

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

**EMRAS II
Reference Approaches for Biota Dose Assessment
Working Group 4
Biota Modelling Group
MINUTES**

**of the Sixth WG4 Meeting held at McMaster University, Hamilton, Canada
18–19 June 2011**

IAEA Scientific Secretary	Working Group Leader
<p>Mr Sergey Fesenko (<i>SF</i>)⁺ Agricultural Countermeasures Specialist (Room A2146) NAFA, Joint FAO/IAEA Division of Nuclear Techniques in Food & Agriculture International Atomic Energy Agency (IAEA) Vienna International Centre PO Box 100 1400 VIENNA AUSTRIA Tel: +43 (1) 2600-21649 Fax: +43 (1) 2600-7 Email: S.Fesenko@iaea.org / Corwin_17F@mail.ru</p>	<p>Mr Nick Beresford (<i>NAB</i>)[#] Radioecologist, Radioecology Group Centre for Ecology & Hydrology (CEH) Lancaster Environment Centre, LEC Building Library Avenue, Lancaster University BAILRIGG, LANCASTER LA1 4AP UNITED KINGDOM Tel: +44 (1524) 595-856 Fax: +44 (1524) 61536 Email: nab@ceh.ac.uk</p>

Attending	
Name / Initials* / Email	Organization / Country
Mr Pål Andersson (<i>PA</i>) (pal.andersson@ssm.se)	Swedish Radiation Safety Authority (SSM), SWEDEN
Mr David Copplestone (<i>DC</i>) (david.copplestone@stir.ac.uk)	University of Stirling, UNITED KINGDOM
Mr Richard Goulet (<i>RG</i>) (Richard.goulet@cnsccsn.gc.ca)	Canadian Nuclear Safety Commission (CNSC), CANADA
Mr Marcus Grzechnik (<i>MG</i>) (Marcus.Grzechnik@arpansa.gov.au)	Australian Radiation Protection & Nuclear Safety Agency (ARPANSA), AUSTRALIA
Mr Rudie Heling (<i>RH</i>) (heling@nrg.eu)	Nuclear Research & Consultancy Group (NRG), NETHERLANDS
Ms Brenda Howard (<i>BJH</i>) (bjho@ceh.ac.uk)	Centre for Ecology & Hydrology (CEH), UNITED KINGDOM
Mr Mathew Johansen (<i>MJ</i>) (mathew.johansen@ansto.gov.au)	Australian Nuclear Science & Technology Organisation (ANSTO), AUSTRALIA
Mr David Rowan (<i>DR</i>) (rowand@aecl.ca)	Atomic Energy of Canada Limited (AECL), CANADA
Mr John Twining (<i>JT</i>) (john.twining@ausradeco.com.au)	Austral Radioecology, AUSTRALIA
Ms Hildegard Vandenhove (<i>HV</i>) (hvandenh@sckcen.be)	Studiezentrum für Kernenergie (SCK/CEN), BELGIUM
Mr Mike Wood (<i>MDW</i>) [#] (m.d.wood@salford.ac.uk)	Manchester Metropolitan University (MMU), UNITED KINGDOM Current address: University of Salford, United Kingdom

⁺ *SF* was unable to attend the meeting, at the time of which he was still working at IAEA's Laboratories at Seibersdorf.

[#] *NAB* was unable to attend so *MDW* chaired the meeting on his behalf and subsequently compiled these Minutes.

*Initials used to refer to participants within minutes and actions as appropriate.

Opening discussion

MDW presented a summary (prepared by **NAB**) of recent activity on publications linked to WG4. The Exercise 3 paper has now been published in Radiation and Environmental Biophysics. The reference is as follows:

Vives i Batlle J, Beaugelin-Seiller K, Beresford NA, Copplestone D, Horyna J, Hosseini A, Johansen M, Kamboj S, Keum D-K, Kurosawa N, Newsome L, Olyslaegers G, Vandenhove H, Ryufuku S, Vives-Lynch S, Wood MD, Yu C (2011) The estimation of absorbed dose rates for non-human biota: an extended inter-comparison. Radiat. Environ Biophys 50:231-251

MJ has circulated a draft of the LFBG paper for comment. He has not received comments to date but welcomed comments during the EMRAS II WG4 meeting or during the 'ICRER 2011' Conference.

