WG 3 – Norm and legacy sites

Application of models for assessing radiological impacts arising from NORM and radioactively contaminated legacy sites to support the management of remediation

Rodolfo Avila
Tasks

• Task 1 – Methodology for risk/safety assessment in support to remediation
• Task 2 – Development of the Normalysa modelling platform
• Task 3 – Model-model and model-data comparison studies
Goal for this meeting
Finalisation of Reports

Case Studies
Assessment Tool
Methodology
Task 1

• Developed a methodology for risk/safety assessment in support to remediation of sites impacted with NORM and other radionuclides

ADAPTED EXISTING METODOLOGIES

– ISAM methodology for safety assessment of disposal facilities
– The methodology developed in the EMRAS II Program
Scope of the methodology

- **Imminent Risk**
  - Workers
  - Public
  - EMRAS II Assessment Methodology

- **Risk of Remedial Actions**
  - Workers
  - Public
  - EMRAS II Remedial Action Methodology

- **End State Risk**
  - Public
  - IAEA Safety Assessment Methodology

**Is Action Needed?**

**What Risks Does the Action Produce?**
- Operational
- Long Term

**Is the Selected Action Adequate?**
Assessment Framework to support different decisions for remediation of a legacy site
Steps of the methodology

- Scenario Development and Justification
  - Definition of Assessment Context
    - Regulatory Framework
    - Technical Basis of Assessment
    - Assessment Philosophy
  - Interpretation of Assessment Results
    - Interpretation of assessment results in terms of assessment context
    - Evaluate reasonable level of assurance
    - Management of uncertainties
    - Application of management system
- Exposure Conditions Development
  - Source-Pathway-Receptor Analysis
  - Exposure Condition Definition
- System Level Model Development
  - Conceptual Model
    - Define Safety Functions
    - Description
    - Interaction Matrix
  - Computer Model
    - Implement in appropriate software
  - Mathematical Model
- Consequence Analysis
  - Source Term → Transport → Receptor → Dose
  - Uncertainty and Sensitivity Analysis
- Interpretation of Assessment Results
  - Interpretation of assessment results in terms of assessment context
  - Evaluate reasonable level of assurance
  - Management of uncertainties
  - Application of management system
- Review and Modify
  - Effective to Improve Assessment Components
  - Is adequate information available to make decision?
    - Yes
      - Acceptance
      - Make Decision
    - No
      - Rejection
      - Make Decision

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Goals for this meeting

• Review the methodology report
• Finalisation of the report
Task 2

- Development of a set of screening/scoping models and databases for integrated impact assessments that can be used in radiological impact assessments of radioactively contaminated lands, taking into account existing and potential future impacts on humans.
Models in Normalysa

SOURCE

TRANSPORT

RECEPTOR

DOSE

Tailings
Contaminated land
Cover

Atmospheric
Groundwater
Surface runoff

Land
Crop Land
Pasture Land
Forest
Lake/River
Well
Garden plot/fruit land
House
Marine Box

Infant
Child
Adult
Training Exercises

1. Dose calculations from environmental concentrations – monitoring results
2. Atmospheric pathway – radon exhalation from a uranium tailing and atmospheric transport to receptor.
3. Groundwater pathway – transport of radionuclides to a water well from an uncovered uranium tailing
Download Normalysa

You can download the Normalysa software from here:

http://project.facilia.se/normalysa/software.html
Goal for this meeting

• Finalise the model descriptions and other documentation

• Training event - Hands-on training

(Board Room A, Conference Building “M”, 2nd Floor)

Thursday 13:30 - 17:30
Task 3

- **Model–model and model–data comparisons:** For selected scenarios of relevance, model–model and model–data comparisons will be carried out.

  Three comprehensive Case Studies have been fully developed and reports have been prepared.
**Tessenderlo site (Belgien)**

Processing of phosphate ore for the production of dicalciumphosphate (contamination with Radium)
The tailings repository of Bellezane (France)

Two scenarios:

- Present conditions – contamination via groundwater – irrigation with well water
- Future conditions – Abandoned repository – a family builds a house above the tailings and establishes a garden plot on top of it
Pridneprovsky Uranium Legacy Site (Ukraine)
Legacy site with tailings and contaminated buildings
Goals for this meeting

• Compare results with Normalysa and other tools.
• Finalize report of comparisons results.