



Societal constraints related to environmental remediation and decommissioning programmes[☆]



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ABSTRACT

The decisions related to decommissioning or environmental remediation projects (D/ER) cannot be isolated from the socio-political and cultural environment. Experiences of the IAEA Member States point out the importance of giving due attention to the societal aspects in project planning and implementation. The purpose of this paper is threefold: i) to systematically review societal constraints that some organisations in different IAEA Member States encounter when implementing D/ER programmes, ii) to identify different approaches to overcome these constraints and iii) to collect examples of existing practices related to the integration of societal aspects in D/ER programmes worldwide. The research was conducted in the context of the IAEA project Constraints to Decommissioning and Environmental Remediation (CIDER). The research results show that societal constraints arise mostly as a result of the different perceptions, attitudes, opinions and concerns of stakeholders towards the risks and benefits of D/ER programmes and due to the lack of stakeholder involvement in planning. There are different approaches to address these constraints, however all approaches have common points: early involvement, respect for different views, mutual understanding and learning. These results are relevant for all ongoing and planned D/ER programmes.

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1. Introduction

The development of atomic weapons programmes, the use of nuclear energy for peaceful purposes and the operation of non-nuclear industries have led to the harmful effects including contamination of land (soils and groundwater) by radioactive and non-radioactive materials. Therefore managing the legacies from these nuclear related activities pose significant challenges in several countries. In this respect one of the important challenges is the decommissioning of the facilities such as: nuclear reactors and associated fuel cycle installations, -research reactors, - facilities for

the production of radioisotopes for medical purposes, - facilities using radioactive material in consumer products and - facilities used for storage of radioactive waste. In addition, contaminated land, legacy sites and those areas affected by nuclear accidents need to be remediated.

The terms decommissioning and remediation have different meanings for different audiences. In the decommissioning of nuclear facilities (taken as a planned exposure situation) the installation needs to comply with licensing conditions and with the following international standards and criteria – operational dose limits (1 mSv/a) and dose constraint (300 µSv/a) respectively. In other words, after decommissioning there is no reason that facilities under a license should be allowed to incur doses higher than those prevailing during operations. On the other hand, when dealing with sites contaminated by nuclear or radiological accidents or with legacy sites, reference levels in the range of 1–20 mSv/a need to be established (IAEA, 2014c).

Decommissioning is often misused as a synonym of

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dismantling, decontamination or demolition. The International Atomic Energy Agency Safety Glossary defines decommissioning as “administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility¹” (IAEA, 2007). The same publication defines remediation as “any measures that may be carried out to reduce the radiation exposure from existing contamination of land areas through actions applied to the contamination itself (the source) or to the exposure pathways to humans” (IAEA, 2007). In the context of remediation “complete removal of the contamination is not implied” and therefore terms such as restoration and rehabilitation are not be used as synonymous of remediation. These terms may convey the message that the conditions that prevailed before the contamination of the land can be ultimately achieved again. However, a balance should be sought between social, economic, technical and other aspects. The range of non-technical factors that will influence the overall project implementation of decommissioning or environmental remediation strategy (D/ER) will include (IAEA, 2002):

- economy, employment and infrastructure;
- costs, funding, and financing;
- regulatory and institutional aspects;
- stakeholder perception and participation;
- project implementation related risks;
- co-contamination issues;
- future land use;
- stewardship issues.

While the scientific and technical aspects of decommissioning or environmental remediation (D/ER) have been extensively addressed, studies on social and ethical aspects, stakeholder engagement, are still lacking. Moreover, experiences on these aspects have been neither systematically collected nor assessed (IAEA, 2002).

The relevance of stakeholder engagement and communication in complex decision making is recognized by international various organisations (OECD/NEA, 2015; OECD/NEA, 2017; IAEA, 2014a; IAEA, 2016a). Stakeholder involvement in D/ER programmes is also set out in different academic and legal texts, like the amended Environmental Assessment Directive 97/11/EC (European Union, 1997) and Directive 2003/35/EC (European Parliament and the Council of the European Union, 2003). In addition, the Aarhus Convention on access to information, public participation in decision-making and access to justice in environmental matters (UNEC, 1998) states that the public should be involved at the earlier stages of the Environmental Impact Assessment (EIA) process, thus also in D/ER programmes. Bond et al. (2004) conclude that the EIA is a useful tool to involve all stakeholders from the very early stage, in the decision-making process regarding decommissioning. Invernizzi et al. (2017) highlight two of the major social challenges of this kind of projects, i.e. personnel transition and public acceptance. In order to address these two challenges, the authors propose the following key factors: early engagement of stakeholders, early start of planning a decommissioning project and using an already licenced disposal facility. Early engagement of stakeholders has been put in practice in the UK with the Nuclear Decommissioning Authority (NDA) and National Stakeholder Dialogue specific to the Nuclear Decommissioning Strategy (Whitton, 2011).

