Objectives

MODARIA Working Group 3 (WG3) is dedicated to the application of models for assessing radiological impacts arising from NORM and radioactively contaminated legacy sites to support the management of remediation. The specific objective of the work in WG3 is to compare and further develop radionuclide transport and exposure models, as well as radiological impact assessment approaches that can be applied in supporting decision making for the remediation of areas affected by contaminated residues from NORM industries and remediation of nuclear legacy sites. The following are examples of NORM and legacy sites of interest:

— Uranium tailings;
— Phosphate industry;
— Produced water from oil extraction;
— Radon releases during natural gas extraction and transport;
— Coal power production plants;
— Groundwater and brackish water treatment plants;
— Mining (e.g., metals, monazites);
— Depleted uranium sites;
— Legacy sites (e.g., uranium production, nuclear installations, Radium aluminizing works); and
— In situ recovery of uranium as a mining methodology.

Work in the different Tasks

The work has been divided into three main tasks. The progress of the work in the different tasks and the main conclusions and plan agreed upon during this Technical Meeting are presented below:

Task 1: Application of the ISAM Methodology for development of scenarios and conceptual models

During the interim meeting held in Kiev in June 2013, a proposal of methodology for safety assessments in support to remediation of NORM sites was discussed. It was agreed that the methodology will integrate the General Assessment Methodology Process (GAMP) that was developed within the IAEA’s EMRAS II Programme (2009–2011) with an adapted methodology for safety assessment of near surface facilities (the “ISAM Methodology”) that was previously developed during the IAEA’s ISAM Programme “Improvement of Long-term Safety Assessment Methodologies for Near Surface Disposal Facilities” which was completed in 2000. It was agreed during this meeting that the integrated methodology will be based on the GAMP assessment methodology for assessment of the imminent risks to workers and the environment associated with the existing situation at the legacy sites. Assessments of risks to workers and the public associated with the remedial actions will be based on the GAMP Remedial Action Methodology. Finally, assessment of end state (long term) risks to the public will be based on an adapted ISAM methodology.

The future work in this task will then consist of adaptation and integration of these three existing methodologies, as well as developing examples of their application to typical NORM problems.
The planned work within Task 1 includes the following activities:

— Preparation of a high level description of the integrated assessment methodology;
— Development of example cases of the application of the methodology to NORM; and
— Coordination with the IAEA RSLs group on risk assessment in order to avoid duplication of work.

Task 2: Development of the NORMALYSA model platform

Within Task 2 members of WG3 collaborate in the 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 land, taking into account existing and potential future impacts on humans, flora and fauna. This set of models and databases, called the NORMALYSA model platform, covers all types of sources of relevance for NORM and legacy sites of interest, all potentially important transport pathways (e.g., groundwater, atmospheric, surface run-off) and all potentially contaminated receptor environments (e.g., freshwater bodies, groundwater wells, crop lands, pasture lands, etc.) and potential exposure pathways to humans, flora and fauna.

A first version of NORMALYSA was presented during this meeting and hands-on exercises were performed by the participants using a set of tutorials. The latest version of NORMALYSA can be downloaded from a dedicated website: [http://project.facilia.se/normalysa/software.html](http://project.facilia.se/normalysa/software.html)

The planned work within Task 2 includes the following activities:

— Testing of NORMALYSA by members of WG3;
— Documentation of the models using a standardized protocol;
— Developing missing modules (river, fruit land, generic source term);
— Release of an updated version of the software; and
— Preparation of an extended training course.

Task 3: To carry out model-model and model-data comparisons

During this meeting the protocols for three focus sites for the comparisons were presented and discussed: the uranium tailings site in Bellezane (France), a site with residuals from phosphate processing in Tessenderlo (Belgium) and the Pridneprovsky uranium legacy site (Ukraine). A standardized protocol describing the comparison exercises was developed. Using this protocol, the participants will perform the comparison exercises using the NORMALYSA model platform as well as other software tools, such as RESRAD, HYDRUS, CROM, PC CREAM, ERICA, etc. In addition, it was agreed that simpler comparison exercises will be also carried out with the purpose of training.
The planned work within Task 3 includes the following activities:

— Finalization of protocols for the comparison exercises;
— Perform model-model and model-data comparisons; and
— Preparation of reports with results of the comparisons.

Interaction with other MODARIA Working Groups

The work performed within WG3 can be used in WG1 (Remediation Strategies and Decision Aiding Techniques) as an input for decision making on remediation of contaminated lands. It is expected that at least one of the comparison exercises in WG3 Task 3 will also be used as an exercise in WG1. A joint meeting of WG1 and WG3 was held during this TM and it was agreed to maintain exchange of information between these two groups, with the aim of facilitating cooperation at a later stage of the project.

