult to access. From a patient engagement perspective, it is important for radiotherapy programs to collaborate with patients in order to be advised of the realistic barriers to access. These barriers reflect the access to treatment facilities as well as the quality of care (e.g. physical or language barriers, transportation). In clinical cancer settings, complex organizational systems may also limit engagement methods and prevent efforts to permanently implement these policies (Purificacion et al., 2016). Patient feedbacks and patient reported outcomes are seen as important information source. To capture valuable patient feedback, an appropriate quality monitoring and improvement process should be put in place at all radiation treatment programs. Existing approaches have to be strengthened. Experiences from service industry could provide examples, as service users are the most important feedback givers. Correspondingly, patients and families can be seen as service users in radiation therapy, whose feedback is the most important.
- Is dealing with emotions one aim of engagement? And which kind of emotions play a central role? For example in radiotherapy, information support for cancer patients in this setting has been found

to reduce patients' fears and inclinations to decline treatment, and increase coping (Dong et al., 2014).

- How can goals and ideals about patient centred communication in radiology be implemented into day-to-day academic and private practice?

Key challenges	Best practice / recommendations
Improving the implementation of informed consent	Informed consent should be viewed and implemented as a process of ongoing dialogue about anticipated benefits and risks, appropriateness of test or procedure, reporting, billing and future communication
Ensuring conditions for empowerment and involvement: 1) The healthcare professional has enough time to communicate with the patient; 2) The healthcare professional has a holistic view of the patient; 3) Healthcare is well coordinated; 4) The patient feels responsible for his/her own health; 5) Healthcare professionals work together.	Easy access to information and health literacy for patients and citizens Improved education of healthcare professionals in holistic thinking and communication e-Health solutions, e.g. central common electronic record accessible by patients as well as professionals Transparent and comparable information on quality of care
Disconnect between values espoused by radiology leadership and values and practice in the field	Conducting research providing thick description of patient involvement practice in the field
Meeting patients' needs more effectively	Involvement of patients in every aspect of the health system, including policy-making and co-designing of care services Patient empowerment and shift from a paternalistic to a collaborative model
Fragmentation of care in chronic diseases	Change from disease-centred to patient- and family-centred approach
Lack of specific guidance on patient engagement	More active facilitation and specific guidance on how involvement can be practiced by patients and health professionals, e.g. in relation to patient safety, or communication of results between radiologists and patients
Capturing patient feedback	Appropriate quality monitoring and improvement process put in place within all radiation treatment programs.

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4.2.2. Informed consent

Informed consent is an important ethical and practical part of engaging with patients or their personal representatives. According to the BSS (European Basic Standards Directive 2013), medical practitioners have the clinical responsibility to communicate about the benefit and risks of radiation-induced effects of diagnostic and therapeutic procedures to the patients and other involved individuals, and obtain consent for exposing them to radiation.

The following analysis addressed the questions of ENGAGE WP2, focusing on informed consent.

What levels of awareness about external prescriptions of stakeholder engagement in RP do researchers and practitioners reveal?

The American College of Radiology (ACR), the Society of Interventional Radiology (SIR), and the Society for Pediatric Radiology (SPR) revised the practice parameter of informed consent for radiation therapy and image-guided procedures. Informed consent is described a process of an ongoing dialogue and not a simple act of signing a formal document. It is seen as a communication process between the patients/patient's representative and a health care provider in which both parties have the opportunity to ask questions and exchange information relevant to the patient's diagnosis and treatment. Both parties must actively

participate in the complex shared decision-making process and both parties share the responsibility for the accurate exchange of information. The consent process should also include discussion of the anticipated benefits and potential risks of the procedure, as well as reasonable alternatives to the procedure. Consent should be voluntary, given without coercion (e.g. (<https://www.acr.org/-/media/ACR/Files/Practice-Parameters/InformedConsent-RO.pdf> , <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/InformedConsent-ImagGuided.pdf>)

A number of standards for patient consent specific to radiology and radiotherapy have been published, (The Royal College of Radiologists (RCR), 2012; The Royal Australian and New Zealand College of Radiologists (RANZCR), 2011). In addition, several guidelines were developed in United Kingdom, Australia, New Zealand, United States and Ireland for patient engagement in communication and obtaining informed consent in radiation therapy planning.

The clinical guideline for obtaining consent for the diagnostic imaging and radiotherapy workforce developed by The Society of Radiographers (2018) mentions ten recommendations, among which: (https://www.sor.org/sites/default/files/document-versions/obtaining_consent_170118.pdf)

1. Legal Issues: the notion of consent for a specific patient will need to be included in any update.
2. Advocacy: practitioners should act as advocates so that patients are afforded sufficient information to be able to make an informed decision.
3. Shared decision making: consent to treatment should not be seen as an event, but should be viewed as a process. Practitioners should support a patient’s decision by responding to questions at any point before, during and after treatment.
4. Capacity: a patient should be assumed to have capacity to make a decision but some assessment of capacity may be necessary.
5. Communication of risk and benefit: this includes risks and benefits of the treatment or examination and the radiation risk.
6. Practicalities of the consent process: who should take the consent, what form it should take and sample documentation are important elements of the process.

The other recommendations are related to: consent and children; student radiographers and trainee assistant practitioners’ involvement in consent procedures; consent for screening; use of chaperones and consent.

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

According to the American College of Radiology (ACR, 2017) informed consent is a process designed to protect a patient’s medical decision-making in the context of the asymmetrical relationship with the health care system. WHO (World Health Organization) reminds that several factors may affect how the risk is perceived and thus the perception of radiation risk can be influenced among the different stakeholders also in the field of medicine (http://www.who.int/ionizing_radiation/pub_meet/chapter3.pdf). The three key stakeholders, as the referrer, the patient/caregiver and the medical practitioner, are recognised together with the other health professionals, and in addition also those responsible for assessing, minimizing, and/or regulating radiation risks in health care (research agencies, professional societies, competent authorities, policy- and decision makers). These stakeholders have an interest in providing high-quality care to the patient/caregiver/patient’s representative undergoing imaging/treatment procedures and it is essential for them to participate in the risk-benefit dialogue. Documentation of informed consent is recognized as a quality indicator in radiotherapy healthcare (Albert and Das, 2013).

Communication of benefits and risk of medical interventions with the patient are considered as the basis of good medical practice (Semelka et al., 2012). However, the information deemed appropriate for communication depends on the particular situation (e.g. radiology or radiotherapy; being pregnant or breastfeeding) and the national and cultural context. This indicates that professionals should have an adequate level of preparation in order to communicate with the patients.

Several limitations/barriers/problems (O'Dwyer et al., 2003, Akkad et al., 2006, Colyer, 2007, Friedrich-Nel et al, 2015, Brassil and Limerick, 2015) have been identified concerning the implementation in practice of the valid informed consent for medical imaging/treatment:

- The uncertainty/lack of professional guidance to consent for diagnostic and therapeutic procedures using radiation.
- Difficulties describing radiation risk to patients; Not taking into consideration the education and needs of patients.
- The mechanism for provision of risk information to patients.
- The timing for provision of risk formation to patients; The type of consent to be sought to ensure its validity.
- Appropriate documentation of consent.
- Responsibility for the consent process.

Diverse solutions could improve the informed consent process (O'Dwyer et al., 2003; Akkad et al., 2006; Colyer, 2007; Friedrich-Nel et al, 2015; Brassil and Limerick, 2015):

- Promoting active cooperation among professionals, as they have an interest in providing high-quality care to the patient.
- Providing standardized templates: verbal and written communication; tailoring information such as to meet the needs of patients, e.g. in terms of understanding the ionizing radiation risk.
- Dissemination of information concerning risk, benefits and alternatives by using various communication tools at the initial stage.
- Establishing 2 Stages for consent process: (i) the patients receive information and (ii) confirmation of consent prior to the procedure.
- Providing specific consent forms.
- Until legislative clarity is achieved, robust local delegation of responsibility for health professionals is needed.

What else have you found or should we be asking?

Various studies have shown that improving the content of informed consent forms or patient information sheets and providing information in clear and simple terms makes them more understandable and decreases patient anxiety (Pereira et al, 2014; Coyne et al, 2003; Davis et al, 1998).

The National Institutes of Health (NIH) and American Medical Association (AMA) state that the readability of the patient material should be at 3rd to 7th grade level to ensure that the average patient can read the study. Hence, it is important to keep the language in the patient information sheet simple and to avoid uncommon medical terms as much as possible. Free online websites such as Readability Test Tool are available which test copied and pasted text (or a website link) for readability and assign a grade level, thus allowing to create an appropriate level of patient information sheet.

Key challenges identified	Best practice / recommendations
The uncertainty/lack of professional guidance to consent for diagnostic and therapeutic procedures using radiation.	Promoting active cooperation among professionals.
Difficulties describing radiation risk to patients; not taking into consideration the education and needs of patients.	Providing standardized templates: verbal and written communication; Tailoring information to meet the needs of patients.
The mechanism for provision of risk information to patients.	Dissemination of information concerning risk, benefits and alternatives by using various communication tools at the initial stage.
The timing for provision of risk formation to patients; The type of consent to be sought to ensure its validity.	Establishing two stages for the consent process: (i) the patients receive information and (ii) confirmation of consent prior to the procedure.
Appropriate documentation of consent.	Providing specific consent forms.
Responsibility for the consent process.	Until legislative clarity is achieved, robust local delegation of responsibility for health professionals is needed.

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4.3 Stakeholder engagement with respect to indoor radon

How do researchers and practitioners understand and practice stakeholder engagement (at individual

A preliminary literature and document analysis of the radon exposure situations indicates that in previous decades stakeholder engagement has been done in some countries on a really basic level, however most countries focused only on informing public about risks from living in radon prone areas. Radon issues mainly appeared in public discourse through mass media whenever an increased level has been found in a public building, e.g. school or kindergarten. Non-engagement with stakeholders in the radon risk governance resulted in sensational mass media reporting with short term effect on mitigation actions, low awareness of risks related to radon among the exposed populations, and disregard of application of protective actions.

For instance, in 2004 the Swedish National Board of Housing and Planning assessed that only about half of the radon subsidy budget was taken up by concerned homeowners per year in order to apply measures for reducing radon concentration in their house (e.g. ventilation systems) (Lofstedt, 2018). There have been quite a few studies done on radon communication, most of them concluding that stakeholder engagement (participatory practice) is beneficial to radon risk protection actions (Bostrom, Fischhoff, & Morgan, 1992; Fisher & Johnson, 1990; Fisher, McClelland, Schulze, & Doyle, 1991; Guimond & Page., 1992; Lofstedt, 2018).

The legal international and national documents currently require higher involvement of stakeholders in addressing the radon issues. The Basic Safety Standards Directive requires a „Strategy for communication to increase public awareness and inform local decision makers, employers and employees of the risks of radon, including in relation to smoking“ (annex XVIII). Further on it specifically asks for stakeholder engagement: „Member States shall provide as appropriate for the involvement of stakeholders in decisions regarding the development and implementation of strategies for managing exposure situations “(Art. 102.).

Countries that applied stakeholder engagement practice in the past years report great success in their radon action plan. For instance in Hungary all detectors placed in people’s homes have been returned for analysis;

in Ireland, public awareness on radon risks has significantly increased, in Sweden, radon subsidy budget is taken up by homeowners to a greater level.

