Overview of IAEA MODARIA II Working Group 1

Tamara Yankovich, Ph.D.
International Atomic Energy Agency

Ming Zhu, Ph.D., PE, PMP
U.S. Department of Energy, Office of Environmental Management

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Objectives of IAEA Model Validation Programs

To improve capabilities in the field of environmental dose assessment by means of acquisition of improved data for:

- Model testing and comparison
- Reaching consensus on modeling philosophies
- Sharing of approaches and parameter values
- Development of improved methods
- Information exchange
Past International Model Validation Programmes:

• **VAMP: Validation of Model Predictions (1988-1996)**
  - Mainly scenarios from Chernobyl release
  - Transfer data collection

• **BIOMOVVS: BIOspheric Model Validation Study, with SSI, Sweden, 1991-1996**
  - short- and long-term releases
  - power reactors, solid waste disposal repositories, uranium mill tailings

• **BIOMASS (1996-2001)**
  - Chernobyl scenarios
  - Environmental clean-up
  - Long-term environmental impact of waste disposal: *Reference biospheres*

• **EMRAS (2003-2007)**
  - Scenarios from routine and accident situations
  - Transfer data review and update
  - Biota model testing and comparison

• **EMRAS II (2009-2011)**
  - Continuation of EMRAS

• **MODARIA (MOdelling and DAta for Radiological Impact Assessments, 2012-2015)**
MODARIA II: Working Groups

- **Working Group 1** - Assessment and Decision Making of Existing Exposure Situations for NORM and Nuclear Legacy Sites
- **Working Group 2** - Assessment of Exposures and Countermeasures in Urban Environments
- **Working Group 3** - Assessments and Control of Exposures to the Public and Biota for Planned Releases to the Environment
- **Working Group 4** - Transfer Processes and Data for Radiological Impact Assessment
- **Working Group 5** - Exposure and Effects to Biota
- **Working Group 6** - Biosphere Modelling for Long Term Safety Assessments of High Level Waste Disposal Facilities
- **Working Group 7** - Assessment of Fate and Transport of Radionuclides Released in the Marine Environment

**MODARIA II WG1 will further strengthen the linkage between mathematical modelling and decision-aiding tools.**
MODARIA II Working Group 1
Member State Participation

77 MEMBERS FROM 31 MEMBER STATES & IAEA

United Kingdom, 17, 22%
United States, 8, 10%

Grand Total: 77

MODARIA II WG1 was established in late October 2016.
Work Scope:

WG 1: Assessment and Decision Making of Existing Exposure Situations for NORM and Nuclear Legacy Sites

- **WG Leader:** Ming Zhu (USA)
- **IAEA Scientific Secretary:** Tamara Yankovich
- **Methods and tools for radiological impact assessments** and application to specific situations
- Methodologies for **decision analyses for remediation and closure** of NORM and legacy sites
- **Communication** and **engagement** with relevant interested parties
- **Training** for end users for the use of the relevant software
MODARIA II WG1 is a combination of 2 MODARIA I Working Groups:

– one focused on application of decision-aiding tools in remediation; and
– another focused on risk assessment for NORM and radioactively contaminated legacy sites.

MODARIA II WG1 is focused on:

– Developing methodologies and toolsets for risk-informed decision-making for NORM and nuclear legacy sites, including:
– Demonstration of decision-making processes and tools through case studies.
Assessment and Decision Making for Existing Exposure Scenarios of NORM and Legacy Waste Sites

- **Environmental Remediation**
  - Site characterization
  - Remedy selection
  - Remedial action
  - Post-remediation mgt.

- **In-Situ D&D/Site Closure**

- **Risk Assessment**

- **Decision Analysis**

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**Hanford Site Excavation of Cr-contaminated Soil**

**Typical NORM site remediation**

**Savannah River Site H Tank Farm**
Risk Assessment Tasks:

- Develop **improved methodologies** for radiological impact assessments
- Improve **assessment models**
- Conduct **model–model** and **model–data** comparisons
- **Apply methodologies** to existing sites and facilities
- Train **end-users** (regulators, operators, other stakeholders) on the use of NORMALYSA, RESRAD, and other codes
Decision Analyses Tasks:

- Document decision-making processes for **best practices** and **lessons learned**
- Develop lists of “**prevailing circumstances**” and site-specific situations
- Develop **methodologies** and **toolsets** for formalized decision analysis
Recent Activities and Accomplishments:

- **First Technical Meeting** of MODARIA II, Vienna, Austria, 31 October-4 November 2016.

