BIOPROTA

Key Issues in Biosphere Aspects of Assessment of the Long-term Impact of Contaminant Releases Associated with Radioactive Waste Management

Report of Fifth Workshop

Stockholm, 3-4 May 2004

Hosted by SKB

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History

Draft report Version 0.1 prepared by Enviros Consulting Ltd, distributed to those organisations which provided input.

Preface

The report is presented as working material for information. The content may not be taken to represent the official position of the organisations involved.

Contents

1 Introduction

Key issues in biosphere aspects of assessment of the long term impact of contaminant releases associated with radioactive waste management were identified at a Preliminary BIOPROTA Workshop, hosted by Andra in June 2002 [BIOPROTA, 2002a]. 16 agencies provided input and objectives were subsequently agreed. The main intention is to guide how organisations carry out site characterisation when moving to site specific investigations; hence the three themes and tasks identified. Common issues and a way forward were set out in a BIOPROTA Concept and Definition Document [BIOPROTA, 2002b].

The original working arrangements agreed two years ago, were that, following discussion of key uncertainties, Themes and Tasks were agreed and Task Group Leaders agreed to be responsible for co-ordinating model testing and reporting as appropriate. The Technical Secretariat was appointed to document and QA the project in a similar manner to BIOMASS.

Following the September 2003 Workshop in Paris, there has not been as much progress as anticipated in each of the tasks. This Workshop is to discuss what can be achieved and produced before September 2004 with the time and resources available. In addition, some consideration of BIOPROTA management and work programme beyond September 2004 will be discussed.

Other International Programmes

BIOMOSA:
The final BIOMOSA report is expected to be published soon. It is probable that some scientific papers will be drafted for publication in relevant journals and conferences in the near future.

BIOCLIM:
All reports up to and including Deliverable D8 have been produced as ANDRA reports. The final report, D10-12, has been finalised and proof read and will be published imminently. There will be a series of journal papers expected to appear in 2005, within a special edition of the Journal of Radiological Protection. Mike Thorne has a table of contents for those interested.

BIOMASS:
The final BIOMASS report, *Testing of environmental transfer models using data from the remediation of a radium extraction site Report of the Remediation Assessment Working Group of BIOMASS Theme 2, IAEA-BIOMASS-7, March 2004* has now been published. It is available from http://www-pub.iaea.org/MTCD/publications/PDF/Biomass7_web.pdf

EMRAS:
Elisabeth Leclerc-Cessac and Mikhail Balanov will be kept informed of progress within BIOPROTA to ensure that programmes do not duplicate effort. Tasks which are of interest to both are, for example, the database and C-14 modelling because the same modelling issues are of concern (albeit within EMRAS the timescale is for a short term release).

IUR
Subsequent to the last Workshop in Madrid, a draft structure of a report for experimental and monitoring needs, including matrices was developed. Rodolfo Avila (Facilia) and Brenda Howard (CEH) are due to meet to decide how to take this forward

2. Discussion of the Themes and Tasks

The workshop provided a setting for some lively debate for the Themes and Tasks within BIOPROTA. The following note does not document all arguments, rather the most important issues and the agreed decisions regarding how the Themes and Tasks should proceed.

Several of the Tasks were introduced with a presentation by the Task Group Leader (TGL) or the Technical Secretariat. (TS). Where available, these presentations have been filed on Business Collaborator.

2.1: Theme 1: Specialised Database for Key Radionuclides and Process Data (TGL: Enviros)

The functionality of the current version of the database was demonstrated, albeit to a limited extent due to lack of input data which has been provided. As previously, there was consensus on the structure of the report. There are some inaccuracies that need to be addressed, e.g. to ensure correct units and all references included, preferably with supporting files (which should capture all of the caveats associated with the data). Transcription of data must be checked and the supporting report should be quality assured.

Whilst the focus will remain on the key radionuclides previously identified (Cl-36, Tc-99, I-129 and Np-237), other radionuclides will be included where new, interesting or analogue data is appropriate, including stable elements. IAEA TRS 364 data will not be included because of EMRAS review, but relevant Balkema data will be added, although not animal data as this will be superseded by latest MTA reports.

