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

EMRAS II
Reference Approaches for Human Dose Assessment
Working Group 3
Reference Models for "Waste Disposal"

M I N U T E S

of the Third Meeting held at the Helmholtz-Zentrum, Munich, Germany
5–7 October 2010

IAEA Scientific Secretary	Working Group Leader
Mr Gerhard Proehl ***(GP)*** Head, Assessment & Management of Environmental Releases Unit Waste & Environmental Safety Section (Room B0765) Division of Radiation, Transport & Waste Safety International Atomic Energy Agency (IAEA) Vienna International Centre PO Box 100 1400 VIENNA AUSTRIA Tel: +43 (1) 2600-22854 Fax: +43 (1) 26007-22692 Email: G.Proehl(x)iaea.org	Mr Tobias Lindborg ***(TL)*** Biosphere Safety Assessment Manager, Safety & Analysis Swedish Nuclear Fuel & Waste Management Company (SKB) Blekholmstorget 30 Box 250 10 124 STOCKHOLM SWEDEN Tel: +46 (8) 459-8407 Fax: +46 (8) 661-5719 Email: tobias.lindborg(x)skb.se

Attending	
Name / Initials* / Email	**Organization / Country**
Mr Sten Berglund ***(SB)*** (sten.berglund(x)skb.se)	Swedish Nuclear Fuel & Waste Management Company (SKB), SWEDEN
Mr Per-Anders Ekström ***(PAE)*** (peranders.ekstrom(x)facilia.se)	Facilia AB, SWEDEN
Mr Ari Ikonen ***(AI)*** (ari.ikonen(x)posiva.fi)	Posiva Oy, FINLAND
Mr Jan Christian Kaiser ***(JCK)*** (christian.kaiser(x)helmholtz-muenchen.de)	Helmholtz-Zentrum München GmbH, GERMANY
Mr Ulrik Kautsky ***(UK)*** (ulrik.kautsky(x)skb.se)	Management Company (SKB), SWEDEN
Mr Sven Keesmann ***(SK)*** (sven.keesmann(x)nagra.ch)	National Cooperative for the Disposal of Radioactive Waste (NAGRA), SWITZERLAND
Mr Gerald Kirchner ***(GK)*** (gkirchner(x)bfs.de)	Bundesamt für Strahlenschutz (BfS), GERMANY
Mr Ryk Klos ***(RK)*** (ryk(x)blueyonder.co.uk)	Aleksandria Sciences, UNITED KINGDOM
Ms Katerina Kouts ***(KK)*** (kouts.kate(x)gmail.com)	Republican Scientific-Practical Centre of Hygiene (RSPCH), BELARUS
Ms Laura M.C. Limer ***(LL)*** (laura(x)limersc.com)	Limer Scientific Consulting Limited, PEOPLE'S REPUBLIC OF CHINA (Working from Quintessa Limited (UK) at the time of this meeting)
Ms Maria Nordén ***(MN)*** (maria.norden(x)ssm.se)	Swedish Radiation Safety Authority (SSM), SWEDEN
Mr Geert Olyslaegers ***(GO)*** (golyslae(x)sckcen.be)	Studiezentrum für Kernenergie (SCK/CEN), BELGIUM

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

Attending	
Name / Initials* / Email	**Organization / Country**
Mr Danyl Pérez-Sánchez ***(DPS)*** (d.perez(x)ciemat.es)	CIEMAT, SPAIN
Ms Natalia Semioschkina ***(NS)*** (semi(x)helmholtz-muenchen.de)	Helmholtz-Zentrum München GmbH, GERMANY
Mr Graeme (George) Shaw ***(GS)*** (george.shaw(x)nottingham.ac.uk)	University of Nottingham, UNITED KINGDOM
Mr Graham M. Smith ***(GMS)*** (gmsabingdon(x)btinternet.com)	GMS Abingdon Limited, UNITED KINGDOM
Mr Christian Staudt ***(CS)*** (christian.staudt(x)helmholtz-muenchen.de)	Helmholtz-Zentrum München GmbH, GERMANY
Mr Shulan Xu (shulan.xu(x)ssm.se)	Swedish Radiation Safety Authority (SSM), SWEDEN

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

Objectives of the Meeting

The objectives of the meeting were to present and discuss progress with the work of the 4 sub-groups (SG), and to develop a continuing work plan, notably, to be able to provide a draft document with recommendations to the IAEA addressing the WG objectives at the next EMRAS II Technical Meeting in January 2011.