Karine Beaugellin-Seiller (**KBS**) is preparing a paper on dose rates from U-235 series radionuclides and a draft has been circulated to co-authors. **KBS** is also preparing a paper on the effect of heterogeneous distributions in sediment.

MDW also raised the issue that, as WG4 moves closer to publishing the next set of papers, there is an opportunity to strategically target higher impact factor journals with a wider readership. The WG4 participants in attendance were asked to suggest candidate journals during the course of the meeting.

MDW reminded scenario leaders of the need to prepare a chapter for the EMRAS II WG4 Final Report as well as a paper for publication. The scenario leaders requested an email reminder of the chapter requirements for the Report. WG4 decided to keep to the January 2012 deadline for delivery of its Final Report. Chapter leads should therefore target September/October 2011 for delivery of the draft chapters.

Action	Responsible	Due date
Email Final Report chapter requirements to scenario leaders	NAB	08/07/2011 [DONE]
Identify candidate journals for papers in development	ALL	19/06/2011 [DONE]

Beaverlodge Lake scenario

Over the four phases of the Beaverlodge Lake scenario modelling exercise, **RG** has received results from 12 organisations. **RG** had received results from 4 organisations for the final phase of the Beaverlodge Lake scenario, applying models using a 'best approach'.

RG commented that over the 4 phases of the scenario, the variability in predictions reduces. **JT** suggested presenting results as distributions (variability curves) – **RG** to consider this when deciding how best to present. **RG** pointed out that, at Phase 4, there are still notable differences between predictions. Participants were requested to re-check (for errors) their Phase 1 and Phase 4 results, using **RG**'s presentation of the results as a guide to identify where there may be issues.

RG raised the question of whether we should re-run Phase 1 with values from the new wildlife TRS. However, all agreed that the 4 phases currently show an evolution in modelling over the 'life' of the scenario and provide a nice 'storyline' for the paper. It was agreed that re-running with the new wildlife TRS values would add little to an already very full paper.

RG pointed out that the scenario now covers much more than Beaverlodge Lake, so the final paper will be on 'freshwater environments near Uranium mining sites'. **RG** will develop an appropriate draft title for the paper.

DR suggested that Phase 2 figures should present variability in measured data as well as in predictions. **RG** to add this. **RH** commented that we need to be clear which, if any, measured data are based on tissue activity concentrations and what assumptions have been made in converting to whole

body. Concern was expressed that just estimating from muscle and bone, assuming these two tissues equate to 100% of the body mass, may not be appropriate for radionuclides that accumulate in liver or kidney. **MDW** suggested cross checking **RG**'s current calculations against conversion factors for conversion to whole body that were presented in Yankovich (2009) and Yankovich, *et al.* (2010). **RG** and **MDW** to check this.

MDW suggested that the source of the measured caddisfly data should be checked to confirm whether the data are for cased or caseless caddis and, if cased, that the cases were removed prior to analysis. **RG** to check this.

RG noted that within the paper (and chapter) we need to discuss the extent to which assumptions of secular equilibrium are valid for lakes contaminated by U mining site tailings. **RG** to include this in draft paper.

The 'Best approach' (Phase 4) results were discussed for Chironomus. There were notable differences in the doses reported and the contributions of the various radionuclides. **DC** suggested that the limited number of radionuclides reported by the UK participant may be due to a restriction in the number of radionuclides available in R&D 128 (assuming that the UK participant has used R&D 128). All participants to re-check their data and identify likely explanations for differences. **RG** to check with each participant how they had interpreted and applied the 'best approach' guidance for invertebrates.

RG said that he needs to have some text summarising the different approaches used for this scenario. **RG** will draft this and send to participants for them to check and confirm that the summaries are accurate.

