AIR²
Access to INFRASTRUCTURES for Radiation protection Research

Special Issue 5
February 2020

Editorial

With this Special Issue n°5, we start a new series of AIR²: The results of the projects selected during the calls for CONCERT projects. As a reminder, 3 projects have been selected during the first call and 6 during the second one. CONCERT ends on 31 May 2020, so we have only few months ahead of us. These Special Issues will be sent to you as they are realized. We inaugurate this series with the CONFIDENCE project. Through the different Work Packages you will have a summary of this project dedicated to taking into account uncertainties in order to improve modelling and decision making in nuclear emergency situations. Many results have been obtained and the issues raised are very important for the whole scientific community in radiation protection, bringing together contributors from 5 of the 6 platforms: ALLIANCE, EURADOS, MELODI, NERIS and SHARE. **Dr Laure Sabatier, CEA**

The floor to...

CONFIDENCE (COping with uNcertainties For Improved modelling and DEcision making in Nuclear emergenCiEs) started on the 1st January 2017 as part of the European project CONCERT and ended in December 2019. Thirty-one universities, research organisations, technical support organisations and authorities from eighteen countries performed research on uncertainties in decision making in nuclear and radiological emergencies. These organisations are members of European Radiation Protection platforms: ALLIANCE, EURADOS, MELODI, NERIS, and SHARE. This demonstrates the importance of the topic in radiation protection research. The overall budget was 6.201.026€, with an EC contribution of 3.252.487€.

CONFIDENCE – COping with uNcertainties For Improved modelling and DEcision making in Nuclear emergenCiEs

The project was organised in eight Work Packages, six scientific, one for education and training and one for administration. The first seven contribute to this issue in individual sections.

Key findings are summarised here:

- Using ensembles of source term and weather is a practical solution to deal with key uncertainty in the early phase of an emergency such as wind direction, atmospheric stability, source term, and start of release.
- Model and monitoring results can be combined *via* data assimilation to improve the operational picture.
- A novel software tool for calculating health risks was developed.
- Process based radioecological models perform better in the long term compared to empirical ones.
- The stakeholder panels resulted in recommendations for structuring the development of countermeasure strategies in the transition phase.
- Development of mental models, observation of exercises and studies of expected behaviour are key to understand societal and ethical uncertainties.
- Communication of uncertainties to decision makers and general public requires further work to demonstrate the tools and recommendations developed in CONFIDENCE.
- Multi Criteria Decision Analysis is a promising tool to support decision making in the transition and long-term phases of an emergency.
- Education and training was an integral part of CONFIDENCE.

End users have indicated that results achieved are essential for the operational community but that there are still open questions.

Wolfgang Raskob
CONFIDENCE Coordinator

Deputy head of the Institute for Thermal Energy Technology and Safety of KIT

Photo: KIT

CONCERT CORNER

Future events:

11-13 March 2020
CONCERT Final Meeting, CIEMAT, Madrid, Spain
Agenda

28 Sept.-2 Oct. 2020
ERPW 2020, Estoril, Portugal
Deadline for abstract submission: 31 March

WP 6 News:

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Contents:

This project has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 662287

CONFIDENCE WP1

Model improvement in the pre- and release phase, through uncertainty analysis and propagation with an ensemble approach

Work Package 1 of the CONFIDENCE project investigates the uncertainties linked to the pre- and early release phase of an accidental release of radionuclides in the atmosphere. In the absence of environmental measurements of radioactivity, the assessment of the potential consequences and subsequent recommendations for the protection of the population (such as sheltering, evacuation or stable iodine intake) mostly relies on atmospheric dispersion calculations. In such an emergency context, uncertainties are very high and there is an urgent need to decipher and implement actions to protect the population as rapidly as possible.

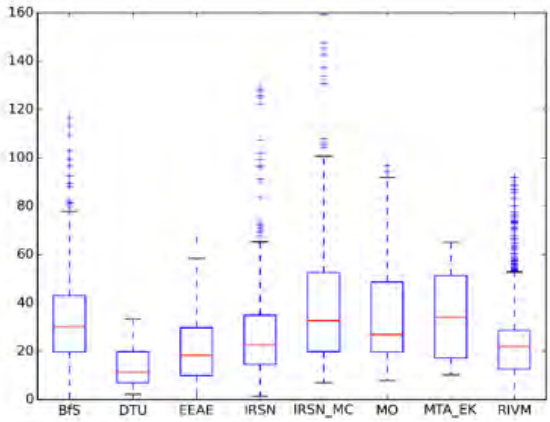

Photo: IRSN, BfS, DTU, EEAE & NCSRD, Met Office & PHE, MTA EK, RIVM

Maximum distance (in km) for the threshold exceedance of 50 mSv for inhalation thyroid dose, for the different participants, 24 hours after the reference release time: ensemble mean (red), 25-75th percentiles (blue box) and ensemble spread (blue dashes and crosses). REM2 case study.

The aim of WP1 was to determine the main sources of uncertainties in these calculations, evaluate how they affect the endpoints used for decision making, and propose practical ways of taking them into account for emergency response in an operational context.
This lead to three tasks:

Task 1.1: Analysing and ranking sources of uncertainties. This included the investigation of uncertainties related to meteorology, source term and atmospheric dispersion model parameters (Leadbetter et al. 2020).

Task 1.2: Uncertainty propagation and analysis. This included the propagation of the uncertainties identified in Task 1.1 through atmospheric dispersion models to produce atmospheric concentrations, deposition and doses, for hypothetical accident scenarios in Europe (Radiological Ensemble Modelling - REM and Western Norway case studies) (Korsakissok et al. 2020) and for the Fukushima disaster. The results of the hypothetical accident scenarios highlighted the importance of taking into account source perturbations and not only meteorological uncertainties. Inter-model variability was found to be not negligible, secondary to meteorological and source term uncertainties in the REM case studies, and of the same order of magnitude in the Western Norway case. Comparisons to environmental observations in the Fukushima case showed that the ensembles of outputs (air concentrations and dose rates) were able to encompass the measurements reasonably well, but with significant variations between the participants.

Photo: IRSN

Irène Korsakissok

Task 1.3: Emergency response and dose assessment. The first subtask consisted of food chain uncertainty propagation, using one of the scenarios of Task 1.2, and the second subtask consisted of issuing practical recommendations for the use of ensemble calculations in an emergency context (Bedwell et al. 2020). Several ways of reducing the computational time of ensemble simulations to make them compatible with operational constraints were explored. Efficiency savings in model setup were identified in order to reduce the model run time for a single simulation. Optimization of the number of members was also investigated, using clustering and sampling methods. These techniques still have to be further developed for the specific application of nuclear accidents, for ensemble calculations to become fully operational.

