ENVIRONET ANNUAL MEETING 2019 PRELIMINARY REPORT

INTRODUCTION

The ENVIRONET Annual Meeting brought together different players related to Environmental Remediation (ER). These included remediation implementers and companies servicing the activities of remediation (e.g. US-DOE, ORANO, WISMUT, ENRESA, DOUNREAY, EUROFINS, ENVIRONET, ECOENGENEERING, ANSTO, LONGENECKER, ROSATOM, CEA, KAERI, EDM-Portugal, Javys-Slovakia), Regulators (CSN-Spain, Stuk-Finland, DSA-Norway, CNSNS-Mexico), Research Organisations and Universities (IRSN, SCK-CEN, Porto University, Huelva University, Basque University), and International Organisations (EBRD). That situation created the opportunity to have the views and perspectives of ER, not only on different themes, but also from players of many different countries. The wide composition of meeting participants in regional terms (noting that all continents in the world were represented) brought out perspectives from countries with different stages of maturity regarding their remediation programmes. This meeting marked the first time that South Korea participated in an ENVIRONET Annual Meeting.

Figure 1 below shows the distribution of sectors represented in the Annual Meeting of ENVIRONET. While there is a diverse mix of sectors, over half (58%) of the participants are from either a) national organizations directly related to the implementation of Decommissioning and/or ER Programs (13%) or b) consultancy companies/contractors implementing ER programs on behalf of the national organisations (45%).
Environmental Remediation is a topic connected to many different situations, including legacy sites from past mining operations, sites affected by accidents, nuclear facilities (that will eventually be decommissioned), NORM sites and even sites affected by contamination due to natural processes. While the broad spectrum of remediation is very interesting, it also imposes an enormous challenge regarding how to address the needs of Member States (MS) across all these dimensions.

Discussions undertaken during the meeting clearly demonstrated that ER cannot be seen through a single and isolated perspective. Rather, the intrinsic multidisciplinary nature of ER requires the consideration of many different aspects, including the social dimension that plays a key role in the overall decision-making process.

Building on the discussions that occurred during this meeting, as well as other discussions involving Steering Committee and ENVIRONET members throughout the past year, an action plan is being developed to support ENVIRONET in 2020 and beyond.

SUMMARY OF KEY MESSAGES

The meeting consisted of an opening session on the first day, followed by eight topical sessions with time for round table discussions at the end of each session. The key messages from each of the topical sessions are presented below. More detailed descriptions of the opening session and the individual topical sessions and related discussions are provided in Attachment 1. ¹

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¹ One of the presentations scheduled for the second day was not presented until Thursday. The discussion for that presentation is included at the place in the schedule where it was originally scheduled.
Session 1: Topical Presentations of Major ER Projects - Focus on Technology

- No specific ER strategy/approach fits all ER projects.
- Characterization and monitoring should be undertaken as often as required across the lifecycle of a project to inform decisions about the path forward. MS could benefit from capacity building in this area.

Session 2: Presentations of problem holders, implementers/contractors on their work depicting, technologies, managerial approaches, costing, challenges and opportunities.

- Strong project management practices are key to ER-program success. However, it has been seen that despite investing in significant efforts in managerial and project management approaches, life cycle costs of ER-programs continue to grow.

Session 3: Presentations from Research Projects – Challenges and Innovation

- All Remediation projects should employ principles of: prudence, accountability, transparency, inclusiveness, sustainability, and optimization (e.g., cost, schedule, stakeholder approval, radiation protection and safety, etc.) and have effectiveness measures built into them.
- Decision-making regarding risks reduction needs to consider social expectations.

Session 4: Topical Presentation on Major ER Projects – Focus on Stakeholder Related Issues

- Further guidance on building and maintaining stakeholder trust during post-accident scenarios would be useful.
- Never make assumptions about what people know, think or feel.
- Tools exist to facilitate stakeholder engagement but should be used with caution.

Session 5: Decision Making in Environmental Remediation

- MS were very interested in (could use assistance with) increasing capacity in the area of strategy development.

Session 6: International Organizations – The Strategic Need of ER Implementation in the Context of the UN_SDGs

- Central Asian countries and other former Soviet Union Republics are till now facing technical, financial and social problems in managing the legacies of uranium mining and milling from the Soviet times, which they can only overcome through assistance by international organizations.
• Reliable and long-term stable mechanisms of funding are a pre-requisite for the successful implementation of large-scale ER programmes.

• International organizations as IAEA, EC, EBRD, UNIDO, UNDP, OSCE and others are important in assisting MS in their efforts to manage ER programs. Capacity building, provision of guidelines and recommendations, provision of financial and technical means, supervising of programme implementations and coordination of activities in projects with trans-boundary impacts are key elements of such assistances.

Session 7: Safety and Regulatory Issues

• MS have a broad interest in the selection of reference levels and would like to have more guidance on this topic.

• An overarching national policy is essential to increase the chances of a successful management of contaminated land.

• Regulatory challenges remain in many countries, particularly in the identification, management and remediation of contaminated lands.

• Incorporating considerations of sustainability, ecological value and social acceptability in national regulations was recognized as one of the biggest challenges for the next years.

Session 8: Remediation After a Nuclear Accident – Experiences with the Chernobyl and Fukushima Accidents

• Remediation of radioactively contaminated sites and management of residual radioactive materials related to Chernobyl and Fukushima accidents represent high priority tasks that pose both technical and societal challenges.

• Communication with residents shall not be seen as a ‘one-sided explanation’ but is dialogue with interested parties to build trust.

• Miscalculations in some early-phase accident response measures in Chernobyl stress importance of awareness and preparedness issues, as well as a need for well-structured and transparent risk-informed decision-making.

• Target dose of 1 mSv/y should be thoughtfully and carefully considered. In many situations it shall be taken as a long-term remedial goal to be achieved through the implementation of a set of measures (not only by decontamination activities). Moreover, it may be achieved through a sequence of intermediate targets.
Open Floor Discussion: Moving from Remediation to Management – Integration with Decommissioning and Waste Management, (Horst Monken-Fernandes, Waste Technology Section, IAEA)

- Lifecycle “environmental management” of nuclear sites can result in the prevention of contamination issues that will entail further remediation towards the end of operations or even before that.
- Proper consideration of sound lifecycle environmental practices will lead to more sustainable management options of contaminated sites.

MEETING CONCLUSIONS

The 2019 Annual Meeting of ENVIRONET had a clear objective to review the achievements of the network over the last 10 years, observe the progress in different programs, understand the innovations that have been offered to the market and anticipate future activities to be addressed, not only in the scope of the network portfolio itself, but also in the overall spectrum of ER. The discussions that were entertained during the meeting pointed to several conclusions that are presented here.