Key challenges identified	Best practice /recommendations
<p>Low level of stakeholder engagement on radon risk governance</p>	<p>Communication strategy to increase awareness with involvement of potentially affected stakeholders in development and implementation of policies</p>

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5. Lessons learned from the practice of stakeholder engagement in other relevant fields

Looking at the broader field of radiation protection and at non-nuclear environmental management fields, it can be observed that stakeholder engagement has played an important role for decades now. The following sections looks at lessons learned from participatory practices in the fields of radioactive waste management (5.1), the radiation protection research community (section 5.2), and disaster prevention planning in relation to chemical or natural hazards, or in areas where managing of a valuable asset is at the core of negotiation activities (5.3).

5.1 Stakeholder engagement practice in relation to exposure to ionising radiation in other fields than emergency response and recovery, medical use of ionising radiation and indoor radon

Different academic studies (e.g. Renn, 2004; Shirabe, Fassert, & Hasegawa, 2015; Tateno & Yokoyama, 2013; Vaughan, 1995), recommendations from international organisations (e. g. IAEA, 2011), experience from various projects such as the IAEA project CIDER (IAEA, 2016) and from decommissioning or environmental remediation projects (Bond, Palerm, & Haigh, 2004; Feldman & Hanahan, 1996; IAEA, 2014) showed that involvement of stakeholders in decision-making on technological, complex and value loaded issues related to exposures to ionising radiation is rather challenging. These studies and practical experiences suggest the main challenges of stakeholder involvement in this areas relate to the demands of different stakeholders. The non-involvement of stakeholders in the early stage of projects dealing with exposure situations can have a significant impact on the implementation, costs and schedule of the project.

Illustrative examples of stakeholder engagement practices and lessons learned are provided by Perko et al (2017).

The **Government of Canada** developed a stakeholder engagement approach for environmental remediation processes (CNL, 2015). Among others, this includes regularly stakeholder interviews, focus groups. Furthermore, the Chalk River Laboratories' Environmental Stewardship Council was established, consisting of representatives from the community, municipalities, Aboriginal and First Nations groups, and from interested environmental groups; members meet regularly [<http://www.nuclearlegacyprogram.ca/en/home/default.aspx>] and are continuously engaged in all ongoing projects.

In Belgium, after a mixed **chemical and radioactive contamination in Olen/Flanders**, a programme to remove and remediate soil from the environment around the site (river banks, streets, backyards of houses) was required. A district with 20 houses, a school and a church were identified as contaminated objects. However, as group of residents did not recognize pollution as a problem and they opposed the remediation (IAEA, 2014, p. 29), a working group was established with the local population under the name of "Dialogue and Consultation". The working group was chaired by an elected representative of the local community and met monthly to follow up the project, discuss their concerns. The working group also hosted invited lecturers and organised excursions until the remediation process was completed (IAEA, 2014).

One of the main problems in the project mentioned above was related to the waste disposal location. People living in the close neighbourhood were not considered to be part of the process for a long period and as a consequence the environmental remediation programme was stopped. The facility owner selected a location for the waste (close to the polluter) and the first stage of the remediation was finished only after appointing an independent facilitator (special state agency OVAM) which developed a stakeholder involvement programme. The facilitating agency engaged with all stakeholders, collaborated with schools in the neighbourhood, provided a lot of opportunities for residents to express their concerns (public meetings, visits at residents' homes, etc.), developed personal relations with the local community, and organised working groups for the residents and involving, among others, the "green political party" in the working group (IAEA, 2014). It also developed strong relations with the local media and constantly informed/educated the journalists.

As part of the **US Formerly Utilized Sites Remedial Action Program (FUSRAP)** in Missouri, USA, in the St. Louis area, different activities were followed to engage with the public. For instance a survey was conducted in the neighbourhoods adjacent to the radioactively contaminated site, in order to ascertain the actual and desired public involvement in the remediation process; to identify health, environmental, economic, and future land-use concerns associated with the site; and to solicit remediation strategy preferences. The desire for public involvement has been high. Stakeholders were also concerned with protecting future generations, better assessment of risks to health and the environment, and avoiding generation of additional contaminated materials. The lessons learned for the future efforts at site remediation was that stakeholder engagement at an early stage is essential and that decisions should be transparent (Feldman & Hanahan, 1996).

An example of a successful stakeholder engagement in decisions related to **long term exposure situations** comes from Germany. For selected contaminated sites, stakeholders (authorities, civil society and industry) found resources to remediate these sites based on the broader engagement. They decided that funding for remediation, although not required by law, would be equally shared by the federal government and the state of Saxony (http://www.wismut.de/www/webroot/en/background_funding.php). The administrative agreement between the national and regional governments stated that at least 50% of the total budget in 2012 was outsourced to third parties by public invitation to tender in a bid to give fresh impetus to regional development. To overcome the constraint related to the limited budget for covering stakeholders' demands

to remediate all sites, the facility owner prioritized some sites and temporarily abandoned environmental remediation plans on other sites, based on the negotiations and common agreement between different stakeholders.

Changing the administrative procedure and legal framework related to exposure situations can cause also changes in stakeholder engagement. Such an example is the **former uranium mine** at Zirovski vrh in Slovenia which started operation in 1982 in the joint state of Yugoslavia. Uranium exploration terminated after 1990, when the process of restructuring of the former State of Yugoslavia had already started. The new state Republic of Slovenia became in 2004 member of the EU and on its turn was obliged to harmonize its own legislation with EU directives. Therefore the legal framework and the administrative procedures changed several times during the implementation of environmental remediation works. The roles, responsibilities and participation possibilities changed for different stakeholders over time, and the project implementer had to address these changes. Although the existing communication and stakeholder involvement programme was limited due to financial constraints, it could still provide sufficient information to all stakeholders, including the consequences of all the above mentioned changes on the on-going environmental remediation works that are proceeding without major issues.

During the **decommissioning of the Vandellós I** nuclear power plant in Spain, a municipal monitoring commission was created, consisting of representatives of affected municipalities, the regional government, a local business association, trade-unions, the local university, the NPP management and the organization implementing the decommissioning project. The Commission had the objective to monitor the decommissioning process and inform and include the local population on a regular basis. The responsible authority for decommissioning, ENRESA, paid special attention to local socio-economic issues, such as employment of local labour force providing contracts to local people or subcontracting companies at the provincial level for the dismantling activities. Additionally, an agreement with mentioned local university on education and scholarships and collaboration with business associations and regional councils were also undertaken as part of the process to build trust with stakeholders (OECD/NEA, 2006a, 2006b).

Under the social projects of the European Commission Instrument of Nuclear Safety Cooperation Programme in Ukraine, **Chernobyl Exclusion Zone (CBZ)**, several activities are implemented with international assistance regarding the decommissioning of the Chernobyl nuclear power plant and other related activities. Radioactive contamination of areas adjacent to the CBZ has resulted in health and ecological issues, affecting people living and working in these areas. Whereas technical issues were extensively addressed by both national authorities and international community, less attention was given to local livelihood conditions such as availability of medical centres, quality of drinking water and locally produced food. As a result, the CBZ Administration requested the European Commission (E.C.), the framework of the intergovernmental agreements between Ukraine and the E.C., to implement various socially valuable pilot activities in the Ivankiv District, a large district in the neighbourhood of the CBZ. Stakeholder engagement activities include supplying medical equipment, mapping radioactive contamination, creating a news and information centre, development and implementation of sanitary protection programmes, construction of greenhouses for production of healthy food, and the construction of a biomass incineration facility for contaminated woods. These activities entailed different participatory practices and included different stakeholders.

The constraints listed in the table below have been suggested by practical experience in the areas mentioned above as potential obstacles to implementing a meaningful stakeholder participation process in different projects related to exposure situations (Perko et al, 2017). Perko et al (2017) also suggest that participative process should lead to effective, democratic, ethical and transparent decisions. The constraints identified as well as examples of possible actions to be undertaken to overcome these constraints are summarised from Perko et al. (2017) and IAEA (2016).

Key challenges identified (Perko et al., 2017)	Best practice / recommendations (selected)
Groups and individuals opposing the implementation of stakeholder involvement in programmes	<ul style="list-style-type: none"> • Identify possible opponents in advance, establish contact and listen to their concerns and suggestions • Integrate their suggestions in the stakeholder involvement plan to the extent possible • Consider such groups separately from other stakeholders and assess the extent to which specific communication and involvement actions may be effective in order to engage them in the process
Complexity of procedures for involvement	<ul style="list-style-type: none"> • Elaborate an involvement plan that consists of well- defined and short term goals • Develop indicators to measure progress achievement • Make clear from the beginning the different phases of the involvement process and the capacity that stakeholders may have to influence decisions in each of the phases • Provide possibilities for feedback and improvement
Changing opinions within one stakeholder group	<ul style="list-style-type: none"> • Keep track of the opinions (e.g. record keeping) • Encourage the nomination of a spokesperson for each stakeholder group who represents a joint opinion • Encourage the stakeholder group to write and share with other groups their position so that any change in opinion needs to be well justified
Limited capacity to express opinions in public	<ul style="list-style-type: none"> • Employ trained and independent facilitators • Use different participatory tools to allow the stakeholders with limited capacity to express opinions (e.g. face-to-face interviews, anonymous voting, etc.) • Conduct targeted stakeholder group meetings • Organise public speaking courses for main communicators
Lack of funding sources to undertake involvement	<ul style="list-style-type: none"> • Design a financial plan for stakeholder involvement which requires low economic resources • Foresee cost for subcontractors (e.g. professional communicators, facilitators), • Provide resources or incentives to cover the costs of stakeholder participation (e.g. logistics, compensation for the loss of earnings) • Plan the budget for communication tools (e.g. print materials, Internet, TV) and use creative low cost tools
Limited access to information and communication	<ul style="list-style-type: none"> • Provide a wide range of tools to get access to information (e.g. Internet access, newspaper, radio) • Target information channels appropriately for the different stakeholders

	<ul style="list-style-type: none"> • Face to face communication with workers involved in the programme is effective and provides cost-free messengers.
Information overload	<ul style="list-style-type: none"> • Provide enough time for processing the information • Establish the information management system (e.g. database, search engines) • Encourage the use of Executive summaries and visual aids in reports • Organise public speaking courses for main communicators • Prioritise and categorise issues, from most relevant to less prone to create impacts in the decision-making process.
Negative experience with stakeholder involvement	<ul style="list-style-type: none"> • Identify negative experiences with former projects at the local, regional, national and even international arena • Acknowledge and explain the motifs and pitfalls of these experiences • Apply the lessons learned
Lack of use of independent facilitation	<ul style="list-style-type: none"> • Employ trained and independent facilitators • Get the neutrality of the facilitator recognized by all parties involved in the process
Lack of motivation to participate in the process	<ul style="list-style-type: none"> • Explain the advantages of participation in the achievement of a mutual satisfactory result and the potential consequences of the absence of effective involvement. • Clarify and guarantee in advance the participants' capacity to influence the decisions related to the programme • Increase general knowledge about the problem being faced • Organize events (e.g. meetings, interviews, etc.) in convenient time and venue
Unrealistic expectations	<ul style="list-style-type: none"> • Justify the choice of options • Show the consequences of different options • Share international practice and standards
Lack of continuous stakeholder involvement and communication	<ul style="list-style-type: none"> • Establish the mechanisms for record keeping and membership of the stakeholders group (e.g. Minutes of the Meetings to be issued and approved appropriately, encourage the nomination of the representatives of the stakeholders group) • Encourage the representatives of stakeholders groups to disseminate the information of the activities undertaken among the members of their group • Provide regular feedback regarding the improvements, modifications or compromises made to the process and which are the results of stakeholder involvement. • Always design the involvement events from "What is here for me" point of view.
Lack of balance between transparency and security	<ul style="list-style-type: none"> • Explain the principles of transparency and security

