Processes and environmental factors influencing the water- and solid-mediated fluxes of radionuclides from source to ocean

Improving the environmental impact assessment and management considering temporal and spatial issues

Scene setting

rodolphe.gilbin@irsn.fr - www.er-alliance.org

Munich, hosted by BfS – 28-29 March, 2018

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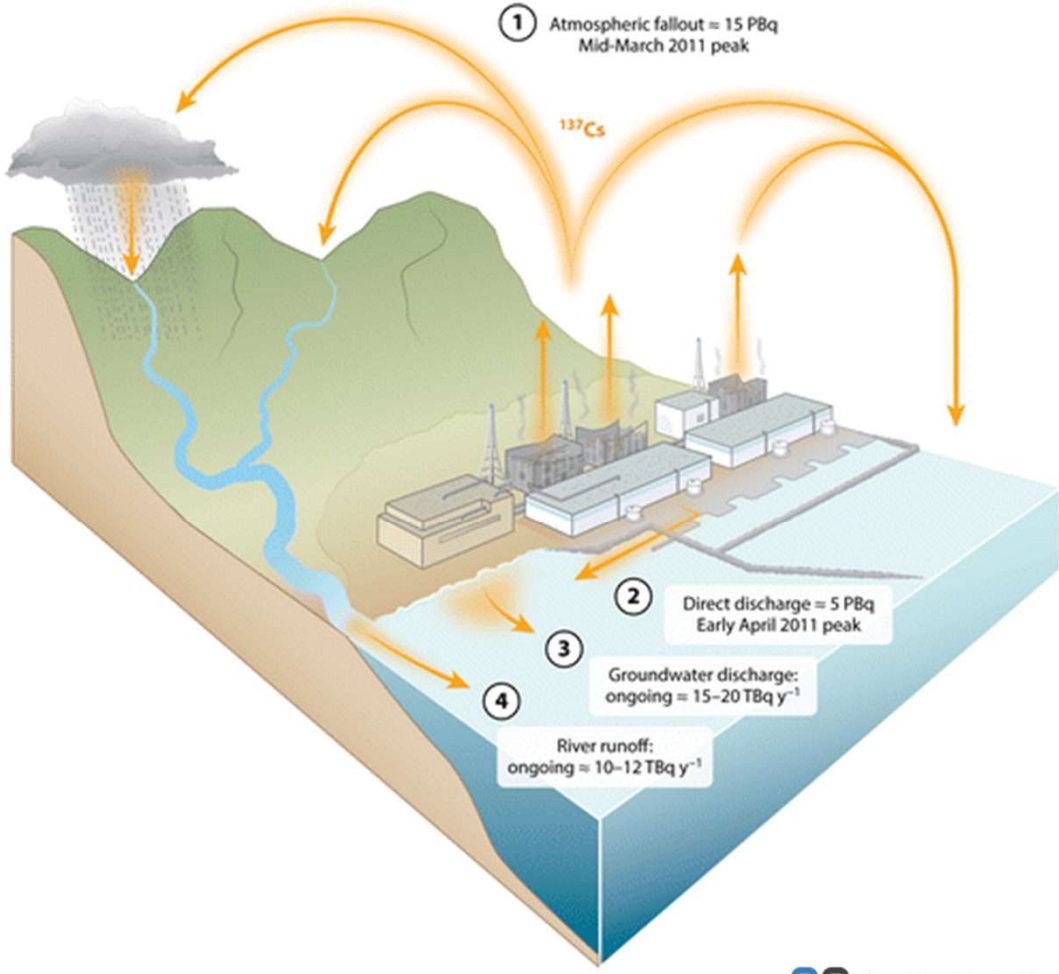
Context – diagnostic after the Fukushima accident
Limits of operational models have been evidenced

Needs:

- Improving the **understanding of elementary processes** (and *in fine* their modelling)
- **Increase the realism** by taking into account
  - **spatial and temproal heterogeneity** of RN distribution and of exposure
  - interactions at the various **interfaces**
- **Increase the predictive capability** of models for radiological risk assessment



Buesseler K, et al. 2017.
Annu. Rev. Mar. Sci. 9:173–203

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Beyond "fukushima-type" scenario

Exposure following a wide range of accident/ incident

(Concert D3.4 First joint roadmap draft – Scenario 6)

- Includes **all types of incidents or accidents** in nuclear installations, transport of nuclear material, military installations and operations,…
- The impact might **range from local to worldwide** and is not limited to individual health effects but may affect the environment as well as economic and social activities
- The timescales may range **from days to decades or longer**

➔ Preparedness, **supporting scientific tools** and engagement of all relevant stakeholders are some of the necessary scientific input to deal with the consequences and mitigate them as much as possible.