¹ Except for a repository or for certain nuclear facilities used for the disposal of residues from the mining and processing of radioactive material, which are ‘closed’ and not ‘decommissioned’. Facility should be understood as the building structures existing in the site and the associated land (soil and groundwater) (IAEA, 2007, p. 48).

However, social research on the societal impacts of decommissioning of nuclear sites is still scarce. In the area of environmental remediation, several studies (Barry, 2012; Oughton, 2013; Feldman and Hanahan, 1996; IAEA, 2014a) have also showed the importance of engaging the affected population in the remediation process. In addition, different academic studies (e.g.: Renn, 2004; Vaughan, 1995; Shirabe et al., 2015; Tateno and Yokoyama, 2013) and international documents (e. g.: IAEA, 2011), show that involvement of stakeholders in technological, complex and value loaded issues is rather challenging. Societal and stakeholder involvement constraints regardless of their origin, will constitute barriers to project implementation and as a result have the potential to cause significant impact on costs and implementation schedules of a project. Whitton et al. (2015) propose a community-led conceptual framework for social sustainability which is able to capture the views and concerns of the wider stakeholder community and is able to inform decision making at the community and strategic level. However, the societal constraints that can impede the implementation of D/ER projects have not been thoroughly assessed. Recognizing the need for a holistic approach, the IAEA put in place a project entitled “Constraints to Decommissioning and Environmental Remediation – The CIDER Project” (IAEA, 2016b) since a holistic approach to D/ER programmes are likely to lead to significant improvements in the effectiveness and acceptability of these programmes in communities (Oughton, 2013). The CIDER project is aimed at examining constraints that slow the pace or even impede the implementation of D/ER projects (IAEA, 2016b). The identified constraints were divided into three major groups: i) Policy, Regulatory Framework and Funding; ii) Technological Aspects and iii) Societal Constraints. The objective of this paper is to summarize the results obtained with the CIDER Project – Phase I focusing on the identification and analysis of the societal constraints that hinder the implementation of D&ER projects. Practical approaches and examples that can assist in overcoming these barriers are also provided. It should be borne in mind that the examples discussed in the paper do not intend to be set as guidance, rather, they are to be seen as mechanisms used by D/ER project implementers, in different IAEA Member States, to address the societal constraints encountered when implementing D/ER projects. Measuring the success of these initiatives was out of the scope of the CIDER Project and therefore this issue will not be addressed in this paper.

2. Methodology

Different approaches were used in order to identify and analyse the societal constraints in D/ER programmes and indicate practical mechanisms that can assist in overcoming them.

Firstly, a survey amongst different countries was conducted in 2012 to gain understanding of the current status of D/ER programmes. The survey was completed by a total of 23 countries, covering about 900 facilities and sites. A particular focus of the survey was to determine the relative importance of the challenges that may impede D/ER programmes. Information was obtained about the following categories of facilities² and sites: i) Licensed nuclear facilities; ii) Radioactively contaminated research and disused defence sites; iii.) Uranium mining and milling facilities; iv.) NORM facilities; v.) Sites affected by major accidents and vi.) Interim waste storage facilities.

Secondly, discussions were conducted at three meetings organised by IAEA in 2013, 2014 and 2015, wherein 28 technical

² Facility includes building, structures and associated land (soil and groundwater).

experts from 16 countries (Belgium, Brazil, Bulgaria, France, Germany, Indonesia, Lithuania, Russian Federation, Serbia, South Africa, Spain, Syrian Arab Republic, Thailand, Ukraine, United Kingdom, and United States of America) took part, in addition to representatives of European Bank for Reconstruction and Development, International Atomic Energy Agency and European Commission. The meetings provided a forum for discussion regarding i) political, legislative, regulatory and financial frameworks; ii) technological and infrastructure and iii) societal and stakeholder issues associated with D/ER programmes and projects. The analysis of these studies provided possible input to the three working groups that identified constraints inhibiting D/ER project and approaches to overcome them.

Finally, communication and stakeholder involvement experts participated in two workshops/consultancies in order to compile and systematise the information gathered through the survey and conduct literature review. Several strategies to overcome the constraints were identified at this stage. Examples of ten D/ER programmes from Belgium, Canada, Germany, Russia, Slovenia, Spain, Ukraine and United States of America were reviewed to illustrate how communication and stakeholder involvement were addressed in different contexts.

3. Results

The survey confirmed that one of the most challenging constraints faced by Member States in D/ER programmes relate to societal aspects that should be addressed by communication and stakeholder engagement strategies. The societal constraints that hinder progress in D/ER programmes are interconnected and strongly influence one another.

Social constraints arise mostly due to the different opinions, perceptions, attitudes and concerns towards the risk and benefit of D/ER programmes shown by stakeholders, and also non-involvement of stakeholders in the planning.

