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# The PREPARE project – Innovative integrated tools and platforms for radiological emergency preparedness and post-accident response in Europe

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**Abstract** – The 3-year PREPARE project that started in February 2013 aims to close gaps that have been identified in nuclear and radiological preparedness in Europe following the first evaluation of the Fukushima disaster. Among other issues, the project will address the review of existing emergency preparedness and response procedures for dealing with long-lasting releases, cross-border problems in monitoring and food safety, and further develop 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, as the management of the Fukushima event in Europe was far from optimal, a so-called Analytical Platform will be developed exploring the scientific and operational means to improve information collection, information exchange and the evaluation of such types of disasters. This will be achieved through a collaboration of industry, research and governmental organisations in Europe, taking into account the networking activities carried out under the NERIS-TP project. Furthermore, the NERIS Platform member organisations (so far 50 partners) will be actively involved in the development of the new tools.

**Keywords:** PREPARE project / nuclear and radiological preparedness / response procedures / decision support systems

## 1 Introduction

Following the Chernobyl disaster, significant progress was made in the area of radiological and nuclear emergency management and rehabilitation. In particular, in the last few years, the multi-national project EURANOS, funded by the European Commission and 23 European Member States, has integrated 17 national emergency management organisations with 33 research institutes and brought together best practice, knowledge and technology to enhance the preparedness for Europe's response to any radiation emergency and long-term contamination. Key objectives of the EURANOS project were to collate information on the likely effectiveness and applicability of a wide range of countermeasures, to provide guidance to emergency management organisations and decision-makers on the establishment of an appropriate response strategy, and to further enhance advanced decision support systems (DSSs), in particular RODOS but also ARGOS and MOIRA, through feedback from their operational use. Furthermore, the project aimed to develop guidance to assist Member States in preparedness for nuclear and radiological emergency response and recovery, and to maintain and enhance knowledge and competence through emergency exercises, training and education.

In 2011, the collaborative project NERIS-TP with 19 partners was established. It had two focal points: the first was top-

ics that were not addressed within EURANOS; and the second was establishing a platform on emergency management and rehabilitation preparedness that should be self-sustainable after the project period. This platform, called NERIS, is where the scientific and operational community can exchange and discuss research needs to further improve radiological and nuclear emergency management and rehabilitation in Europe.

Communication within the NERIS platform and among operational organisations immediately after the start of the releases from Fukushima in March 2011 was clearly disappointing. In particular, the estimation of a potential source term was never harmonised on a European level. Furthermore, issues such as food safety and monitoring of passengers and goods from Japan caused problems in terms of a harmonised response in Europe.

Emergency centres were overwhelmed with requests for dose assessments in Japan. However, this was difficult due to a lack of information on source terms. Furthermore, none of these centres were ready or able to perform analysis for releases into the ocean. With the ongoing release lasting for about one month, doubts were also expressed by various organisations on the adequacy of the existing operational procedures for such long-duration releases.

In this respect, there was a clear need for improvement that can be made by fostering the interaction between science and



**Figure 1.** Preparing Europe for Nuclear Emergency and Recovery (45 partners of PREPARE).

operational centres and by improving communication to the public. These identified gaps will be tackled by the European project PREPARE.

## 2 The PREPARE project

### 2.1 The consortium

The acronym PREPARE stands for Innovative integrated tools and platforms for radiological emergency preparedness and post-accident response in Europe. The organisations forming the core of the consortium successfully participated in the European Framework Programme research projects EURANOS and NERIS-TP.

The consortium combines leading research organisations (24) in the nuclear emergency management area with governmental organisations (13), SMEs (8) and one industry partner from 20 countries (see Figure 1). Countries outside the EURATOM treaty are participating at their own cost, demonstrating the importance of this topic and the attraction of the consortium brought together in this project. The developers and users of the two European decision support systems ARGOS and RODOS are also part of the project.

### 2.2 Work activities

The activities of the PREPARE project will be performed in 7 work packages:

- operational procedures for long-lasting releases: following the Fukushima Daiichi accident, a review of existing EPR procedures for long-lasting releases and identification of

possible need for improvement by performing scenario calculations will be performed on a European level (task of Work package WP1);