1. **Continued and solid coordination between activities developed in the scope of IAEA’s Regular Budget and those developed in the scope of Technical Cooperation Department (TC) was recognised as a key element to maximize the success and effectiveness of assistance provided by the IAEA to its Member States.**
   - **Comments** - A good example of the benefits of this synergy is found in the work of WG-3 (on capacity building) of the CIDER Project. The CIDER project has led to the formulation of a new Inter-regional (INT) project to enhance MS practical skills and knowledge related to D&ER implementation. This new INT project, presented by Portugal in the context of the TC cycles 2020/2021 and 2022/2023, builds upon the concept of the School of D&ER that was originally presented in the preparation of the Madrid Conference in 2016 and in the subsequent CIDER Phase II efforts of WG-3. The new INT project incorporates a fully integrated curriculum with innovative mechanisms of training to provide Member States with a comprehensive training portfolio in D&ER. The training programme involves theoretical and practical activities and combines eLearning, webinars and face-to-face activities to enhance the learning process. Different organisations participating in the Annual Meeting demonstrated interest in hosting some of the events of the training programme (e.g., Slovakia and Spain). The achievements of EC-H2020 INSIDER project will also
be made available for the training program in the scope of site characterization in decommissioning and remediation.

2. **Efforts to assist MS by building capacity to conduct appropriate and cost-effective site characterization and monitoring activities have been seen as a valuable action and should be continued.**

   - **Comments** - Site characterization has been reported as a costly activity in environmental works related to the decommissioning and remediation of nuclear facilities. Characterization activities permeate the entire duration of the project and impose significant costs to the implementers of remediation and/or operators of the site. In addition to characterization, monitoring is also a relevant component of such projects. Innovations such as online monitoring as well as the use of mobile laboratories have been demonstrated to be effective at reducing costs and maximizing results. It has been noticed, however, that training and enabling the workforce involved in such activities is still an important and necessary component. In this context, the role of the Mobile Unit for Site Characterization, developed in the scope of the ENVIRONET activities, was presented as a contribution to address the issue of capacity building in site characterization. In addition, the inclusion of specific modules on installation and site characterization in the new INT project will further enhance MS capacity.

3. **Focus shall be placed on enhancing national capabilities in the area of project planning/management and strategy development in environmental remediation.**

   - **Comments** - Strong project planning and management practices are key to ER program success. However, these approaches should be tailored to the specifics of the site/program. Different modalities need to be adjusted to the specific situation and that experiences are not directly transferable from one situation to another. IAEA has been commended for its efforts in providing MS with some tools in the direction of strategy development and project management/planning. Two examples that have been highlighted by the participants were the ENVIRONET DERES Project that contributes to the determination of site end-states, a key element in environmental remediation projects and the Strategy Matrix, developed by WG-1 in the scope of CIDER Project Phase II, that helps MS identify gaps and prioritize actions that will allow for a proper institutional infrastructure development with a view to facilitate the implementation of ER projects. The new ENVIRONET project MAESTRI, intended to contribute to the adoption of sound approaches for
the proper management of contaminated lands, received the expression of interest, in terms of participation in the project activities, from different MS representatives.

4. **The proper understanding and correct application of the basic principles of radiation protection is necessary for MS to establish a framework to support successful ER projects.**
   - **Comments** - The concepts of optimization (ALARA), justification and even reference levels are not yet completely assimilated. The new Safety Guide on ER (DS 468), as presented in one of the meeting sessions, will bring updated guidance towards the implementation of ER projects. However, some gaps remain, including, among other things, practical guidance on the development and selection of reference levels. The Madrid Conference in 2016 clearly expressed the desire of the international community represented in the event to have the IAEA provide guidance on how to establish such levels. Not only should this guidance address elements of reduction of exposure to radiation, consideration of remedial options but also issues such as associated costs, ecological value, social expectations and sustainability. Different techniques that can be adopted in support of the establishment of reference levels, e.g., Cost-Benefit analysis and Multi Criteria Decision Analysis (MCDA) were also briefly discussed during the meeting and will be further elaborated in the scope of the MAESTRI project. Collaboration with different sectors of the IAEA in pursuing this objective will be necessary and synergies will be pursued to maximize the results. Guidance should also be included on how to incorporate these issues into a national policy that will increase the chances of successful management of contaminated land.

5. **Improvements in remediation techniques, technologies and approaches (also applicable in the context of decommissioning) have been demonstrated, but additional efforts are needed to disseminate these innovations to MS.**
   - **Comments** - While the adoption of new techniques/approaches is desirable, MS stressed that implementers should adhere to overarching principles such as prudence, accountability, transparency, inclusiveness, sustainability and optimisation. Therefore, meeting participants indicated that guidance is needed in this regard, i.e., in technology/technique selection.

6. **Dealing with Stakeholder Engagement and Communication in the scope of Environmental Remediation remains a challenging task to many MS. Building on the idea that no one solution fits all, effective exchange of experience in this area will certainly be beneficial.**
• **Comments** - The engagement of stakeholders (interested parties) in the decision-making process regarding implementation of remediation measures was examined during one of the meeting sessions. One of the key messages was that one should never make assumptions about what people know, think and feel. The proper consideration of community interests was highlighted as a crucial aspect of engagement. Also important is the development of strategies to handle sensitive aspects of stakeholder engagement, such as determining to what extent stakeholders should drive the decisions or providing for reversing/modifying earlier decisions. Stakeholder engagement is continuously supported and promoted in many IAEA initiatives and reports (including Safety Standards), however participants indicated that at least in the scope of ER, guidance is needed on how to do it effectively.

7. *The value of the IAEA coordination of international activities in Central Asia through the Coordination Group for Uranium Legacy Sites (CGULS) initiative was recognised as an important mechanism to enhance the implementation of ER projects in those countries.*

• **Comments** - The Strategic Master Plan developed under CGULS provides an important road map. It was also noted that reliable and long-term secured funding is a pre-requisite for the successful implementation of large-scale ER programmes. Funding needs to be based on technical solutions in line with recognized good practices. The remediation projects funded and implemented by ROSATOM and the EBRD in Central Asia are essential initiatives. In addition to the implementation of technical solutions, the improvement of country- and site-specific socio-economic conditions was pointed out as a key objective of environmental remediation.

8. *International organizations were considered as key players in providing assistance to many MS to manage their remediation projects.*

• **Comments** - Capacity building, provision of guidance materials and recommendations, funding, provision of technical means, supervision of program implementation and coordination of activities are key elements of such assistance. Therefore, international organizations should continuously improve their assistance delivery mechanisms to MS adjusting this assistance to MS needs, keeping in line with developments observed in the assisted countries. ARTEMIS is recognized as a useful tool that the IAEA can provide for the review, improvement and optimization of ER programs.
9. It is important to maintain robust mechanisms of experience exchange and sharing of good practices regarding implementation of sustainable and holistic approaches to decommissioning, waste management and environmental remediation.

- **Comments** - For legacy sites, active (or intensive) remediation is not always justified and the optimal management option might consist of institutional controls and/or monitoring of exposures. It was stressed that to assure the safe, optimal management of radiologically contaminated sites, policies and strategies are required. An overarching policy might be supported by several strategies and programs tailored to the characteristics of the different types of sites (e.g., nuclear, accident/incident affected, NORM). The IAEA was called upon to have in place mechanisms that can help MS address these challenges. Again, the projects developed in the scope of ENVIRONET activities were recognised as useful tools in this direction, in conjunction with other initiatives developed by the IAEA in this field.