MDW raised the issue of where to publish the results of this scenario. Various journals were suggested. **RG** and **MDW** to look through the possibilities and identify one or two journals to approach to see if in scope. This was done at the end of the meeting. **RG** will contact the editors of *Aquatic Toxicology* and *Environmental Health Perspectives*.

RH suggested that a dynamic modelling approach should be used for Beaverlodge. **MDW** commented that we need to move forward to publication with this scenario, so including a dynamic approach was outside the scope of the EMRAS II activity, but could be something to consider in the follow-up programme. **RH** encouraged everyone to include this in their response to the IAEA's EMRAS II Follow-up Programme Questionnaire.

Action	Responsible	Due date
Identify candidate journal(s) for this paper	MDW & RG	27/06/2011 [DONE]
Summary of modelling approaches to be circulated to participants	RG	06/07/2011
Participants to re-check Phase 1 and Phase 4 results and to confirm with RG	All participants	08/07/2011
Contact editor(s) for identified journal(s) to see if in scope	RG	15/07/2011
Participants to confirm that summary is correct	All participants	15/07/2011
RG to confirm with Phase 4 participants how they used 'best approach' guidance	RG + Phase 4 participants	15/07/2011
Draft paper to be circulated	RG	16/09/2011
Comments on draft paper to be returned to RG	All participants	30/09/2011
Draft chapter to be circulated	RG	14/10/2011

UPDATE: WG4 Final Report chapter will be prepared before paper. This will be circulated to participants early in January 2012 for comment.

Fukushima

MDW introduced the session and presented initial assessments from IRSN and CEH. Presentations were given by participants on an initial assessment using the ICRP approach (**DC**), defining the atmospheric source term (**MG**) and modelling dispersion in the coastal environment (**RH**). **JT** mentioned that the IAEA will be setting up a 3 year monitoring programme for the East-Asia region and that Australia would welcome suggestions regarding media/organisms/radionuclides that may be appropriate for analysis within that programme. **JT** and **RG** discussed two papers on health risks that may be of interest to WG4:

- Poon CB & Au SM, J. Radiol. Prot. 23 (2003) 97–104
- Christodouleas JP *et al.*, N Engl J Med 364 (2011) 2334-2341

The group discussed ways in which Fukushima may be used as a focus for future activities within EMRAS. All agreed that there was no time to develop a scenario on Fukushima within EMRAS II and that it wouldn't add much to current knowledge on the models themselves. There was support for including a paragraph or two in the WG4 Final Report to indicate the work that members of WG4 had been undertaking on Fukushima. Support was also expressed for developing a Fukushima-based component of work within the EMRAS II follow-up programme, perhaps focussing on the development of dynamic modelling for non-human biota assessment and/or development of recommendations as to how assessments could/should be conducted for accident situations.

Action	Responsible	Due date
WG4 members to supply NAB with information on their Fukushima-related activities	All	07/10/2011
One or two paragraphs on Fukushima-related activities of WG4 members to be included in Final Report	NAB	28/10/2011

Wetlands scenario

PA presented an overview of the wetlands scenario. Results prepared to date for this scenario were presented by **MG**, **MJ** and **PA** (who presented K-BIOTA results). **MDW**, **DC** and **BJH** confirmed that they are still to submit results for this scenario.

PA presented comparison of results received to date. All participants were asked to re-check their results and try to explain any differences. Participants should look at the presentation from **PA** to identify issues relevant to their results. Some of the issues raised included:

- Steel Creek:
 - **MJ** and **MG** to check their Steel Creek biota activity concentration results to identify why **MG's** results are consistently a factor of 2.5 lower. **DC** suggested that this could be due to one group changing the % dry weight soil/sediment within ERICA.
 - Participants were predicting lower than measured data for Steel Creek. **PA** will re-check assumptions used to convert some of the measured data to whole body. **DC** suggested that invertebrate measurements may be high if samples had not been washed prior to analysis. However, **DR** observed that aphid data was also high and aphids shouldn't have much soil contamination.
 - **DC** and **MDW** looked at the sources of the CR data that were being used for the invertebrates and it seems that these may be heavily influenced by data from the temperate coastal sand dunes studied by **MDW** and **DC**. The data Cs transfer in these sand dunes is low, so that may account for the under prediction.
 - Differences in SCK and K-BIOTA results, although both seemed to have used the same approach.