The database will be populated with data from:

- MTA biokinetic data from the FSA and Imperial College data sets,
- ANDRA student collating Cl-36 data,
- ECOMAtters (TS to request data sets from Steve Sheppard),
- Ulla Bergstrom provide reports on U and Ra, Cs in natural environments; whilst not key radionuclides, they are of interest,
- TGL to examine YMP ERMYN data for relevant inputs.

Those mentioned above are requested to provide data as soon as possible. Any other data is welcomed. The TGL will circulate a note repeating the key radionuclides and processes, however other can be added as suggested above.

For September 2004, the TGL will produce a version of the database with data for several radionuclides, a supporting report providing background to the structure and use of the database, some discussion of the populating data, and guidance for using Cl-36 data, and

interpretation and discussion of recommendations for new experimental research. It may also be possible to create write enabled partitions so that other users can include data without affecting version control. MTA will investigate this functionality with NNC.

2.2: Theme 2: Modelling

First 4 tasks of T2 are model testing exercises, regarding whether site differences are arbitrary or not.

Task 1: Develop guidance on irrigation modelling (TGL Ulla Bergstrom)

A presentation was made by the TGL, detailing the participants, objectives, test calculation scenario, similarities and discrepancies. The presentation can be found on Business Collaborator.

The future work programme between May and September will involve:

- Checking values
- Obtaining better description of conceptual models (including discussion of evapotranspiration)
- Analysis of the calculation at each step
- Obtaining consensus for conclusions and recommendations
- Improving and finalising the report

The TGL has specific questions to ask participants (via the TS), and in addition the participants are requested to provide more detail on real irrigation patterns in their countries, and the definitions of processes such as interception. MTA will check the correct Nirex data is used. Participants and the TGL will also check that the conceptual model described reflects the calculations provided.

The TGL with TS support will produce a final report for September taking account of participant input and providing conclusions.

Task 2: Develop guidance on the inhalation pathway for actinides accumulating in soils/sediments (TGL, Maryla Wasiolek and Wesley Wu)

The TGL could not attend the Workshop, therefore the TS described the Task and Working Material report in its current form.

As above for Task 1, the future work programme between May and September will involve:

- Checking values
- Obtaining better description of conceptual models
- Providing sensitivity analyses
- Obtaining consensus for conclusions and recommendations
- Discussion on different important processes, e.g. dust loading, activity distribution among differently sized particles and chemical form.

Participants are asked to comment on their model sensitivities and uncertainties, e.g. for enrichment and particle size and talk about caution. Specific data to include is additional

Ciemat information, and human behaviour assumptions, a memo on which will be provided by MTA (for behind a tractor), and resuspension data from Rocky Flats.

If appropriate, a matrix of parameter values such as particle size of dust loading and associated activity will be developed as well as a commentary on the association of dose coefficient with particle size.

The TGL with TS support will produce a final report for September taking account of participant input and providing conclusions.

Task 3: Model Review for C-14 Dose Assessment (TGL, Steve Sheppard)

A review of C-14 modelling approaches has been conducted by Steve Sheppard, ECOMatters with input from several participants. Interested participants are requested to comment on the review drafted by Steve Sheppard as soon as possible. Comments will feed into the May - September work programme. Participants are also requested to consider the input data, and consider the relevance of specific values, as this will be more valuable at this stage than a test calculation. Subsequent Working Material will therefore discuss the different principles otherwise any future test calculation would not be comparable.

Issues such as carbon flux models and interpreted transfer factor approaches can be considered, in addition to the differences in modelling of pathways, atmospheric exchange, geosphere carbon sources, carbon pool distribution relative to each other and their changes. Participants are invited to discuss and provide input data regarding their own C-14 model (e.g. compare EdF, ECOMatters and MTA conventional, agricultural, terrestrial ecosystem models and approaches). ANDRA may wish to be involved and could scrutinise the report.

