The IAEA's Programme on Environmental Modelling for RAdiation Safety (EMRAS II)

EMRAS II
Reference Approaches for Human Dose Assessment
Working Group 2
Reference Approaches to Modelling for Management and Remediation at "NORM and Legacy Sites"

M I N U T E S

of the 2nd Working Group Meeting
held as part of the Joint EMRAS II Working Group Meetings (WG1 & WG2)
at IAEA Headquarters, Vienna
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IAEA Scientific Secretary	Working Group Leader
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Attending	
Name / Initials* / Email	**Organization / Country**
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Mr Daniel Cicerone ***(DC)*** (cicerone@cnea.gov.ar)	Comision Nacional de Energia Atomica (CNEA), Argentina
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Mr Thierry Doursout ***(TD)*** (thierry.doursout@irsn.fr)	Institut de Radioprotection et de Sûreté Nucléaire (IRSN), France
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*Initials used to refer to participants within minutes and actions as appropriate.
#WG1 participants who joined the last part of this meeting.

Attending	
Name / Initials* / Email	**Organization / Country**
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Mr Stéphane Pepin ***(SP)*** (stephane.pepin@fanc.fgov.be)	Federal Agency for Nuclear Control/Agence Fédérale de Controle Nucléaire (FANC/AFCN), Belgium
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Mr Alan Henry Tkaczyk ***(AHT)*** (alan@ut.ee)	Institute of Physics, University of Tartu, Estonia
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Mr Stuart Walker ***(SW)*** (walker.stuart@epa.gov)	U.S. Environmental Protection Agency (EPA), USA

*Initials used to refer to participants within minutes and actions as appropriate.
#WG1 participants who joined the last part of this meeting.

1. Welcome and introduction

AL opened the meeting by thanking all of the participants for coming to the meeting. She also thanked the participants and the IAEA for supporting the proposed work on NORM and legacy sites' remediation and management. The interesting work done in the EMRAS I NORM Working Group (NORM WG) was acknowledged, where site specific data were gathered and hypothetical scenarios developed with a view to performing model intercomparisons. WG2 will build on this work and take it one step further, placing particular emphasis on assessment within a regulatory context.

The Terms of Reference (ToR) for this WG focuses on the need for better guidance to assist regulators in their approach for remediation of contaminated sites. Environmental impact and risk assessment models are an important part of such work. The models are developed by researchers/modelers and can be used to assist regulators in their decisions regarding remediation options.

The goal WG2 is to create a good dialogue between researchers/modelers and regulators to find robust and user friendly risk and impact assessment models that can assist in justifying, choosing management options and optimising remediation decisions for contaminated sites. The assessment approaches and concomitant models should be flexible enough to allow for site specific adjustments due to local environmental, cultural, social and/or regulatory conditions. WG2 will indentify several important issues that require consideration in the selection and utilisation of computer models for NORM and legacy sites risk assessment.

The ultimate aim would be a guidance document on a general assessment process that regulators could use for the safe planning and implementation of remediation options. This guidance must allow for national or local adaptation when necessary.

WG2 will obviously need some interaction with WG1 on "Controlling Discharges" and WG3 on "Waste Disposal", and some WG2 participants also take part in that work.

GP from the IAEA also welcomed the participants and emphasized the importance of WG2. There has been a shift in the emphasis put on NORM discharges and management in recent years, acknowledging that NORM is a relevant dose contributor to both humans and the environment.

2. Challenges for remediation and regulatory supervision of NORM and legacy sites

Challenges for remediation and regulatory supervision of legacy sites were presented by representatives from 8 different countries (i.e., Argentina, Belgium, Brazil, Estonia, Hungary, Norway, Poland and Russia). Even though there is a wide range of sites existing around the world, all with different conditions or problems, a general view was shared that the guidance in place is not necessarily well suited for addressing legacy issues. The hypothetical scenarios are useful for model development and testing, but do not allow model validation. The real scenarios require assumptions to deal with non-ideal situations, particularly geometry and there is still a good deal of work to do on the real scenarios.

There is still considerable scope for model development, particularly for situations involving multiple area sources and feedback processes. Better international and national recommendations and guidance are needed to assist regulators and operators in planning and implementing remediation options. The existing sites around the world are in need of clean-up or mitigation actions in order to protect humans and the environment. It was also acknowledged that there is, so far, little cooperation between regulators of radioactive contamination and regulators of other hazardous substances. It would be a benefit if all the hazards at a site could be treated in an integrated way.