Results are presented in 2 parts. First part discusses several important types of constraints that hinder the progress in D/ER program implementation and possible actions to be undertaken to overcome these constraints. Second part deals with the Constraints that hinder progress in stakeholder involvement in D/ER programmes and possible actions to be undertaken to overcome these constraints.

3.1. Constraints that hinder the progress in D/ER programmes and possible actions to be undertaken to overcome these constraints

Although the approaches to overcome the societal constraints are well-known, they are often kept as paper plans and not implemented in practice. For instance, the importance of early engagement is often acknowledged, but practice shows that this happens mainly on a later stage when D/ER projects are jeopardised.

Here we describe 9 important constraints hindering the progress of D/ER programme. Table 1 summarises the main results in tabular form.

In general, the level of knowledge by the general public related to nuclear and radiological concepts is rather low. Due to the fact that the nuclear field is technical in nature and was surrounded by secrecy in the past, some stakeholders tend to have a sceptical attitude regarding nuclear/radiological related issues.

To overcome the constraint related to limited knowledge and understanding, it is important to improve public knowledge by providing relevant and timely information in a simple layman's terms. This process should be continuous although it takes time and resources. Before defining the D/ER programme, there is a need

to identify the level of knowledge and understanding among the different stakeholders so that their involvement in the decision making process can be more effective and productive. This can be done by conducting public opinion surveys, discussions, establishment of focus groups, coordination with local educational institutions, etc. The implementer will then be better positioned to identify target groups for developing a focused awareness-raising strategy. An example to illustrate this challenge is the Canadian Nuclear Legacy Liabilities Program (NLLP) (CNL, 2015). A website provided updated information on the environmental remediation programme, frequently asked questions (FAQs) have been compiled, along with stakeholder interviews and the results of focus groups, among other activities in order to help to improve public understanding and awareness.

In addition to these activities, a pragmatic approach on educational and training programmes can be developed together with academic centres to improve the knowledge and understanding of the issue and process taking into account that children and teenagers can act as good information “carriers” to their parents and surroundings in particular. This could be done by establishing collaboration and network between D/ER experts and teachers. For the general public, interactive information centres can be established showing the benefits and drawbacks of D/ER programmes. This approach stimulates systematic information processing, which is more persuasive than heuristic information processing (Petty and Cacioppo, 1986).

2 Concerns related to the waste disposal on site

While D/ER projects aim to improve the current situation, genuine concerns may arise regarding the need to dispose of the nuclear waste on-site or elsewhere. If the end state of the project is not well defined and not agreed with stakeholders then a significant volume of radioactive wastes is accumulated which requires an interim on-site storage and/or on-site disposal. In such case Not In My Back Yard (NYMBY) syndrome can appear. In the context of D/ER programmes, NIMBY is mainly associated with siting waste storage facilities. The NIMBY syndrome reflects stakeholders' concerns of having a controversial or a perceived hazardous facility constructed near to where they permanently live. A key issue here is that locals may fear that what is initially to be considered as a storage facility (i.e. temporary in nature) may become a disposal facility (i.e. a permanent solution). It is noteworthy to mention as an example, such situation was triggered due to the resistance of locals after the Goiania accident in Brazil (IAEA, 1988). In some cases, residents reject the facility because of their expectations that property values will be reduced (Gawande and Jenkins-Smith, 2001)

In order to identify the NIMBY syndrome and reasons for stakeholders' perception, an analysis should be done. The perceptions of risk could be different within different stakeholder groups and shall be addressed separately. The construction of a facility can go forward if the proposal is accepted, or at least tolerated, by the residents in that area. Stakeholders should understand the long term process involved in a D/ER programme, the benefits it may bring as well as the disadvantages of each option within a decision making process. Invernizzi et al. (2017) suggest that the use of an already licenced site to locate the waste repository in the same country is likely to be better accepted by the community.

In order to avoid NIMBY, the agency responsible for remediation of chemical and radiological NORM contamination in Olen/Flanders (Belgium) hired a facilitating agency. This agency constantly communicated with all stakeholders, collaborated with schools in the neighbourhood, provided a lot of opportunities for residents to express their concerns (public meetings, visited residents at their

Table 1
Constraints that hinder progress in D/ER programmes and possible actions to be undertaken to overcome these constraints.
1 Limited knowledge and understanding of the issues and process

