



EUROPEAN RADIOECOLOGY ALLIANCE

The European Radioecology Alliance: Facing Challenges for Radioecology through its SRA and Roadmap

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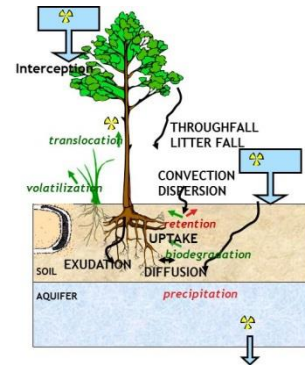
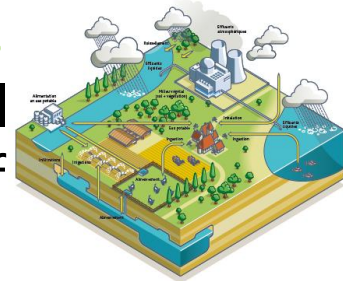
On behalf of the Alliance

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Ch1 Predict human & wildlife exposure in a robust way by quantifying key processes that influence radionuclide transfers & exposure

1. Identify and mathematically represent key processes that make significant contributions to environmental transfers of radionuclides and resultant exposures of humans & wildlife
2. Acquire the data necessary for parameterisation of key processes controlling the transfer of radionuclides
3. Develop transfer and exposure models that incorporate physical, chemical and biological interactions, and enable predictions to be made spatially and temporally
4. Represent radionuclide transfer and exposure at landscape or global environmental level and indication of associated uncertainty



NERIS
EURADOS

NERIS

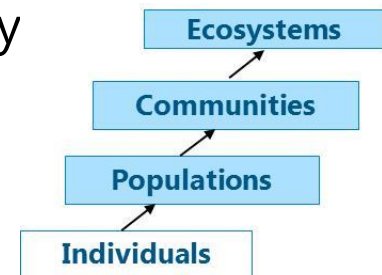
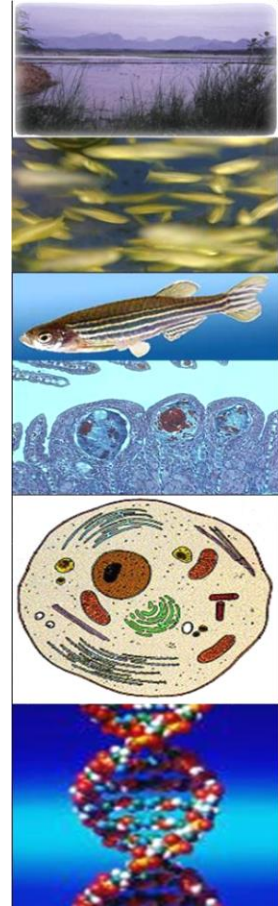
NERIS
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Ch2 Determine ecological consequences under realistic exposure conditions

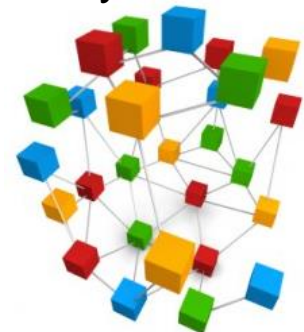


1. Establish processes link radiation induced effects in wildlife from molecular to individual levels of biological complexity
2. Determine what causes intraspecies and interspecies differences in radiosensitivity
3. Understand the interactions between ionising radiation effects and other co-stressors
4. Identify the mechanisms underlying multigenerational responses to long-term ecologically relevant exposures
5. Understand how radiation effects combine at higher levels of biological organisation (population dynamics, trophic interactions, indirect effects at the community level, and consequences for ecosystem functioning)



Ch3 Improve human and environmental protection by integrating radioecology

- NERIS 1. Integrate uncertainty and variability from transfer modelling, exposure assessment, and effects characterisation into risk characterisation
- NERIS 2. Integrate human and environmental protection frameworks
- NERIS 3. Integrate risk assessment frameworks for ionising radiation and chemicals

- NERIS 4. Provide a multi-criteria perspective in support of optimised decision making
- 5. Integrate ecosystem services, ecological economics and ecosystem approaches within radioecology
- NERIS 6. Integrate decision support systems



