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"

M I N U T E S

of the 2nd Working Group Meeting
held as part of the Joint EMRAS II Working Group Meetings (WG4, WG5 & WG6)
at IAEA Headquarters, Vienna
20–21 July 2009

IAEA Scientific Secretary	Working Group Leader
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Name / Initials* / Email	**Organization / Country**
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Ms Snezana Dragovic ***(SD)*** (sdragovic@inep.co.rs)	Institute for the Application of Nuclear Energy (INEP), Serbia
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Mr Jan Horyna ***(JH)*** (jan.horyna@sujb.cz)	State Office for Nuclear Safety (SÚJB), Czech Republic
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Ms Brenda J. Howard ***(BJH)*** (bjho@ceh.ac.uk)	Centre for Ecology & Hydrology (CEH), UK
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Attending	
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*Initials used to refer to participants within minutes and actions as appropriate.

Objective of the Meeting

The objectives of this (the second) meeting of WG4 were to review progress on the actions agreed at the First EMRAS II Technical Meeting (held 19–23 January 2009) and agree future work programme. ***NAB*** also noted that the group should use the meeting as an opportunity to update members on their activities as appropriate. Time was allowed within the agenda for ***SD*** to inform the group of an IAEA Technical Cooperation (TC) Project entitled, “Providing technical support for implementing modern approaches and tools for the assessment of radiation impact on terrestrial and freshwater environments”. The main interaction of this TC Project with WG4 will be with regard to model evaluation being conducted by TC. ***BJH*** also gave an overview of a project to develop a radiological environmental assessment training programme that CEH (in associate with IRSN, WSC and EA) has recently been awarded. The group will be notified of the project website as it becomes available.

NAB thanked all participants for completing agreed tasks to, or ahead of, schedule. The dates of the next (second) EMRAS II Technical Meeting were confirmed as being ***25–29 January 2010***.

BWG publications updates

An overview paper of the EMRAS (I) Biota Working Groups's activities has recently been published in Radioprotection [Bergen special issue]: Beresford, N.A., Barnett, C.L., Beaugelin-Seiller, K., Brown, J.E., Cheng, J-J., Copplestone, D., Gaschak, S., Hingston, J.L., Horyna, J., Hosseini, A., Howard, B.J., Kamboj, S., Kryshev, A., Nedveckaite, T., Olyslaegers, G., Sazykina, T., Smith, J.T., Telleria, D., Vives i Batlle, J., Yankovich, T.L., Heling, R., Wood, M.D., Yu, C. 2009. Findings and recommendations from an international comparison of models and approaches for the estimation of radiological exposure to non-human biota. *Radioprotection* 44, 5, 565–570. doi: 10.1051/radiopro/20095104. Contact NAB if you would like a copy of this.

The paper on the Chernobyl Scenario is ready to submit to *J. Radiological Protection* (awaiting instructions on submission process) and the Perch Lake Scenario paper should have been finalised during the course of the meeting ready for submission to the same journal. Coauthors will be sent an electronic (pdf) version of these papers as they are submitted.

Exercise 3

Twelve groups have submitted results to this exercise (to compare dose estimates under simplistic scenarios). Runs have included inputs by model developers who have gone back to the original code to derive values and inputs by model 'users' applying default options. Values from the ICRP *Reference and Animal Plants* report were also included.

NAB presented a comparison of runs by the same approach (two runs by RESRAD-BIOTA and five using variants of the approach underlying the ERICA methodology). ***JVB*** followed this with a presentation on a statistical approach for comparing the outputs and the results of this. It was noted that some of the differences in model outputs may be resolved by a QC check of inputs.

It was agreed to work towards preparing a publication on this exercise for final discussion during the January 2010 meeting. The group agreed that ***JVB*** would take the lead in drafting this. ***NAB*** noted that the paper should note what we have not considered in dosimetry comparisons (e.g., doses in air, heterogeneous distributions).