- **WG1 First Interim Meeting**, Brussels, Belgium, June 26-30, 2017, including field trip to the Tessenderlo Chemie (TCH) phosphate processing Site.

- 2 sites were selected for **Case Studies**; An additional site will be evaluated in late 2017

- 2 additional sites were selected as **examples for sharing good practices and lessons learned**

- A **Work Plan** has been developed for 2017-2019

- An **Interim Report** is being prepared
MODARIA II WG1 Activities
Sites Selected for Case Studies:

Tessenderlo (TCH) Phosphate Processing Site
Belgium

Pridneprovsky Uranium Legacy Site
Ukraine
Tessenderlo (TCH) Phosphate Processing Site, Belgium

Site locations: The facilities (orange); sludge basin (dark blue); waste water buffer basin (light blue); landfill (green); out of operation (dashed); discharge points to the rivers (yellow)

Sludge pond at the Kepkensberg site

Ra-226 contamination in the Winterbeek River
Pridneprovsky Uranium Legacy Site, Ukraine

Location of Zapadnoe tailings

Distribution of Rn-222 flux (mBq/m²/s) from the surface of Zapadnoe tailings in September 2009
Material Disposal Area B
Los Alamos National Laboratory
USA

Beaverlodge Mine/Mill Site
Canada
Material Disposal Area B - Los Alamos National Laboratory, USA

Site layout

Distribution of Pu concentrations from samples

A clean-up area at LANL MDA B
Beaverlodge Mine/Mill Site Closure

Beaverlodge Mine/Mill in 1983

Modeling Non-Human Biota

Assess Information  Assess Risk  Assess Options  Implement & Monitor Options  Apply for Release

Management Framework

2012 Remediation Options Workshop
A Work Plan has been developed, including:

- Literature review, data analysis, model-model/data comparisons, and documentation activities for 2017-2019
- Demonstration of use of Guided Interactive Statistical Decision Tools (GiSdT) for stakeholder-engaged structured decision-making at the MODARIA II 2nd Technical Meeting, October 30-November 3, 2017
- Presentations at international conferences (e.g., NRPA International Workshop; WM2018)
- Preparation of an Interim Report due to IAEA by October 2018; Final Report due October 2019.
Collaborations/Leveraging:

• Within *MODARIA II*:
  ➢ WG 5: Joint session in June 2017; biota modeling
  ➢ WG 3: Human-biota modeling
  ➢ WG 2: Urban scenarios; joint meeting at 2nd TM
  ➢ WG 6: FEPs list

• Within the IAEA:
  ➢ RICOMET, CIDER, ENVIRONET
  ➢ ICRP Task Groups 98 and 105

• External:
  ➢ P&RA CoP
  ➢ ICEMM
  ➢ ASCEM
  ➢ ERAD
Positive Feedback Loops and Leveraging:

Needs

- Member States
- Needs for Tools, Parameter Values, Capacity-building

Tool Development and Testing

- VAMP
- BIOMOVS
- BIOMASS
- EMRAS
- EMRAS II
- MODARIA
- MODARIA II
- etc.

Outcomes

- Knowledge sharing
- Linkages with other networks
- New ideas
- Gap filling
- New knowledge and new tools

IAEA
Positive Feedback Loops and Leveraging:

Outcomes from Tool Testing and Development:
- Knowledge sharing
- Linkages with other networks
- New ideas
- Gap filling
- New knowledge and new tools

Development of Safety Guidance

Application of Guidance to Develop New Tools

Positive Feedback

Development of New Methodologies and Tools, and Improvement of Existing Tools

NORMALYSA, RESRAD, etc.
Further information on MODARIA II WG1 and other IAEA International Model Validation Programmes:

Thank You!

t.yankovich@iaea.org
Ming.Zhu@em.doe.gov