Constraint	How to overcome this constraint
Limited knowledge and understanding of the problem and process	<ul style="list-style-type: none"> • Identify the existing level of knowledge and understanding related to D/ER programmes • Develop a focused strategy for raising awareness • Establish public interactive information centres and develop educational programmes • Disseminate information material
Concerns related to on-site waste disposal	<ul style="list-style-type: none"> • Reach a common understanding of the problem, including stakeholders' perceptions of risk • Explain and discuss alternative approaches including not doing anything • Conduct dialogue with specific stakeholder in groups limited to 15 people • Encourage the local community to establish working groups to interact with the facility owner • Consider providing independent experts or financial resources to local communities to hire their own independent experts • Identify possible opponents in advance • Establish contact with possible opponents and listen to their concerns and demands • Agree on the ground rules to establish a dialogue • Agree on an independent facilitator
Differing demands and concerns among different stakeholder groups	<ul style="list-style-type: none"> • Identify demands and concerns of stakeholders and their own prioritization (e.g. public opinion surveys and focus groups) • Share results within the stakeholder groups • Establish an overall understanding (e.g. arrange informal events together, on-site visits and share international experience) • Encourage stakeholder to be prepared to make compromises • Check satisfaction with achieved outcomes at the end of the programme • Jointly frame the problem (sharing information about the problem, diagnosing it and presenting an overall perspective) before embarking on possible solutions
Limited budget to cover all stakeholders' demands	<ul style="list-style-type: none"> • Inform all the stakeholders of the available budget and its limits • Provide regular information on expenditure against budget • Organise negotiations between different groups of stakeholders • Seek international, national or regional collaborations
Negative experiences with D/ER programmes	<ul style="list-style-type: none"> • Identify and acknowledge negative past experiences • Apply lessons learned from negative experiences
Lack of support by the governmental authorities to implement D/ER	<ul style="list-style-type: none"> • Link the D/ER programme with social programmes (e.g. health issue, employment and food production) • Advertise the benefits of remediation activities at the given location • Attract the attention of governmental authorities to potential ecological problems for not performing D/ER (e.g. organizing excursion tours for politicians) • Establish alliances with local leaders, NGOs, civil society organisations, etc., to bring this topic higher on the political agenda. • Involvement of the international community, where considered appropriate
Changing the administrative procedure and legal framework related to D/ER programmes	<ul style="list-style-type: none"> • Clearly identify changes and influence of these changes on the D/ER programme • Provide public information on (new) procedures and make these available to different stakeholder groups (targeted) • Identify (new) roles and responsibilities of stakeholders and seek their agreement and understanding
Lack of trust between stakeholders	<ul style="list-style-type: none"> • Develop an updated plan for public participation and make it available to targeted stakeholders • Be as transparent, dedicated, open and competent as possible • Develop responsible relationships (e.g. keep promises and provide justifications) • Select appropriate people to communicate that are close to stakeholders (e.g. living in the area and using the same language) • Do not change communicators during the key process • Listen to public concerns and address them by taking specific actions • Admit uncertainties and problems
Lack of recognition of links between environmental, economic and social concerns	<ul style="list-style-type: none"> • Focus on solutions that link together their environmental, economic and social concerns • Promote sustainable programmes • Host a series of public dialogues and form partnerships with impacted communities

homes, etc.). This agency developed strong relations with the local media and constantly informed/educated the journalists. They also developed personal relations with the local community and organised working groups for the residents to discuss and address specific concerns related to waste disposal (IAEA, 2014a). Another example of addressing NIMBY is, the remediation of off-site areas affected by the radioactive releases during the Fukushima accident. Contaminated soil has been removed from many places and an Interim Storage Facility (ISF) is under construction. The government of Japan through the Ministry of Environment (MoE) established individual negotiations with land owners to secure a site for the installation of the ISF (IAEA, 2014b).

3 Different risk perception among stakeholders

Perception of radiological risks is different among stakeholder

groups and is the result of individual beliefs, attitudes and norms as well as wider social and cultural aspects. Different risk perceptions, especially related to low doses of radiation, may result in disagreements related to D/ER projects. Furthermore, they may change over the time.

A careful analysis of risk perceptions related to different aspects of D/ER programmes of the different stakeholder groups might help to reveal the differences in their opinions, concerns and demands. Surveys, focus groups, interviews or other social science methods are useful to identify differences among stakeholder groups. However, the question is how to accommodate different priorities. It is often the case, that concerns can be addressed once identified (e.g. agreement on selection of transport routes or schedule of noisy work). In case there are multiple decision options, large number of stakeholders and high stakes involved, a formal method for decision aid (e.g. multi-criteria analysis) can help to identify which

demands have to be prioritised. Transparency, openness, involvement and continued iteration are essential ingredients for finding a compromise between all parties.

In Missouri, a public attitudes survey was conducted adjacent to a radioactively contaminated site. The most highly ranked site concerns were; surface water and groundwater contamination, desire for public involvement and potential health risks. Preferred remediation strategies included treatment of contaminated soil and excavation with off-site disposal. However, no strategy was viewed as a panacea. Respondents were also concerned with protecting future generations, better assessment of health risks and the environment, and avoiding generation of additional contaminated materials. Survey findings suggested three general points that need to be conveniently addressed in future efforts at site remediation: decisions should be transparent, sensible and cost-effective (Feldman and Hanahan, 1996).