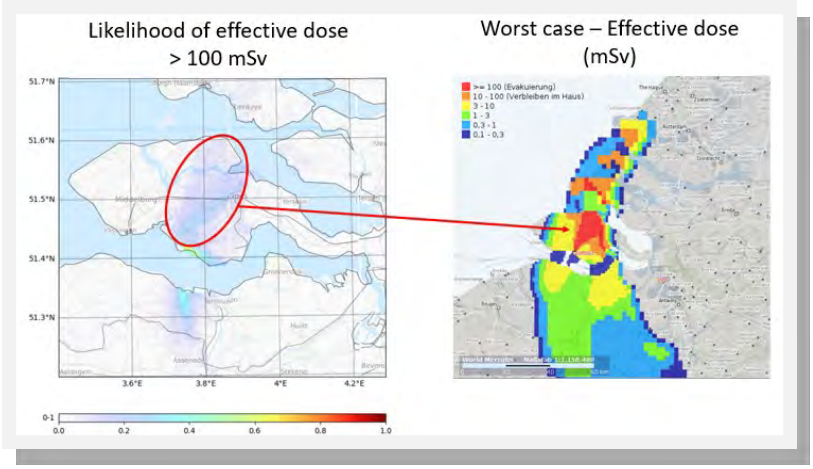

Photo: BfS

Left: Likelihood of exceeding the threshold of 100 mSv effective dose. 0 means that no ensemble member predicts a threshold exceedance, 1 means a perfect agreement between the members to predict a threshold exceedance. Right: Effective dose map (in mSv) predicted by one of the members, chosen because it was the "worst case" (in terms of population). REM2 case study.

IRSN INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

ID Card:

Keywords:
Atmospheric dispersion models, meteorological ensembles, uncertainty propagation, Fukushima

Work Package leader:
Irène Korsakissok, IRSN

Partners:
- IRSN, France
- KIT, Germany
- BfS, Germany
- EEAE, Greece
- NMBU, Norway
- MET, Norway
- DSA, Norway
- PHE, United Kingdom
- Met Office, United Kingdom
- DTU Wind Energy, Denmark
- RIVM, The Netherlands
- KNMI, The Netherlands
- MTA EK, Hungary

Duration:
36 months

WP budget:
Approx. 770581€ with 426476€ EC contribution

Infrastructures:
ECMWF Integrated Forecast System, NMI's and KNMI's infrastructures were used to create meteorological ensembles.

The following atmospheric dispersion models were used to compute the consequences on hypothetical and past accident scenarios:

IRSN: IdX (C3X platform)
BfS: RIMPUFF (RODOS platform)
EEAE: DIPCOT
MET: SNAP
Met Office and PHE: NAME (atmospheric dispersion) and PACE (dose)
DTU: RIMPUFF
RIVM: NPK-PUFF
MTA EK: SINAC

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Related to:
NERIS

Ranking uncertainties in atmospheric dispersion modelling following the accidental release of radioactive material, Leadbetter S. J. et al. (2020), Radioprotection, vol 55 HS1
Uncertainty propagation in atmospheric dispersion models for radiological emergencies in the pre- and early release phase: summary of case studies, Korsakissok I. et al. (2020), Radioprotection, vol 55 HS1
Operationalising an ensemble approach in the description of uncertainty in atmospheric dispersion modelling and an emergency response, Bedwell P. et al. (2020), Radioprotection, vol 55 HS1

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Reduction of uncertainty in dose assessment for improving situation awareness and risk estimation

WP2 brought together scientists from radiological emergency response centers, monitoring experts, dosimetrists and risk modellers with the objective of improving awareness of the radiological situation by optimizing monitoring data, dose assessment, individual dose measurements and calculating health risk estimates. The structure of the Work Package is illustrated in the figure bellow (Woda et al. 2017). Measurement uncertainties of stationary and mobile monitoring systems were assessed, including the uncertainty due to iodine speciation in the monitoring of airborne radioactivity.

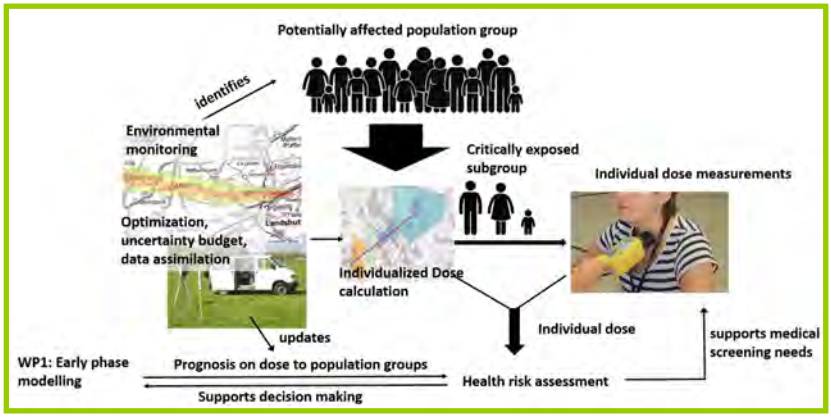

Photo: C. Woda/HMGU, F. Gering/BfS and M. Bleher/BfS

Structure and Task interaction of the Work Package

Generally, the uncertainty budget was dominated by the detector environment (sites, vehicles) and by the uncertainty in interpolation but not by the measurement/detector uncertainty itself. Monitoring strategies were further developed to reduce the interpolation uncertainty by increasing the network density through deployment of mobile measurement systems. In this context, a first step in assessing the quality of possible citizen measurements was undertaken by evaluating external dose -rate measurements based on the smartphone CMOS (camera) sensor in reference fields. It could be further shown that the uncertainty in the radiological picture in the early phase can be reduced by combining modelling and monitoring data through data assimilation. A software for individualized dose calculation was developed, based on environmental monitoring input data and individual movement profiles through the contaminated area. Dose uncertainty was considered by an ensemble approach.

Assessment of thyroid dose was improved by developing a smartphone/tablet app for this purpose, using thyroid monitoring and modelling data, including the new OIR/ICRP Model for adults, individual exposure parameters and 'Dose Per Thyroid Content' functions. A sensitivity analysis of thyroid doses was carried out for uncertainty evaluation (Lopez et al. 2020).