The comparison and review will consider whether equilibrium or dynamic fluxes are required and whether kinetics matter terrestrially (possibly not because equilibrium would normally be reached in a few years), whether mass flux is important and what it looks like i.e. concentration in different pools.

Mike Thorne will therefore make contact with Steve Sheppard and agree a work programme through to September 2004. The TS can provide support as necessary for completion of a final report.

Task 4: Updated Model-Model Comparison Exercise (TGL, Achim Albrecht)

A presentation was made by Hide Yoshida (JNC) on behalf of the TGL, detailing the participants, objectives, test calculation scenario and results of the inter-comparison exercise. The presentation can be found on Business Collaborator.

The modelling approaches of the participants varied slightly, although there are incomplete descriptions of some conceptual and mathematical models and therefore comparison has not been completed. Participants are requested to update information to explain the results in more detail and allow the TGL to draw conclusions.

Within the Well scenario the results for some of the radionuclides illustrates good agreement between the different calculations. Where differences arise, it may be due to Kd, water flow or irrigation rate etc, although greater analysis is required to fully determine the reasons for the differences.

The concentration of radionuclides in soil has been included, and those models that include a sub-soil or unsaturated soil layer, the concentration of radionuclides in this compartment would be useful to provide more information on losses and inputs. MTA, Alexandria Sciences and UKAEA are requested to provide this data to the TGL as soon as possible.

For the River Flooding scenario, the flood rate is low and is more likely to be an annual average value for a site only occasionally flooded. If this is the case, then a more appropriate description is required.

For the Well scenario there is confidence in the results and the known differences can be explained. The River scenario requires better information and is more difficult to interpret (this might be done post September). Cropping and percolation losses, irrigation rates and seasonal change all affect the results and will be considered in the conclusions of the Task.

Participants are requested to provide comments on the latest draft report and the TGL will make specific requests for data or to answer questions as necessary. MTA will provide a note on Cl-36 cropping losses in arable and pasture land. The timescale of producing final report material from this Task is shorter than the others due to the return of Hideji Yoshida to Japan from Andra at the end of July.

Task 5: Update and review use of analogue data to resolve the key issues identified (TGL, P Degnan)

No progress on this Task has been made since the previous Workshop. Nirex as TGL are unlikely to have time to commit to this, and therefore has let a contract to Enviros to complete the Task. A draft final report for comment is expected in July.

Task 6: Environmental Change

This task has been amalgamated with Task 7, see below.

Task 7: Geosphere Biosphere Interface Zone (TGL, Ciemat)

A Workshop took place in December that benefited from participation of geologists, radioecologists, and biosphere modellers to discuss the GBIZ. Several key issues were raised (the Workshop report and presentation material can be found on Business Collaborator).

It is not possible for Ciemat to remain as TGL, but all concerned would like Ciemat to remain involved in the drafting of the final Task report. The Task will benefit from the good will of the SC and consultants to make added value comments on the current draft report, provide text of issues raised from the December workshop, and suggest

recommendations for a future work program so that the report can be published. Therefore there is an action on participants to revisit both the Working Material report and the Workshop input/output, for production of a final report.

Enviros will do the editorial work, and will request feedback on particular issues as necessary. BIOCLIM/BIOMOSA material will be included as appropriate.

2.3 Theme 3: Site Investigation, Experiments and Monitoring

Task 1 and 2: Develop guidance on biosphere site specific characterisation and Research Protocols

The two Tasks within Theme 3 were combined in 2003 into one Working Material report which currently has some gaps which can be filled from the following inputs:

- MTA text on Swedish ecosystems and Nirex Sellafield site characterisation.
- Approaches adopted in and objectives of the national programmes.
- Posiva, monitoring and characterisation of underground facility. Input from Posiva 2003-05 report.
- YMP RMEI characterisation report (TS).
- Historical evolution of strategy (including a justification of methods to demonstrate how and why we are looking at and measuring particular issues).
- Characterisation of natural background
- Section describing site characterisation of shallow burial sites e.g., BNFL Drigg, Centre de L'Aube and El Cabril. Comparison and similarities between shallow and deep biosphere characterisation can be made. There is potential for lessons to be learnt for deep programmes from shallow characterisation schemes which have a longer history of site specific investigation.
- How to handle data e.g. GIS and database stores etc. Lessons can be learnt from SKB programme with input from Tobias Lindborg.