All of the presentations given are available on the WG2 web page: (http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-two.htm).

3. Main outputs from EMRAS I NORM Working Group

ROB gave a presentation of the main outputs from the work in the NORM Working Group under the EMRAS I Programme (NORM WG). At the beginning, it was realized that most of the available environmental models were made for anthropogenic nuclides, triggered by the Chernobyl accident. At the same time, NORM is ubiquitous and the highest contributor to individual doses after medical exposures. Specificities for NORM to be aware of include:

— Decay chains, chemical properties will change over time;
— Very large volumes of material involved;
— Re-use of residues possible – NORM residues have been utilized in this way previously;
— Regulatory issues: there is a shift in emphasis from limitation to optimisation and acceptable risk;
— Cannot assume secular equilibrium; and
— Time frames range from short (for atmospheric dispersion) to long (for ground water dispersion).

Often there is no historical data available due to a lack of regulation, with concomitant mandatory monitoring, in the past.

The models evaluated included screening models, compliance models and detailed assessment models. The general criteria for a good model, decided by participants in the NORM WG, included:

— Easy to use;

— Readily available;
— Well documented;
— Supported; and
— Tested (verified and validated).

Hypothetical standard scenarios were developed in EMRAS I to assist in model intercomparison and development:

(i) point source (stack);
(ii) area source; and
(iii) area source + river.

Four real scenarios were also considered. In particular, comprehensive data were collated for the two sites Gela (in Italy) and Kavala (in Greece). These sites can now potentially be used for modeling in WG2.

All details and data can be found in the draft final report from the NORM group:
http://www-ns.iaea.org/projects/emras/draft-reports.htm

ROB's presentation is available on the WG2 web page:
(http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-two.htm).

4. Presentation of relevant existing models

Six different models (and modelling environments) that could be used for environmental impact and risk assessments were presented:

PC-CREAM, EPA's models, Ecolego, Erica Tool, RESRAD-OFFSITE and CROM code

Presentations of the various models can be found on the WG2 web page.

The list includes screening models, modelling environments (where models can be developed) while others are fully detailed assessment models. All have constraints in terms of their limited applicability to particular scenarios or output results. Also, some are freely available while others have to be purchased.

It was decided to refine and complete the description of various models already included in the final report from EMRAS I, add description on additional models, and incorporate this list in the guidance document, stating what kind of scenarios they are suitable for, what results they can produce and what the limitations are.

5. Presentation of a draft General Model Development Process

DPS presented a draft General Assessment Methodology Process (please note the change of title) and there were discussions about what it should include. The draft will be sent to all participants for comments, but it was decided that it should:

— be a guidance for regulators on what assessments are necessary when planning and implementing remediation options;
— cover both NORM and legacy sites;
— focus on the importance of the assessment context and the iterative process needed;
— not overlap with work being done in other WGs or described in other IAEA documents;
— link to assessment approaches for other hazardous substances but that this should be considered for (possible) inclusion at a later stage; and
— not include detailed mathematical descriptions, but link or appendix to relevant descriptions published in other IAEA documents (to avoid overlap, e.g., with the IAEA expert group on mathematical modeling).

6. Plenary discussions

Issues for discussion in plenary sessions included:

— *Uranium mining legacy – which sub-group?*

The group had differing views on this. Some felt that the environmental transfer part was best modeled along with other NORM scenarios while others saw it as a part of the nuclear fuel cycle and thus belonging to the nuclear legacy group. In one respect, including U-mining in both subgroups could provide a useful theme of common interest between the groups. It was decided that participants could discuss this further in the sub-groups before a decision could be made.

— *Are the models presented at the meeting freely available or at least possible for WG2 to use for free in EMRAS II?*

ERICA Tool, EPA's models and RESRAD are freely available via internet, while for e.g., PC-CREAM a license must be purchased. Some institutions have licenses for certain models. ***RA*** generously offered free use of Ecolego for work in this group. It was decided that NRPA should send out a questionnaire to all organizations asking them what models they are using/have licenses for.