10. The transition from a narrow approach to “environmental remediation” to the broader and more encompassing approach of “environmental management” was seen as a positive and necessary development”.

- **Comments** - The concept of environmental management as already discussed in the WATEC 2019 meeting report provides more flexibility of action, promotes sustainability, and allows for a life-cycle approach, acting not only to deal with existing contaminated sites but also avoiding the creation of new ones. It has been suggested that this development should be carefully considered by NEFW management in particular.

11. From an administrative point view, the Steering Committee (SC) unanimously agreed to appoint Karen Smith (ANL-USA) as the next chair of the ENVIRONET having Maria de Lurdes Dinis (Porto University-Portugal) as vice-chair. The SC also decided to appoint Christine Gelles as a special adviser for the committee.
ATTACHMENT 1
Detailed Meeting Notes by Session

Opening Day

The 2019 ENVIRONET Annual Meeting began with the Opening Ceremony. Ms. Miller (chair of Environet) welcomed everyone to the special 10th Anniversary Meeting of ENVIRONET. Special opening remarks were made by Mikhail Chudakov (Deputy Director General Nuclear Energy-Department), Gustavo Caruso (Director, Office of Safety and Security Coordination, Department of Nuclear Safety and Security) and H. E. Marcel Biato (Ambassador of the Permanent Mission of Brazil to the IAEA). Mr. Biato, in particular, recalled the beginnings of ENVIRONET 10 years ago and commented that ENVIRONET had been very helpful in assisting in environmental remediation issues in his country.

Horst Monken-Fernandes, Co-Scientific Secretary for ENVIRONET, provided an overview of the accomplishments of ENVIRONET over the last 10 years. Many projects have been undertaken, including Mobile Unit for Site Characterization, training courses, development of a presence on CONNECT, as well as projects such as CIDER (Constraints in Decommissioning and Environmental Remediation - in cooperation with IDN), DERES (Definition of Environmental Remediation End-States), NORM and LeTrench (Remediation of Sites Containing Legacy Waste Trenches).

Christophe Xerri, presented awards to Leo van Velzen, Karen Smith, and Peter Booth to recognize and show appreciation for their contributions over the lifetime of ENVIRONET. The three are members of the Steering Committee of ENVIRONET and were present at the Consultants Meeting when ENVIRONET was planned and are still part of the network today. Mr. Booth was the first chair of the Steering Committee and Ms. Smith will be the incoming chair for 2020.

The remaining part of the day saw updates on DERES and the NORM projects by Mr. Monken-Fernandes and the LeTrench project by Ms. Baines, both from the Department of Nuclear Energy, as well as updates on the Mobile Unit for Site Characterization, ENVIRONET in CONNECT, TC Strategies to Support Capacity Building in MS, and Contributions of ENVIRONET to Capacity Building, by Milan Matos (Physics Section, Division of Physical and Chemical Sciences), Andressa Junger (Department of Nuclear Energy), Martin Krause (Director, Division of Technical Cooperation) and Maria Lurdes Diniz (Porto University, Portugal), respectively. Each of the presentations highlighted the role that ENVIRONET has played in sharing information and developing ER capacity in MS. A nod was also given to the role that ENVIRONET can play in the future.

Technical Sessions

Session 1: Topical Presentations of Major ER Projects - Focus on Technology

Session Chairs: Mr. Leo van Velzen (Netherlands) and Ms. Natalya Latynova (Russian Federation)

This session provided ENVIRONET members with an update on the technological challenges, specific experiences and lessons learned in major Environment Remediation projects.

Four presentations were given:

1. Towards an interim end state at Dounray (Mr. Ian Darby, United Kingdom)
2. Remediation projects for NORM contaminated sites at the Syrian oilfields (Mr. M. S. Al-Masri, Syria)
3. Remediation of uranium mining legacy sites in Bulgaria (Ms. Polya Pencheva, Bulgaria)
4. Uranium mine remediation in Australia (Mr. Peter Waggitt, Australia)

Presentation 1: Towards an interim end state at Dounreay; Mr. Iain Darby

The first part of Mr. Darby’s presentation gave the NDA perspective on “Site End States” and the NDA’s role in determining the end states. The challenges to establish this “interim end state” were explained with the aid of the “Dounreay Timeline”. The remediation and restoration works will be contained within discrete zones (referred to as “Zonal Approach” method). “Mini Facility studies” will contribute to the “Zone Closure Process”.

In the second part of his presentation Mr. Darby focused on characterization methods for waste materials. This process of “characterization, decision making and delivery” is iterative. Characterization should be undertaken as often as required during the lifecycle of a project to gather information for decision-making.

Other important points were made.
   - Radiological characterization is undoubtedly one of the key factors for any successful remediation project. MS should have good knowledge of techniques, tools and methodology to carry out successful projects.
   - Well-planned characterization leads to optimized waste management costs.

Presentation 2: Remediation projects for NORM contaminated sites at the Syrian oilfields; Mr. M. S. Al-Masri

Mr. Al-Masri started the presentation with a historical overview of the discovery of NORM in Syrian oilfields. Up to 2012 Syria had well-established regulations and several remediation projects were started and successfully completed. Oilfields contaminated as a result of poor past practices have been identified as a result of recent upheaval in the country.

Additional information was presented about the Syrian “Remediation Program Objectives” and “Land Remediation Program”.

Remaining challenges facing Syria include
   - Remediation of new contaminated oilfields and surface water
   - Decommissioning of destroyed oil/gas production facilities
   - Disposal of generated NORM waste.

Presentation 3: Remediation of uranium mining legacy sites in Bulgaria; Ms. Polya Pencheva

Ms. Pencheva gave a summary of the regulations concerning remediation of the uranium mining legacy sites in Bulgaria. The activities anticipated for remediation of uranium extraction and processing wastes in the Republic of Bulgaria are:
   - “Technical decommissioning”
   - Physical and biological remediation and purification of uranium contaminated mine waters
   - Environmental monitoring in the regions affected by the uranium extraction
The technical decommissioning of the mining facilities for classical extraction in the Upper Thracian Valley was accomplished between 1992 and 1997. The decommissioning of the processing plant near Buhova has been completed in 2002 – 2003 and the Zvezda plant in 2004.

The technical reclamation of the Eleshnitsa tailings pond is completed, however, the thickness of the sealing layer is 0.5 – 0.9 m, instead of the designed 3 m, due to funding constraints.

Results and challenges still to face include

- Assessment of remediation activities up to now for all sites
- Risk assessment
- Decision making and the development of the strategy for management of existing sites
- Remediation of tailings ponds – Buhova and seven other sites of former uranium industry
- Lack of legislative framework

**Presentation 4: Uranium mine remediation in Australia; Mr. Peter Waggitt**

- Mr. Waggitt presented the state of uranium mine site remediation in Australia. Uranium mining has a long history since 1900. Australia has the largest reserves but has never been the world’s top producer. Currently, five mines are still in operation. Remediation is planned for all sites. Older operations were not always cleaned up, so some legacy sites do exist. The remediation of smaller sites seems to be going well.