- Plant external dose rates are approximately 1 order of magnitude different between the two Australian groups and SCK external dose rates are very low. **DC** checked and confirmed that this could not be explained by differences in soil dry weight assumptions.
- SCK dose rate predictions were notably high for some animals.

— Utnora:

- Predictions were generally above measured data. **JT** suggested that maybe Cs in the soil is strongly bound. **PA** to check field data to see if there is any information on this. **BJH** suggested taking some new samples and analysing for radiocaesium interception potential (RIP). **PA** will collect samples and send to SCK by 01/08/2011. SCK will analyse and return results to the group by 31/08/2011.
- The two Australian groups had similar external dose rate results, but the fern internal dose rate data was quite different.
- SCK to provide a dose rate estimate for frog in soil.

— Duke:

- ^{14}C activity concentrations were high for SCK.
- **PA** asked **HV** to clarify why ^{14}C in air had been calculated from soil.

PA to agree with **NAB** a deadline for the WG4 Final Report chapter.

Action	Responsible	Due date
Data check and remaining modelling results to PA	PA	18/07/2011
Agree a deadline for the WG4 Final Report chapter	PA + NAB	18/07/2011
Soil samples to be collected from Utnora and sent to SCK	PA	01/08/2011
PA to circulate comparison of data to group Participants to try to identify and explain differences in results.	All participants	22/08/2011
SCK to analyse soil samples from Utnora and provide results to group	HV	31/08/2011
PA to circulate draft paper	PA	07/10/2011

Little Forest Burial Ground

MJ presented LFBG scenario outline and results of the model intercomparison. One query that **MJ** identified was why the external acacia dose reported by CEH was higher than the total acacia dose rate (**MJ** to check with **NAB**).

MJ had circulated a draft of the LFBG paper prior to the meeting. All agreed that this was an advanced draft and was near to a draft suitable for submission. **MJ** requested participants to provide comments by 04/07/2011. **MJ** will then produce a draft final version of the paper. The target journal was discussed and all agreed that the paper would be suitable for *Science of the Total Environment* (STOTEN). **MJ** will format the paper for this journal.

All agreed that the additional data and information should be provided in the form of electronic supplements to accompany the paper and that these should take the form of formatted MS Excel workbooks. **JT** noted that a disclaimer should be added to the soil table to clarify that some of the data are estimates rather than being based on measurements.

MJ to agree with **NAB** a deadline for the WG4 Final Report chapter.

Action	Responsible	Due date
Comments on draft paper to MJ	All participants	04/07/2011 [DONE]
Draft final paper to be circulated (formatted for STOTEN)	MJ	18/07/2011 [DONE]
Comments on paper to be returned to MJ	All participants	01/08/2011 [DONE]
MJ to finalise paper and submit to STOTEN	MJ	19/08/2011
Agree a deadline for the TECDOC chapter	MJ + NAB	18/07/2011

Maralinga

MJ presented some work that ANSTO is undertaking at Maralinga in collaboration with other researchers in Australia. **MDW** and **DC** suggested that this could be used as a scenario for future work under the EMRAS II follow-up programme, perhaps linking to the effects group.

Dynamic modelling review

HV presented the results of the review undertaken by Jordi Vives i Battle (**JViB**). Some strange responses were identified including some apparent disagreements between responses for certain questions. It was noted that some of the questions may have been interpreted in different ways. It was suggested that **JViB** should follow-up with individual respondents, but **HV** pointed out that this would be very time consuming. **MDW** suggested that **JViB** writes up the review based on current responses and highlights areas where misinterpretation of questions may be an issue. All were supportive of this way forward.