— *For case study sites:*

- How fast can the necessary data be made available for modelling? (If not already available from previous work)?
- Can we get the authorities in these countries involved in the work?
- Prioritisation/timing when choosing sites (from simple to more complex?)

These questions were to be addressed by the sub-groups when they chose the case study sites. It was considered important to get the regulator in the country involved in order to put the assessment and modeling into a suitable context. There was also a requirement to specify a deadline for providing the necessary data to test various models. A suggestion was made to start with more simple sites, moving on to more complex sites once experience had been gained.

— *How to link to other relevant work like WG1 and WG3, and the IAEA expert group on mathematical modelling?*

The need to link to these other groups was clearly stated. ***RA*** also mentioned the draft Safety Guide No. DS 355 "The Safety Case and Safety Assessment for Radioactive Waste Disposal" and that we must not overlap with the recommendations described there. No decisions on how to interact with other groups was taken during the meeting, but ***AL*** would need to establish the necessary links.

Some guidance for the work in subgroups was presented by ***AL***:

— *Choosing/prioritising sites for testing of general assessment approach:*

- Availability of data; and
- Involvement of regulators.

— *Regulators must specify the challenges/problems related to remediation -> can the models give the answers needed?*

- Current situation (environment, workers, public);
- Releases during remediation (environment, workers, public);
- Assessment of risk for unwanted incidents during remediation; and
- Situation post-remediation (environment, workers, public).

— *What models could be tested at the site? Screening models (e.g., simple, steady state) vs. full assessment models (e.g., complex, multi-media).*

— *Comparison between model results.*

— *Are the models sufficient to answer the problems of the regulators?*

7. Work in parallel for the two sub-groups ("NORM sites" and "legacy sites") to establish work plans

The two sub-groups had the following participants during the meeting:

— **NORM (O'Brien to lead):** Cicerone, Da Costa Lauria, Doursout, Potiriadis, Nuccetelli, Mikhalik, Pérez-Sánchez, McDonald and Pepin

— **Nuclear legacy (Sneve to lead):** Horyna, Varga, Brown, Avila, Walker, Krajewski and Krajewska.

The groups developed work plans for the next year(s).

8. Plenary reporting from the two subgroups

The two sub-groups presented their work plans in a plenary session. The presentations are available on the WG2 web page. Additional points/comments made:

— When a private company owns data, there was a suggestion to make a formal request from the IAEA (***GP***) to explore whether data could be made freely available to us for work in this group.

— It was noted that FEPs analysis for NORM sites would be similar to a threat assessment that we do for nuclear legacy sites.

— There was a suggestion to make a list of NORM scenarios with data that people could use for future testing assessments even if these data were not dealt with explicitly within the planned report for EMRAS II.

— Scenario providers are expected to work the coming months for developing the scenarios. Scenario data should be ready by mid-January 2010. Some of these scenarios will be used to develop the guidance document, and others will be used to test the applicability and usefulness of the guidance.

Nuclear legacy group:

— ***SW*** needs specification on what kind of data and how it can be used before asking for data from sites. The subgroup leader (***MS***) agreed to provide guidance here.

— All participants from countries with case study sites to send information on national regulations related to nuclear and U legacy + examples on their application (where remediation has been done) to ***MS***. The subgroup leader (***MS***) will provide guidance on what type of information is required.

— Suggestion to invite regulators from countries with case study sites to a sub-group meeting in May 2010.

Involving operators:

— Could be invited to specific meetings related to case study sites.

— Might be a challenge to get them interested in the work.

Commonalities for the two sub-groups: uranium mining sites could fit into both groups + legacy issues are addressed in both sub-groups.

8. Summary

The outcomes of WG2 are envisaged to be:

(i) Guidance documents for regulators on the general assessment process necessary for remediation of sites (either a single document covering remediation of all sites, or alternatively two documents covering NORM and nuclear legacy sites independently).

(ii) A final report from the WG2 work where models, sites and data are listed in more detail, and with recommendations on what is needed in model development to meet regulators' needs. Issues concerning the availability and suitability of existing models, the relative importance of the transfer processes and the different pathways, the way that local/site-specific factors/issues should be treated, should be also addressed.

It was concluded that WG2 should work as one group even if we sometimes divide into sub-groups for specific reasons. Some participants might like to work on both NORM and legacy sites equally, and all participants should take part in the common work on the General Assessment Methodology Process.