Industry is steady at present although the Ranger site is steadily progressing to closure. The Ranger site will continue to be a focus of activity as remediation becomes the dominant activity.

Exploration of uranium continues – slow but steady. Other prospects may develop but the market will need to improve. Long term monitoring and stewardship and relinquishment are yet to be discussed fully.

**Session key messages**

- An overall ER strategy can be applied, however as soon as it becomes more site specific, e.g., “nuclear” or “oil & gas” or “uranium”, etc., approaches and methods to apply start to differ. No specific ER strategy/approach fits all ER projects.
- Developments in remedial technologies and approaches gained from ER projects should be gathered, and communicated to MS, having similar challenges.
- Characterization and monitoring should be undertaken as often as required across the lifecycle of a project to gather information to inform decisions. MS could benefit from capacity building in this area.

**Session 2: Presentations of problem holders, implementers/contractors on their work depicting, technologies, managerial approaches, costing, challenges and opportunities.**

Session Chairs: Mr. Leo van Velzen (Netherlands) and Ms. Natalya Latynova (Russian Federation)

ENVIRONET members were updated on the challenges that problem holders, implementers/contractors are facing in the field of technologies, managerial approaches, costing and opportunities.

The session included three presentations:

1. Environmental monitoring during remediation of Uranium mines (Mr. J. Grossmann, Germany)
2. Mobile laboratories for site characterization (Mr. P. Letessier, France)
3. A project management approach to Environmental Remediation Programs –Looking back and Looking forward at US lessons learned & Challenges (Ms. C. Gelles, USA)

Presentation 1: Environmental monitoring during remediation of Uranium mines; Mr. J. Grossmann (Germany)

Mr. Grossmann started his presentation with a short introduction on Uranium mining legacy as a result of activities undertaken in the aftermath of World War II. In Europe and Asia a great number of small mines were also started at that time. In the EU more than 87 tailing sites exist covering 2,530 ha in total. The main focus of the mining operations was on production and environmental aspects were not properly considered, resulting in the need for remediation. A number of cases exist where remediation is still pending.

Environmental Remediation starts with environmental characterization. During environmental remediation monitoring will also be undertaken providing documentation of the results of remediation actions and serving to support any disputation of eventual claims.

Turnkey solutions/scenarios includes: autonomous monitoring stations and mobile solutions for dose rate and spectroscopic measurements, data transmission for remote areas, cloud hosted monitoring center for data storage, visualization of data and remote control of the monitoring stations, online recording of ambient equivalent dose rate at points of interest, online recording of rivers and effluent groundwater and activity concentration of relevant radionuclides, deployment of several monitoring stations in the initial phase of the remediation works, mobile assessments, and automated data transfer and visualization on maps.

Presentation 2: Mobile laboratories for site characterization, Mr. P. Letessier (France)

Mr. Letessier provided a presentation on the development and advantages of a mobile radiological laboratory, which can be situated and operated a customer site.

A mobile laboratory (SMART Lab) has been developed in close cooperation with CEA/France. The main purpose of the mobile laboratory is to characterize a high throughput samples by non-destructive assay methods or by (very) simple destructive characterization methods. The laboratory is equipped to cope with samples of drinking water, foodstuff, NORM, D&D waste from the surrounding of NPPs. In the latter two cases, the operators should have the technical expertise to deal with difficult to measure radionuclides and matrices. A word of caution was provided - a mobile laboratory is very nice, but alone by itself, it is like a “Formula One car without a good pilot”.

Training and enabling of the workforce involved with the operation of the laboratories is important and necessary.

The mobile laboratory has been used satisfactorily during the environmental remediation of the CEA Fontenay-aux-Roses (Paris area).

Presentation 3: Challenges in Project Management in Environmental Remediation; Ms. C. Gelles (USA)

The foundations for successful remediation project management were described as policy, defined/assigned responsibilities, regulatory framework, documentation of the inventory of (legacy) sites, national and site-level strategies, scope, schedule and cost, sufficient resources (financial, human and technology), etc.

Keys to successful projects have included:
• Defined end state/site use.
• Robust stakeholder engagement. Stakeholder interests and confidence levels change throughout project lifecycle. “Do not betray trust of stakeholders and regulators”.
• Apply performance-based contracting approaches (rather than cost-reimbursable). “Manage the contract, not the contractor”. Tailored acquisition strategy – highly incentivized.
• Alignment of the following 4 factors is needed e.g., i) Technical; ii) Regulatory; iii) Acquisition; iv) Stakeholder alignment & acceptance.
• Apply proven, foundational project management, e.g., if a project has a long duration, develop cost and project schedule in rolling detail.
• Rigorous, detailed reporting on project implementation, e.g., use of metrics and dashboards.
• Identify all risks to project execution and develop detailed risk mitigation plans within an active risk management program, e.g. not a one-time exercise, but regularly and take adequate measures on risks that become sufficiently high.
• Carefully select the acquisition approach to balance risks and reward potential.
• Workforce management and community impacts must be included in the planning and throughout execution.
• Do not overpromise.
• Do not under fund.

Significant progress has been made in the completion of complex remediation efforts. However, there were also drawbacks, e.g., fire and radiological events at WIPP; Regulatory issues (e.g., missed cleanup milestones); transuranic waste drum events; cost and schedule increases for major treatment projects; despite significant investment, life cycle costs continue to grow.

USDOE Environmental Management’s challenges (an outside perspective):

• Not keeping the balance between “focus on project management tools (in theory) & tailored for project purpose”
• Keeping enough focus on risk management
• Loss of institutional knowledge
• Regulatory agreements and program plans begin to diverge
• The continuing change in priorities
• The imbalance in risk share between DOE and contractors, between regulators and DOE

Major EM competitive acquisitions take too long to complete and are very costly to both EM and industry. EM is in the process of reinvigorating the completion mindset. Strong project management practices are key to ER program success, but approaches should be tailored to the specifics of the site/program.

In its 30-year history, DOE EM approaches have matured, evolved, devolved (to some degree) and are now returning to proven practices. Proven model consists of full alignment of technical, regulatory and contract strategies with active stakeholder engagement.

Session key messages

• Laboratory and mobile instrumentation for characterization, optimizing the workflow, etc. are nice to have, but not alone by itself without qualified and experienced operators. Having a qualified and experienced workforce is important and necessary.
• Strong project management practices are key to ER-program success. Applied approaches should be tailored to specifics of the site/program.
Despite investing in significant efforts in managerial and project management approaches, life cycle costs of ER-programs continue to grow, particularly for the US DOE.

**Session 3: Presentations from Research Projects – Challenges and Innovation**

Session Chair: Dr. Tim Payne (Australia)

Four presentations provided an update on recent work performed to enhance ER capabilities.