	<ul style="list-style-type: none"> • Establish and communicate the security and transparency policy • Establish a security committee to coordinate the requests for information disclosure • Develop commitment by all parties to share information in a transparent manner and to protect sensitive and confidential information (e.g. through an ethical charter or in case of commercial classified information which is protected from dissemination by law)
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5.2 Stakeholder engagement in the governance of radioactive waste

5.2.1 Introduction

Stakeholder engagement (SE) in radioactive waste governance (RWG) can be seen as a first of a kind wide public involvement process in the governance of radiological risks. As stated in the final report of the CIP project (EC CIP, 2010):

“For many years, the issue of radioactive waste management was approached as a mainly technical challenge, and remained an internal matter for the nuclear sector and national policy makers. From the 1970s the main effort was focused on research to develop safe technical solutions for managing radioactive waste over the long term. In this traditional approach, a technical concept, chosen by national decision makers on the basis of expert recommendations, is developed within a national policy framework. The first and key step for the implementation of this policy – besides research and demonstration – is to identify a host site which would allow the concept to be realised under reliable conditions of technical safety in the long term. The process goes from research to demonstration and implementation and from national policy to local siting. The decision made now is expected to provide a solution for the near and distant future. In a large number of countries throughout Europe and worldwide, this path very often led to a dead end. Faced with repeated failures resulting from fierce public criticism, experts and policy makers gradually realised that the complexity of the issues called for a more open and inclusive management approach.”

Or, as phrased in the European guidelines formulated by CIP Guidelines for the Inclusive Governance of Radioactive Waste Management:

“Civil society and institutional players have both complained about a ‘democratic deficit’ in radioactive waste management. The deficit results from certain characteristics of traditional decision making, namely: (1) A focus on decisions prepared exclusively by experts and public servants; (2) A strict reliance on representative democracy. Traditional decision-making frameworks tend to assign a passive role to civil society. They assume that ‘experts know best’, and that the public interest is best defended by the State and by representatives acting ‘for’ the population.”

Since then, the main motivation for SE can be called ‘a care for social justice towards citizens’, in the sense that it became recognised that citizens have the right to have a say in decisions that might affect them in a negative way. In the CIP Guidelines, it is stated that ‘citizen participation is a right’, referring to the UNECE Aarhus Convention that recognises that ‘wider participation can foster better, more sustainable decisions. The Convention establishes citizens’ right to obtain information, their right to participation, and their right to seek justice.’

As a second motivation for SE, the CIP Guidelines document recognises that ‘safe management depends also on citizen involvement’, in the sense that ‘... the quality and safety of RWM over the long term depend not only on technical arrangements, but also on civil society’s vigilance and follow-up. Citizens have vital contributions to make at every phase: developing knowledge and expertise, shaping decisions, and monitoring the performance of waste management installations during operation and after closure.’

Finally, throughout the past decades, the insight came that participation also leads to the generation of ‘better knowledge’, seeing knowledge as a synergy of insights from the wider stakeholder community, including expert, civil society and indigenous local knowledge.

In sum, taking into account the three motivations for SE formulated above, it was said in the CIP Guidelines that ‘good governance’ of radioactive waste is *inclusive governance*, or thus governance that

- *“... recognizes that no one player or organization has the resources, knowledge, and/or authority necessary to tackle common affairs alone;”*

- *“... seeks to foster interaction among the different networks of players in preparing decisions that will be well-founded, transparent, fair, sustainable and effective;”*
- *“... implies that action can be taken at appropriate levels, in a manner complementary to the power or the formal authority of the State;”*
- *“... recognizes that all citizens, with or without mandate, are entitled to take an interest in public issues and to address them.”*

The analysis presented in this section draws knowledge from more than 10 years of European funded research on SE in RWG (see e.g. Baudé et al, 2009a,b; Gilli et al, 2009; Mays, 2009; Laes et al, 2009; Wylie, 2010; Réaud et al, 2009a,b; Richardson et al, 2009). These research projects involved many European Member States in various combinations.

The first part is structured along the ENGAGE WP2 guiding questions. In this, only key challenges, obstacles and best practice were selected that can also be relevant for the three ENGAGE application contexts.

The second part recalls guidelines for SE drawn from a Belgian case study on SE in RWG.

It is also worthwhile to note here that the selected reports are only a small fraction of the research output related to SE in RWG produced in the last decades. Even the selected reports contain already a massive amount of information relevant to the ENGAGE project, but impossible to synthesise and summarize in this short literature review. One of the recommendations of ENGAGE should therefore be to advise end users of SE information and guidelines to not overlook what has been produced in past research devoted to RWG as well as in other technology application contexts.

5.2.2 Key challenges, obstacles and best practice in stakeholder engagement in the governance of radioactive waste: lessons learned from research and practice in European context

How are RWG communities responding to “external” pressures, mandates, demands, and/or expectations commending stakeholder engagement in RWG? And how does this show in practice (e.g. specific cases)?

As pointed out in the introduction, RWG, and especially the process of disposal site selection, typically evolved from a technocratic DAD approach (decide, announce, defend) to a more open and cooperative approach. The response of Local communities (being the key stakeholder in RWG siting processes) thereby evolved from protest to cooperation when the possibility for engagement was created by the mandated authorities and institutions, although in various cases, tensions, scepticism and suspicion remained.

Which (other) real or potential forms and instruments of stakeholder engagement and public participation can be observed in RWG practice, showing no reference to existing requirements?

In all RWG research and existing RWG SE processes, the importance of the development of skills and know-how necessary for SE was recognised. As stated in the CIP Guidelines, addressing RWM issues requires a local community to mobilize and develop expertise inside and outside the community, given that engagement is a time and resource consuming process for a local community. This may be facilitated by:

- Dialogue processes to help build up local players’ skills and competence.

- Opening up expertise – choosing issues to investigate, engaging own experts, stretching institutional experts.
- Availability of a diversity of external expert resources to support the investigations carried out by the community and foster the development of local skills and expertise.
- Means for upkeep of local skills and know-how across the years.
- Assuring transparency and traceability.
- Networking and pooling resources with other local communities, nationally and internationally.

What levels of awareness about external prescriptions of stakeholder engagement in RWG do researchers and practitioners reveal?

While awareness of policy instruments (such as Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) Directives) is generally high among social science researchers and RWG mandatories, it was observed that knowledge of these instruments among local populations is low. There is thereby no difference between Western and Eastern European countries. Awareness of the existence and applicability of soft law guidelines such as the Aarhus Convention and the Espoo convention was found to be generally low to non-existing among local populations.

As mentioned by Wylie (2010), administrative borders are not enough to define the communities affected or concerned by the existence of any RWM project. As well in RWG research context as in existing RWG SE processes (such as the Belgian partnership process), there has been awareness of the complexity of demarcating the affected community: How to geographically demarcate the affected region? What criteria to use? Why this village and not the one right next to it? As specified in Wylie (2010), geographic features (and underlying geological characteristics), infrastructure and other physical features may be useful in outlining the communities concerned, and also administrative borders will play a role. However, it is especially important to respect the ways in which people define their own communities, and to grasp in this manner what precisely may be affected by a project. Such a meaningful definition may rely on at least four key elements of the experience or sense of community:

- Membership: Identity and the sense of belonging.
- Emotion: Attachment to a home place, the feelings and symbols of community.
- Integration: Local democratic processes that mobilize people.
- Reinforcement: Economic activities and networks that knit together a 'functional' area.

According to Gilli et al (2009), local stakeholders are concerned about how to sustain vigilance and responsibility for RWM facilities over the phases of their development and operation, and throughout the many years beyond.

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

Researchers who participated in RWG research often saw themselves as facilitators and mediators of process, in the meaning elaborated upon in ARGONA (2010).

- National and local politicians often saw SE as a concession towards the citizens rather than as a moral obligation or a practical need;
- Citizens active in SE see themselves as representing the population and as fulfilling a responsibility towards society;
- Researchers and practitioners participating in RWG SE research and practice understood the importance of multi-level governance and of the formal arrangements needed to make that possible. As specified in [01b], the participation of local stakeholders in RWG decision making does not take place in a vacuum. The local level is inevitably impacted by the decisions taken at other governance levels. Integrating with issues, players and forums (formal and informal) at the other governance levels (region, State) is therefore a key condition for local engagement to be meaningful and sustainable. It was also concluded that communities with strong leadership, good deliberation processes and procedures for developing a long-term sustainable development vision are more successful in influencing decisions. National and European networking of communities also proves to be an efficient and useful tool.

What were the rationales for stakeholder engagement, the final objectives?

- For citizens and concerned civil society representatives, the rationale for SE is primarily a care for social justice towards citizens: citizens should have the right to have a say in decisions that might affect them in a negative way. This is particularly relevant in a RW siting process, but also in the context of general RWG policy (in a national or international context) or of the technical design of a RW disposal site. In practical cases such as the SE process around HLW disposal in Sweden or the LILW disposal process in Belgium, it is observed that candidate communities in a siting process also deal with questions of general policy and technical design of the site;
- Additional motivations are the contribution of stakeholders to long-term safety governance and better knowledge generation (seeing knowledge as a synergy of insights from the wider stakeholder community, including expert, civil society and indigenous local knowledge);

Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement?

- Typical for stakeholder engagement in RWG is the very long time dimension of the processes (even in the case of short & intermediate level waste, time dimensions to take into account are 300 years and more). This means evaluation of objectives should be done on a continuous basis according to some recurrent procedure, and the robustness and sustainability of these evaluation processes (over the years and across generations) is a concern of research and policy, as much as the robustness and sustainability of other policy processes (such as funding and compensation schemes or preservation of records, knowledge and memory across generations);

Have there been any guided improvement activities?

Stakeholder engagement in RWG typically concerns very long time frames. Opposite to this, the existing stakeholder engagement in RWG processes in Europe have only started several years ago, which means that concrete policy improvements might eventually be expected in the future.

One current principal improvement very relevant for RWG is the change in understanding of the meaning of compensation or local benefits. While in many practical SE cases (such as the Belgian LILW RWG process), compensation was first understood as ‘tangible’ concrete measures that would mainly benefit the current generation (such as direct money, free internet for all local citizens or sports facilities), gradually the insight came that a compensation of a long-term burden (accepted on a voluntary basis) should also (and primarily) benefit the future generations who, in addition, have no say in the decision making on the eventual acceptance of a disposal site. Compensation measures or benefit packages should therefore not be seen as products but rather as processes that require SE in themselves. As specified in the CIP Guidelines document, *‘... the scope and scale of benefits packages may be closely related to the definition of ‘affected community’. Benefits packages can be designed to sustain the economic community within which the directly affected population is located. Outsiders’ perceptions of the community or territory could also be taken into account in plans to enhance sustainable economic development, especially if a negative perception or stigma should result in economic loss. Successful processes tend not to impose benefits packages, but rather to design them in negotiation with a locality. The application of rigid legal instruments to designate the scope, scale and purpose of benefits packages can be problematic: they offer little margin for negotiation or adaptation to specific local needs and requirements, and can result in gross inequalities between components of the directly affected populations. In contrast to applying rigid criteria for benefits based on spatially or administratively defined zones, a governance process based on identifying a directly affected population, and the diversity of communities in which it is embedded, offers welcome flexibility.’*

What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?

