

The work programme of NERIS in post-accident recovery

T. Schneider^a, S. Andronopoulos^b, J. Camps^c, T. Duranova^d, E. Gallego^e, F. Gering^f, O. Isnard^g, M. Maître^a, C. Murith^h, D. Oughtonⁱ, W. Raskob^j

^a*Nuclear Evaluation Protection Centre, CEPN, 28 rue de la Redoute, 92260 Fontenay aux Roses, France; e mail: thierry.schneider@cepn.asso.fr*

^b*National Centre for Scientific Research “Demokritos”, Greece*

^c*Belgian Nuclear Research Centre, Belgium*

^d*VUJE, a.s., Slovak Republic*

^e*Polytechnical University of Madrid, Spain*

^f*Federal Office for Radiation Protection, Germany*

^g*Institute for Radiation Protection and Nuclear Safety, France*

^h*Federal Office for Public Health, Switzerland*

ⁱ*Norwegian University of Life Science, Norway*

^j*Karlsruhe Institute of Technology, Germany*

Abstract—NERIS is the European platform on preparedness for nuclear and radiological emergency response and recovery. Created in 2010 with 57 organisations from 28 different countries, the objectives of the platform are to: improve the effectiveness and coherency of current approaches to preparedness; identify further development needs; improve ‘know how’ and technical expertise; and establish a forum for dialogue and methodological development. The NERIS Strategic Research Agenda is now structured with three main challenges: (i) radiological impact assessments during all phases of nuclear and radiological events; (ii) countermeasures and countermeasure strategies in emergency and recovery, decision support, and disaster informatics; and (iii) setting up a multi faceted framework for preparedness for emergency response and recovery. The Fukushima accident has highlighted some key issues for further consideration in NERIS research activities, including: the importance of transparency of decision making processes at local, regional, and national levels; the key role of access to environmental monitoring; the importance of dealing with uncertainties in assessment and

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management of the different phases of the accident; the use of modern social media in the exchange of information; the role of stakeholder involvement processes in both emergency and recovery situations; considerations of societal, ethical, and economic aspects; and the reinforcement of education and training for various actors. This paper emphasises the main issues at stake for NERIS for post accident management.

Keywords: Post accident management; Stakeholder involvement; Atmospheric and aquatic modelling; Environmental monitoring; Education and training

1. INTRODUCTION

Following the Chernobyl accident, European research programmes have been set up to further investigate and improve nuclear emergency and recovery preparedness and management. Created in 2010, the aim of the NERIS platform is to foster cooperation in this field. Currently, 57 organisations from 28 different countries are members of the European platform. Among them, 26 are members of the legal association and contribute to its financial support. The main objectives of the platform are to: improve the effectiveness and coherency of current approaches to preparedness; identify further development needs; improve ‘know how’ and technical expertise; and establish a forum for dialogue and methodological development (Liland and Raskob, 2016).

The aim of this paper is to present the recent activities developed within the NERIS platform, and to introduce the issues at stake for further research. In this perspective, a new version of the NERIS Strategic Research Agenda and a first roadmap have been adopted, taking into account the latest developments and the preliminary lessons learned following the management of the Fukushima accident.

2. NERIS ACTIVITIES

2.1. NERIS working groups

To achieve its objectives, three working groups have been created:

- The Working Group on Practical Implementation of the International Commission on Radiological Protection (ICRP) Recommendations aims at developing guidance and adapting existing decision support systems to the new approach for emergency and recovery preparedness and management. A dedicated meeting was organised with ICRP Task Group 93 in April 2016 to discuss the update of *Publication 109* on emergency (ICRP, 2009a) and *Publication 111* on recovery (ICRP, 2009b). Among the topics addressed during this meeting, it is worth mentioning the expectations on the role of the reference level, the level of exposure of concern in terms of health protection, as well as the importance of preparedness and stakeholder participatory approaches.

- The Working Group on Management of Contaminated Goods aims at contributing to the development of strategies, guidance, and tools for the management of contaminated products. This working group relies on a series of dialogues established in 11 European countries with producers, retailers, and consumer associations addressing the key issues at stake in case of long-lasting contamination of the territories and the impacts on agricultural sectors. In this perspective, the working group is closely following the feedback experience of the management of food products after the Fukushima accident.
- The Working Group on Information, Participation, and Communication aims at favouring the exchange of experience and elaborate recommendations on information to the public, communication among experts and stakeholders, and participation of the relevant stakeholders in emergency preparedness and response processes. This working group relies on the establishment of a forum of exchange for users of the ‘analytical platform’, developed in the PREPARE research project, intended to be a focal point for collecting information, analysing any nuclear or radiological event, and providing information to the public about the consequences and its future evolution.