1. **DEMETERRES Project – Development of Innovative Technologies for Removing Radionuclides from Contaminated Solid and Liquid Matrices**, (Nathalie Leonhardt, CEA France)
4. **Removal of Radioactive Alkali Elements from a Laboratory Effluent and Sequestration of these Elements in a Complex Perovskite Mineral**, (Nour-el-Hayat Benhabiles, Algiers Nuclear Research Center, Algeria)

**Presentation 1: DEMETERRES Project – Development of Innovative Technologies for Removing Radionuclides from Contaminated Solid and Liquid Matrices, (Ms Leonhardt)**

Ms. Leonhardt described the DEMETERRES Project and the development of bio- and eco-technologies for effluent and soil restoration following a nuclear accident. Partners in this research include organisations like CEA, IRSN and INRA and industrial partners like AREVA and VEOLIA. The DEMETERRES Project is a holistic solution for contaminated environments. It focuses on developing innovative bio-technologies such as phyto-extraction and environment friendly physical-chemical technologies for the remediation of contaminated soils. Research topics focus on:

- Specific sorbents for Cesium removal, potassium copper hexacyanoferrate nanoparticles
- Flocculation - a physical separation process to remove fine phyllosilicates, which have trapped 80-90% of the Cs. It relies on the negative charge of fine particles and attachment to foam bubbles. It was developed in France and tested in the Fukushima area.
- Bio remediation. Some high performance plants have been identified which don’t bioaccumulate Cs, e.g., rice you can grow in contaminated soil that does not result in contaminated grain. The next phase of work will demonstrate the technologies, develop the crops, contribute to economic recovery and extend the technology to other elements.

**Presentation 2: TERRITORIES Project – To Enhance uncertainties Reduction and Stakeholder Involvement Towards Integrated and Graded Risk Management of Humans and Wildlife in Long-lasting Radiological Exposure Situations, (Mr. Guillivic)**

The TERRITORIES Project centers around risk management of humans and wildlife in radiological exposure situations, with objectives around dose and exposures, stakeholder engagement and education/training. The project has 11 partners throughout Europe, and it involves many deliverables and work packages. Twenty-one reports are underway to provide guidance for management. The main goal of the project is to reduce the uncertainty associated with the decision making process, particularly in a post-accident context. This project considers the role of social
science. Recovering daily life is not just about radiological protection, but all dimensions of the people’s lives. A concern for radiological protection is necessary, but the worries and concerns of people whose lives have been overwhelmed by the accident also need to be understood.


The INSIDER Project is aimed at improved nuclear site characterisation and waste minimisation and has identified that reliable data on all components of the system (ER, D&D, WM) are needed for more efficient remediation. Key aspects of INSIDER are data analysis and sampling design methodology. The Scientific Secretary of Environet is the Chair of the End-User Group of Insider.

**Presentation 4: Removal of Radioactive Alkali Elements from a Laboratory Effluent and Sequestration of these Elements in a Complex Perovskite Mineral, (Mr. Nour-el-Hayat Benhabiles)**

The fourth presentation in this session provides an overview of research done by the Algerian Nuclear Commission (COMENA). It has been stated that Algeria lacks adequate of environmental nuclear regulation. The Commission has only 90 researchers and due to retirement laws, many have left at a young age. Waste forms currently being investigated include borosilicate glass, phosphate glass and ceramics. The inability to perform sufficient characterization is an issue however. In the future, research activities might include atmospheric dispersion, bioremediation and bacteria.

**Session Key Messages**

- All projects would employ principles of: prudence, accountability, transparency, inclusiveness, sustainability and optimization. Research Projects needs to have effectiveness measures built into them.
- Decision-making regarding risks and exposures need to consider social expectations.
- Harmonisation of environmental remediation procedures between all MS is not necessary as each site is unique.

**Session 4: Topical Presentation on Major ER Projects – Focus on Stakeholder Related Issues**

Session Chair: Peter Booth (UK)

The session comprised of three interrelated presentations.

1. Trust as a Fundamental Element in Stakeholder Engagement in ER Projects – Is it Impossible to Gain the Trust of Stakeholders? (Peter Booth, UK)
2. IAEA Approach in Support of Stakeholder Communication and Involvement, (Lisa Berthelot, NENP/IAEA)
3. Stakeholder Communication and Engagement in RWM Including D&ER – Specific Circumstances, (Hiro Tachibana, NEFW/IAEA)

**Presentation 1: Trust as a Fundamental Element in Stakeholder Engagement in ER Projects – Is it Impossible to Gain the Trust of Stakeholders? (Mr. Booth)**

Mr. Booth split his presentation into two parts, both dealing with the common theme of developing trust. Part one provided a perspective of gaining trust and was supported by overview of how trust was built in the UK in relation to remediation activities on nuclear and defence sites. The second part focussed a Japanese student whose family had been evacuated from their hometown of Okuma.
after the 2011 accident at Fukushima Diiachi NPP. The objective of this story was to highlight the importance of considering post-accident psycho-social effects within stakeholder engagement.

Presentation 2: IAEA Approach in Support of Stakeholder Communication and Involvement, (Ms. Berthelot)

Ms. Berthelot focussed on the IAEA’s tools and approaches in support of stakeholder communication. While her focus was primarily on the IAEA’s engagement work related to new nuclear build projects, she provided some generic messages that were equally applicable to remediation projects. One of the key messages was that one should never make assumptions about what people know, think and feel. The only way one can gain a correct understanding of these issues is by asking.

Presentation 3: Stakeholder Communication and Engagement in RWM Including D&ER – Specific Circumstances, (Mr. Tachibana)

The third presentation from Mr. Tachibana provided an insight into stakeholder engagement tools and initiatives related to radioactive waste management. However, a joint document is to be produced which covers stakeholder engagement for the combined subjects of radioactive waste management, decommissioning, and environmental remediation. He cited the nuclear communications toolbox that offers tools to support effective communication on the benefits and risks associated with the use of nuclear technologies. The protection of local interests was highlighted as a crucial aspect of engagement as was providing the opportunity for reversing/modifying earlier decisions.

Session Key Messages

- Building trust takes time but can be destroyed overnight. Further guidance on stakeholder relations would be useful, particularly for post-accident scenarios.
- Never make assumptions about what people know, think or feel.
- Tools exist to facilitate stakeholder engagement, and opportunities for reversing or modifying earlier decisions are crucial.

Session 5: Decision Making in Environmental Remediation

Session Chair: Catrinel Turcanu, SCK/CEN, Belgium

The session on decision-making in environmental remediation consisted of four presentations.

1. Cost Benefit Analysis in Support of Decision Making, (Saied Dardour, NENP/IAEA)
3. Participatory Mechanisms in Decision Making with a View to Enhancing the Quality of the Process, (Yevgeniya Tomkiv, NMBU/CERAD, Norway)

Presentation 1: Cost Benefit Analysis in Support of Decision Making, (Mr. Dardour)

Cost-Benefit Analysis (CBA) is an analytical tool that enables the evaluation of ER projects and their potential solutions. The presentation provided insights into CBA and its application for assessing the potential economic, environmental and social impacts associated with the remediation of a site. Mr. Dardour emphasized that the timeframe is important and should be the starting point for any
economic analysis (with the use of discount rates). The example was given of the UK Treasury Green Book for the appraisal and evaluation in the Central Government, which sets standards for the application of CBA in UK. Mr. Dardour distinguished between the financial analysis (made on behalf of the sponsor) and the economic analysis (made from the point of view of society). When moving from financial to the economic analysis, adjustments are needed; costs and benefits will be discounted using a social discount rate. The latter concept is subject to debate; therefore transparency is very important. All assumptions should be documented when setting the social discount rate.