- platform for information collection and exchange: the objective of this activity is to develop scientific methods and tools that could be used by a European Platform (*i.e.* focal point) for the collection and analysis of information from any nuclear or radiological event, particularly regarding the consequences and any further developments. The intention is to set up such a Platform on a scientific level and discuss within the three years of the project whether such a platform should be formalised either as part of the NERIS Platform or as a tool of the European Commission (task of Work package WP2);
- recommendations related to quality control of contaminated goods already exist worldwide (IAEA, Codex Alimentarius, and in Europe Euratom regulations). However, following the Fukushima accident the organisations that had to deal with these guidelines realised that they are very generic (based only on criteria on activity concentration) and many adaptations had to be developed for their operational use. Improvements should be proposed on a European level to clarify and harmonise international rules and operational procedures, taking into account the viewpoint of all relevant stakeholders (*e.g.* industry, trade, consumers) (task of Work package WP3);
- improvement to terrestrial aspects of decision support systems: Fukushima clearly demonstrated the importance of a source term estimation that is not only based on information from the plant operators. Lessons from Chernobyl showed deficits in the representation of the physico-chemical properties of radionuclides emitted in the atmospheric dispersion models of ARGOS and RODOS. Both gaps will be closed now in Work package WP4. For the source term estimation, we intend to combine dispersion calculations with monitoring information around a power plant. In the case of the physico-chemical properties of the radionuclides, we intend to enhance the source term module as well as later phase countermeasure modules in ARGOS and RODOS to deal with that complexity;
- improvement to aquatic aspects of decision support systems: the aquatic models in decision support systems are far less developed than those for terrestrial ecosystems. This was apparent for the Fukushima accident as during the first month, there was no simulation of the activity released into the ocean. In this respect, we intend to integrate state-of-the-art aquatic models into the RODOS DSS and couple them with countermeasure simulation models. Further to this, the new capabilities will be tested for several important European aquatic systems (task of Work package WP5);
- communication with the public: the overall objective of this work package is to investigate the conditions and means for relevant, reliable and trustworthy information to be made available to the public at the appropriate time and according to its needs, both during the nuclear emergency as well as in the post-emergency phases. Information needs

in this context refer to the understanding (by the members of the public) of the evolution of the accident, its management (and the related potential risks) and the capacity of the population and communities to prevent or mitigate individually and collectively harm arising from the threat (task of Work package WP6);

- training and dissemination: basic training of key players in the field of nuclear and radiological emergency and post-accident management will be achieved by the organisation of two basic courses, one on Preparedness and Response for Nuclear and Radiological Emergencies (arranged March 17–21, 2014) and one on Late Phase Nuclear Accident Preparedness and Management (arranged September 16–18, 2014). Further emergency exercises to evaluate the response during an accident involving international transport of radioactive material and a table-top exercise to evaluate the preparedness for monitoring the extent of large-scale cross-border radioactive contamination in the aftermath of a nuclear accident will be organised. A final dissemination workshop is planned at the end of the project (task of Work package WP7).

### 3 Progress made within the first 18 months

The PREPARE project is progressing as anticipated. In the first year most of the work packages delivered design reports of the software tools that will be delivered in the first year. This was the case for WP2, WP4 and WP5. Other work packages such as WP1 defined scenarios for long-lasting releases and performed first calculations aiming to present the findings in the first half of the project.

Within WP2, the analysis of an ongoing event will be supported by a knowledge database which contains historic events but also scenario calculations with the RODOS system. This allows one to deal with uncertain information, in particular in the early phase, by comparing key information of the current database with the historic one. To facilitate this activity, a list of attributes describing a scenario has been defined and distributed to the partners.

Within WP3, the terms of reference for setting up stakeholder panels have been prepared and panels have been initiated in Belgium, Finland, France + Switzerland, Greece, Ireland, the Netherlands, Norway, Portugal, Spain and the United Kingdom. International organisations will also follow that activity.

Interview guidelines and about 20 interviews have been completed in WP6. They aim to reveal what happened after Fukushima and what problems have been encountered by the practitioners. Furthermore, a workshop was organised discussing how to manage complexity in nuclear accidental situations by taking the interaction with experts and society into account.

Within WP7, two training courses are under preparation and in particular, the late phase one will be organised in Belarus to demonstrate to the participants the real life following such a nuclear incident.

PREPARE also works together with Japanese organisations, among them CRIEPI (the Central Research Institute of the Electric Power Industry), Fukushima university and the FAIRDO (Fukushima Action Research on Effective Decontamination Operation) project.

### 4 Conclusions

The Fukushima incident has highlighted further gaps which will be tackled in the still ongoing European research project PREPARE. The project is progressing as foreseen and the first year's results are in line with the proposed deliverables. Within the next two years, various methods, tools and software products will be produced and disseminated via the NERIS platform and the two decision support systems ARGOS and RODOS.

### References

PREPARE web page: <http://www.prepare-eu.org/index.php>

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