Welcome and Overview of MODARIA II Programme

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MODARIA II Programme: objective

• … to improve capabilities in the field of environmental transfer of radionuclides and public and non-human biota exposures assessment, by means of acquisition of improved data for model testing, comparison, reaching consensus on modelling philosophies, approaches and parameter values, development of improved methods and exchange of information.
MODARIA II Programme: applications

- Prospective and retrospective assessments used for protection of people and the environment.
- National and international regulatory frameworks.
- Consistent with and useful for the application of IAEA Safety Standards.
MODARIA II Programme

• Successor of a series of programmes initiated in 1985 (BIOMOVS I & II, VAMP, BIOMASS, EMRAS I & II, MODARIA I)

• Run for 3 years from, 2016 to 2019; Annual Technical Meetings, Interim Meetings.
  • ~135 participants from 43 Member States.
  • First time for some Member States and participants.

• 7 Working Groups + Subgroups.

• Participants from: Universities, Laboratories, Technical Support Organizations, Regulators, Operators, Consultancy Services, Governmental org. and private companies.
Working Groups

MODARIA II
IAEA Programme on MOdels and DAta for Radiological Impact Assessment
(2016–2019)
MODARIA II Programme: WGs

- **1**, Assessment and Decision Making of Existing Exposure Situations for NORM and Nuclear Legacy Sites (Ming Zhu, Tamara Yankovich)
- **2**, Assessment of Exposures and Countermeasures in Urban Environments (Kathleen Thiessen, Tamara Yankovich)
- **3**, Assessments and Control of Exposures to the Public and Biota for Planned Releases to the Environment (Juan Carlos Mora, Diego Telleria)
- **4**, Transfer Processes and Data for Radiological Impact Assessment (Brenda Howard, Gaby Voigt, John Twining, Andra Iurian, Alexander Ulanovsky)
- **5**, Exposure and Effects to Biota (Nick Beresford, Jordi Vives, Frédéric Alonzo, Diego Telleria)
- **6**, Biosphere Modelling for Long Term Safety Assessments of High Level Waste Disposal Facilities (Tobias Lindborg, Andrey Guscov)
- **7**, Assessment of Fate and Transport of Radionuclides Released in the Marine Environment (Raul Perianez, Paul McGinnity)

**Chair**: Tiberio Cabianca
Focus of Technical Meeting

• Complete and review work of the Working Groups
• Develop final reports
• Schedule high quality outputs to be published by IAEA (+ possible Special Issue of JRP – see later)

• Discuss ideas for the future programme:
  • Important to align with wider safety objectives of IAEA and consider cross-cutting topics + continuing to respond to changing concerns of Member States
  • Opportunities this week to input ideas and suggestions for the next programme
Publishing work of MODARIA

- Very important to IAEA
- Guidance and information for Member States
- Outstanding reports from earlier programmes
  - Find effective ways to get work published
  - Make best use of experience and numbers of participants to assist WG Leaders
2020?

- Consolidation of work and publications
- Planning for next programme 2021-
  - Further discussions over coming months with range of interested parties + questionnaire
Introductory Slides to MODARIA II Working Groups

MODARIA II TM, 21–24 October 2019
WG 1: Assessment and Decision Making of Existing Exposure Situations for NORM & Nuclear Legacy Sites

- **Focus** on risk-informed decision analysis with stakeholder engagement:
  - Approaches
  - Toolsets
- **Demonstration** through Case Studies of representative NORM and legacy sites
- Technical exchange and **Leveraging** to maximize impact on mission work
- **Training** to raise the standard for practice and gain acceptance of desired outcomes

**Status and Remaining Work**

- **Framework developed for** risk-informed decision analysis with stakeholder engagement
- **Modeling analysis is near completion** for Case Studies
- **Key chapters of the WG1 report are prepared** to document methodologies and Case Studies
- Collaborative efforts and **Training ongoing**
- Work planned to **complete the WG1 report in 2020**
- Ideas are being collected for the future MODARIA programme

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**IAEA**

**WG1 IAEA Scientific Secretary:** Tamara Yankovich (T.Yankovich@iaea.org)

**WG1 Group Leader:** Ming Zhu (US DOE) (Ming.Zhu@em.doe.gov)
Objective: To test and improve the capabilities of models used in the assessment of radioactive contamination in urban environments

