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 - Integration
Task 1

- Development of methodology for risk/safety assessment of NORM and legacy sites in Support to remediation

**ADAPT EXISTING METODOLOGIES**

- Application of the ISAM methodology for development of scenarios and conceptual models for different cases of relevance for safety assessment of NORM and legacy sites.

- Consider other existing applicable methodologies (EMRAS II)
For discussion during this TM

By combining and synthesizing the strengths of the two methodologies, the potential exists for MODARIA to develop an improved methodological approach.
Methodology for End State Risk Assessment

- Consist of seven interrelated steps
- Based on the ISAM Methodology
- Specific issues considered (FEP lists)
- Small conceptual variations have been introduced
# Table of Content of the methodology report

1. **Introduction**  
   (Environmental contamination by NORM, NORM Related industries, Legacy sites)

2. **Characterisation of NORM Facilities and contaminated sites**  
   (pre-mining baseline, natural background, site/facility characterisation for assessment)

3. **Overview of existing methodologies**  
   (EMRAS II, IAEA Safety Assessment methodology, Other)

4. **Assessment Framework for remediation of NORM contaminated sites**  
   (Assess need for remediation, Comparative assessment of alternatives, End State compliance assessment)
Table of Content of the methodology report

5. Assessment methodology for remediation of NORM contaminated sites
   (Assessment Context, System description, Scenario Development and Justification) – Features Events and Processes (FEP) list – Adaptation from IAEA Safety Assessment Methodology.

   Examples of typical scenarios for different types of situations

6. References

7. Appendices
   (Recent ICRP recommendations, etc)
Goals for this TM

- Finalize draft of the methodology document that can be submitted to review.
- Agree on the application for the three Case Studies
- Agree on other applications
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, flora and fauna.

**NORM And Legacy Sites Assessment**
Models in Normalysa

- **SOURCE**
  - Tailings
  - Tailing pond
  - Rock pile
  - Contaminated land
  - Cover

- **TRANSPORT**
  - Atmospheric
  - Groundwater
  - Surface runoff

- **RECEPTOR**
  - Land
  - Crop Land
  - Pasture Land
  - Forest
  - Lake/River
  - Well
  - Garden plot/fruit land
  - House

- **DOSE**
  - Infant
  - Child
  - Adult
Steps for doing an assessment

1. Setup assessment
2. Define model
3. Enter time series
4. Enter parameter values
5. Run simulation
6. Analyse results
7. Generate report
1. Setup assessment
2. Define model
2. Define model
3. Enter time series
4. Enter parameter values
5. Run simulation
6. Analyse results

![NORMALYSYA Interface]

- Context
- Model
- Options
- Inputs
- Parameters
- Simulation
- Charts
- Tables

[Graph: Tailing to GW time series, Conc out (Si-90)]

19 November 2014
Veronika Rensfeldt, Facilia AB
7. Generate report
Download Normalysa

You can download the Normalysa software (BETA) from here:

http://project.facilia.se/normalysa/software.html
Goals for this TM

- Demonstrate the new version of Normalysa
- Put together the new library of models
- Review and documentation of the models/default parameter values
- Start application to Case Studies and other cases
- Organize training
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

• Apply the methodology
• Apply NORMALYSA
• Start the comparison exercises