Experience with local SE processes in RWG shows that issues of local political authority need to remain at the centre of concern. Effective SE in RWG requires that citizens’ partnerships or other forms of stakeholder representation deliberate authority over RWG aspects with the local elected political representation (for instance the municipality council). One has to remain vigilant for the fact that robustness and sustainability of the SE process can be endangered by change of political representation on the occasion of elections, even without altering the concrete RWG implementation process (for instance the construction of a disposal site) itself.

What are RWG actors and communities doing that may de facto count as stakeholder engagement (but are not necessarily labelled that way)?

- The partnerships in the Belgian LILW RWG process, in their capacity and role of representatives of the local population, organise information and discussion sessions open to the (local) public on a regular basis. They find it their responsibility to give feedback to the local population they represent (CIP final report; Laes et al, 2009);

Are there any alignments/misalignments between case practice, on the one hand, and external conceptions and prescriptions, on the other, and if so why?

In the LILW RWG process in Belgium, LC stakeholders admitted at one point that it is not easy to deliberate and determine what would be a good or fair compensation. They also noted that there was guidance missing to steer and facilitate this thinking process. In some countries, there is a historical tradition of compensating LCs for risks and burdens coming with nuclear activity with specific social services and sports and leisure

infrastructure (as in the case of Sellafield in relation to the villages at the UK West Cumbria Coast). However, in RWG SE processes and related research, it was recognised that also generations in the (far) future should benefit from compensation, given that the burden for them could be bigger than for the current generation (see also the reflection on compensation above).

In various RWG SE research processes, the incompatibility of the criteria of safety and compensation was recognised: if one requests the guarantee of ‘absolute safety’ of the RW disposal site, what would then still need to be compensated? The insight came that these criteria are not necessarily incompatible, but complex questions in themselves and each of them relevant as such: it is impossible to guarantee absolute safety in the (far) future, so compensation is ethically acceptable and recommended. At the same time, it seems to be impossible to determine and guarantee a fair or good compensation as (1) it is challenging to guarantee a compensation agreed upon today (in whatever form) to be effective into the far future and (2) one can never know whether the future generations would be satisfied with the form and amount of compensation.

It is worthwhile to note here that, although the two issues presented above are examples from experience, it may be clear that the tensions described are not case-specific but rather fundamental for RWG and even for other contexts of application of radiation. The fundamental tensions can be phrased as follows:

- (1) how to determine fair and effective compensation for the future generations if those future generations cannot be involved in this reflection themselves?
- (2) how to (pragmatically and ethically) justify (risk) compensation if one asks at the same time ‘absolute safety’ (and thus ‘zero risk’)?

One possible answer to the two questions is that one needs to adopt a responsible attitude but also that one has to allow reasonableness:

- (1) In the first case, reasonableness refers to the fact that the current generation has no choice but to think in the place of the future generations, so the current generation has to do the best it can do now, and explain the future generations why it thought this was the best it could do.
- (2) In the second case, reasonableness refers to the insight (of the stakeholders) that one may want to strive for absolute safety, but that one can never guarantee it for several reasons (limited predictive capacity of simulation models, lack of knowledge of specific natural or technical phenomena, contingencies such as accidental intrusion in the disposal site, ...), which means that it is also ethically reasonable to ask for compensation.

Which challenges and opportunities do you encounter for stakeholder engagement in the specific case of RWG?

- For RWG, typically two kinds of SE have been considered relevant: SE in policy related to technical options and solutions and SE in the siting process for a waste disposal site;
- Typical for RWG is that an essential stakeholder is missing, namely the future generations, a fact that opens ethical questions related to accountability, such as
 - the choice for retrievable or non-retrievable disposal;
 - the possibility for future generations to benefit from compensation;
 - the way in which and the ‘degree’ to which current generations can ‘represent’ the future generations in their moral thinking (what are the ethics of the future generations?);

- Robustness and sustainability of the participatory process, among other:
 - danger of ‘stakeholder fatigue’,
 - danger of loss of political support,
 - danger of loss of records, knowledge and memory across generations,
- Political representativeness: is a tool such as a partnership a good democratic representation?
- Ethics and practice of compensation
 - What is a good/just/effective compensation?
 - How to ensure compensation into the far future?
 - How to avoid competition for hosting the waste repository (YIMBY)?

<i>What else have you found or should we be asking?</i>
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- The importance of social recognition and reward for citizens and LCs: research ([01e]) showed that local communities accepting the national waste (and thus the risk and burden) consider social recognition for this commitment very important (sometimes even more important than financial compensation). In other words: these local communities want the general public (on national level) to know that they are carrying the burden for them;
- Citizens are interested in worst case scenarios, no matter how unlikely such scenarios are. Institutional representatives and engagement process facilitators and mediators should be prepared to discuss the worst of the worst case scenarios (Jonsson and Andersson, 2010);

5.2.3 Guidelines for local community engagement

Laes et al (2009) formulated guidelines for local community involvement based on the Belgian case study on local partnerships for the siting of a LILW repository. The objective of their research brief was to provide insight into the “*applicability of the Belgian partnership model as a 'tool' to organise local democracy for engagement in RWG*” and “*the socio-political context (historical and actual) and the legal frameworks in which the structuring of local communities and development of local democracy need to be 'embedded'.*”

The guidelines provide “*decontextualised reflections on aspects of public participation, compensation, local democracy in a national political context and the role of institution*” and can thus be useful not only for RWM governance processes in general, but also for other SE contexts. The following list summarises Laes et al (2009).

1. Quality of local democracy

Early involvement and joint problem definition: possibility for candidate communities to become involved in the first stage of the process (in the case of already existing waste) and to participate in the 'joint definition' of the problem or challenge at stake. This facilitates the development of a common language enabling non-experts to communicate better their concerns and views.

Participation instead of consultation: the local governance process should have a real influence on the outcome instead of only a consultative character restricting involvement to 'negotiating conditions for acceptance' of an imposed option.

Clear terms of reference: clear definition of mandates and framing of issues at stake, with a possibility to reconsider and modify these 'terms of reference' at any time in the process.

Regular independent assessment of legitimacy: the legitimacy of the local representation of the community should be assessed regularly in terms of its legitimacy, with the aid of an independent 'guardian' to check if it still (1) covers the full spectrum of stakeholders and (2) has satisfactory contact with the grassroots level.

2. Quality of multi-level governance

Multi-level inclusive governance with balanced articulation of participation and decision making: governance approaches should deal only with issues or make decisions about policies that can be handled most effectively at that level. Binding decision should only be taken if that decision has been explicitly approved by the institutions that hold legitimate decision-making power (based on practices of representation and/or of constituency, e.g. a municipal council, parliament, government).

Step-wise decision making process: an integrated plan for RWM should be developed, including flexibility, but also clear definition of activities to be fulfilled before moving from one to another stage. Decisions to move from one stage to another should be taken by legitimate 'rights-holders' (e.g. citizens acting through their representatives).

Distribution of (dis-)advantages at all negotiation levels: the consequences (economic, social, environmental) of decisions taken should be proportionate to the expectations laid out in the original mandate, or the general standards of fairness in society. Claims of disproportionate effects should be investigated and addressed at the appropriate level.

3. Development of local knowledge, know-how and expertise

Opening up of expertise: participants in a governance arrangement have the autonomous right to seek information and invite consultation from any sources they choose. To ensure transparency, (in)formal procedures should be set request from experts clarification of assumptions, uncertainties, credibility of evidence.

Openness and transparency: all information needed to arrive at robust decisions should be openly available, in accordance with (legal) instruments at national and EU level. A clear 'audit trail' of decisions should be established.

Opening up themes and topics for debate: changes in the original mandate of a governance should be subject to deliberation among participants, and be encouraged if this deliberation concludes that it cannot fulfil its original mandate without taking on new tasks/issues.

4. Durable local integration of RWM activities

Facilitating durable local participation: development and maintenance of necessary competences and know-how to follow-up the site among local actors' such that they remain a decision-making partner, on the basis of legally carried long term financial and structural arrangements.

(Risk) compensation as ethically justifiable policy practice: compensation (community benefits) can support the durability of local integration of RWM activities by means of durable financial structures or projects with explicit link to the site. Structures that enable cooperation and dialogue between all municipalities involved should be facilitated.

Key challenges identified for local community engagement	Best practice / recommendations
Definition of affected community	Understand and respect the ways in which people define their own communities, and what precisely may be affected by a project
Quality of local democracy	<ul style="list-style-type: none"> • early involvement and joint problem definition • participation instead of consultation • clear terms of reference • regular independent assessment of legitimacy
Quality of multi-level governance	<ul style="list-style-type: none"> • multi-level inclusive governance with balanced articulation of participation and decision making • step-wise decision making process • distribution of (dis-)advantages at all negotiation levels
Development of local knowledge, know-how and expertise	<ul style="list-style-type: none"> • organising dialogue process • opening up of expertise • making expert resources available • openness and transparency • opening up themes and topics for debate • networking and pooling resources with other communities
Durable local integration of RWM / process activities	<ul style="list-style-type: none"> • facilitating durable local participation • (Risk) compensation as ethically justifiable policy practice

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5.3 Stakeholder engagement in radiation protection and European radiation protection research

This section provides an overview on the role of stakeholder engagement in radiation protection research as reflected in academic literature, policy documents of radiation protection platforms or international organisations. A brief look is given first to the international level, followed by European radiation protection research projects and platforms, notably in the framework of CONCERT, the European Joint Programme for the Integration of Radiation Protection Research (see: <http://www.concert-h2020.eu/en>). Next, ENGAGE WP2 guiding questions will be briefly addressed. The purpose is not to provide a comprehensive list of activities, but to give insight into prominent European approaches.

International view on stakeholder engagement in radiation protection

In 2008, IRPA published guiding principles on stakeholder engagement for radiation protection professionals. The guidance was “*produced to help radiation protection professionals to understand the objectives, requirements and demands of stakeholder engagement, encourage participation and provide a framework for establishing a constructive dialogue with other stakeholders*” (IRPA 2008). The guiding principles aim to promote “*participation of all relevant parties in the process of reaching decisions involving radiological protection which may impact on the well-being and quality of life of workers and members of the public, and on the environment. In promoting this approach, radiological protection professionals will aim to develop trust and credibility throughout the decision making process in order to improve the sustainability of any final decisions*”. In this context, Aakhus (2011) reflected on the importance of knowledge and competence for communication design practices. From his point of view, radiological protection professionals need to have knowledge and competence in communication as practice in order to deal with the requirements of stakeholder engagement.