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| Monday    | Short-range atmospheric dispersion  
Urban scenarios  
Boletice exercise |
| Tuesday   | Contaminant transport from external locations  
Chalk River (Ar-41) exercise  
Šoštanj exercise (Case 3)  
Šoštanj exercise (forecast modelling)  
Southeast Asia benchmark modelling |
| Wednesday | Urban contamination exercise--Fukushima  
Dirty bomb simulations for airports  
Report preparation, status and plans |
Working Group 3: Assessments and control of exposures to public and biota for planned releases to the environment
1. Develop a practical approach, based in ICRP and IAEA guidance, to perform dose assessments on biota for routine discharges. The final aim is to perform integrated dose assessments on humans and biota by using the same dispersal models.

2. Compile information on national and international regulation.

3. Look for codes available to perform dose assessments on biota.

4. Develop specific scenarios (source terms and environmental data around nuclear installations).

5. Perform dose assessments on biota (Intercomparison).

6. Provide recommendations to the IAEA.

Submitted Summer 2019
Working Group 4: Transfer Processes and Data for Radiological Impact Assessment

Subgroup 1: Distribution coefficient - $K_d$
- identification of user needs for $K_d$ database, discuss how to report $K_d$ values for terrestrial, freshwater and marine systems in combined MODARIA I and II report, presentations of new $K_d$ data

Sub group 2 Fukushima TECDOC
- Compilation of transfer parameter data compiled after the Fukushima accident in Japan – review of main findings and conclusions

Sub group 3 Non temperate systems
- discussion and analysis of the arid/semi-arid and tropical TF datasets and the final report
Working Group 5: Biota exposures modelling

- Objectives:
  - Demonstrate fit for purpose regulatory models
  - Validate, test, improve models for different applications
  - Good practice guidance

- Animal – environment exposure spatial modelling

- Lessons learnt paper
  - Capabilities of openly available models
  - Parameter values
  - Dosimetry/voxels/geometries - organisms
  - Coping with heterogeneous media distributions
  - Radionuclide specific issues (decay series, Ar, Kr etc.)
  - How to sample/analyse for wildlife assessment
  - Extending allometric capabilities

Reindeer exercise
Lessons learnt paper
Soil contamination in home ranges
Moose scenario
**Working Group 5: Biota effects modelling**

- Objective: apply population models for biota to evaluate the robustness of current protection system for biota.
- Learn from these applications, particularly regarding spatial and ecological issues.
- Identify new experimental evidence on the historic effects of radiation in biota.
- Compare population modelling approach for radiation with the approach used for chemicals regulation.
- Provide guidance on the use of population models in evaluating regulatory benchmarks.
- Guidance understood as a set of recommendations, not a guide to replace international guidance, standards or benchmarks.

New population model for Chernobyl field voles

- Review data on effects of historical doses
- Reviewing chemical toxicity models
- Production of journal publications
Objectives: to evaluate, update and clarify the BIOMASS-6 methodology, and deliver a report that:

- Describes the biosphere assessment strategy and its links to the overall safety assessment,
- uses the lessons learned since 2001, including from the BIOPROTA program,
- describes supporting information/models needed for dose modelling,
- extends consideration to a wider range of geographical environments,
- assesses and incorporates latest science that supports dose assessment concept and modelling,
- describes how site understanding functions as basis for model development,
- links landscape and environmental change (MODARIA I) to dose modelling.
Working Group 7: Assessment of Fate and Transport of Radionuclides Released in the Marine Environment

- Transport and fate of radionuclides released into the sea:
  - Fukushima accident releases and historical releases from European reprocessing facilities (Sellafiled, La Hague):
    - Long-term (up to 50 year) simulations for 137-Cs
    - Oceanic scale
    - Biota uptake models integrated within transport models
  - Generic NPP scenario in the Atlantic Coast of the US (WG3):
    - Blind model comparisons
    - Local-scale one-year simulations
    - 12 radionuclides considered

- Description of water/sediment interactions and use of $k_d$s
  - The use of equilibrium and kinetic models
  - 1-step vs. 2-step kinetic model comparisons
  - Single-layer vs. layered sediment model comparisons
  - Handling changing environmental conditions (salinity, pH)

- Testing numerical schemes in Lagrangian models
  - Interpolation numerical schemes
  - Model output sensitivity to grid resolution