Photo: HMGU

Clemens Woda

Dose measurements in personal objects (mobile phones, chip & SD cards) from external exposures were optimized in the low dose range and a methodology derived to estimate organ doses with uncertainties from these measurements. A workshop was organized on integrating biodosimetry infrastructures (e.g. MULTIBIODOSE guidance, RENEB network) into emergency response.

Software for quick and efficient use in cancer risk assessment was developed, based on risk models for leukaemia, thyroid cancer, breast cancer and all other solid cancers, being consistent to the methodology described in the WHO report of the Fukushima accident. Cancer incidence rates from country-specific registries for selected European countries (Germany, Scandinavia, Switzerland) were integrated into the model database (Walsh et al. 2019). The risk assessment tool serves to optimise health monitoring programs in the transition phase but it was also explored to what extent it can support decision making in the early phase. Important sources of uncertainties were considered.

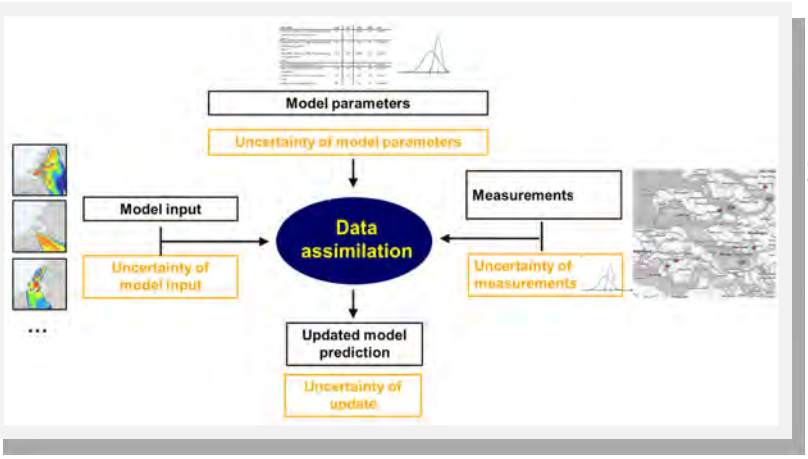

Photo: F. Gering/BfS

Illustration of the data assimiliation approach for an improved radiological picture

Risk bases can complement dose bases for implementing and optimising a radiological protection strategy in urgent and transition emergency phases, Walsh L., Ulanowski A., Kaiser J. C., Woda C., Raskob W. (2019), Radiat Environ Biophys, 58 (4), 539-552

Woda C. et al. (2017). ICRER 2017, Berlin, Germany

Lopez M. A. et al. (2020). IM 2020, Budapest, Hungary

HelmholtzZentrum münchen
Deutsches Forschungszentrum für Gesundheit und Umwelt

ID Card:

Keywords:
Dose assessment, environmental monitoring, data assimilation, individual dose measurement, health risk assessment

Work Package leader:
Clemens Woda,
Helmholtz Zentrum München

Partners:
- BfS, Germany
- HMGU, Germany
- CIEMAT, Spain
- University of Zürich, Switzerland
- IRSN, France
- PHE, United Kingdom
- DSA, Norway
- STUK, Finland
- KIT, Germany

Duration:
36 months

WP budget:
979273€ with 546323€ EC contribution

Infrastructures:
Exposure platforms:
SSDL Neuherberg, Germany
Analytical platforms:
RENEB

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MELODI
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EURADOS

Radioecological modelling: fit for purpose

The objective of Work Package 3 (WP3) of the CONFIDENCE project was to improve the capabilities of radioecological models used to predict activity concentrations in foodstuffs and to better characterise, and where possible, reduce uncertainties. Our work programme addressed key challenges identified in the Radioecology ALLIANCE Strategic Research Agenda and specifically those of the Human Food Chain Roadmap.

Photo: Cath Barnett/CEH

Collecting soils from an upland site in England to be sent to SCK•CEN, Belgium for use in greenhouse studies

The work programme of CONFIDENCE WP3 had three over-arching and interlinked tasks: i) Improving models; ii) Can process-based models reduce uncertainties?; iii) Including "hot particles" in radioecological models.

The key outputs and findings of CONFIDENCE WP3 are:

- The incorporation of the FDMT model into a flexible modelling platform (ECOLEGO) allowing, for instance, sensitivity analyses, investigation of regionalisation and the replacement of default model components with process-based models.
- Development of process-based soil-plant models for Sr.
- Identification of the strengths and weaknesses of the Absalom process-based soil-plant model for Cs.
- Development of a model for fuel particle behaviour in the soil-plant system.
- Recommendation that in the short-term, process-based soil-plant models (for Cs, Sr and fuel particles) will generally give no added benefit, i.e. models such as FDMT are sufficient for predictions during this phase (because soil-plant transfer contributes little to radionuclide activity concentrations of crops in the short-term). However, longer-term predictions made using FDMT, or similar models, during the early phase after a deposition event should be communicated with care.
- Demonstration of the predictive power (and problems) of proposed phylogenetic models for predicting Cs and Sr activity crops.
- Compilation of a dataset of radionuclide biological half-lives for farm animal products.
- Derivation and publication of a dataset of transfer parameters for Mediterranean systems.
- Experimental studies showing that: i) there is negligible root uptake of I-131 by crops; ii) there is transfer of I-131 deposited onto foliage to fruits and tubers; iii) the presence of (goitrogenic) rapeseed in the diet of cows reduced the transfer of I-131 from blood to milk.

Photo: CEH

Nick Beresford

Recommendation that FDMT parameters be updated taking into account latest international recommendations and outputs of CONFIDENCE WP3.

The WP has presented recommendations based upon: the outcomes of the work programme; a questionnaire sent to Japanese scientists involved in responding to the Fukushima accident; a joint workshop organised by CONFIDENCE WP3 in association with the Radioecology ALLIANCE Human Food Chain Working Group. The recommendations and findings from CONFIDENCE WP3 are discussed in CONCERT deliverable D9.17 and have helped to revise the Strategic Research Agenda (SRA) for radioecology (available early 2020).