4 Limited budget to cover all stakeholders demands

In the implementation of D/ER programmes some stakeholders may desire to have a site cleaned-up to background levels or at least to residual levels that are lower than expert's assessment. Although these goals may be reached in some circumstances, they might incur extra budget to the project. For instance, stakeholders may prefer a specific technique or technology for environmental remediation which is excessively costly (e.g. pump-and-treat, instead of monitored natural attenuation of contamination). Stakeholders may require specific studies to be conducted in order to obtain second opinions, to resolve different views or to perform additional field measurements. Financing stakeholders' all expectations and demands could be costly and may require special funding.

The D/ER implementer should provide clear information at the beginning of the programme to all stakeholders about the available funds for the implementation of the project, funding agency, the priorities given to different actions, including the extent to which stakeholder demands can be met. The project budget should have margins to address reasonable propositions made by stakeholders that have not been anticipated during the planning stage (i.e. contingency plan). International support and collaboration with international, national and regional organisations can be sought to overcome this constraint and should be presented as an opportunity for regional development. In addition, priority should be given to some sites to be remediated within the whole area based on negotiations and common agreement with different collaborating parties. Negotiations shall be facilitated by a commonly agreed independent party.

The limited funding of the remediation project Wismut (Germany) has been an issue for a long time. After long negotiations between the regional and federal governments, economic resources were committed for priority sites in 2001 and for all abandoned sites in 2003. The funding for remediation is 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 outlines that at least 50% of the total budget in 2012 had to be outsourced to third parties by inviting public tender in a bid to give fresh impetus to regional development.

5 Negative experience with the D/ER programmes

The failure of the implementations of D/ER programmes in the past may evoke an impression that constraints in D/ER cannot be overcome in other projects too, leading to a lack of trust between stakeholders. Previous negative experiences from similar D/ER

activities could lead to negative attitudes towards the new D/ER projects. These attitudes can drive barriers among different stakeholders to participate in the programmes.

As part of the documentation associated with the D/ER project, it is interesting for the implementer to collect positive and negative experiences from previous projects. It is important to analyse the causes and reasons for failure, identify pitfalls and difficulties before a new project starts as well as how to implement these experiences in an efficient, participatory and ethical manner.

One of the uranium tailing piles of the former uranium legacy site in Ukraine "Pridniproviskiy Chemical Plant" was reinforced and covered by the State Remediation Programme (2003–2005). However, insufficient budget for maintenance and monitoring of the tailing led to its collapse. The local media blamed the site operator owner for inefficient management and radioactivity release. As a result of this negative experience, locals formed an opinion that it would be better to leave the tailings untouched. Later on, projects implemented with international assistance in the Pridniproviskiy Uranium Legacy site helped to promote the goals and objectives of the remediation activities on-site. Press-releases, press-conferences, public hearings and sharing positive experiences of environmental remediation from other countries helped to improve the understanding of local stakeholders regarding the need of remediation activities implemented in the site. Moreover, it resulted in the comprehensive local support of the new State Remediation Programme for the period between 2010–2014 and related ecological programmes for the neighbouring Dniprodzerzhinsk city.

6 Lack of support by the governmental authorities to implement D/ER

Sometimes Governmental authorities may give a low priority to the implementation of D/ER programmes compared with other issues. Such situation is observed when the budget is limited and preferential focus is given to issues that can be addressed in the short-term (eventually with greater visibility). However, by not remediating a contaminated, ingestion of contaminated food by members of the local community may lead to undesired health effects in that population. Furthermore, D/ER programmes may not be recognized as directly linked to priority areas (e.g. improving quality of life).

Linking D/ER with socioeconomic programmes may provide increased motivation among relevant authorities responsible toward the implementation of D/ER programmes. Such programmes may include taking care of health issues, employment initiatives and food production. In this way, if sufficient resources are available, the D/ER programme may contribute to improving the quality of life of the community) and should receive greater support by governmental authorities. Attention to environmental problems may be enhanced by, for instance, with the organization of educational tours aimed at illustrating practical solutions to the problematic issues and thus gain increased commitment for programme implementation. Establishing alliances with local leaders, NGOs, civil society organisations, etc., can help to bring this topic higher on the political agenda.

In the immediate aftermath of the breakup of the former Soviet Union, the recovery of reactor sections of decommissioned atomic submarines from the in-water storage was a low priority issue for the Russian authorities. The storage area at Sayda Bay, near Murmansk, Russian Federation, was remote and there was no suitable infrastructure for managing the waste. The Group of Eight (G8) States (IAEA, 2016c) provided the resources needed to remediate the site, as part of the remediation of Cold War legacy sites in the former Soviet Union. The remediation programme was linked to the

need to reshape the landscape and build new infrastructure. For this, an important socio-economic driver was the use of local contractors and the training of local people to take up the jobs in the maintenance centre and conditioning centre (IAEA, 2014c).