Two projects at the level of the IAEA were mentioned. The first is an open source tool for cash flow calculations and discounting of cash flows; the tool provides confidence levels around estimates. The second is a serious game developed to allow reflection on energy systems; this can be used to reach out to stakeholders and explain the benefits of nuclear energy program. The speaker highlighted that the technical analyses and feasibility studies are a pre-requisite.


The second presentation focused on a practical strategy matrix tool developed as part of the ENVIRONET CIDER II project, to support development and assessment of an environmental remediation strategy. The matrix tool developed within CIDER II illustrates the connections between the key elements of a strategy for environmental remediation of a legacy site and the factors that can impact the development of the strategy. The tool is useful to analyze key constraints in the development and implementation of a D&ER strategy in specific situations. The matrix-based analysis can be repeated throughout the D&ER process to highlight gaps, issues or constraints that require action. The tool has been tested with a number of real-world problems.

Ms. Gelles also mentioned the CIDER II service of integrated facilitation, which is being introduced to match needs and resources. A question was asked about the mechanism through which a Member State can contact IAEA and express a need. It was suggested that ENVIRONET Regional Coordinators can act as mediators and bring the request to the attention of the ENVIRONET SC or a request could also be made through Technical Cooperation, also perhaps facilitated through ENVIRONET. The difference was pointed out between ARTEMIS, which provides Member States with peer review missions, and CIDER II, which is not a peer review, but helps instead to structure the approach to environmental remediation.

**Presentation 3: Participatory Mechanisms in Decision Making with a View to Enhancing the Quality of the Process, Ms. Tomkiv**

The third presentation emphasized that participatory decision-making processes should be inclusive, independent, flexible and have continuity, transparency and accountability. Flexibility and continuity requires that stakeholder views should be included in the process and taken into account throughout the process. Independence means not only independence from the funder, but also that stakeholders should be able to influence the agenda. Stakeholder engagement should have a real impact on decisions; this requires commitment from the decision-maker. Transparency is needed in terms of aims, purpose and outcome of the decision process. Two case studies were used to illustrate how these attributes can be applied in practice when evaluating or organizing participatory processes, one of them in Norway at the time of Chernobyl and the other at a recent date, in the framework of a research project.
A remark was made that empowerment also needs to be taken into account. In France, the Open Radiation project enables citizens to measure radioactivity in the environment. Another participant remarked that currently a shift in the relations between citizens and scientists is taking place. Citizen’s data are taken seriously by scientists and recent publications in scientific journals are analyzing such data. Another participant mentioned the collaboration between France and Belarus for a citizen science project.

Presentation 4: The New IAEA –ENVIRONET MAESTRI – (Management Systems Supporting Environmental Remediation) Project (Ms. Turcanu)

The objective of MAESTRI is to provide practical guidance supporting a structured approach to the management of sites contaminated by past or ongoing activities, including:

- Considerations underlying the environmental site management decisions (institutional, safety, economic, social, ethical);
- Sustainability assessment of environmental management decisions;
- The evaluation of social, economic and environmental aspects of site management options;
- The application of aiding tools to support a transparent, consistent, comprehensive and inclusive decision-making process.

Social multi-criteria evaluation is a good framework to evaluate remediation options in a participatory, coherent, effective and transparent way. Social multi-criteria evaluation promotes a multi-disciplinary approach and considers also the ethical aspects (i.e. the impact of remediation options on the different social actors). The need for an integrated approach was identified by MS at the ENVIRONET annual meeting in 2017. In response, in 2018 a new project was proposed.

Participants suggested focusing on economic and social factors and developing a practical approach that considers effective stakeholder involvement and synergies with complementary initiatives.

MAESTRI will be an action-oriented project that will incorporate existing activities at the IAEA and within the EU. Synergies with the European projects TERRITORIES and CONFIDENCE have already been established. Multi-disciplinary cooperation with social scientists was acknowledged as beneficial and needed. A project meeting will take place in 2020. A number of participants to the ENVIRONET meeting have expressed their interest in the project.

Session Key Points

- ENVIRONET Regional Coordinators can facilitate the interaction between MS and TC and CIDER II.
- MS were very interested in (could use assistance with) increasing capacity in the area of strategy development.
- The social aspects of decision-making are very important. A significant amount of discussion was generated on the active role of stakeholders in the decision-making process.
- The MAESTRI project generated much interest from the meeting participants.

Session 6: International Organizations – The Strategic Need of ER Implementation in the Context of the UN_SDGs

Session Chair: Peter Schmidt, Wismut GmbH, Germany

The session was comprised of the following presentations:

2 Peter Waggitt from Australia gave also a presentation during the session on the role of international organisations. His talk was about remediation of mining areas in Australia. The reason why this presentation
1. **Support to Central Asian Countries to Advance their Remediation Projects (Michelle Roberts, WES/IAEA)**

2. **The Role of the EBRD in Supporting Environmental Remediation Projects (Simon Evans, EBRD)**

3. **Support provided by ROSATOM in the Remediation of Legacy Sites in Central Asia (Alexander Bychkow, ROSATOM, Russian Federation)**


**Presentation 1: Support to Central Asian Countries to Advance their Remediation Projects (Ms. Roberts)**

Michelle Roberts from the IAEA Waste Safety Section reported about the work of CGULS (Coordination Group of Uranium Legacy Sites). Established in 2011, under the umbrella of IAEA, CGULS coordinates the activities of international organizations, consultants and potential donors in capacity building and in the development and implementation of remediation programmes in the area. In 2017, a Strategic Master Plan was issued by CGULS to ensure that remediation activities are addressed in a timely, coordinated, cost-effective and sustainable manner in the Central Asian countries, as well as in accordance with international recommendations. The Plan includes milestones of and funding mechanism for remediation of Uranium Legacy Sites (ULS) in the area.

**Presentation 2: The Role of the European Bank for Reconstruction and Development (EBRD) in Supporting Environmental Remediation Projects (Mr. Evans)**

Simon Evans, an Associate Director at EBRD reported how the Bank funds projects of decommissioning of nuclear facilities and of remediation of radioactively contaminated sites. Funding mechanisms and methods applied by the Bank to control proper use of the funding provided were explained. Currently, EBRD is involved in funding ULS remediation for seven sites in Kyrgyzstan, Uzbekistan and Tajikistan. Funding is currently available for four of these sites, two sites in Kyrgyzstan (Shekaftar and Min Kush) and two sites in Uzbekistan (Chakesar and Yangiabad).