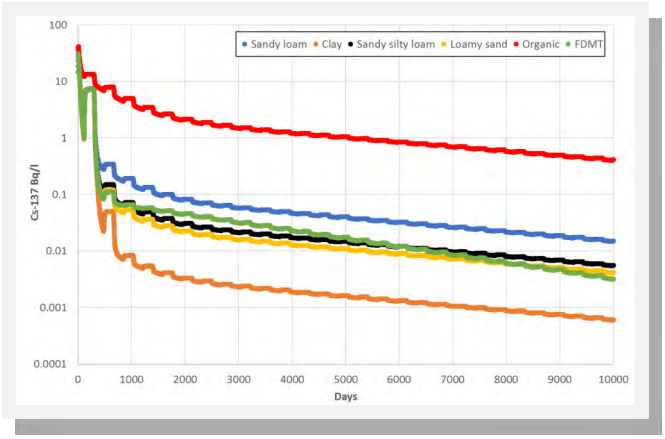

Photo: DSA & CEH

Predicted Cs-137 activity concentrations in cow milk for five different soil types using the 'Absalom' process-based soil-plant model implemented in FDMT-EGOLEGO; for comparison, predictions using default FDMT parameters (as implemented in the JRodos DSS) are also presented.

Fit-for-purpose modelling of radiocaesium soil-to-plant transfer for nuclear emergencies: a review, Almahayni T., Beresford N. A., Crout N. M. J., Sweeck L. (2019), J Environ Radioact, 201, 58-66

Moving radiation protection on from the limitations of empirical concentration ratios, Beresford N. A., Willey N. (2019), J Environ Radioact, 208-209, 106020. doi.org/10.1016/j.jenvrad.2019.106020

UK Centre for Ecology & Hydrology

ID Card:

Keywords:
Food chain, probabilistic modelling, process-based models, fuel particles, Mediterranean

Work Package leader:
Prof. Nick Beresford,
UK Centre for Ecology & Hydrology (CEH)

Partners:
- CEH, United Kingdom
- SCK•CEN, Belgium
- DSA, Norway
- University of Extremadura, Spain
- NMBU, Norway
- CIEMAT, Spain

Duration:
36 months

WP budget:
Approx. 1178000€ total eligible costs with 500000€ EC contribution

Open Access of produced data:
- Elemental concentrations (Ca, Cs, K, Mg, Sr) in a range of crops and associated soils from the UK and Spain. NERC Environmental Information Data Centre.
- Radionuclide biological half-lives for farm animals. NERC-Environmental Information Data Centre.
- CONFIDENCE FDMT implementation in ECOLEGO. https://www.storedb.org.
- Submitted. Calcium and magnesium concentrations in plants used as human and animal foods derived from global literature. NERC Environmental Information Data Centre.
- Transfer parameters for radionuclides and radiologically significant stable elements to foodstuffs in Spain. NERC-Environmental Information Data Centre.

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CONFIDENCE WP4

Transition to long-term recovery, involving stakeholders in decision-making processes

WP4 has involved technical experts (partners) and stakeholders (SH) under a framework of structured collaboration devoted to identify and to deal with the uncertainties raised during the transition phase (TrP) of a nuclear emergency. The objective was to improve preparedness for off-site emergency management starting in the transition phase. Strategies defined here influence also the subsequent long-term exposure situation and post accidental recovery management. Improvement was realised by promoting recommendations and best practices for the decision making (DM) process with the involvement of SHs.

on scenarios, national SH panels were set up in nine different European countries: Spain, France, Greece, Norway, Netherlands, Belgium, Slovakia, Portugal and Ireland. Representative contamination scenarios situated in the TrP and a structured methodology using scenario-based discussions were developed to support the panels.

Photo: CIEMAT

Milagros Montero

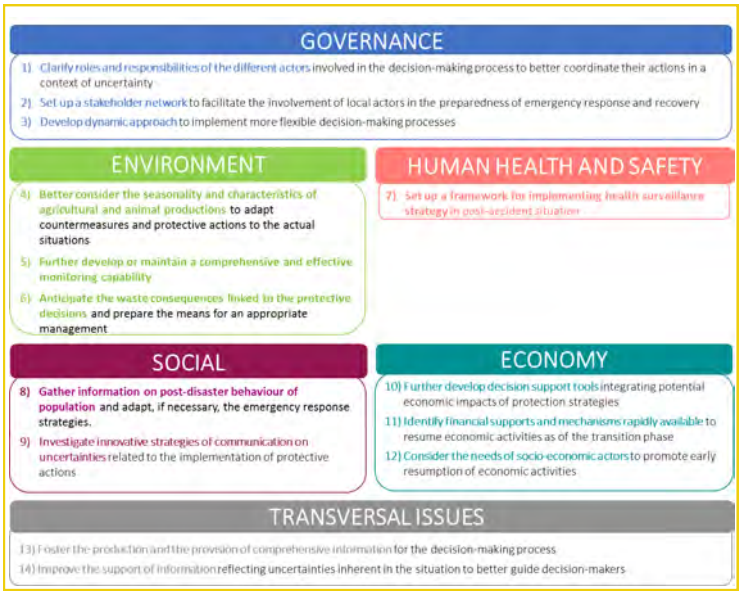

Photo: M. Maitre/CEPN

Scheme of the CONFIDENCE recommendations to improve the decision -making processes in the transition phase of a nuclear emergency.

Work there was combined with transnational SH (consultation) surveys, following a Delphi methodology, to prepare questions and issues to be used as a basis for the panel discussions, to assess the relevance of uncertainties and to select and prioritise the most relevant preferences and criteria resulting from the different panels so that they can be used in the DM tools of WP6.

Using this methodology, national SH panels were confronted with uncertainties generated mainly by ambiguity in the DM during the TrP. Preferences and expectations of local and national SHs have been collected together with key criteria/ attributes influencing the development and preference setting of the recovery strategies within the TrP.

An exhaustive cross-country analysis of the panels' results was carried out, connecting the critical uncertainties to the sustainability criteria/requirements which should drive the DM and optimisation of alternative strategies. Finally, recommendations to deal with such uncertainties were elaborated with the additional aim to identify gaps and further research needs.

Different tools and participatory approaches were applied in three consecutive tasks:

- Recovery scenarios planning for the establishment and optimisation of remediation strategies.
- Scenario-based stakeholder engagement in decisions.
- Guidelines and recommendations to address the planning and DM during the TrP.