7 Changing the administrative procedure and legal framework related to D/ER programmes

Legal, regulatory and financial frameworks (and also people in charge of these activities in the organisations) may change during the long term implementation of D/ER programmes. This might lead to changes in the D/ER implementation plan causing an increase in funding, a prolongation in the schedule and difficulties to retain qualified personnel.

In case of relevant administrative and/or legal framework changes related to the D/ER programme, it is important to clearly identify these changes and how they might influence the implementation of the D/ER programme. Based on this analysis, the facility owner should clearly explain the necessary changes in the ongoing D/ER programme and specify the new roles and responsibilities of the organisations involved. As a result of this transient situation, an updated plan for public participation will be needed and disseminated.

The case of the former uranium mine at Zirovski vrh (Slovenia) illustrates an approach to overcome constraints related to changing administrative procedures (<http://www.rudnik-zv.si/zgodovina/>, 2014). The mine started operation in 1982 in the former Yugoslavia. The activities for closure of the uranium mine and related environmental remediation of the generated uranium tailings started under the new state Republic of Slovenia. The legal framework and the administrative procedures changed several times during the implementation of environmental remediation works, as a result of Slovenia becoming a member of the European Union. The roles, responsibilities and participation possibilities changed during this time, and the project implementer addressed these changes in legal documents. Although the existing communication and stakeholder involvement programme was limited due to financial constraints, it provided sufficient information to all stakeholders, by including the consequences of all the above mentioned changes.

8 Lack of trust between stakeholders

Trust and credibility in organisations involved in D/ER programmes or individuals depend on the perception of knowledge, expertise, honesty and cooperation between individuals, organisations and community. In general, stakeholders may agree more on a certain D/ER programme if this is perceived to be implemented by a trusted organization. The fact that the facility owner might be a state owned company or a private company may be perceived differently by some stakeholder groups and they may show different concerns depending on programme implementer.

It is important to keep in mind that overcoming distrust may take a long time. As a first step, the owner could initiate a comprehensive and concerted effort to engage the community about site issues and remediation solutions. To achieve this, it is advisable to meet early with the community in order to respond to community concerns and to explain what actions will be taken to address their concerns. In this process it is necessary to openly share information and to work with the community to involve them in decision making and data gathering. Accomplishing promises, acknowledging uncertainties and justifying the decisions taken are important for developing a healthy and responsible relationship. By involving the local people respected by the majority of stakeholders with local officials, policy makers, it is

possible to build trustworthy relationships. Furthermore, by setting up the headquarters or maintaining active partnership with key actors in the community is important to foster the whole process of trust building.

For the purpose of building trust, during the decommissioning of the Vandellós I nuclear power plant (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 nuclear power plant management and the organization implementing the decommissioning project (ENRESA). The objective of the commission was to monitor the decommissioning process and update the information to the locals on a regular basis. ENRESA paid special attention to local socio-economic issues, such as employment of local labour force. Additionally, an agreement with a local university providing scholarships and promoting the collaboration with business associations and regional councils was considered as a part of the process to build trust with stakeholders (OECD/NEA, 2006b; OECD/NEA, 2006a).

9 Lack of recognition of links between environmental, economic and social concerns

Environmental, economic and social aspects of D/ER programmes are interrelated and cannot be taken separately if the aim is to achieve a sustainable programme. These aspects are rarely addressed in a holistic manner. If the socio-economic impacts have not been considered in the planning stage of a decommissioning programme, substantial consequences of the programme on the community could be neglected. For instance, questions such as whether the remediation project could negatively affect a community's ability to garden, fish or hunt because of possible future contamination may be crucial for the community. It may also be the case that the intention of the staff working in the D/ER programme is to retain D/ER jobs. Overall, the lack of recognition of the links between environmental, social and economic concerns in D/ER programmes could hinder the implementation of the programme itself.

Promoting sustainable programmes helps to overcome these constraints. Integrating economic and social concerns into environmental decision making can be accomplished by forming partnerships with impacted communities and learn about quality of life and environmental justice concerns of the community. Both owners and regulators need to be responsible to answer about local economic and health impacts. This knowledge can be improved by gathering a wide-variety of information from local residents including demographic information, oral history of community's health and the location of important cultural, religious, and historical sites. This information on social, economic and cultural concerns of the community needs to be integrated in the D/ER project.

Radioactive contamination of the areas adjacent to the Chernobyl exclusion zone has resulted in health and ecological issues, affecting people living and working in these areas. Technical issues were extensively addressed by both national authorities and international community, whereas less attention was given to local livelihood conditions such as availability of medical centres, quality of drinking water and locally produced food. Within the framework of the intergovernmental agreements between Ukraine and the European Commission, the Chernobyl Exclusion Zone Administration requested the European Commission to implement various socially valuable pilot activities in the Ivankiv district, a large district in the neighbourhood of the Chernobyl exclusion zone. These activities include supplying medical equipment, mapping radioactive contamination, creating a news and information centre,

developing and implementing sanitary protection programmes, constructing greenhouses for production of healthy food and constructing a biomass incineration facility for contaminated woods.