WG4 commented that it would be helpful if the Final Report chapter were to include information on the capabilities of each dynamic model, including the radionuclides that can be assessed.

Action	Responsible	Due date
Agree a deadline for the WG4 Final Report chapter	JViB + NAB	18/07/2011

EMRAS II Follow-up Programme Questionnaire

MDW reminded participants about the questionnaire circulated by the IAEA, requesting people to identify areas of interest for the follow-up programme to EMRAS II. Participants discussed various ideas for future work within, and these included the suggestions that **NAB** had compiled from previous discussions on future directions:

- Review of aquatic Kds and whether they are fit-for-purpose.
- Current equilibrium type models generally suitable for most applications but there may be requirements to develop dynamic models –develop into a manageable task for the next phase (based on current review and human model).
- Combined assessments – may link to above.
- Development of best practice guidance for different scenarios.
- More on lack of transfer data for key organisms and continued uncertainty/variability re application of generic CRs.

BJH reminded participants that the more people who complete and return the questionnaire, the higher the chance that some of the WG4 areas of common interest will be taken into the next phase of the ‘EMRAS’ programme. **MDW** asked all participants to ensure that they submit their completed questionnaires to Claire Halsall at the IAEA by the 30/06/2011 deadline.

Action	Responsible	Due date
Complete questionnaire on proposed EMRAS II Follow-up activities and return to Claire Halsall	ALL	30/06/2011

UPDATE: Since this meeting was held it was announced that the follow-up programme to EMRAS II – “MODARIA” (**MO**delling and **DA**ta for **R**adiological **I**mpact **A**ssessments) – will run for 4 years (2012–2015) and the first Technical Meeting will take place at IAEA headquarters in Vienna, 19–22 November 2012.

WG4 MEETING AGENDA

Saturday, 18 June 2011

09:30–17:00	Welcome and introductions	Mike Wood (MMU, UK)
	Meeting objectives and updates	
	Beaverlodge:	
	Presentation of Beaverlodge scenario objectives, phases and results	Richard Goulet (CNSC, Canada)
	Discussion	All participants
	Suggest outline for Beaverlodge paper (and report chapter) including indication of content for each section	Richard Goulet & Mike Wood
	Agree timetable for remaining activities	Richard Goulet
	Fukushima:	
Fukushima assessment undertaken for ICRP	David Copplestone (Sterling University, UK)	
*Defining an Atmospheric Source Term During Early Stages of the Fukushima Nuclear Accident	Marcus Grzechnik (ARPANSA, Australia)	
Fukushima and BMG	Mike Wood	

Sunday, 19 June 2011

09:00–17:00	Start of meeting and plan for the day	Mike Wood
	Wetlands scenario:	
	Introduction to the scenario	Pål Anderson (SSM, Sweden)
	Summary of *doses and approach : Wetland scenario (*A. Bollhöfer, ERISS; C. Doering, ARPANSA and B. Ryan, Paulka R&E, Australia)	Marcus Grzechnik
	Wetlands scenario intercomparison – SCK/CEN *approach and results (*J. Vives I Batlle, SCK/CEN, Belgium)	Hildegard Vandenhove (SCK/CEN, Belgium)
	*Some initial results , overview and discussion	Pål Anderson
	Agree timetable for remaining activities including revision of ERRORS, new submissions and publication	Pål Anderson & Mike Wood
	Little Forest scenario:	
	*Dose Modelling Comparison for Terrestrial Biota	Mat Johansen (ANSTO, Australia)
	Overview of way forward for draft paper with suggested timetable	
	*Review of dynamic models (*J. Vives I Batlle)	Hildegard Vandenhove
	Discussion	All participants
	AoB, round-up of actions and meeting close	Mike Wood

* Indicates the name of the presentation given on the WG4 web page (<http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-four.asp?s=8>).

^ Presentation submitted, but participant absent from the meeting.