Next Meeting

Although it was agreed that the 2014 Interim Meeting would be planned for August 2014 in South Africa, upon reflection the dates in August were inconvenient for many participants and the next possibility at the end of September was deemed too close to the 3rd MODARIA Technical Meeting when all Working Groups will also meet (10–14 November 2014, IAEA Headquarters, Vienna).
## Attending

### IAEA Scientific Secretary
- **Mr Russel Edge**  
  Decommissioning & Remediation Unit (Room B0749)  
  Waste & Environmental Safety Section  
  Division of Radiation, Transport & Waste Safety  
  International Atomic Energy Agency (IAEA)  
  Vienna International Centre, PO Box 100  
  1400 VIENNA, AUSTRIA  
  Tel: +43 (1) 2600-21263  
  Fax: +43 (1) 26007  
  Email: R.Edge@iaea.org

### Working Group Leader
- **Mr Rodolfo Avila Moreno**  
  Director  
  Facilia AB  
  Gustavsvägen 151C  
  SE-16751 BROMMA  
  SWEDEN  
  Tel: +46 (8) 256-725  
  Fax: +46 (8) 259-665  
  Email: rodolfo.facilia@gmail.com / rodolfo@facilia.se

## Participants

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<tr>
<th>Name / Email</th>
<th>Organization / Country</th>
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</thead>
</table>
| **Mr Talal Al Mahaini**  
(talal.al.mahaini@sckcen.be) | Studiezentrum für Kernenergie (SCK/CEN), BELGIUM |
| **Ms Joanne Brown**  
(joanne.brown@hpa.org.uk) | Health Protection Agency (HPA), UNITED KINGDOM |
| **Mr Justin Brown**  
(justin.brown@nrpa.no) | Norwegian Radiation Protection Authority (NRPA), NORWAY |
| **Mr Dmytro Bugai**  
(dmtr.bugay@gmail.com) | Institute of Geological Sciences, UKRAINE |
| **Mr Sohan Chouhan**  
(chouhans@aecl.ca) | Atomic Energy of Canada limited (AECL), CANADA |
| **Ms Dejanira da Costa Lauria**  
(dejanira@ird.gov.br / dejanira.lauria@gmail.com) | Instituto de Radioproteção e Dosimetria, Comissão Nacional de Energia Nuclear do Brasil (IRD/CNEN), BRAZIL |
| **Mr Thierry Doursout**  
(thierry.doursout@irsn.fr) | Institut de Radioprotection et de Sûreté Nucléaire (IRSN), FRANCE |
| **Mr Josua Adriaan Joubert**  
(jiajoubert@nnr.co.za) | National Nuclear Regulator (NNR), SOUTH AFRICA |
| **Mr Antti P.A. Kallio**  
(antti.kallio@stuk.fi) | Radiation & Nuclear Safety Authority (STUK), FINLAND |
| **Mr Matthew W. Kozak**  
(mkozak@intera.com) | INTERA Inc., UNITED STATES OF AMERICA |
| **Ms Irena Malátová**  
(irena.malatova@suro.cz) | National Radiation Protection Institute (SÚRO), CZECH REPUBLIC |
| **Mr Topg Marpaung**  
(t.marpaung@bapeten.go.id) | Nuclear Energy Control Board (BAPETEN), INDONESIA |
| **Ms Solofelang Bontle Masike-Ibiyemi**  
(smasike@nnr.co.za) | National Nuclear Regulator (NNR), SOUTH AFRICA |
| **Ms Katerina Navrátilová-Rovenská**  
(katerina.rovenska@suro.cz) | National Radiation Protection Institute (SÚRO), CZECH REPUBLIC |
| **Ms Cristina Nuccetelli**  
(cristina.nuccetelli@iss.it) | Instituto Superiore di Sanità (ISS), ITALY |
| **Ms Catherine Ollivier Dehyae**  
(catherine.ollivier@edf.fr) | Electricité de France (EDF), FRANCE |
| **Ms Veronika Raguz**  
(veronika@facilia.se) | Facilia AB, SWEDEN |
| **Ms Beatriz Robles**  
(beatriz.robles@ciemat.es) | CIEMAT, SPAIN |
| **Ms Elizabeth Ruedig**  
(liz.houser@gmail.com) | Colorado State University, UNITED STATES OF AMERICA |
| **Mr Borut Smočis**  
(borut.smodis@ijs.si) | Jozef Stefan Institute, REPUBLIC OF SLOVENIA |
| **Mr Juan Tomás Zerquera**  
(j.tomas@cphr.edu.cu) | Centro de Protección e Higiene de las Radiaciones (CPhR), CUBA |
| **Mr Japie van Blerk**  
(aquisim@netactive.co.za) | AquiSim Consulting, SOUTH AFRICA |
| **Mr Oleg Voitsekhovych**  
(o.voitsekhovych@gmail.com) | Ukrainian Hydrometeorological Institute (UHMI), UKRAINE |
| **Mr Qifan Wu**  
(wuqifan@mail.tsinghua.edu.cn / qf-wu@qq.com) | Tsinghua University, PEOPLE'S REPUBLIC OF CHINA |
| **Mr Charley Yu**  
(cyu@anl.gov) | Argonne National Laboratory (ANL), UNITED STATES OF AMERICA |