3.2. Constraints that hinder progress in stakeholder involvement

An analysis of the stakeholders concerns, values, attitudes and interests may reveal the possibility to establish contact and potential collaboration with stakeholders. This collaboration should be initiated as soon as the concerns and demands are put forward, thereby jointly agreeing to establish a necessary dialogue and jointly framing the issue if possible. The involvement of an independent facilitator accepted by all parties and/or the international community can help to open up dialogue. In addition, providing stakeholders with financial resources to choose their own experts could be seen as a mechanism for building trust among the different parties (for instance the case in Olen, Belgium (IAEA, 2014a)).

There are several constraints as discussed below are obstacles in implementing a stakeholder participation process, which in turn will have negative consequences in the overall project implementation. Possible actions to be undertaken to overcome these constraints are presented in Table 2.

Absence or ineffectiveness of national policy and legal framework

Some countries may not have stakeholder involvement as a requirement for the implementation of D/ER programmes within their national policy and legal framework. Other countries may have such requirements but they may not be applied properly for a number of reasons such as the lack of expertise, lack of resources, lack of political will, etc.

Groups and individuals against the implementation of stakeholder involvement in D/ER programmes

Some groups may disapprove stakeholder involvement in D/ER programmes, often because a technocratic approach is considered more appropriate. They believed that the 'experts know the programme well and can decide for the people who do not understand the technical issues'. Additionally, an important reason against the involvement of a stakeholder in the programme arises when the participants suspect that the process is mere window dressing and they will have no influence in the final decisions.

Complexity of procedures for involvement

The design of the stakeholder involvement process is too complex and could ultimately lead to confusion, delays and an inefficient public involvement process. The types of complexity could be associated with the lack of clear stages within the participation process, the lack of a clear definition of roles and responsibilities within the stakeholder involvement process, the participation methods may be too convoluted, the organization or rules for participation may not be clear, overlapping responsibilities, etc.

Changing opinions within one group

Stakeholder involvement is expected to be a continuous process that will take time. In some instances, stakeholders may change their opinions over a long time frame for multiple reasons. For instance, they may lose interest due to the influence of other groups, they may seek a financial reward, they may become conversant with the subject, new people may become involved in

the organization with different ideas or perspectives, an external event such as an accident or an incident, may also change their opinion on a specific subject, etc.

Limited capacity to express opinions in public

Stakeholders may not be used, skilled or confident enough to speak in public and thus prefer not to express their opinions or concerns, especially if their view is in support of the owner or different from the "loud voices" or their concern is "too personal". Participants with a strong opinion against a proposal are often more vocal or trained in public speaking and therefore have a greater ability to impact and influence the audience. If some of the voices are not heard or expressed through different channels, the stakeholder involvement process can lead to biased discussions and biased results. If significant number of people represent this situation, then they might wish to get away from the process and the overall negotiations might lose representativeness.

Lack of funding sources to undertake involvement

Some stakeholders will find it difficult to participate in a stakeholder involvement processes due to the lack of financial resources required to cover their travel time, allowance at the meeting place, etc. The lack of funding sources may discourage them from participating or constrain the level and frequency of their participation.

Limited access to information and communication

The lack of computers, access to internet or not being proficient in information technology issues might reduce the level of involvement of some stakeholders. Additionally, some organisations restrict the information placed in the public domain for security reasons and therefore, access to certain information might be limited.

Information overload

Too much information in an inappropriate form may discourage participants to effectively contribute in the stakeholder involvement process. (e.g. too long and too technical reports, too many public information releases, overloading mailboxes, etc.).

Negative experience with stakeholder involvement

Previous negative experiences may lead participants to have negative perceptions of the outcome and thus, refuse to be involved in the future D/ER programmes.

Lack of use of independent facilitation

An experienced neutral third-party may facilitate effective participation in the stakeholder engagement in D/ER. It is often the case that the owner does not recognize the need of hiring expert facilitators at the outset, either because it may be more costly or it may delay the start of the D/ER programme implementation. Additionally, if the expert facilitator is recruited, the challenge might be that he/she is not recognized by all parties to remain neutral and is seen to support one of the parties and therefore, he or she is not trusted.

Lack of motivation to participate in the process

Different factors may affect the motivation to become involved

Table 2
Constraints that hinder progress in stakeholder involvement in D/ER programmes and possible actions to be undertaken to overcome these constraints.