The thirteenth IRPA Congress in Glasgow, 2012, addressed among its 13 scientific areas: “Stakeholder engagement and involvement”. At this congress, interaction with stakeholders in radiological protection situations was at the centre of discussions in many sessions. Lazo et al. (2012) argued that “*in making radiological protection decisions, be they for worker, patient, public or environmental protection, decision makers must address the science of radiological protection and its uncertainty, and the social values and*

economic situations of affected stakeholders and their diversity.” It was recognized that stakeholder engagement has become more and more important for radiation protection; however, radiation protection professionals and their organizations need new skills in order to implement effective stakeholder engagement. Several challenges for the coming years were identified, including the importance of internationally sharing best practices in stakeholder engagement, better education and training in risk communication, further emphasizing the need for stakeholder engagement in emergency management planning, and fostering the use of latest communication technologies to enhance effectiveness and efficiency of communication.

At the level of international organisations such as ICRP, the need for stakeholder engagement has been reflected in a number of publications and statements. As one example, a part of the ICRP publication 101 is dedicated to stakeholder involvement (ICRP 101). This can be also found in some countries at national level, for instance in Finland. In an article entitled “Half a century of radioecological research and surveillance at STUK” (Finish Radiation Safety Authority), Ikäheimonen (STUK, 2009) identifies an increasing need for the interaction with stakeholders also in the field of radiation protection. The author describes involvement of the stakeholders’ opinions in decision making as a challenge for future work. Articles like this reflect the perceived need for a better alignment with different societal actor’s interests and views. ICRP (2017) also mentions the “mechanisms for interaction with stakeholders” in relation to justification and optimisation of protection as one of the 10 key research priorities (<http://www.icrp.org/docs/ICRP%20Research%20Priorities%202017.pdf>).

Answers to WP2 guiding questions, related to European stakeholder engagement approaches

What levels of awareness about external prescriptions of stakeholder engagement in RP do researchers and practitioners reveal?

Concerning stakeholder engagement in radiation protection research, researchers, industrial and institutional end-users, governmental organisations and research policy makers have been increasingly involved in the elaboration of strategic research agenda’s and/or setting up research priorities. A recent document setting first steps and current ideas to build a joint roadmap for radiation protection research makes specific reference to Responsible Research and Innovation in defining the societal challenges for future research (Impens et al, 2017).

However, the need for stakeholder engagement and citizen-centred communication has not penetrated the whole radiation protection community. In the recent article “What’s next in Radioprotection?”, Bourguignon et al. (2017) refer only to educating the public and the media on radiation protection issues. Here, education is described as a top down process based on the expectations that better educated public, media and health practitioners can “*give radiological protection its proper place*”.

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

At European level, in recent years the view on stakeholder engagement has moved from involving stakeholders with an interest in radiation protection research itself (e.g. researchers, radiation safety authorities, people professionally exposed to ionising radiation) towards taking into account other stakeholders’ views on radiation protection and RP research. This process might have been accelerated by the platforms properties to take responsibility for a broader view on radiation protection and of course due to increased international debate on the importance of integrating social sciences and humanities into

radiation protection (e.g. RICOMET 2015 declaration, <http://ricomet2015.sckcen.be/-/media/Files/Ricomet2015/RICOMETdeclaration.pdf?la=en&hash=ADB2A908D893172BE33C69A6E7F21CB5218F68EB>).

Analysing the role of stakeholder engagement in European radiation protection research and development, the following predominant stakeholder engagement activities of European projects and platforms can be observed:

MELODI (founded in 2010): In the fifth annual MELODI workshop in 2013, risk communication and risk perception was integrated for the first time in the programme, with the aim to lay a foundation for a discussion between social, human and natural sciences. By means of three presentations, attention was drawn to societal aspects of radiation protection. Potential bridging points and mutual understanding were discussed. This discussion also was input for the OPERRA stakeholder management strategy (see below). On the MELODI website, no statements on stakeholder engagement can be found. But, events that foster engagement are linked in the area “News archive”, such as RICOMET 2018 conference, CONCERT public survey, etc.

EURADOS (platform, founded in 1981) engaged with various stakeholders in 2016, when developing its Strategic Research Agenda (SRA.) The aim was to take into account views of diverse stakeholders on the EURADOS SRA, to gather different viewpoints on the research proposals elaborated by EURADOS, to ensure that no important points have been overseen. Another aim was to ensure that EURADOS SRA reflects the societal needs in the choice of the dosimetric aspects to be taken into account for further research, and identified the societal implications of these aspects as topics to be addressed in parallel research. A workshop was held in June 2016 in order to further develop the SRA based on feedback and input from international organisations with interest in the dosimetry of ionizing radiation. Results of the First EURADOS stakeholder workshop are summarized in: EURADOS Stakeholder Workshop on June 30th, 2016; EURADOS Report 2017-02, Neuherberg, April 2017; http://www.eurados.org/-/media/Files/Eurados/documents/EURADOSReport2017_02.pdf?la=en&hash=90835CFCC974A3923AA6101CA24830DE5C61544E

Similar, **ALLIANCE** (European Radioecology Alliance) invited a wide range of interested stakeholders to contribute to the SRA (e.g. Hinton et al. 2013). The European Radioecology Alliance was founded in 2009 to coordinate and promote European research on Radioecology. The stated aim of the its Strategic Research Agenda (SRA) is “*to be useful for science and society, shared by stakeholders and researchers and realistic from an operational and scientific point of view*”. It is “*a document open for debate with all relevant actors*”, which are defined as research bodies (universities, research centres), authorities and other related radiation protection associations (e.g. technical platforms)

In **NERIS**, stakeholder involvement plays an important role since the founding of the platform in 2010. As NERIS subscribed to a holistic approach to emergency management instead of focusing only on radiation protection research, societal aspects and aspects of stakeholder engagement have been considered from the beginning. The base for the NERIS approach and stakeholder engagement activities are the experiences gained in EURANOS, NERIS-TP and PREPARE projects. Fundamental working principles and aims of NERIS include collaboration with concerned parties of different governmental levels, science, NGO’s, policy in emergency and recovery preparedness and response, dialogue, partnership, networking, training. NERIS is working on the basis of stakeholder involvement. Stakeholder engagement processes were informed by social scientists and structured according to combined social sciences and radiation protection expertise.

EUTERP (European training and education in radiation protection foundation, founded in 2010), dedicated in its Workshop 2015 for the first time one session to “Communicating radiation risks” (see: <http://www.euterp.eu/EUTERP2015/index.html>) .

The following projects have to be mentioned which contributed to increasing stakeholder engagement in radiation protection research.

OPERRA (project, 2013-2015):

OPERRA WP4 dealt with “Reaching out to new Member States, academic & professional partners, stakeholders & authorities”. Main objectives of its WP4 were 1) *To ensure the involvement of all other actors, aside from those clearly identified as already playing a central role, who may also contribute to defining the future research priorities in radiation protection and 2) To benefit from all resources that may serve the interests of the European radiation protection community.* Detailed objectives were stated as follows:

- *To explore how the potential of academic & professional institutions can be integrated to strengthen their role in radiation protection research, and*
- *To take advantage of their experience in social & human sciences (e.g. risk communication, risk perception, ethics)*
- *To undertake coordination activities to remove the barriers that inhibit the involvement of the new EU Member States in radiation protection research*
- *To encourage an active dialogue with all parties at the national & international level with a significant interest in radiation protection*
- *To ensure that the research prioritized by key platforms (MELODI, Alliance, NERIS and EURADOS) is directed towards issues of concern to major stakeholders & authorities*

This list of objectives reflects an approach to stakeholder engagement, recognising that this is a science per se, which requires expert knowledge.

In 2013, the OPERRA Stakeholder Management Strategy was developed (see <http://www.melodi-online.eu/doc/OPERRA%20Stakeholder%20Management%20Strategy%20Final.pdf>) within its task 4.3 “Reaching out to major stakeholders & authorities”. The aim of the dialogue between OPERRA and stakeholders is to help ensure that :

- *OPERRA addresses real concerns of the radiation protection community.*
- *OPERRA’s activities are integrated with related activities elsewhere.*
- *OPERRA’s achievements are recognised by the wider community in radiation protection.*
- *OPERRA does not become too inward-facing or self-serving on its activities.*
- *OPERRA’s activities are seen to be an appropriate use of EC funding to address EC citizens’ concerns related to effects of ionising radiation. ...*

More detailed objectives are given in http://www.melodi-online.eu/doc/DPP_OPERRA.pdf

In 2014, OPERRA launched the eSurvey of stakeholder views on radiation protection research in Europe „Priorities for radiation protection research: analysis of the OPERRA stakeholder survey”³.

This first e-survey with stakeholders related to radiation protection research was rated as a success. The summary of the report stated that: „*This report provides an analysis of responses to the OPERRA eSurvey of stakeholder views on research topics of greatest relevance to radiation protection in Europe. The survey was carried out by members of the OPERRA project with assistance from members of the European radiation protection platforms, MELODI, EURADOS, NERIS and ALLIANCE, representing low dose risk, dosimetry, emergency planning and radioecology interests respectively. The response was encouraging, with 274*

³http://www.melodi-online.eu/doc/operra_esurvey2014/OPERRA%20D4-5%20Analysis%20of%20stakeholder%20questionnaire%20responses%202015-07-06.pdf

completed surveys for analysis from a range of types of respondent, mainly from those with a scientific background and considerable experience in the area. Most response came from those with interests in low dose risk and dosimetry, with least from those in the emergency planning and ethics areas. There were additionally NGO and a few public respondents. Responses were provided by 21 European countries plus some from countries further afield such as the USA, China, Russia and Egypt”.

The **EAGLE** project (Enhancing education, training and communication processes for informed behaviours and decision making related to ionizing radiation risks; 2013-2016) fostered good practices in information and communication in ionizing radiation. The project worked on and with means of stakeholder engagement, exchange and communication. The project brought together representatives from a wide range of societal stakeholders involved in radiation protection issues (authorities, researchers, media, NGO’s, local communities, and many others). Among others, the project deliverables (see: <http://eagle.sckcen.be/>) entail “*recommendations intended to help European actors in the field of ionizing radiation to move closer to a citizen-centered communication process, supporting better informed decision-making about ionizing radiation risks*”. The RICOMET conference in 2015 (First International Conference on Risk Perception, Communication and Ethics of Exposures to Ionising Radiation <http://ricomet2015.sckcen.be/en>), organised as part of the EAGLE project, brought together stakeholders from different fields of radiation protection, and provided room for discussing EAGLE results and several other radiation protection issues. The RICOMET conference was the first important attempt to bring together stakeholders from different areas of radiation protection. Despite EAGLE closing in 2016, RICOMET conference was continued since then every year. The importance of stakeholder engagement was pointed out in the “Public Declarations after the RICOMET Conferences in 2015 and 2016”, Mol, August 2015, 2016 (to be found at <http://ricomet2015.sckcen.be/en> and <http://ricomet2016.sckcen.be/en>).

In **CONCERT**, stakeholder engagement is part of Work package 5: “Stakeholder involvement and communication in radiation protection research”. Task 5.1 was dedicated to building a strategy for engaging with societal stakeholders, with the aim of including more parties than only those with a (direct) stake in radiation protection research. Within this work package, a Stakeholder Group was set up with representatives of the groups described to be important stakeholders for CONCERT partners. Members of the Stakeholder Group were identified by asking each European RP research platform to identify potential members of the Group that would represent stakeholders in the specific field of activity of the platform. As a result, the Stakeholder Group members represent NGOs, Universities, RP Authorities, International organisations, operators.