**Presentation 3: Support provided by ROSATOM in the Remediation of Legacy Sites in Central Asia (Mr. Bychkow)**

Mr. Bychkov, a former Deputy Director General of IAEA (2011 – 2015) reported on three remediation projects in Central Asia, funded by the Russian Federation and developed and implemented by ROSATOM. The remediation activities at the Kadji Sai site in Kyrgyzstan are close to being terminated. At the Min Kush site, also in Kyrgyzstan, remediation activities are currently performed. The focus is on the technically challenging relocation of uranium mill tailings from a pond near to residential areas to a disposal site remote from Min Kush. The urgency for relocation is due to landslides potentially hitting the pond resulting in blockages of water pathways and subsequent

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was given during this session was late arrival of Mr. Waggitt. Thematically, his talk was initially planned for presentation in the session on major ER projects. The presentation is therefore summarised under the ER project chapter.
spillages of large amounts of radioactive tailings towards residential areas. For the Istikol site in Tajikistan, a remediation programme has been developed which includes inter alia the flattening and coverage of a large pile of mill tailings that impacts the environment and human health of the local population. Commencement of remediation is planned for 2020. Beside presentation of technical solutions, Mr. Bychkov highlighted the importance of contributing to state of the art remediation and also to the socio-economic development of the affected areas in Central Asia.

**Presentation 4: ARTEMIS – An Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation Programmes (Mr. Gordon)**

ARTEMIS is an integrated review service for radioactive waste and spent fuel management, decommissioning and remediation programs. Mr. Gordon explained what ARTEMIS stands for, what the review scope is, how the review process is structured and what the ARTEMIS review benefits are. The IAEA review service helps regulators, national policy and other decision makers, organizations and facility operators in the member states to optimize their plans and programmes in all fields of nuclear activities, including in the field of ER. The review process may include study of the documents, review missions, technical meetings, interviews and site visits. Observations, findings and recommendations are provided to the member states in a review report.

**Session Key Messages**

- Large-scale ER projects highly benefit from assistance provided by international organizations, particularly in developing countries.
- The first three presentations focused on the remediation of uranium legacy sites in Central Asia. Central Asian countries and other former Soviet Union Republics are till now facing enormous technical, financial and social problems in managing the legacies of uranium mining and milling, which they can only overcome through assistance by international organizations.
- Coordination of the international activities in Central Asia ensures that remediation activities are addressed in a timely, coordinated, cost-effective and sustainable manner, in accordance with international recommendations. IAEA is playing a leading role in the coordination process. The Strategic Master Plan developed under the CGULS platform provides a road map for the funding and implementation of ER in the countries.
- Reliable and long-term stable mechanisms of funding are a pre-requisite for the successful implementation of large-scale ER programmes. Funding needs to be based on developed technical solutions in line with best practise and under consideration of regulatory constraints. Country-specifically available resources and infrastructures are being considered as well. Funding of ER in Central Asia through the EBRD may serve as an international benchmark.
- The remediation projects implemented by ROSATOM in Central Asia are an essential contribution to the management of uranium legacy sites in this region. The same applies to feasibility studies and environmental impacts assessments initiated and funded by the European Commission for seven sites in Central Asia. Implementation of these ER projects is funded by EBRD.
Beside the development of technical solutions for ER, the improvement of country- and site-specific socio-economic conditions is a key objective of environmental remediation. The involvement of stakeholders in this process is essential.

The IAEA has developed a number of very useful tools to assist member states in developing their ER policies and strategies. With ARTEMIS, the International Atomic Energy Agency provides a special tool for the review, improvement and optimization of such programmes in line with international recommendations.

International organizations as IAEA, EC, EBRD, UNIDO, UNDP, OSCE and others are important in assisting MS in their efforts to manage ER programs. Capacity building, provision of guidelines and recommendations, provision of financial and technical means, supervising of programme implementations and coordination of activities in projects with trans-boundary impacts are key elements of such assistances.

International organizations should continuously improve their efforts with respect to the needs in MS and adjust and amend their commitments in line with developments in the beneficiary countries.

ENVIRONET is a good platform to facilitate exchange of knowledge among experts and stakeholders in the MS to arrive at suitable solutions for the development, funding and implementation of ER programmes on an international scale.

Session 7: Safety and Regulatory Issues

Session Chair: Marta García-Talavera (Spain)

There were three presentations in the session on safety and regulatory issues.

2. Regulation of Radiologically Contaminated Land: Challenges and Opportunities from the Spanish Perspective (Marta Garcia-Talavera, SCSN, Spain)
3. Experience of Norway in Regulating Legacy Sites (Jelena Popic, DSA Norway)


Ms. Roberts gave an overview of the new IAEA Safety Guide on ER. This publication is a revision of a Safety Guide published in 2007 as IAEA Safety Standards Series No. WS-G-3.1 Remediation Process for Areas Affected by Past Activities and Accidents. The revision was commenced for a number of reasons, including: (a) to provide guidance on how to meet the requirements in IAEA Safety Standards Series No. GSR Part 3 (2014); (b) to reflect good practice in the Member States; and (c) to address issues that arose after the Fukushima nuclear accident. Aspects related to the legal and regulatory framework were addressed, as well as policies and strategies for environmental
remediation, which are considered in relation to the requirements established in GSR Part 1 (Rev. 1) on Governmental, Legal and Regulatory Framework for Safety.

Ms. Roberts highlighted that regulations need to be adequately flexible to take situation-specific conditions into account. She emphasized both minimization of radioactive waste and communication and consultation with interest parties as key aspects in remediation planning and implementation. She also addressed recommendations for protective actions and remedial actions intended to reduce existing prolonged exposure due to contamination, based on a graded approach. Examples from Chernobyl and Fukushima are included, as well as a case from the remediation of Maralinga.

Subsequent discussions showed a broad interest in how the radiological protection principles of justification and optimization are to be applied in the selection of remedial options and in the establishment of reference levels. Both regulators and practitioners expressed great interest in this new Guide.

Presentation 2: Regulation of Radiologically Contaminated Land: Challenges and Opportunities from the Spanish Perspective (Ms. Garcia-Talavera)

Ms. Garcia-Talavera provided insight into the inventory of contaminated sites in Spain, including nuclear sites under decommissioning, former uranium mining and processing sites, land affected by nuclear and radioactive incidents and NORM contaminated sites. She presented the regulatory framework and the strategies to manage contaminated land. She further highlighted the main regulatory challenges and opportunities for improvement in the next few years in the following areas: merging divergent regulation, policy financing, stakeholder engagement, ethics, sustainability, technological innovation, and staff capacity building.

Presentation 3: Experience of Norway in Regulating Legacy Sites (Ms. Popic)

Ms Popic presented the regulation of legacy sites in Norway. These include: NORM sites (Fe mining site, Nb legacy mine, alum shale disposal site); post-Chernobyl fallout contaminated sites and one spent fuel disposal site. She described the regulatory making process at the Norwegian Radiation and Nuclear Safety Authority (DSA) and pointed to the long processes for assigning responsibilities and to the communication of risk as the main challenges encountered. She also presented DSA initiatives to address legacy sites internationally, including bilateral cooperation with the Russian Federation, Ukraine and central Asian countries.