Action list:

— We need to find a host for the WG2 meeting in May 2010, preferably close to a site that we can visit. All to check the possibility of arranging this in their country with visit to a site and involving the national regulators. Feedback on this by 30 October 2009 to the whole group.

— NRPA to send an email with questionnaire on models including a box to tick if one is volunteering to give a brief description of a specific model (what can it be used for, what kinds of scenarios, output results, limitations, etc.) for the guidance document. Deadline for sending out questionnaire: 15 December 2009, deadline for response from all by 15 January 2010 to NRPA. Summary will be presented at 2nd EMRAS II Technical Meeting (TM), being held at IAEA Headquarters in Vienna, 25–29 January 2010.

— The draft General Assessment Methodology Process should be distributed by ***DPS*** for comments by 15 December 2009, feedback expected from all by 15 January 2010 to ***DPS***. A revised version to be discussed during the 2nd EMRAS II TM in January 2010.

— ***MS*** to send request to participants for relevant national regulations in relation to performed remediation of legacy sites by 1 December 2009. Participants from relevant countries to send ***MS*** links to relevant regulations by 15 January 2010.

— All scenario data for specific sites must be provided by mid-January 2010, to be presented/discussed during the 2nd EMRAS II TM in January 2010.

WG2 MEETING AGENDA		
1.	**Welcome and introduction**	Astrid Liland, WG2 Leader NRPA, Norway
2.	**Challenges for remediation and regulatory supervision of NORM and legacy sites:**	
	International Experience and Challenges to Regulatory Supervision of Legacy Sites	Malgorzata Sneve, NRPA, ♣Norway
	Problems in regulation of nuclear legacy sites in Russia	Nataliya K. Shandala, FMBA, ♣Russian Federation (presented by Astrid Liland)
	Belgian regulations with respect to the management of radioactively contaminated sites: experiences, challenges and prospects	Stéphane Pepin, FANC, ♣Belgium
	Uranium mining activities in Los Gigantes, Argentina: possible case study site	Daniel Cicerone, CNEA, ♣Argentina
	Assessment Issues for Long Term Management of two Legacy Sites in Estonia♠	Alan Tkaczyk, University of Tartu, Estonia
	Environmental pollution and remediation challenges in Upper Silesia Coal Basin in Poland	Boguslaw Michalik, Central Mining Institute, ♣Poland
	Brazilian experience in Remediation of NORM Contaminated Sites	Lauria Dejanira, IRD/CNEN, ♣Brazil
	Guideline levels for sustainable management of food production	Beáta Varga, Central Agricultural Office, ♣Hungary
3.	**Main outputs from ♣EMRAS I NORM Working Group**	Richard O'Brien, ARPANSA, Australia
4.	**Presentation of relevant existing models**	
	♣PC-CREAM	Paul McDonald, Westlakes, UK
	♣US EPA's models for establishing cleanup levels in soil, water, buildings and streets at Superfund sites	Stuart Walker, EPA, USA
	The ♣Ecolego tool	Rodolfo Avila, Facilia, Sweden
	The ♣ERICA tool	Justin Brown, NRPA, Norway
	♣RESRAD-OFFSITE	Richard O'Brien, ARPANSA, Australia
	Application of the ♣RESRAD code to Radiological Assessment of an Area with Uranium Residual Material in Spain	Danyl Pérez-Sanchez, CIEMAT, Spain
	The ♣CROM code	Danyl Pérez-Sanchez, CIEMAT, Spain
5.	**Presentation of a ♣Draft General Model Development Process**	Danyl Pérez-Sanchez, CIEMAT, Spain
6.	**Plenary discussions**	
7.	**Work in parallel for the two subgroups ("NORM sites" and "legacy sites") to establish work plans**	
8.	**Plenary reporting from the two subgroups:**	
	Summary of the ♣Nuclear Legacy subgroup	Malgorzata Sneve, NRPA, Norway
	♣Assessment FEPs	Richard O'Brien, ARPANSA, Australia
	Summary of the ♣NORM subgroup	
9.	**Summary and conclusions**	Astrid Liland, WG2 Leader NRPA, Norway

♣ Indicates the name of the presentation given on the WG2 web page (http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-two.htm).

♠ This presentation is unavailable due to copyright issues.