Constraint	Approaches to overcome these constraints
Absence or ineffectiveness of national policy and legal framework	<ul style="list-style-type: none"> • Establish a national policy for D/ER programmes which addresses all necessary legal, technical and social requirements
Groups and individuals against the implementation of stakeholder involvement in D/ER programmes	<ul style="list-style-type: none"> • Identify possible opponents in advance • Establish contact with possible opponents and listen to their concerns and suggestions • Integrate their suggestions and solutions to the stakeholder involvement plan to the extent possible • Consider such groups separately from the 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
Changing opinions within one group	<ul style="list-style-type: none"> • Provide possibilities for feedback and improvement • 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 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
Lack of funding sources to undertake involvement	<ul style="list-style-type: none"> • Organise public speaking courses for main communicators • Make a financial plan for stakeholder involvement which requires low economic resources • Foresee cost for subcontractors (e.g. communication companies, 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, etc.) 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 • Face to face communication with workers involved in the D/ER programme is effective
Information overload	<ul style="list-style-type: none"> • Provide enough time for processing the information • Establish an 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 D/ER projects at the local, regional, national and even international arena • Acknowledge and explain the benefits and pitfalls of experiences • Apply the lessons learned from previous experiences
Lack of use of independent facilitation	<ul style="list-style-type: none"> • Employ trained and independent facilitators
Lack of motivation to participate in the process	<ul style="list-style-type: none"> • Get the neutrality of the facilitator recognized by all parties involved in the process • 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 D/ER programme • Increase general knowledge about the problem being faced • Organise events (e.g. meetings, interviews, etc.) at the 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 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
Lack of balance between transparency and security	<ul style="list-style-type: none"> • Always design the involvement events from the point of view of "what is here for me" • Explain the principles of transparency and security • 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)

in a D/ER programme. These factors may include the lack of trust in the promoter of the process, the lack of clarity regarding the responsibilities or the involvement process, unsatisfying experiences from similar participation processes in the past, the long duration of the D/ER programmes, the lack of capacity to influence the stakeholder involvement process, etc.

Unrealistic expectations

One of the constraints faced in a stakeholder involvement process is the high expectations from some stakeholders regarding the involvement process itself and the solution proposed (in terms of safety). If these expectations are unrealistic it is unlikely that they

will be fulfilled, leading to mistrust in the D/ER programme being implemented or in the stakeholder involvement process having an impact on the final decisions.

Lack of continuous stakeholder involvement and communication

Involvement of stakeholder groups at different stages of the D/ER programme may also change over time, as the programme progresses. While one stakeholder group could be important or motivated at the beginning of the project (e.g. national authorities), another group could gain relevance at a later stage (e.g. local community).

Lack of balance between transparency and security

Important security information is involved with some D/ER programmes (e.g., transport of nuclear material, access to nuclear infrastructure, etc.) and there is also a need for transparent public communication about these related activities. Security issues can be sometimes used as an excuse to elude the involvement of the stakeholder by claiming it to be sensitive or informant source. As a result, stakeholders are confronted with partial information and they may perceive that some interesting or negative information is withheld.

Table 2 summarises the constraints identified above and the approaches proposed to overcome these constraints.

4. Conclusions

The purpose of this paper is to systematically review societal constraints related to D/ER programmes and propose approaches to overcome these constraints. For this purpose, various methods (survey, discussions, case studies, workshops) were used in the framework of the IAEA CIDER project. Generally, the results showed that societal aspects are one of the key challenges related to D/ER programmes and they arise mostly as a result of the different perceptions, attitudes, opinions and concerns of stakeholders towards the risks and benefits of D/ER programmes as well as the lack of stakeholder involvement planning. Specifically, the results showed that societal constraints arise mostly as a result of the following factors:

- Limited technical knowledge and understanding of the issues and process
- Concerns related to the waste disposal on the backyard (NIMBY)
- Different demands and concerns between stakeholders
- Limited budget to cover stakeholders' demand
- Negative experience with the D/ER
- Lack of support from national authorities
- Changing the administrative procedure and legal framework related to D&ER programmes
- Lack of trust between stakeholders
- Lack of recognition of links between environmental, economic and social concerns

In addition, the paper identifies the following constraints that hinder progress in stakeholder involvement in D/ER programmes: absence or ineffectiveness of national policy and legal framework; groups and individuals against the implementation of stakeholder involvement; complex procedures for involvement; changing positions within one group; limited capacity to express opinions in public; lack of funding sources to undertake involvement; limited access to information and communication; information overload; negative experience with stakeholder involvement; lack of

independent facilitation; lack of motivation to participate in the process; unrealistic expectations; absence of continual stakeholder involvement and communication and lack of balance between transparency and security.

Practical approaches were suggested to overcome these constraints together with collected experiences from different IAEA Member States. All the approaches stress the importance of early engagement of stakeholders as a vital part of the early planning of D/ER programmes. The assessment of the impact of the approaches is out of the scope of this paper, which should be considered in future research.

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