Both presentations, as well as the subsequent discussions, showed that regulatory challenges in the identification, management and remediation of contaminated land are similar in most countries.
ENVIRONET has effectively addressed them and continues to provide support to Member States in many of them. It was also noted that Member States aim for a holistic approach to decommissioning, waste management and environmental remediation. An overarching national policy is essential for an efficient management of contaminated land. Strategies setting out the means for achieving the goals and objectives of the national policy may be elaborated in several different components. Lastly, incorporating considerations of sustainability, ecological value and social acceptability in national regulations was recognized as one of the biggest challenges for the next years.

Session Key Messages

- MS have a broad interest in the selection of reference levels and would like more guidance on this topic.
- Regulatory challenges remain in many countries, particularly in the identification, management and remediation of contaminated lands.
- MS aim for a holistic approach to decommissioning, waste management and environmental remediation. An overarching national policy is essential for an efficient management of contaminated land.
- Incorporating considerations of sustainability, ecological value and social acceptability in national regulations was recognized as one of the biggest challenges for the next years.

Session 8: Remediation After a Nuclear Accident – Experiences with the Chernobyl and Fukushima Accidents

Session Chair: Dmitry Bugai (Academy of Science, Ukraine)

The presentations in this session included

1. An Overview of the Remediation works After the Chernobyl Accident (Dmitri Bugai, Academy of Science, Ukraine)
2. Innovating the Chernobyl Landscape: Environmental Assessment for Remediation and Management (Yevgeniya Tomkiv, NMBU/CERAD, Norway)
3. Status of the Remediation of off-Site Areas Affected by the Fukushima Accident (Yoshimoto Mori, MOE, Japan)
4. Potential Cooperation Projects related to Chernobyl Site in Ukraine (Simon Evans, EBRD)

Presentation 1: An Overview of the Remediation works After the Chernobyl Accident (Mr. Bugai)

Dr. Bugai reviewed both past and recent experiences of remedial (accident mitigation) measures in Chernobyl zone. A brief “post-audit” of early phase (1986-1989) Chernobyl accident mitigation measures aimed at site clean-up and limiting off-site releases of radioactivity was provided and “lessons learned” were summarized. An update on recently completed (2014 – 2019) environmental remediation projects in Chernobyl was given. Challenges for the future related to managing ‘nuclear legacies’ of Chernobyl accident were also discussed.
Presentation 2: Innovating the Chernobyl Landscape: Environmental Assessment for Remediation and Management (Mr. Tomkiv)

The second talk presented work performed within the iCLEAR project. This project aims to help develop long-term strategies for management of the Chernobyl Exclusion Zone (CEZ). The project focuses both on the CEZ and the newly established Chernobyl Biosphere reserve, as well as on the areas currently classified as Zone of Obligatory Resettlement. Mr. Tomkiv described the protocol for future reuse of lands for agriculture that has been developed within the iCLEAR project. It also presented the results of the interviews that explored opinions and attitudes of the local residents with regard to the possible re-classification of the area and reuse of land.

Presentation 3: Status of the Remediation of off-Site Areas Affected by the Fukushima Accident (Mr. Mori)

Mr. Mori discussed the progress made to date in the decontamination of affected areas since the Fukushima Daiichi NPP accident. In addition, the lessons learned and future challenges were also presented. This information will be useful for other countries in preparing for accidental radioactive contamination events.

Presentation 4: Potential Cooperation Projects related to Chernobyl Site in Ukraine (Simon Evans)

Mr. Evans provided an overview of activities of the EBRD as International Financial Institution (IFI) serving the international community as a manager of nuclear safety multilateral grant funds. The special focus was projects implemented in Chernobyl such as: Shelter Implementation Plan, Chernobyl Spent Fuel Processing and Storage Facility, and The New Safe Confinement. Key decommissioning challenges and success factors of Chernobyl related projects were discussed. Potential future cooperation projects in Chernobyl were presented.

Session Key Messages

From Chernobyl:

- Remediation of radioactively contaminated sites and managing residual radioactive materials related to Chernobyl and Fukushima accidents represent a high priority task for Ukraine and Japan respectively, that pose both technical and societal challenges.
- Miscalculations in some early-phase accident response measures in Chernobyl stress importance of awareness and preparedness issues, as well as a need for well-structured and transparent risk-informed decision-making.
- Current day problems in managing legacy sites in Chernobyl affected areas are often related to ‘legacies’ of early phase accident response measures, which often were carried out without due consideration of possible “secondary” negative effects (e.g., groundwater contamination, plant uptake) as well as without due provisions for managing resulting residual radioactive materials.
- Several remediation projects in the Chernobyl zone completed in recent years with support of international technical-assistance (IAEA, EC) demonstrated potential for risk-based optimization of remedial efforts and successful implementation of remediation (cooling pond decommissioning, remediation of legacy waste dump sites inside/outside Exclusion zone).
- Returning to agricultural productive use of contaminated areas in Ukraine in restricted zone adjacent to Chernobyl NPP appears to be feasible from radiological point of view but poses
complex legal (land ownership) and societal issues (informing and gaining trust by local population).

From Fukushima:

- Target dose of 1 mSv/y of should be considered as a remedial goal to be achieved by implementing a set of measures (not only by decontamination activities), and it may be achieved through sequence of intermediate targets (Environmental Management vs. Environmental Remediation).
- Experience in implementation of decontamination measures can be gained/improved by learning through demonstration projects or actual activities.
- Important prerequisite for decontamination activities is acquisition of consent from residents. Communication with residents is not a ‘one-sided explanation’ but it requires two-side dialogue with interested parties to build the trust. Public communication regarding nuclear risks should include both measures in “peacetime” (e.g., education on the radiation issues) and in emergency situation (e.g., Information dissemination and sharing, public engagement).
- Some key challenges remaining for Fukushima include
  - Decontamination activities in the Difficult-to-Return Zone
  - Planning and implementation of long-term countermeasures in forests
  - Safe management and disposal of stored radioactively contaminated soil and waste
  - Restoration of Temporary Storage Sites for wastes
  - Recycling of removed soil
  - Dissemination of science-based knowledge on remedial activities among residents of affected areas to avoid misconception.

Open Floor Discussion: Moving from Remediation to Management – Integration with Decommissioning and Waste Management, (Horst Monken-Fernandes, Waste Technology Section, IAEA)

Session Chair: Susan Miller (SC Chair)

Mr. Monken-Fernandes presented a vision of “environmental management” that went beyond simply remediating contaminated land to a vision that included lifecycle “environmental management”. This vision involved a life cycle approach, from proactively preventing contamination of land before it occurs to ongoing monitoring requirements if site cleanup requires multiple steps over long time periods. The concept of “environmental management” allows for better integration of decommissioning, environmental remediation and waste management as well as ensuring a more holistic, cost effective, lifecycle-optimized and enduring approach to site cleanup. The MS in attendance agreed that this way of thinking about environmental management and expressed that it was more closely aligned with what they were experiencing in their own countries.

Key Session Messages

- Lifecycle “environmental management” can result in the prevention of contamination issues in the first place.
- “Environmental management” will result in more optimized and sustainable cleanup of contaminated sites.