The following actions related to Exercise 3 were agreed:

Action	Responsible	Due date	Status
Circulate results summary to all participants for checking – to include targeted questions	NAB	04/08/09	Done
Comment on the above and provide explanations for differences in results were applicable – copy to NAB & JVB	All participants	07/09/09	Done
Run R&D128 'default' spreadsheet	LN	01/09/09	Done
Send NAB comparison of on-sediment v's on-soil results from ERICA default run	LN	01/09/09	Done
Consider splitting analyses of gamma emitters to <50 keV and > 50 keV	JVB	18/12/09	
Circulate draft manuscript for comment	JVB	18/12/09	

Participants had requested that Ar, Kr and Rn be included within Exercise 3. However, this was not possible as too few models considered these radionuclides. As Ar and Kr can contribute >50% of the total releases to terrestrial ecosystems from nuclear power plants there is an acknowledged need to include these radionuclides within assessments. The England and Wales Environment Agency

R&D128 approach does include Ar and Kr[1] and consideration is being given to incorporating this approach within the ERICA Tool. ***JVB*** presented an overview of the methodology which estimates cloud immersion doses and is similar to approaches used to assess the dose of these radionuclides to humans. ***SK*** noted that a similar approach was being considered for RESRAD-BIOTA although this would also consider immersion doses from a wider range of radionuclides. Whilst there was little negative comment on the approach, the following points were made:

(1) Better justification of zero internal dose required for small organisms (for which diffusion may be important) and as a result of inhalation;
(2) The choice of plant occupancy factors (1 for soil and 0.5 air) was queried;
(3) ***TY*** noted that Trevor Stoki (Health Canada) had expertise in considering Xe exposure.

There was a request that a methodology for estimating Rn doses to biota (developed for the EA and consideration by the ICRP) be presented by ***JVB*** during the January 2010 meeting.

Heterogeneous distribution

KBS and ***AH*** presented preliminary results from their activities to consider how to model doses to biota as a consequence of highly heterogeneous distributions of radionuclides often observed in soil/sediment profiles (specifically examples of TENORM radionuclides in sediment profiles as provided by CNSC). Provisional results for a range of distribution-habitat scenarios (based on profile data for Beaverlodge Ace Bay) were presented. These were shown to influence the total dose rate and contributions of different radionuclides. However there were significant differences between the outputs of the two models (EDEN and EPIC-DOSES3D) which require investigation. It is intended to subsequently compare estimates with homogenous distribution assumptions and conduct a similar evaluation for Dubyna Lake.

Actions for heterogeneous distribution assessment:

Action	Responsible	Due date	Status
Investigate reason for variation between models	KBS/AH	01/10/09	
Complete evaluation and report to group	KBS/AH	Jan. 2010	

Scenarios

Beaverlodge Lake

RG presented an overview of the study area and the data available for the Beaverlodge Lake Scenario. He suggested that the scenario be approached in stages, the first stage providing media activity concentrations to modellers with the request for output activity concentration in and dose rates to chironomids, bivalves and piscivorous and benthic feeding fish. Subsequent stages would additionally provide available fish activity concentration and include the estimation of risk quotients.

There was sufficient interest within the group to ensure that this scenario is viable (approximately 7 groups stating intent to participate). It was requested that ***RG*** provides summarised activity concentration and stable (heavy metal) data for each assessment site. A timetable was agreed as outlined in the actions below:

[1] See Vives i Batlle, J., and Jones, S.R., 2003, A methodology for the assessment of doses to terrestrial biota arising from external exposure to ^{41}Ar and ^{85}Kr Accompanying CD to Copplestone, D.A., Bielby, S., Jones, S.R., Patton, D., Daniel, P., and Gize, I., Impact assessment of ionising radiation on wildlife R&D Publication 128 (Bristol: Environment Agency) (March 2003 update).