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For the national programme inputs, it was suggested to provide a series of questions or a template to national representatives. Initially, information provided under the following headings would be appropriate: climate, geology, edaphology, topography, water bodies, ecosystem characteristics, and human influences.

The TGL with TS support will produce a final report for September taking account of participant input and providing conclusions.

3 Work Programme and Schedule

Publication of Task Reports

The Tasks will continue as described above and be internally reviewed by task participants. Where possible, external review of reports would be beneficial. So far as practicable, the reports will be published as stand alone documents and subsequently

compiled into a single volume. The reports will be made available in hardcopy and pdf on the website.

September Workshop

It was agreed that a meeting would be held in Pori, Finland, hosted by Posiva. The Workshop will take place on 22 -23 September and an excursion to Olkiluoto is planned for 24th September. Details of travel and accommodation will be circulated in due course. It is as yet undecided whether this Workshop will be made open to a wider audience i.e. whether to focus only on presentation and discussion amongst contributors to the various Task outputs, or whether to also invite a wider audience. The Steering Committee and the Technical Secretariat are working on developments of a future BIOPROTA programme beyond September 2004.

4 Acknowledgement

All participants expressed their thanks to SKB for arranging the Workshop at the Scandic Hasselbacken and providing excellent facilities and hospitality.

5 References

BIOPROTA (2002a). BIOPROTA Key Issues in Biosphere Aspects of Assessment of the Long-Term Impact of Contaminant Releases Associated with Radioactive Waste Management, Report of Workshop 12-14 June 2002, hosted by Andra, Chateney-Malabry.

BIOPROTA (2002b). BIOPROTA Key Issues in Biosphere Aspects of Assessment of the Long-Term Impact of Contaminant Releases Associated with Radioactive Waste Management, Project Concept and Definition Version 2, September 2002.

APPENDIX A: Workshop Participation List

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APPENDIX B: Workshop AGENDA, Sweden, May 2003.

The meeting will focus on progress to date and implementation of a future work plan. Presentations will be made by Task Group Leaders and/or the TechSec.

Monday 3 May

12.00PM Lunch

14.00PM Day One

Coffee will be served between 14.30 and 15.00 hrs

Introduction: Aims and Objectives of the Meeting, Chairman and TechSec
Review of agenda
Theme 1: The specialised database: developments since 2003, TechSec

Theme 2: Task 1 Irrigation Modelling, TGL or TechSec
Theme 2: Task 2 Inhalation Modelling, TGL or TechSec

5.30PM Close (for participants)

Steering Committee Meeting

Tuesday 4 May

9.00AM Day Two

Theme 2: Task 3 C14 Modelling: Discussion of C14 modelling review, discussion of participant experience when modelling, TGL or TechSec
Theme 2: Task 4 Model Intercomparison: Results of the previous test calculation, discussion of conclusions, H Yoshida, Andra

Theme 2: Task 5 Natural Analogues: review of analogue database, analogue data that can be used in biosphere assessments, P Degnan

12.00PM Lunch

13.00PM

Theme 2: Task 6 & 7: Environmental Change and the Geosphere Biosphere Interface Zone, review of December workshop, consideration of way forward, TGL or TechSec

14.30PM Coffee

Theme 3: Task 1 & 2: Site Characterisation, and Research Protocols, TGL or TechSec
Discussion of collaborative efforts with IAEA and IUR strengthening BIOPROTA

Future Work Programme: Discussion of proposals for work to end September 2004 and beyond, Chairman or Techsec

17.00 Close