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What are the research needs?

Research needs for the development of **integrated and operational tools** (in support to the risk & environmental impact assessment and decision-making in case of an accident/incident)

« integrated »

multi-media (and their interfaces)

multi-processes (physical, chemical, biological)

multi-disciplinary

multi-spatial (from local to global)

multi-time (short-, long-term remobilization)

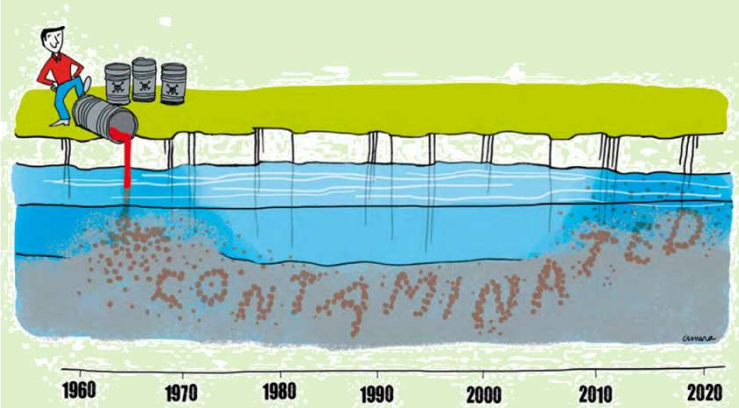
multi-endpoint (human health, ecosystem function and services, economy, societal…)

« operational »

based on realistic data

validated through comparison with observations

" Remediation and protection measures need to be integrated into river basin management plans.



European Sediment Network

We need better understanding of the underlying processes of remobilization, phase transfer, availability of contaminants and their transport."

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joint ALLIANCE+NERIS R&D challenges
(Concert D3.4 First joint roadmap draft – Challenges)

Integration and optimization of environmental exposure assessment for ionising radiation and other stressors

- **Mechanistic understanding of RNs dispersion and transfer processes** in and between the various components of the geosphere, biosphere and atmosphere, and associated mechanistic process-based modelling including foodwebs and biokinetics modelling
- **Modelling of process interactions** at the various biosphere interfaces at the local, regional and global scales
  - **watershed continuum** from the source to the ocean (freshwater, estuarine, brackish, marine)
  - **landscape-based models** in terrestrial ecosystems (agricultural, forest, natural, urban)
- **Remediation and countermeasure strategies** in support of the management of radiocontaminated sites (multi-criteria decision support approaches)

Optimising emergency and recovery preparedness and response

- **Customisation of models** (atmospheric, river, marine, brackish water, terrestrial and urban dispersion models, food chain models and dose assessment models)
- **Improvement of monitoring** of the different environmental compartments, foods and goods
  Includes the combination with modelling (data assimilation) to improve dose reconstruction and predictions of the impact of an accident

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Session 1

- Integrated watershed approach in support of environmental impact assessment including remediation (AMORAD French project) - **Olivier Evrard (LSCE, France)**
- Source-sink modelling for non-radioactive pollutants - **Nick Beresford (NERC-CEH, UK)**
- Relevant activities in the CONFIDENCE project- **Nick Beresford (NERC-CEH, UK)**
- inland rivers-sea continuum - **Fabricio Fiengo Perez (SCK•CEN, Belgium)**
- Application of countermeasures in freshwater ecosystems - **Jim Smith (UoP, UK)**
- Urban hydrology - **TBC**
- Hydrological model chain the JRODOS Decision Support System - Wolfgan**g Raskov (KIT, Germany)**
- Modelling of suspended riverine sediment fluxes at global, regional and locals scales: major controls, anthropogenic perturbations and associated pollutant fluxes from land to sea - **Wolfgang Ludwig (CEFREM, France)**
- The Rhone sediment observatory : evaluation and communication on the fluxes of particulate contaminants at the basin scale - **Olivier Radakovitch (IRSN, France)**