The work in the first task identified and assessed those criteria and factors (including the spatial and temporal influence in the establishment of the reference levels and the evaluation of the uncertainties in the optimisation process), that improve/affect the selection, efficiency and ending of remediation strategies, in both urban/ inhabited and agricultural areas through modelling and literature review. Results provided can be summarised as recommendations for both the use of current models (e.g. ERMIN) and their future developments and on which information and map results can be used to help the recovery preparedness. Following the work

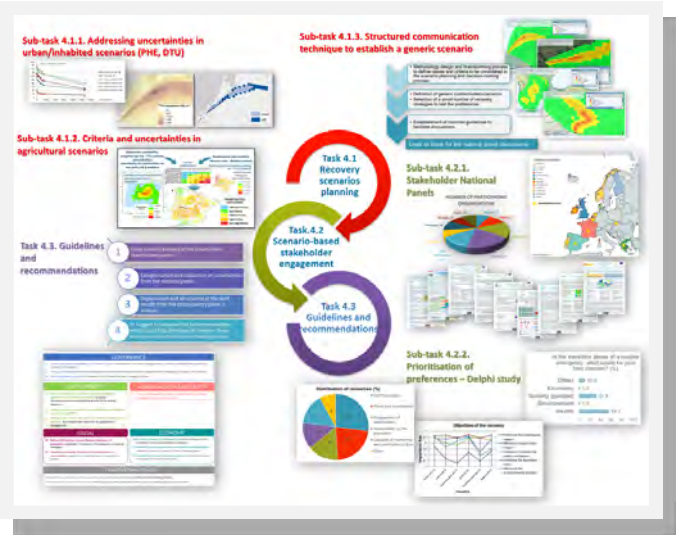

Photo: M. Montero/CIEMAT

Summary of the steps followed in the CONFIDENCE WP4 research

Uncertainties confronting stakeholders and decision-makers in planning intervention in urban and agricultural scenarios, Charnock T. et al. (2020), Radioprotection, vol 55 HS1

Stakeholder involvement through national panels and surveys to address the issues and uncertainties arising in the preparedness and management of the transition phase, Montero M. et al (2020), Radioprotection vol 55 HS1

Towards an improved decision-making process to better cope with uncertainties following a nuclear accident, Durand V. et al. (2020), Radioprotection, vol 55 HS1

ID Card:

Keywords:
Emergency preparedness, transition phase to long-term management, uncertainty, scenario-based analysis, stakeholder engagement, decision making process

Work Package leader:
Milagros Montero,
Environment Department, CIEMAT

Partners:
- CEPN, France
- CIEMAT, Spain
- EPA, Ireland
- EEAE, Greece
- IRSN, France
- DSA, Norway
- DH-PHE, United Kingdom
- DTU, Denmark
- RIVM, The Netherlands
- SCK•CEN, Belgium
- STUK, Finland
- VUJE, Slovakia
- APA, Portugal
- IST, Portugal
- WFSR, The Netherlands

Duration:
36 months

WP budget:
Approx. 762058€ with 373101€ EC contribution

Infrastructures:
Models and tools:
MCDA, ERMIN, JRODOS, GIS
Participatory tools:
stakeholders' panels, dedicated workshops, surveys, questionnaires

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Social, ethical and communication aspects of uncertainty management

WP5 employed a multi-method approach to identify uncertainties faced by public and emergency & recovery management actors, and how these uncertainties impact their decision-making processes; to highlight ethical implications of uncertainty management; and to develop and test selected communication tools (Turcanu et al. 2020).

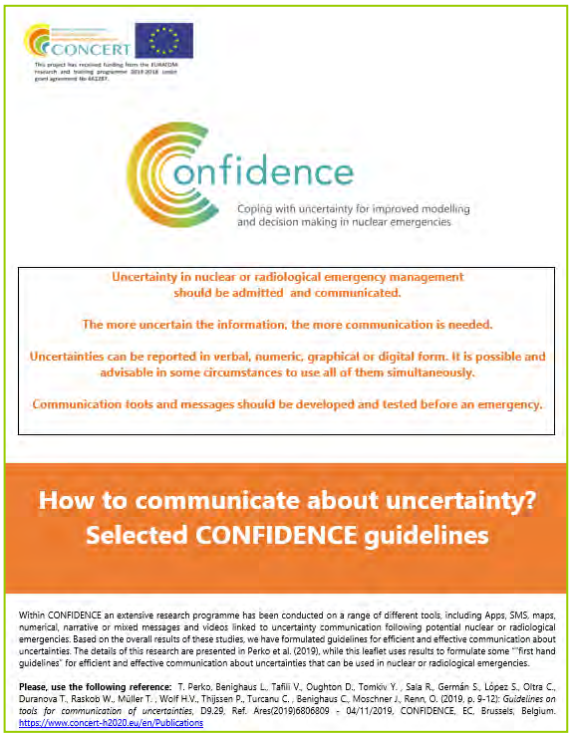

Photo: T. Perko/SCK•CEN

CONFIDENCE recommendations on communicating about uncertainties (leaflet cover)

Research was conducted with document and media analysis of past incidents/accidents; interviews; mental models research; surveys on perception of, and compliance with, protective actions; workshops with local actors; naturalistic observations of emergency exercises; communication experiments with narrative/numerical information; tests of communications tools (maps, apps, text messages).

Various types and sources of social uncertainties were identified (Tomkiv et al. 2020). This showed that uncertainties faced by different actors are inter-connected, e.g. knowledge uncertainties for emergency actors (e.g. how serious is the accident?) may be decision uncertainties for citizens (e.g. shelter or self-evacuate?). Non-experts face different uncertainties than experts, e.g. what to do in case of an accident, how will they be informed, how to protect their family, impact on society and family life in affected areas, contradictory or delayed information, perceived lack of transparency.

Emergency and recovery plans should take into account the needs and concerns of affected people. Citizens may lack knowledge about protective measures (e.g. purpose and time of intake for stable iodine), may distrust their protective effectiveness or have specific difficulties to undertake those actions. Infrastructures should be set up supporting people's information before and after an accident. The memory of Fukushima and Chernobyl accidents is still present and defines people's mental models in relation to a nuclear accident. Most trusted communicators in an emergency were identified as national crisis centres, rescue services, research organisations, medical doctors, nuclear safety authorities.

Photo: SCK•CEN

Catrinel Turcanu

Advice was provided for identifying and addressing social uncertainties (Turcanu et al. 2020) and guidelines were formulated for efficient and effective communication about uncertainties in nuclear or radiological emergencies (Perko et al. 2020).