Action	Responsible	Due date	Status
Draft scenario description and spreadsheet - send to NAB for initial comment*	RG	21/08/09	Spreadsheet supplied
Comment on draft	NAB	27/08/09	Commented on spreadsheet
Circulate revised draft to BMG for comment	RG	31/08/09	
Provide comments on draft scenario spreadsheet and description	All participants	21/09/09	
Circulate finalised files	RG	30/09/09	
Complete model runs and provide RG with completed spreadsheets	All participants	01/12/09	
Present initial evaluation of results at January 2010 meeting	RG	Jan. 2010	
Agree workplan for scenario Jan 2010-Summer 2010	All participants	Jan. 2010	

*To include requested definition of 'fish flesh'.

Little Forest Burial Ground

JT presented an updated overview of information available for the potential Little Forest Burial Ground Scenario. A number of potential options for how the scenario could be constructed (current and prospective exposures) were suggested. The group made a number of suggestions for additional data to be included in the scenario, including: TLD dose rate results; gamma-dose rate surveys at 5 cm and 1 m above ground surface; analyses of further biota samples if possible (accepting ethical restrictions); lysimeter water data; information on plant rooting depth. ANSTO will refine the scenario for presentation at the January 2010 EMRAS II Technical Meeting. It was suggested that as for Beaverlodge Lake a staged approach is used with the first assessment considering the current situation and the scope of any prospective assessment to be discussed in January 2010.

Actions related to Little Forest Burial Ground scenario:

Action	Responsible	Due date	Status
Draft scenario description and spreadsheet for presentation and agreement in January 2010	JT/MJ*	Jan 2010	
Agree first phase of scenario		Jan 2010	
Complete model runs and provide ANSTO with completed spreadsheets	All participating	By summer 2010 meeting	

*Mat Johansen (ANSTO).

Wetland scenario

KS presented a suggestion for a wetland ecosystem scenario based on a Swedish study site. The amount of data available for the site was very limited and unless more could be gathered the general consensus was that the scenario may not be viable.

However, a wetlands scenario would test (stretch) the models and this is a good reason to consider further. Subsequent to the WG4 Meeting ending, alternative wetlands datasets were suggested and ***NAB*** has conveyed these to ***KS*** for consideration.

Action related to wetland scenario:

Action	Responsible	Due date	Status
Consider availability of alternative wetlands datasets - discuss with TY, MW, NAB	KS	Jan 2010	

WG4 MEETING AGENDA		
Monday, 20 July 2009		
09:15	Welcome & introductions	
09:30	Workshop objectives & updates	Nick Beresford
09:45	Exercise 3 – overview	Nick Beresford
10:00	Presentations on application of models: RESRAD-BIOTA (UoL) RESRAD-BIOTA (ANL) ERICA (ANSTO) ERICA (SCK·CEN) DosDimEco EPIC DOSE3D EA R&D128 SÚJB K-BIOTA EDEN ICRP RAP report	Presenting: Mike Wood Sunita Kamboj John Twinning Hildegarde Vandenhove Hildegarde Vandenhove Ali Hosseini Jordi Vives i Batlle Jan Horyna Nick Beresford Karine Beaugelin-Seiller Nick Beresford
	Coffee break as appropriate	
12:30	*Lunch*	
13:30	Analyses of Exercise 3 results	Jordi Vives i Batlle
	Exercise 3 discussion & plan for publication	All participants
14:30	Modelling absorbed dose with heterogeneous distribution of radionuclides in media EDEN EPIC DOSE3D	 Karine Beaugelin-Seiller Ali Hosseini
	Coffee break as appropriate	
16:30	Close	
Tuesday, 21 July 2009		
09:00	Exercise 3 – what we didn't do … A possible approach to modelling the exposure of wildlife to noble gases	Jordi Vives i Batlle
10:00	Beaverlodge scenario – available data, objectives and way forward	Richard Goulet
Coffee break as appropriate		
11:30	Little Forest scenario – available data, objectives and way forward	John Twining
12:30	*Lunch*	
13:30	Wetland scenario – overview and wayforward	Karolina Stark
14:00	Update on dynamic modelling review	Jordi Vives i Batlle
14:30	Presentation of IAEA TC Project – providing technical support for implementing modern approaches and tools for the assessment of radiation impact on terrestrial and freshwater environments	Snezana Dragovic
15:00	AoB, round-up of actions and close	