ALLIANCE develops roadmap with COMET

- **Strategy**
 - Underpinning science for an enhanced basis for fit-for-purpose human and environmental impact assessment by mechanistic modelling, improved parametrization, improved databases
- **5-year roadmap and implementation plan**
 - Initiate a limited number of research activities that have been identified as priority in the radioecology SRA
- **Scoping**
 - Focus should extend from basic science (mechanistic understanding) to application to improve radiation protection and communication with society
 - Research proposed should interlink the different Challenges presented in the SRA. Aspects from Challenge 3 should always be considered.
 - Prioritising research topics of radioecology within the roadmap also to areas relevant for post-emergency management and low-dose effect research to provide a powerful catalyst to further develop collaboration between the four platforms of radiation protection, ALLIANCE, NERIS, MELODI and EURADOS.
- **Criteria for research prioritization**
 - Impact
 - Feasibility
 - Relevance → Problem solving
 - Public perception
 - Good science=novel
 - Links with NERIS, MELODI, EURADOS

Translation of overall strategy in challenge-related approach and expected outcome

- For Challenge 1

- Approach: Improve human and environmental dose and impact assessment by mechanistic/process-based modelling of environmental transfer and exposure in the biosphere
- Expected outcome: Fit-for-purpose environmental models to support human and wildlife impact assessment and risk management

- For Challenge 2

- Approach: Unravel causes and mechanisms of radiation induced effects in wildlife from molecular to individual levels up to populations.
- Expected outcome: Knowing causes of biological effects to detect early damages and to protect populations

- For Challenge 3

- Approach: Improve risk characterisation by better quantification of uncertainty and variability of exposure and effects.
- Expected outcome: An integrated approach to enhanced risk characterisation and communication (connecting science, economy & society)

Topical roadmaps

• Atmosphere transfer processes

- Enhance understanding of transfer processes of radioactive aerosols to soil and biota
- Contribution of fog and snow events in transfer models.
- Investigate secondary emission mechanisms

• Human food chain

- Improve quality and completeness of radiological parameters
- Incorporate the “human-environment” into models, including the region-specific parameterisation
- Optimise model complexity

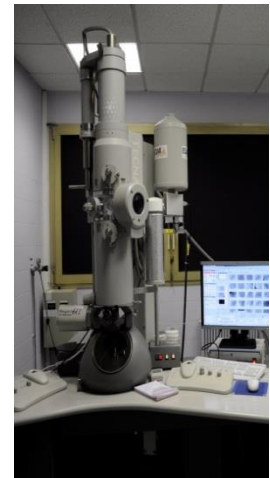
• Marine radioecology

- Improve knowledge on transfer processes for marine organisms and on marine transfers in non-equilibrium situation.
- Consolidate/develop prediction tools to model transport, transfers and radiation exposure for man and marine wildlife
- Provide dynamic models incorporating spatial and temporal processes



Topical roadmaps

- **Naturally Occurring Radioactive Materials (NORM)**
 - Identify and understand the key processes relevant for radionuclide transfer under NORM site conditions
 - Develop/test tools to assess radionuclides migration in environment, their transfer into biota & human food chain
 - Optimization of remedial options or methods preventing radionuclide transfer
- **Transgenerational effects of exposure to radiation**
 - Understand contribution of genetic and epigenetic changes to propagation of effects through generations
 - Determine the molecular basis of resistance/vulnerability gained through generations



Intra- & inter-species differences in radiosensitivity

- Elucidate mechanisms explaining inter- and intra-species sensitivity
- Identify specific molecular or cellular fingerprints as biomarkers of radiosensitivity
- Implement powerful meta-analysis among species and exposure conditions

Next phase

- Global objectives defined, next phase under development: roadmap should not be driven by what the participating organisations can do!
- Broad objectives should be clearly defined
 - What are the needs that drive us to these objectives?
 - What key-questions do we want to reply to?
 - Why do we need this given objective?
 - In defining the objectives, the link with SRA should be made clear and the broader/applied picture should not be overlooked, nor the potential interaction with NERIS, MELODI, EURADOS.
- We should identify the sub-objectives and needs and sub-questions we want to have an answer to and why these are important to achieve the overall objectives/needs.
- What do we need to do achieve the objectives?
 - Contributors
 - Own/external funding