The concept of dignified living conditions was proposed as common objective for emergency & recovery managers and local actors confronted with the consequences of a nuclear accident. The impact of national policies was studied on the capacity of local actors to deal with uncertainties, for instance by carrying out their own measurements. Local actors (e.g. teachers, doctors) that may be in a favourable position to interact with affected people should be identified in the preparedness phase; these actors should be trained with relevant knowledge and communication skills.

WP5 provides evidence that sound communication, openness and transparency about uncertainties may contribute to better decisions.

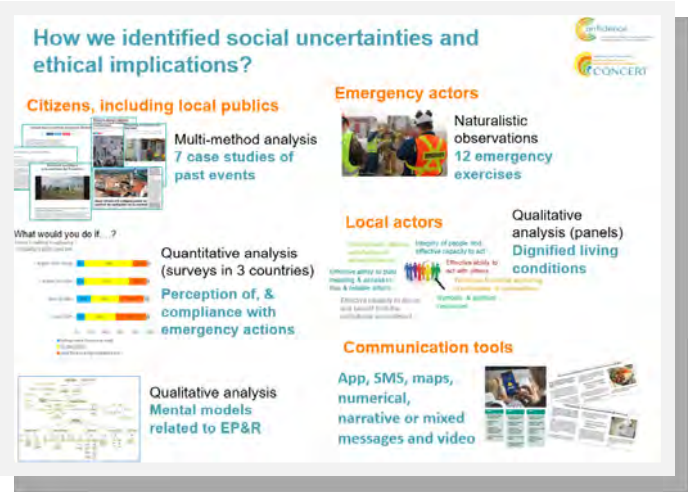

Photo: C. Turcanu/SCK•CEN

Summary of CONFIDENCE WP5 research

ID Card:

Keywords:
Nuclear emergencies, social uncertainties, dignified living conditions, communication

Work Package leader:
Catrinel Turcanu, SCK•CEN

Partners:
- SCK•CEN, Belgium
- MUTADIS, France
- EIMV, Slovenia
- NMBU/CERAD, Norway
- CIEMAT-CISOT, Spain
- EEAE, Greece
- DIALOGIK, Germany
- CEPN, France
- VUJE, Slovakia
- IST, Portugal
- JSI, Slovenia
- DSA, Norway

Duration:
36 months

WP budget:
762058€ with 373100€ EC contribution

Open Access of produced data:
On request

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Related to:
NERIS
Social Sciences and Humanities ALLIANCE

Social, ethical and communication aspects of uncertainty management, Turcanu C. et al. (2020), Radioprotection, vol 55 HS1
Guidance on communicating about uncertainties in nuclear emergency management, Perko T. et al. (2020), Radioprotection, vol 55 HS1
Societal uncertainties recognised in recent nuclear and radiological emergencies, Tomkiv Y. et al. (2020), Radioprotection, vol 55 HS1

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Decision making under uncertainties

Until lately decision support tools for nuclear emergencies have not considered uncertainty. The first goal of WP6 of CONFIDENCE aimed to improve such tools to handle uncertainty in input and output by introducing robustness indicators and new methods to process and visualise uncertainties. The second goal was to better understand the effects of uncertainty in collaborative decision making by simulating the process with agent based modelling.

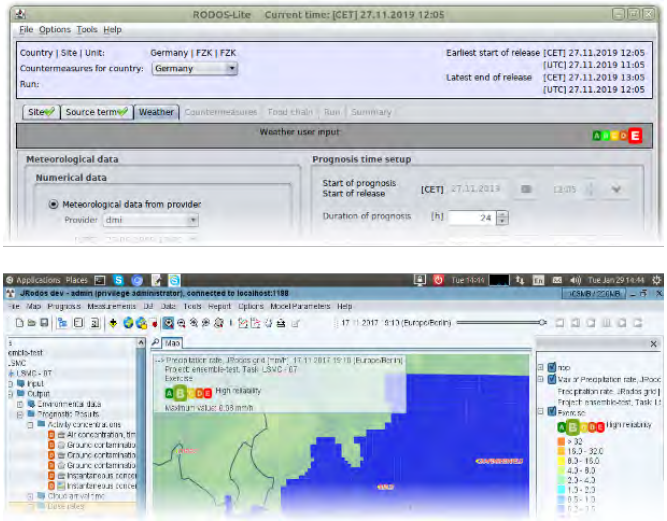

Photo: KIT

JRodos demonstrator of robustness indicators from A to E in weather forecast and results

Indicators for robustness should be simple and intuitively to understand. Several ideas on indicating the robustness of suggested strategies of a decision support system have been considered. Inspired by the French food nutri-score and the European Union energy consumption labelling, WP6 suggested 5 different classes of trust from best A to worst E. Accordingly the classes are also colour encoded. For demonstration purposes, this suggestion has been implemented in the decision support system JRodos for classifying the trust in source term and weather forecast.

JRodos was also enhanced to handle uncertainties in source term and weather by ensemble evaluation. For this a set of source terms is combined with a set of weather forecasts, each of them with possibly different likelihoods. The results of all combinations are merged according to their likelihood and type of result, e.g. equally likely evacuation maps can be merged cell-wise by simply counting the number of results exceeding the limit, normalising the values afterwards. Such a result is referred to as frequency map that indicates how likely a certain threshold will be exceeded in a cell.

Photo: IKIT

Tim Müller

The decision support tool based on multi criteria decision analysis (MCDA) was enhanced to process probabilistic instead of deterministic data. Based on this probabilistic MCDA an ensemble evaluation framework iteratively generates randomized deterministic MCDAs and aggregates their results to values like rank count, average ranking, outranking, etc. These results are communicated to the users as e.g. charts or textual summaries.

Collaborative decision making between stakeholders was simulated using agent based modelling (ABM). Several different types of stakeholders respectively agents and negotiation methods to model the interaction and workflow have been established. In a given scenario the agents assess different strategies and continue to negotiate with each other until they agree on one single strategy. The negotiation is visualised to follow the process interactively.

During stakeholder workshops the enhanced tools and new methods have been evaluated. The indicators and most types of maps were judged to be helpful for decision making. The MCDA tool was discussed in detail and approved to be very helpful, assuming that stakeholders are aware of the method and the meaning of parameters. The ABM was well received but because of its complexity it is unlikely to be used by the stakeholders directly.