2.2. Recent European research projects of direct interest for NERIS activities

Several projects developed within the Euratom framework programme for radiation protection research deal with emergency and recovery issues. PREPARE- and OPERRA-related projects (i.e. CATHyMARA, HARMONE, and SHAMISEN) have been undertaken.

- The PREPARE project (2013–2016) aimed to close gaps that had been identified in nuclear and radiological preparedness following the first evaluation of the Fukushima accident (Duranova, T. et al., 2016). Among others, the project addressed the review of existing operational procedures for dealing with long-lasting releases, cross-border problems in monitoring and food safety, and further developed missing functionalities in decision support systems ranging from improved source term estimation and dispersion modelling to the inclusion of hydrological pathways for European water bodies. In addition, a so-called ‘analytical platform’ has been developed to explore the scientific and operational means to improve information collection, information exchange, and the evaluation of such types of disasters.
- The CATHyMARA project (2015–2017) focused on post-accidental ^{131}I measurement in the thyroid, particularly for children, with specific emphasis on the monitoring strategies and assessment of thyroid doses resulting from intakes of radio-iodine. Monitoring strategies addressed monitoring of children and adults, required capabilities, and existing gaps. Strategies also addressed harmonisation of measurements and dose assessment to be done by national authorities within the European Union and neighbouring countries. This project relied on a review

of existing European means; on two thyroid measurement intercomparison circuits, focusing on children; on Monte-Carlo-based device calibrations; and on the development of emergency-oriented dose assessment methods. The main outcome of the project was guidelines based on practical experience and the comparison of existing and required means.

- The HARMONE project (2015–2017) aimed to harmonise and expand the modelling approach of the European decision support systems RODOS and C3X/SYMBIOSE. To achieve this goal, the project dealt with many possible release scenarios, environmental characteristics, and shortcomings on information in the early phase of an emergency. To adapt the models better to the environmental conditions all over Europe, geographical and climatic influences on regional fishing and farming practice were assessed. Europe was divided into regions with common radio-ecological characteristics, and the relevant data were collected and implemented as generic information in the decision support system. Aquatic, groundwater, snow melt, forest, and terrestrial models in these decision support systems were updated with the new data sets, and their implementation improved.
- The SHAMISEN project (2015–2017) aimed to draw lessons from the Chernobyl and Fukushima accidents and other major nuclear accidents in order to make recommendations for medical and health surveillance of affected populations. Strong cooperation was established with experts involved in the follow-up of Chernobyl and Fukushima. It focused on what it is necessary to do (or not do) in order to improve the follow-up of affected populations, and respond to their needs without creating unnecessary anxiety. The recommendations prepared within the projects were presented and debated with a panel of stakeholders, including representatives of ICRP and other international organisations.

2.3. Ongoing European research projects of direct interest for NERIS activities

Currently, several projects developed within the Euratom framework programme Horizon 2020 for radiation protection research are under development as part of projects within the European Joint Programming Project CONCERT (i.e. CONFIDENCE, TERRITORIES, SHAMISEN SINGS, and ENGAGE).

- The CONFIDENCE project (2017–2019) will perform research focused on uncertainties in the area of emergency management and long-term rehabilitation, with a focus on the early and transition phases of an emergency. The work programme is designed to understand, reduce, and cope with the uncertainty of meteorological and radiological data, and their further propagation in decision support systems. Consideration of social, ethical, and communication aspects related to uncertainties is a key aspect of the project activities. Improvements in modelling and combining simulation with monitoring will help to gain a more comprehensive picture of the radiological situation, and will clearly improve decision-making

under uncertainties. Decision-making principles and methods will be investigated, ranging from formal decision-aiding techniques to simulation-based approaches. These will be demonstrated and tested in stakeholder workshops, applying the simulation tools developed within CONFIDENCE. A comprehensive education and training programme is fully integrated with the research activities.

- The TERRITORIES project (2017–2019) targets an integrated and graded management of contaminated territories characterised by long-lasting environmental radioactivity, filling in the needs that emerged after the Fukushima experience and the publication of International and European Basic Safety Standards. A graded approach for assessing doses to humans and wildlife, and managing long-lasting situations (where radiation protection is mainly managed as existing exposure situations), will be achieved through reducing uncertainties to a level that can be considered fit-for-purpose. The integration will be attained by: (i) bridging dose and risk assessments and management of exposure situations involving artificial radionuclides (post-accident) and natural radionuclides; (ii) bridging between monitoring and modelling of environment, human, and wildlife populations; (iii) bridging between radiological protection for members of the public and wildlife; and (iv) bridging between experts, decision makers, and the public, while fostering a decision-making process involving all stakeholders. The overall outcome is an umbrella framework that will constitute the basis to produce novel guidance documents, and will be widely disseminated to the different stakeholders and accompanied by an education and training programme.
- Quite recently, two new research projects have been selected for a 2-year period: SHAMISEN SINGS, aiming at nuclear emergency situations, improvement of dosimetric, medical, and health surveillance, and stakeholder involvement in generating science; and ENGAGE, aiming at enhancing stakeholder participation in the governance of radiological risks for improved radiation protection and informed decision-making.