CONCERT stakeholder strategy follows the aim “*...to increase the impact of its activities through communication and dialogue with stakeholder groups both from within the field of radiation protection and the wider public. Such communication and dialogue will help improve the understanding of the risks associated with radiation exposure and the balance between risks and benefits in uses of radiation in differing applications. Further the stakeholder work will help ensure that CONCERT addresses issues that concern and are of relevance to stakeholders in the radiation protection arena and that are scientifically feasible*”. CONCERT stakeholder approach has the following objectives:

- *To encourage a wider public and societal stakeholder interest in radiation protection research and at the same time encourage support within CONCERT for science and research for and with society, and communicate the societal benefits of radiation protection research*
- *To establish mechanisms for public and societal stakeholders to have a say in developing CONCERT’s research priorities.*
- *To engage informed stakeholders in establishment and development of long-term European research programmes in radiation protection.*

- *To establish routes to inform and educate public and societal stakeholders on the scientific basis of radiation protection, and the judgements made within the system of protection.*
- *To provide consistent and clear information on implementation of radiation protection standards in Europe with a view to encouraging consistent approaches among nations (Bouffler S, 2015: CONCERT D 5.1 – CONCERT Stakeholder Management Strategy)*

With respect to the engagement of those with professionally concerned with radiation protection and interested researchers, CONCERT stakeholder engagement approach builds on experiences made in OPERRA project stakeholder involvement strategy. Here, the approach described in the respective deliverable is comprehensive. Moreover, with respect to involving researchers and representatives of governmental organisations dealing with radiation protection, there are a lot of existing and proofed procedures to include relevant parties and governmental and policy levels. But, with respect to involvement of groups such as patients, civil society, diverse societal groups, the approach does not present a comprehensive stakeholder engagement strategy. In the report it is stated that, compared with OPERRA stakeholder strategy, CONCERT “needs to reach out to wider and more general stakeholders”. Accordingly, an eSurvey was set up that aimed at gauging “the perception of radiation risk, the ambitions and the values amongst a wide range of people who are not radiation specialists”. Currently, the results from the surveys in different languages are evaluated.

While the elaboration of research calls within CONCERT is open for feedback to various stakeholders, there are limitations on the organisations that can be part of a consortium (e.g. third parties cannot co-fund their participation with in-kind contribution, as it is the case for CONCERT partners).

What were the rationales for stakeholder engagement, the final objectives? Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement? Have there been any guided improvement activities?

The final objectives for stakeholder engagement in European radiation protection are to ensure that no important view on radiation protection has been overlooked. CONCERT seeks to engage not only stakeholders directly interested in research itself, but also to consult other societal stakeholder groups including the general public (e.g. in the framework of the CONCERT WP5 Stakeholder group where a variety of societal stakeholders are represented, including NGO’s). There have been also attempts to capture opinions of wider publics (e.g. OPERRA eSurvey); however, these present certain sampling issues.

Descriptions of the stakeholder engagement can be found at the level of radiation protection platforms or the CONCERT programme, but in general without a formal critical evaluation of the stakeholder engagement process and the achievement of its objectives, carried out with the respective stakeholders (with notable exceptions in the area of emergency preparedness, response and recovery).

What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?

Recognition for the role or need for stakeholder engagement varies with context.

The experience of the Stakeholder Group of CONCERT show that its members have a great interest in participating to this group and be able to provide their comments on the research projects undertaken under the CONCERT framework. The main issue remains the availability of these members to participate to the meetings due to their current workload.

Are there any alignments/misalignments between case practice, on the one hand, and external conceptions and prescriptions, on the other, and if so why? Which challenges and opportunities do you encounter for stakeholder engagement in your specific case?

Stakeholder engagement in practice in radiation protection research has the potential to be further improved according to international prescriptions. Among the challenges, the following can be mentioned:

- Need for more knowledge of, and competence, in practice-based communication
- Development of new skills, such as sharing best practices in stakeholder engagement, better education and training in risk communication, and tapping into new communication technologies
- Closer alignment needed between different societal actors' interests and views
- Move towards people-centred communication: what does this entail? How to organize it?
- Some stakeholder groups insufficiently considered, such as: patients, civil society, other societal groups

What else have you found or should we be asking?

- How to accelerate the process of bringing together different disciplines which are both necessary to start a stakeholder process in a certain field?
- How to raise awareness of the need to engage?

Looking at activities and projects launched by European platforms and projects, it can be concluded that there is an awareness of the need to take into account societal aspects, and to identify stakeholders' needs and interests. A barrier for more and better structured stakeholder engagement seems to be competence that is required for sound and successful engagement processes, which is generally lacking among radiation protection researchers. It can be observed that, social scientists have been consulted in drafting radiation protection research agenda's within OPERRA and CONCERT.

Key challenges identified	Best practice / recommendations
<ul style="list-style-type: none"> • Need for more knowledge of, and competence, in practice-based communication • Development of new skills, such as sharing best practices in stakeholder engagement, better education and training in risk communication, tapping into new communication technologies • Closer alignment needed between different societal actors' interests and views • Move towards people-centred communication • Some stakeholder groups insufficiently considered, such as: patients, civil society, other societal groups 	<ul style="list-style-type: none"> • Risk communication and risk perception increasingly integrated into radiation protection research and development, through exchanges with SSH researchers • SSH becoming more integrated into Platform SRA's • General acknowledgment of the need to adopt a holistic approach to emergency management. This approach comprises stakeholder engagement (including wider publics) and collaboration with social scientists • Stakeholder processes centred on mutual learning as an outcome in its own right • Outreach activities initiated and followed up • More reflexive consideration (awareness) among platform members of "best practices" and barriers in engagement

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5.4 Lessons learned from other relevant non-nuclear fields

The following paragraphs takes a look outside the radiation protection area to investigate how other communities are responding to requirements for stakeholder engagement, mandates, demands, or expectations and how this shows in practice. Also, benefits and lessons learned will be pointed out.

In several fields of disaster, risk or hazard management, participation, stakeholder engagement or community involvement are important aspects. They are not discussed in the context of mandates or official expectations, but mostly in relation to experiences from past incidents or embedded in discussions for better preparedness. Sometimes, standard documents such as the Aarhus convention are referred to. OECD, as one main player, has discussed very actively the issue of stakeholder engagement. A series of reports, workshops, safety guidance have been drafted, taking into account perspectives and perceptions of various stakeholders. The most important lessons learned regarding stakeholder engagement will be summarized below.

In summary, the analysis of experiences from diverse hazards and resources management fields suggests that questions related to stakeholder engagement should always be discussed together with the relevant stakeholders specifically for the issue in focus. By this, it can be ensured that internal as well as external stakeholders can participate to the discussions, can give their view and learn about stakeholder engagement and can contribute concerns, aims, and views on limits of the engagement processes. Moreover, manifold views can highlight who is included in and excluded from engagement processes.

A focal point of successful stakeholder engagement is seen the flexibility in acting and taking decisions.

Main challenges for stakeholder engagement are, similar to other fields, costs and language, outreach, challenges in citizen's involvement themselves, not enough training, division of responsibilities, long duration. Regulatory frameworks can help to raise priority of stakeholder engagement and to diminish obstacles. As good practices the following are mentioned: integration of local residents in planning phase,

professional communication concept, starting early and keeping up-to-date with activities, continuity, as well as a combination of information and interaction. For interaction, up-to-date information, appropriate content, diversity of tools and channels and continuity are indispensable.

Good examples for such processes are the “Stakeholder Engagement for Inclusive Water Governance” (OECD, 2015) and “Guidance on developing safety performance indicators related to Chemical Accident Prevention, Preparedness and Response” (OECD, 2008). This OECD guidance acknowledges the role that industry, public authorities and communities play to prevent and prepare chemical accidents. Here, involvement of the public in preparing information and communication for disaster prevention, preparedness and management, is a topic in a special part of the document. This kind of guidance can be used without further need to adopt other legal or official requirements.

At the UN level, a shift in disaster prevention and disaster management can be observed in the approach of UNISDR (United Nations Office for Disaster Risk Reduction). In its SENDAI framework, working with communities instead of planning for communities has been emphasized for several years now. Community helpers are taught in communication and sensitive health care before going into field work. Working together with local networks has replaced the approach of engagement, which has traditionally had the connotation of “somebody engaging someone”.

This view on collaboration with local actors is particularly relevant in the context of radiation protection, particularly in situations where the aim is to change attitudes and behaviours such as to raise the level of protection and to diminish outbreak consequences.

In the following, a couple of findings from the natural hazard area and for dealing with manmade disasters will be highlighted.

What levels of awareness about external prescriptions of stakeholder engagement do researchers and practitioners reveal?

In 2010, **OECD published the “Policy Handbook on Natural Hazard Awareness and Disaster Risk Reduction Education”** to support countries in strategies to reduce the large scale damaging effects of natural hazards. The broad strategy emphasizes on patterns of human behaviour, individual and collective actions, hazard awareness, risk perception and education as essentials aspects of disaster risk reduction. Activities for natural disaster risks reduction are captured in a three-step approach for effective risk communication and education strategies: 1) In-depth scientific assessment of the relevant natural hazards and disaster risks; 2) Identification of desired behaviour and perception changes; 3) Identification of respective roles of stakeholders, and appropriate tools and methods to educate stakeholders and induce action (OECD, 2010). Participation is seen as important aspect in identifying risk awareness and disaster relevant behaviour and for designing effective education related to risk awareness and risk reduction. Cross-sectoral collaboration is mentioned as important means for achieving consensus for disaster reduction strategies and education.

The handbook recommends “Good practices”, in which on different administrative levels responsibilities for guidance and possibilities and duties for collaboration are described. Assessments of needs and priorities as well as of disaster risk awareness should be carried out at different levels, to be sure to take into account the levels’ relevant attitudes and expectations. Tasks of the governmental level are see in leadership and coordination; assessment of risk awareness needs and identification of strategic priorities; hazard mapping and risk assessment; public awareness campaigns and events; national-level guidelines on public message content; different “educational” activities. Besides cross sectoral partnerships for school education and private sector, also civic sector initiatives such as grassroots initiatives are mentioned as important co-designer for disaster risk protection measures. Community participation is emphasized for the whole process

of risk awareness and risk reduction initiatives. Especially appropriate risk communication activities and educational initiatives benefit from community involvement.

In the report **“Stakeholder Engagement for Inclusive Water Governance”**, OECD provides an interesting insight into current trends, drivers, obstacles, mechanisms, impacts, costs and benefits of stakeholder engagement in the water sector. Although it does not deal with a mere disaster-related topic, it gives an example for a wide-ranging and analytic approach to stakeholder engagement. As a result of a large process approaching stakeholder engagement in the water sector, six principles on stakeholder engagement in water governance are provided: i) inclusiveness and equity; ii) clarity of goals, transparency and accountability; iii) capacity and information; iv) efficiency and effectiveness; v) institutionalisation, structuring and integration; and vi) adaptiveness (OECD, 2015).