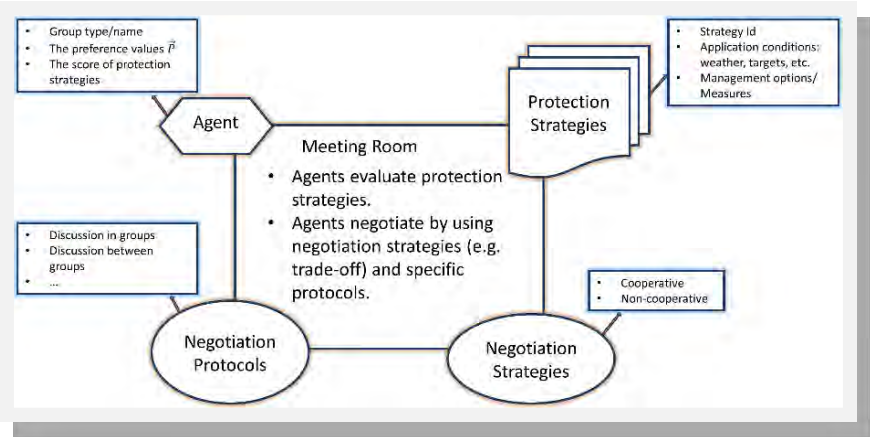

Photo: KIT

The structure for agent based modelling of collaborative decision making

ID Card:

Keywords:
Decision support, multi criteria decision analysis, agent based modelling, robustness indicators

Work Package leader:
Tim Müller,
Karlsruhe Institute of Technology (KIT)

Partners:
- NMBU, Norway
- DSA, Norway
- PHE, United Kingdom
- DTU, Denmark
- RIVM, The Netherlands
- SCK•CEN, Belgium
- UMIL, Italy
- VUJE, Slovakia
- UK Met Office, United Kingdom
- RIKILT, The Netherlands
- STUK, Finland

Duration:
36 months

WP budget:
Approx. 808196€ with 393780€ EC contribution

Infrastructures:
Models and tools:
MCDA tool

Contact:
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Related to:
NERIS
Social Sciences and Humanities

Dealing with uncertainties in multi criteria decision analysis, Raskob W., Müller T., in RICOMET 2018, http://ricomet2018.sckcen.be

Agent-based Negotiation Simulation, Bai S., Raskob W., in 5th NERIS workshop, https://www.eu-neris.net/activities/workshops/roskilde-2019.html

Education and Training

The objective was to develop training courses and educational material for professionals and students related to CONFIDENCE issues and activities and to disseminate the results in a form of a dissemination workshop and open access Journal.

The training course "Use of uncertain information by decision makers at the various levels within the decision making process and its communication" was developed, prepared and conducted at VUJE, Trnava, Slovak Republic, 13-15 May 2019 with 25 participants from 15 countries. The objective was to present guidance and recommendations for the decision making in the post release and transition phase taking into account uncertain information to be presented and tested. Training the trainers and facilitators of national, regional and local workshops was one of the goals.

Photo: T. Duranova/VUJE

Photos from A) CONFIDENCE training sessions; B) the CONFIDENCE Dissemination workshop

The workshop "Do process-based models have a role in human food chain assessments" took place on September 9-11, 2019 in Madrid (CIEMAT) with a range of 40 stakeholders. The aim of the workshop was to discuss soil-plant process-based models to gain opinion on if stakeholders saw benefit in process-based model use and development.

The CONFIDENCE course "Communication under uncertainty: Nuclear or radiological emergencies, radiation protection and other issues important to know for your (future) occupation" was designed to be applicable to a wide range of students and professionals, and can be adapted according to needs and background of the audience. Lectures followed by table-top exercises and round-table discussions have been performed in universities in Belgium (University of Antwerp, March 8, 2018), Spain (Universitat Pompeu Fabra, Barcelona, May 31, 2018 and Polytechnic University of Catalonia (UPC), Barcelona, June 1, 2018), Italy (University of Milan, March 25 and April 16, 2019 and University of Milan-Bicocca, October 12, 2019), Norway (Norwegian University of Life Sciences, summer 2019) and Slovak Republic (Academy of Police Force in Bratislava, October 22 and 29, November 19, 2019) and NEA/IRPS held at Stockholm University on August 2018.

Photo: T. Duranova/VUJE

Tatiana Duranova

The CONFIDENCE Dissemination Workshop took place on December 2-5, 2019 in Bratislava with participation of 90 experts. It was designed as interactive and dynamic meeting focusing on main achievements of the project. Results were communicated by oral presentations, posters, scenario based facilitated discussions, working in groups, round table discussions and panel discussions.

More than 30 articles (each with its own DOI) will become available in a special issue of the Radioprotection Journal, in HTML and in PDF format (website: http://www.radioprotection.org/). Papers are indexed at Google and Google Scholar and published in Open Access. Availability is envisaged for end of May 2020.

Photo: D. Oughton/NMBU

Training location in Norway

ID Card:

Keywords:
Education, training, workshop, stakeholders, dissemination

Work Package leader:
Tatiana Duranova, VUJE

Partners:
- KIT, Germany
- CEH, United Kingdom
- CEPN, France
- CIEMAT, Spain
- HMGU, Germany
- IRSN, France
- MUTADIS, France
- EEAE, Greece
- NMBU, Norway
- DSA, Norway
- SCK•CEN, Belgium
- STUK, Finland
- UMIL, Italy

Duration:
36 months

WP budget:
Approx. 274529€ with 153200€ EC contribution

Infrastructures:
Models and tools:
MCDA tool
JRODOS

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Related to:
NERIS
ALLIANCE
EURADOS
Social Sciences and Humanities

Education and training general approaches and actions of the NERIS Platform and CONFIDENCE project, Duranova T. et al. (2019), 4th ERPW, October 14-18, 2019, Stockholm, Sweden

Education and Training activities. Key results of the CONFIDENCE European research project, Duranova T. et al. (2020), Radioprotection, vol 55 HS1