3. NERIS ROADMAP

In September 2017, NERIS adopted its first roadmap for further research development in emergency and recovery management, taking into account the latest developments and the preliminary lessons learned following the management of the Fukushima accident.

3.1. Some lessons from Fukushima

Management of the consequences of the Fukushima accident highlighted the importance of providing good transparency of the decision-making processes at local, regional, and national levels. It also highlighted the key role of access to environmental monitoring. This means that measurements have to be available and, as much as possible, understandable by the different stakeholders, and there

is a need to provide access to individual devices for performing measurements at local levels. Although it was already identified in the long-term management of the Chernobyl accident, the availability of new devices has proven the need for developing new monitoring approaches, even in the early phase of the accident.

Despite the developments achieved since the Chernobyl accident in improving the assessment and management of the consequences of the accident and identifying countermeasure strategies, significant uncertainties still exist. These uncertainties have to be addressed in order to improve the assessment and management of the different phases of the accident.

The extensive exchange of information through social media just after the Fukushima accident has created a new situation, implying that experts in radiation protection should reconsider the process of information dissemination. This new situation creates a challenge for producing information accessible to the public, and organising the moderation of fora of exchange, allowing people to give their opinions on a series of situations at stake during the different phases of the accident.

Largely introduced by *Publications 103* (ICRP, 2007) and *111* (ICRP, 2009b), the Fukushima accident has clearly reinforced the role of stakeholders in both emergency and recovery situations. In order to improve the efficiency and sustainability of protective actions, engaging stakeholders in the decision-making processes and empowering them to contribute to the assessment of the situation have been acknowledged as crucial, although quite demanding for the experts, who have to learn how to communicate with local stakeholders. In addition, the need to further consider societal, ethical, and economic aspects in emergency and recovery management has been highlighted. The usefulness of reinforcing education and training for various actors has also been emphasised.

3.2. Main challenges identified in the NERIS roadmap

Three main challenges have been identified for the NERIS roadmap: (i) challenges in radiological impact assessment during all phases of nuclear and radiological events; (ii) challenges in countermeasures and countermeasure strategies in emergency and recovery, decision support, and disaster informatics; and (iii) challenges in setting up a transdisciplinary and inclusive framework for preparedness for emergency response and recovery.

These main challenges will notably aim at providing:

- increased capabilities to assess the different radiological situations, including improved modelling, monitoring, and data assimilation;
- for the implementation of optimisation:
 - improved decision-making using the analytical platform and knowledge database to cope with the different phases and scales of the accident (local/regional/national/international);

- better knowledge on countermeasures and countermeasure strategies with a specific focus on transition and long-term phases;
- development of a guidance framework for establishing a successful stakeholder engagement process;
- integration of citizen science in radiological risk governance, notably by further developing the co-expertise approach, allowing stakeholders to better participate in decision-making processes;
- improvement of preparedness and response in health surveillance programmes, taking into account the general objective of improving the living conditions of affected populations;
- improvement of the management of food and non-food products from contaminated areas; and
- approaches better addressing ethical, societal, and economic aspects in the decision-making processes.

4. CONCLUSION

With the adoption of a new strategic research agenda and its first roadmap, the main challenges have been identified for NERIS research activities. To be successful in promoting useful and efficient research in the following years, NERIS aims to reinforce joint research at European Union level in interaction with the other research platforms in radiation protection (i.e. MELODI for low doses, ALLIANCE for radioecology, EURADOS for dosimetry, and EURAMED for medical exposure).

It will also be important to consolidate the connection with organisations involved in the management of Chernobyl and Fukushima accidents, notably with ICRP and Japanese organisations. To respond to the needs and expectations of those in charge and/or concerned with the preparedness for emergency response and recovery management, NERIS will engage in dialogue and consultation with them, and will aim to contribute to exchange and improved harmonisation of emergency and recovery approaches in Europe.

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For further information:

CONCERT: <http://www.concert-h2020.eu/en/>

NERIS: <http://www.eu-neris.net/>

OPERRA: <http://www.melodi-online.eu/operra.html>