In an example on oil spill, given by Walker et al. (2015), community participation took place only to a low extent, and this was not initiated by specific regulatory requirements, but took place because of regional and local concern and commitment. As this example shows, *“problems in engagement during an incident can be traced back to lack of involvement in the planning phase”* (Walker et al., 2015). *“The absence of a regulatory driver to engage with the general public and communities during oil spill preparedness means that engagement is often overlooked or treated as a low priority during response. Also, the lack of clear funding to reimburse community engagement activities through the Oil Spill Liability Trust fund is a disincentive to community engagement”* (Walker et al., 2015).

Using the example of oil spill communication, it becomes clear that in emergency situations with rapidly changing information landscape and complex technical issues, effective communication and information sharing between emergency response organisations and the public is impeded. The vast amount of situation specific and changing information hinders transparency, and understanding and interpreting information is limited. Uncertainty is amplified because in such dynamic situations both responders and the public are trying to make sense of a complex information landscape. Involvement and interactions of different kind take place in parallel.

In Bostick et al (2016) stakeholder involvement is described as part of costal disaster resilience planning. Stakeholder involvement is necessary to reach resilience, which is described as the *“ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events”*. Stakeholders shall be involved to gain a basic understanding of stages (prepare, absorb, recover, and adapt) and domains of resilience (physical, information, cognitive, social). By this, stakeholders understand the models and scenarios and are able to identify critical system functions. *The methodology balances stages, domains, scenarios, critical functions, competing interests, and limited resources (for risk management) in a philosophy of resilience.* The methodology allows stakeholders to participate in the process and to have an influence in the decisions made.

How do researchers and practitioners understand and practice stakeholder engagement (at individual and institutional level)?

In the methodological framework *“Disaster Risk Assessment and Risk Financing”* (G20 & OECD, 2012), multi-level governance and multi-actor participation is a central part of governance:

- *Identify and involve key groups of stakeholders in risk assessment*
- *Assign a lead national government authority to coordinate a national risk assessment, ensure adequate coordination among ministries and consultation mechanisms, and interface with relevant, sub-national bodies, local centres of scientific research, operators of critical infrastructure and supra-national institutions*

- *Clearly identify authorities at sub-national levels of government responsible for conducting local risk assessments and establish a process for coordination with the co-ordinator of the national risk assessment*
- *Ensure adequate institutional capacity to support training programmes in the use of risk assessment methodology, and provide adequate resources to ensure an up-to-date and forward-looking risk assessment process” (G20 & OECD, 2012)*

At a sub-national level of government, such guidelines can be used for development of a hazard and risk registry at the local level. Conversely, those risk registries feed into national risk assessments, such as that macro and local views are interlinked.

It is also stated that *“A common understanding of core terminology promotes the development of consistent approaches to disaster risk assessment and thereby facilitates the comparability of outcomes”*. Data sharing and open systems are seen as means for better informed decisions, which are a base for building resilience.

The OECD project on *“Stakeholder Engagement for Effective Water Governance”* (OECD, 2015) focused on recommendations, drivers, obstacles, indicators and principles for stakeholder processes. A wide range of drivers have been shown to influence stakeholder engagement, from political, regulatory, to economic aspects. It is deemed important to have a careful look at perceptions across categories of stakeholders. Mapping and categorisation of (external and internal) stakeholders is important, and it is also necessary to have *“coordinators”* of stakeholder engagement who bridge the different categories and gaps between different governmental levels. In this sense, also trans-scalar strategies are required when engaging stakeholders that cut across the traditional government levels (e.g. citizens’ movements, platforms, etc.).

The report makes the following distinction between public participation and stakeholder engagement: *“The former encompasses a range of procedures and methods designed to consult, involve and inform local communities and citizens (i.e. the “public”, essentially civil society and customers). The latter opens a broader perspective to different groups of actors, including levels of governments, the private sector, regulators, service providers, donor agencies, investors and other relevant constituencies, in addition to civil society in its different forms (e.g. non-governmental organisations, citizen movements, etc.)”* (OECD, 2015)

Cost-benefit analysis is often brought as argument for or against stakeholder engagement. It can be a useful indicator of the effectiveness of stakeholder engagement but it is important to understand the structure of the costs of engagement, and to characterise them better: e.g. costs of *“facilitating”* engagement processes, including costs related to acquiring information, and the costs and benefits that are *“outcomes”* of engagement processes (e.g. reputational costs). It is also important to understand how costs and benefits interact with each another to have an indicator of institutional effectiveness (OECD, 2014).

What were the rationales for stakeholder engagement, the final objectives? Has there been a critical evaluation of the attainment of objectives and of the impact of stakeholder engagement? Have there been any guided improvement activities?

Several different goals of stakeholder engagement can be identified in the literature analysed.

- Raising awareness of a topic to prepare or to plan for,
- Ensuring that choices made for managing challenges are the right ones,
- Ensuring that management preparedness takes into account all important aspects and stakeholders to involve them already in the planning phase and not only in the disaster phase,
- Contributing to resilience and responsiveness,
- Up-to-date procedures,
- Realising a whole-of-society-approach,
- Trust and confidence (e.g. in industry, regulators).

The OECD “Recommendation of the council in the governance of critical risks” (OECD, 2014) assumes that an all-hazards-approach to risk governance enhances resilience and responsiveness. Members should *“Engage all government actors at national and sub-national levels, to coordinate a range of stakeholders in inclusive policy making processes which would: i) support citizen engagement and invite communities, businesses, individuals and households to take greater responsibility for their own safety; ii) develop a shared vision of critical risks and the division of responsibilities for shouldering the management burden; iii) foster a whole-of-society approach to clarify accountability and achieve better outcomes with more resilient communities”* (OECD, 2014). In this OECD paper, the whole-of-society approach is also encouraged in the context of risk communication and transboundary co-operation. Part of that is a two-way communication between government and stakeholders with the aim of making information accessible in a manner appropriate to diverse communities, sectors, industries and with international actors.

In 2008, OECD published the “Guidance on developing safety performance indicators (SPIs) related to Chemical Accident Prevention, Preparedness and Response” (OECD, 2008). In this guidance, cooperation and collaboration between industry, public authorities and communities is seen as enforcing the important tasks every actor has: *“Through such co-operation, industry can achieve the trust and confidence of the public that they are operating their installations safely, public authorities can stimulate industry to carry out their responsibilities and work with communities to ensure proper preparedness, and communities can provide chemical risk and safety information to the potentially affected public and help to motivate industry and public authorities to improve safety”*. It argues that the duty for cooperation lies especially with the public and public authorities.

Consequently, *“Public authorities should:*

- *provide leadership and motivate stakeholders to improve chemical accident prevention, preparedness and response;*
- *develop, enforce and continuously improve regulations, policies, programmes and practices;*
- *help ensure that there is effective communication and co-operation among stakeholders.*
- *The public should:*
- *be aware of the risks in their community and what to do in the event of an accident;*
- *co-operate with local authorities and industry in emergency planning and response. “*

Interestingly, the key role of communities and the public is seen among others in information acquisition, communication and participation in decision making. So a clear duty of the public is to participate actively.

The guidance develops SPIs for community preparedness and response, as *“community preparedness and response relied on the actions of all community members and would be most affected by the lack of public participation”*.

Regarding the role of participation of stakeholders, some examples will be quoted: Participation of NGOs is demanded for legislative and regulatory processes; all parties expected to participate in emergency response should be identified in advance and be involved in planning process as well as coordination activities or relevant players; public shall be involved in debriefing and accident investigations. Accordingly to those requirements, possible SPIs are proposed particularized as guiding checklist. For each the public authorities’ level, the level of emergency response personnel and the communities, a section is dedicated to safety performance indicators related to external cooperation with stakeholders and participation activities for communities respectively.

An important part of SPIs for chemical accident preparedness and response is to integrate periodic reviews of the indicators to ensure these *“are well defined and provide the information needed to monitor safety-*

related policies, programmes, procedures and practices and to respond to potential safety issues". In addition, this ensures that only indicators are used which are still important.

This guidance provides a good tool for raising awareness on how to proceed and set the appropriate framework for involvement and participation. The term stakeholder engagement is not used in this document. The term stakeholder is not explicitly defined, it is used in the sense of actors that "*...have important responsibilities with respect to accident prevention and to taking appropriate actions in the event of an accident...*". Internal as well as external stakeholders are implied. Examples for stakeholder are relevant authorities at all levels, Industry, Non-Governmental Stakeholders, Communities/Public.

What forms of acceptance, resistance, denial, or alteration of engagement do you observe or encounter? And how do these forms change over time?

Generally, it can be observed that the perception of the need for participation and engagement increases over time. Also the image of "involvement" changes and the related use of terms. Participation is rather seen as "involvement into something", engagement is sometimes framed as "joint developing of respective topics".

In OECD's project "Stakeholder Engagement for Inclusive Water Governance" (OECD, 2015), a challenge is seen in pursuing engagement efforts for improving water management in a context where stakeholders are already satisfied with the way it is. It was recommended to direct also attention to trends in the types of mechanisms for engagement used across different categories of stakeholders. Also, the classification of categories of stakeholders should try to take into account different forms and (strategic) orientations of even apparently similar groups, such as between civil society and NGOs (OECD, 2014). Special attention was demanded for the importance of managing expectations of stakeholders for the success of the engagement process and for dealing with frustration when stakeholders do not have the power to make the decisions themselves.

A survey carried out within this project (OECD, 2015) revealed as main obstacles to the integration of stakeholder engagement:

- A lack of political will
- Institutional fragmentation
- Weak legal frameworks (which means that the absence of leaderships, coordination and requirements hinders stakeholder engagement).

As main obstacles to the effective implementation of engagement processes the following were identified

- A lack of clarity on the use of stakeholders' inputs
- Lack of funding
- Information asymmetries, knowledge asymmetries
- Conflict and/or lack of interests – in summary, the absence of clear objectives, financial means and sufficient transparency to support the effective implementation of engagement processes.

It is argued that there should be an aspiration for anticipatory and resilient stakeholder engagement. One way to achieve this is, formally, to foster systematic stakeholder engagement and provide a strong sense of legitimacy. Informally, it is important to remain flexible regarding time and focus, and allow inputs from a wide range of stakeholders.

Throughout the revised literature it is also apparent that the will of stakeholders to be engaged and the effort of institutions to engage are seldom at the same level.

Other obstacles can be that stakeholders find it difficult to square the topics in focus with their own values related to that special topic. Own priorities are set against discussion subjects (TNS BMRB & Devine-Wright, 2014). Regarding accident preparedness, risk perceptions might differ in different stakeholder groups. Relatedly, mental models of topics differ between involved parties. Classical mechanisms of risk perception and dealing with risks, confidence, communication and confirmation of opinions play a central role in engagement processes. Which in turn requires the appropriate competences in the engagement process. A problem on a quite fundamental level of engagement can be that those “to be engaged” can have a different idea on how and for what purpose to be involved than the options a regulatory base provides.

Other aspects mentioned in the context of risk management are mentioned in different articles. For example, the aim of engagement processes does not necessarily have to be conflict resolution or consensus building; the diversity of opinions and other relevant aspects (tools, aims) can instead be valued as design issue. A deeper analysis of all experiences and views of stakeholder engagement goes far beyond the scope of this deliverable, for this reason, such aspects are only touched on to provide a sense for the complexity of engagement obstacles and drivers as well as of the scientific approaches to analyse engagement.