AIR²

Access to INFRASTRUCTURES

Issue	Exposure platforms	Databases, Sample banks, Cohorts	Analytical platforms, Models & Tools
Published to date:			
Oct 2015, #1	FIGARO	FREDERICA	RENEB
Nov 2015, #2	B3, Animal Contamination Facility	The Wismut Cohort and Biobank	The Hungarian Genomics Research Network
Dec 2015, #3	Pulex Cosmic Silence	STORE	METABOHUB
Feb 2016, #4	SNAKE	French Haemangioma Cohort and Biobank	Dose Estimate, CABAS, NETA
Mar 2016, #5	Radon exposure chamber	3-Generations exposure study	PROFI
Apr 2016, #6	Biological Irradiation Facility	Wildlife TransferDatabase	Radiobiology and immunology platform (CTU-FBME)
May2016, #7	CIRIL	Portuguese Tinea Capitis Cohort	LDRadStatsNet
Jun 2016, #8	Mixed alpha and X-ray exposure facility	Elfe Cohort	ERICA Tool
Jul 2016, #9	SCRS-GIG	RES³T	CROM-8
Sep 2016, #10	Facility radionuclides availability, transfer and migration	INWORKS cohort	France Génomique
Oct 2016 #11	LIBIS gamma low dose rate facility ISS	JANUS	Transcriptomics platform SCKCEN
Nov 2016, #12	Microtron laboratory	EPI-CT Scan cohort	CATI
Dec 2016, #13	Nanoparticle Inhalation Facility	UEF Biobanking	The Analytical Platform of the PREPARE project
Feb 2017, #14	Infrastructure for retrospective radon & thoron dosimetry	Chernobyl Tissue Bank	HZDR Radioanalytical Laboratories
Special Issue 1	1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES	1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES	1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES
Mar 2017, #15	Alpha Particles Irradiator Calibration Laboratory at KIT		SYMBIOSE
Apr 2017, #16	Changing Dose rate (SU) Low dose rate (SU)		Advanced Technologies Network Center
May 2017, #17	Chernobyl Exclusion Zone	Chernobyl clean-up workers from Latvia	BfS whole and partial body Counting
Jun 2017, #18	MELAF	Belgian Soil Collection	INFRAFONTIER
Jul 2017, #19	MICADO'LAB	Estchern Cohort	ECORITME
Sep 2017, #20	DOS NDS		CERES

Future events:

CONCERT Short Courses

24-28 February 2020
Emergency and recovery preparedness and response,
National Center of Radiobiology and Radiation Protection, Bulgaria
Contact:
Nina Chobanova

9-13 March 2020
Radiation Protection: Basics and Applications,
Forschungszentrum Jülich, Germany
Contact:
Ralf Kriehuber

15-29 March 2020
Monitoring strategies applied in NORM involving industries – evaluation of occupational exposure and environmental impact,
Central Mining Institute, Katowice, Poland
Contact:
Boguslav Michalik

16-27 March 2020
Health effects induced by radiation and space conditions,
SCK•CEN Mol, Belgium
Contact:
Sarah Baatout

30 March 2020
EU CONCERT Radiation Protection Research Projects and UK NIHR HPRU in Chemical and Radiation Threats and Hazards Medical Radiation Theme - Final Stakeholder Dissemination Meeting,
Newcastle, United Kingdom
Contact:
Liz Ainsbury

20 April-1 May 2020
Assessment of long-term radiological risks from environmental releases,
Technical University of Denmark, Risø Campus, Denmark
Contact:
Kasper Andersson

18-29 May 2020
Modelling radiation effects from initial physical events,
University of Pavia, Italy
Contact:
Andrea Ottolenghi

See also on CONCERT website

Editorial Committee: Maria Panagiotopoulou, Jean-Michel Dolo, Laure Sabatier

Special Issue 5
February 2020

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Access to INFRASTRUCTURES

Issue	Exposure platforms	Databases, Sample banks, Cohorts	Analytical platforms, Models & Tools
Published to date:			
Oct 2017, #21	CALLAB Radon Calibration Laboratory		CORIF
Nov 2017, #22	Calibration and Dosimetry Laboratory (INTE-UPC)	German airline crew cohort	Centre for Omic Sciences (COS)
Dec 2017, #23	NMG	Techa River Cohort (TRC)	iGE3
Special Issue 2	MEDIRAD	MEDIRAD	MEDIRAD
Feb 2018, #24	UNIPI-AmBe	Greek interventional cardiologists cohort	SNAP
Special Issue 3	2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS	2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS	2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS
Mar 2018, #25	IRRAD	MARiS	BIANCA
Apr 2018, #26	Forest observatory site in Yamakiya	BBM	OEDIPE
May 2018, #27	Belgian NORM Observatory Site	The German Thorotrast Cohort Study	VIB Proteomics Core
Jun 2018, #28	CERF	Mayak PA worker cohort	Geant4-DNA
Jul 2018, #29	TIFPA	RHRTR	D-DAT
Sep 2018, #30	HIT	The TRACY cohort	COOLER
Oct 2018, #31	PTB Microbeam	The BRIDE platform	BRENDA
Nov 2018, #32	AGOR Facility at KVI-CART LNK		MARS beamline at SOLEIL
Dec 2018, #33	PARISII	The ISIBELa cohort	CIEMAT WBC
Feb 2019, #34	The MIRCOM microbeam	The ISE cohort	EFFTRAN
Special Issue 4	NSRL	LSAH & LSDA	GeneLab
Mar 2019, #35	IRSE Experimental Farm	The MWF database	DSA Environmental Laboratory
Apr 2019, #36	PG stack at Barreiro, Portugal	CONSTANCES	The MCDA Tool
May 2019, #37	LERF	IMMO-LDRT01 cohort	Radiochemical and Radioactive Analysis Laboratory (INTE-UPC)
Jun 2019, #38	FAIR	The BACCARAT study	CIEMAT *In Vitro* Internal Dosimetry Laboratories
Jul 2019, #39	AMBIC	LSS	LRM
Sep 2019, #40	FRM II	REQUITE	TU Dublin Analytical Platform
Special Issue 5	CONFIDENCE	CONFIDENCE	CONFIDENCE

Future events:

Other Events

19-24 April 2020
ICRER: 5th International Conference on Radioecology & Environmental Radioactivity, Amsterdam, The Netherlands

19-24 April 2020
IM2020: International Conference on Individual Monitoring, Budapest, Hungary

5-8 May 2020
1st ISORED scientific and organisation meeting, Sitges, Spain

27-29 May 2020
6th NERIS workshop: Operational and research achievements and needs to further strengthen preparedness in emergency management, recovery and response, Barcelona, Spain

28 September-2 October 2020
ERPW2020: European Radiation Protection Week 2020, Estoril, Portugal
Deadline for abstract submission: 31st March 2020

Editorial Committee: Maria Panagiotopoulou, Jean-Michel Dolo, Laure Sabatier

Special Issue 5
February 2020