Attention was also laid on the aspect of power sharing, which implies shifts in power distributions. At least on a micro level, engagement requires power sharing which leads to new distribution of power. This can cause new engagement barriers and micro climate changes through and during engagement processes (Tseng & Penning-Rowsell, 2012).

On the contrary, as opportunities for stakeholder engagement can be mentioned:

- Proactivity: be proactive, do not wait for being asked to engage;
- Framing engagement: address public concerns and thoughts;
- Empowerment: give time, show possibilities for influence;
- Transparency, accessibility: make engagement accessible, ensure independence and accountability.

Knowledge asymmetry develops not only across, but also within categories of stakeholders and influences intra-group dynamic (TNS BMRB & Devine-Wright, 2014). Members with more knowledge might have potentially higher influence as they are more self-confident. Accordingly, one of the main challenges in stakeholder processes is dealing with knowledge management, influencers, and opinion making.

Appropriate information and balancing of information material have a central role: partial information absorption can be a result of information overload. The initial impression by introductory information counts a lot, because it remains influencing later perception in the same way. The way introductory information is framed can keep the appetite for further information – or not (TNS BMRB & Devine-Wright, 2014).

Particularly in emergency situations, the challenge with communication is a) to have defined and functioning channels of communication, b) to make the flow of information work between operators, c) to have clearly assigned responsibilities and competencies (e.g. who informs in which situation), and d) to make sure that the receivers of the message know they can trust the information and that they are prepared to act (Höppner, Buchecker, & Bründl, 2010).

Participation is seen as one of several critical success factors in managing disasters. Disaster management requires effective coordination and collaboration among stakeholders at all involved levels, at least: international, national, regional, organizational, and case specific. Lack of coordination among different level of organizations, including governmental agencies, NGOs, International NGOs, donors was found as common problem (Lin Moe & Pathranarakul, 2006).

What are actors and communities doing that may de facto count as stakeholder engagement (but are not necessarily labelled that way)?

- Community participation: *Care must be taken so that efforts to include communities do not become marred in political alliance-building or become seen as a means of extracting favours* (OECD, 2010)
- Transversal risk governance (different policy levels)
- Stakeholder engagement in resilience planning
- Stakeholder engagement is strongly influenced by scenario and risk type. Discourse, special form of a dialogue in which all affected parties have a right.
- Knowledge coproduction approaches (Reyers, Nel, O'Farrell, Sitas, & Nel, 2015), participatory production and exchange of knowledge
- Effective communication is described as a collaborative working relationship (Lin Moe & Pathranarakul, 2006).

Are there any alignments/misalignments between case practice, on the one hand, and external conceptions and prescriptions, on the other, and if so why? Which challenges and opportunities do you encounter for stakeholder engagement in your specific case?

Up to now, reflections on stakeholder engagement do not focus on the question how prescriptions are implemented in practices, but rather how engagement can be performed in the most appropriate way. For that, specific risk and disaster management areas are analysed separately and the specific properties, settings histories and stakeholder landscape is taken into account. There are hardly any references to regulatory frameworks to be evaluated or to be put in practice; the aim is instead to provide guidance on how to proceed in a specific case. However, regulatory frameworks for stakeholder reengagement are sometimes mentioned as prerequisite for promoting stakeholder engagement in practice and reducing obstacles to stakeholder engagement.

Often, engagement is assessed as iterative learning process with a continuous circle of monitoring, evaluation and adjustment.

One definition of stakeholders says: Stakeholders are part of a community and broadly defined as those groups that have a stake, interest, or right in an issue or activity and those that will be affected either negatively or positively by decisions about the issue or activity (Walker et al., 2015). The problem that hides behind that global definition of stakeholder is that there is significant divergence in mental models of all potential stakeholders. This can be seen as a major misalignment between external conception and practice.

An analysis of practicing participation in the year 2010 is provided in the work of CapHaz-Net (citations in original document): *Communication to facilitate participation is prone to the same pitfalls as participatory approaches and processes in other fields too (see also the CapHaz-Net WP 2 report on risk governance by Walker et al. 2010 (and the WP3 report on risk perception by Wachinger and Renn 2010). Indeed, there seems nothing unique about the natural hazard context that makes it immune from the self-selection of participants, tokenism, a limited room for negotiation, interest based manipulation, the exercise of power or poorly designed and implemented tools. If the quality of communication tools and procedures is poor and contextual conditions unfavourable, participation might even have the opposite effect to that originally intended (e.g. Cooke and Kothari 2001). Naturally, two-way communication and participation in the context of natural hazards are exposed to all these challenges too. However, reviewing the literature it seems that there is, as yet, not much discussion on which participatory communication techniques are appropriate in which risk management situations, beyond the conclusion that such techniques should be applied in situations where a diversity of interests and viewpoints exist"* (Höppner et al., 2010).

What else have you found or should we be asking?

- Role of knowledge and knowledge development in stakeholder engagement: knowledge development important but also source of conflict. Access to knowledge
- Learning processes are important mechanisms to improve the outcomes of engagement processes.
- Connect different levels of responsibilities and actions. Transversal networking, engaging.
- Categorization of stakeholders; who categorizes? Who does the classification?
- Dealing with conflict – constructive or consensus oriented;
- Important in first phase: identification of perspectives and stakeholder selection, confrontation of claims and ideas.
- Integrating disaster management planning and community planning (Pearce, 2003)

Key challenges identified	Best practice / recommendations
Highlight who and what is included in and excluded from engagement, and provide opportunity for external stakeholders to express their views	Discuss questions related to stakeholder engagement together with the relevant stakeholders specifically for the issue in focus
Difficulty to engage with local communities in the event of an incident	Involve local communities from the preparedness phase Establish a regulatory frameworks dedicated to SE
Limitation of engagement to institution-led approaches in disaster preparedness	Integration of local residents in planning phase: working with communities. Cross sectoral partnerships Involving civic sector initiatives in the co-design disaster preparedness measures, e.g. grassroots initiatives
Bridging between different categories of stakeholders	Analyse perceptions across different categories of stakeholders Appoint coordinators of engagement
Effective communication	Professional communication concept, starting early and keeping up-to-date with activities, continuity, as well as a combination of information and interaction
Enhancing resilience and responsiveness	All hazards approach
Anticipatory and resilient stakeholder engagement	Foster systematic stakeholder engagement and provide a strong sense of legitimacy. Remain flexible regarding time and focus, and allow inputs from a wide range of stakeholders
Knowledge asymmetry between, but also within categories of stakeholders	Recognise the challenge, open it for discussion and adapt if needed

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6. Conclusion and outlook

At first glance, work for this deliverable showed that the general underlying principles (e.g. inclusiveness, fair deliberation, transparency, mutual learning, access to resources, collaboration), core values (e.g. informed consent, empowerment) and global aims (e.g. developing radiation protection decision-making that attends to the values, needs and concerns of the affected stakeholders) are similar across the nuclear and non-nuclear fields analysed. At the same time, it showed that each field has its particular context in which participation takes place. Accordingly, the meanings, triggers, challenges, drivers, expectations, and objectives of participatory practice have to be analysed at different levels, moving from the overarching view towards detailed case studies. The ENGAGE core question, namely contrasting the prescriptions for stakeholder engagement and lived practice, can best be analysed by such a graded approach.

Generally, challenges / enablers for stakeholder engagement can be summarized in terms of awareness of the issue, attitudes toward engagement, availability of resources, policy framework, diverging/converging values and stakes, changes in engagement culture and perceived benefit of engagement processes. Also within engagement processes, altered power distribution and changed knowledge allocation have to be identified and opened for discussion.

On the basis of document analysis, it did not become clear which role do external prescriptions really play for initiating stakeholder engagement in practice. The engagement commitments espoused at the level of RP professional communities go in some cases beyond the legal requirements for engagement (e.g. for emergency management), in other cases they are slowly catching up, but still lag behind more general policy frameworks, such as Responsible Research and Innovation. In again other cases there is a gap between espoused values and practice (e.g. in relation to the implementation of informed consent for medical exposures to ionising radiation), and between expectations from engagement of different actors (e.g. emergency managers and authorities have different views on the need to involve local populations in the development of emergency plans). In parallel, forms of non-governmental participation (e.g. initiated by civil

society organisations or citizens) continue to mature and develop in parallel with participation at governmental level.

With respect to the three ENGAGE exposure situations, it could be observed that especially in the field of emergency and recovery preparedness and response, a wide spectrum of participation forms have been enacted in the 15 last years - not least initiated or enforced by Chernobyl and Fukushima accidents. Main challenges and best practice are similar for the nuclear and non-nuclear disaster preparedness, for instance working *with* local communities instead of planning *for* them; or differing level of awareness of the issue among stakeholders. Particular challenges for nuclear emergency management are the complexity of post-accident management, the lack of experience of most stakeholders, the sometimes unclear roles and responsibilities and the split-up of emergency management in different phases which requires entirely diverse approaches, procedures and engagement strategies.

Related to medical exposure to ionising radiation, in this report emphasis was put on the involvement of patients in the care cycle. Different manifestations of “engagement” have developed in the past years, driven by a change towards value based and holistic care approaches. Lack of time, shortages of staff, patients’ lack of information and attitudes of health professionals are seen as important challenges of enhanced interaction with the patients as well as carers and helpers, and the discrepancy between value orientation adopted by radiological societies and daily work in doctor’s surgeries or hospitals also hamper interactions between patients and health professionals. The need for guidance has been revealed, on how involvement – particularly informed consent - can be practiced by patients and health professionals.

For indoor radon, past experiences showed that efforts in communication and engagement can lead to higher public awareness and adoption of recommendations on protective measures against high radon concentrations in homes.

The way forward

The results reported in this deliverable form the base for case studies for the three exposure situations considered in ENGAGE, that will be carried out within task 2.2, 2.3 and 2.4.

Task 2.2, Stakeholder engagement in the medical field: Cases studies

- Justification, optimisation, education and training at Institute of Oncology Ljubljana (Slovenia)
- Education and training related to medical exposure to ionising radiation – exploring (international) stakeholders’ view and approaches
- Stakeholders’ role in the performance of medical exposures of pregnant women (Greece)
- Stakeholders’ role in radiation protection: the case of interventional procedures (Italy)
- Radiation protection in Paediatric CT-scanning (Spain).

Task 2.3, Stakeholder engagement in relation to emergency and recovery preparedness and response: Cases studies

- EP&R information and communication as prescribed in BSS directive in practice at different levels (national, regional, local) in Slovenia
- Drills and exercises practice at different levels related to the nuclear accident at Slovak NPPs – INEX4, INEX5 and National exercises performed in Slovakia

- Stakeholder involvement experience from the Steering committee for the management of the post-accident phase of a nuclear accident or a radiological emergency (CODIRPA) of the French Safety Authority (ASN).
- Contextualised view on participation comprising both institutional and non-institutional processes and actors (Belgium)
- Stakeholder's involvement EP&R issues in Spain: How research institutions help them to seat and work together on EP&R: example of CIEMAT.

Task 2.4 Stakeholder engagement in relation to indoor radon exposures: Cases studies

- Evaluating websites related to radon from a stakeholder engagement perspective.
- Revised BSS: case study of school located in an area with increased radon concentrations (Belgium)