Presentations by participants, followed by discussion

SG1(1): Modelling the fate of radionuclides from nuclear waste repositories in biospheres under climate change: "the analogue approach" (Jan Christian Kaiser, HZ-M)

SG1 focuses on the use of data for present day conditions at other sites with different climate and other characteristics which are considered as suitable analogues for future conditions at the site in question.

JCK summarised the waste arisings anticipated in Germany and the plan for development of deep geological disposal. Concerning safety assessment, there is a group in HZ-M looking at the retention of radionuclides in the geosphere (waste matrix, filling material and technical barriers, host rock, overburden), and a team doing groundwater transport modelling. The biosphere team is looking into interfaces with the biosphere (rise of contaminated groundwater, well), and the impacts of subsequent utilisation of that water. The water dynamics between the well and groundwater cases are quite different. ***JCK*** noted possible impacts of water table position on redox sensitive radionuclides, i.e., those for which redox conditions will affect their behaviour.

It is clear that the interfaces and the dose assessments can be influenced by climate change. The approach being adopted is first to look at the climate conditions at a range of sites from northern Scandinavia to Morocco and to consider how those conditions would affect biosphere dose conversion factors (BDCFs), all other things being equal. The local consumption of different foods has also been considered and the implications for soil properties, which in turn affect the selection of model parameters. Soil properties etc., were assumed to be constant. It was noted that for some radionuclides, the assumptions for transfer factors were the same at all sites, but this may reflect lack of data rather than a similarity of behaviour in different conditions. A range of results was presented and discussed.

JCK then presented some ideas about the general interaction of climate and soil processes and hence for modelling the transition between different climates. Suggested assumptions included:

— Consider only two generic models: warm → cold and cold → warm. That means well → rising groundwater and vice versa (simpler possibility ration of irrigated and wet areas changes during climate change);

— Transitions occur between equilibrium states;
— Main impact on redox-sensitive radioelements like Tc, I and Se.

JCK noted that modelling a change in conditions as instantaneous can give a spike response which is not realistic. However, it was also noted that human actions can cause rapid changes in systems, albeit still with a relatively smoothed out implication for changes in level of exposure. ***GK*** cautioned about the use of 1st order representation of long-term dynamic representation of radionuclide behaviour in soils. ***GP*** noted the use of empirically based model validation work carried out by BfS. It is possible that more could be made of historic monitoring data at nuclear sites in this context, for partial model validation. (EMRAS II WG2 is collecting such information in relation to NORM radionuclides which could be of interest to WG3.)

SG 2(1): ♣Effect of climate change on dose impact assessments – how to proceed? (Geert Olyslaegers, SCK/CEN)

SG2 focuses of the important features of the soil plant system. It is considered important because of the role of the foodchain in the most significant exposures for the most significant radionuclides, such as Cl-36 and I-129, as determined from previous assessments. Of special interest is how environmental change affects processes and parameters.

GO summarized the currently anticipated climate changes in the short- and long-term and the corresponding effects on managed ecosystems. Many biosphere components might be affected, e.g., soil-plant TF's, biomass, transpiration rate, water consumption, animal TF's, species of plants and animals present, diets (human and animal), irrigation regime, erosion, and bioturbation. Changes in the irrigation regime and in the level of the phreatic surface were noted as especially relevant. Data were presented showing that an increased atmospheric CO_2 level can result in increased plant growth rates.

GO then presented some results for effects on BDCFs for a range of radionuclides, based on assumed linkages between CO_2 and temperature data, and a set of illustrative precipitation rates. The results indicate that precipitation is a more important factor than CO_2 levels, except in the case of C-14, where there is a diluting effect. ***GO*** noted an interesting discussion in Dowdall, M., Standring, W., Shaw, G., and Strand, P., (2008) Will Global Warming Affect Soil-to-Plant Transfer of Radionuclides. J. Env. Radioactivity 99, p1736–1745.

UK mentioned that SKB has been looking at how temperature change might affect ecosystem dynamics and noted only one order of magnitude difference primary production from arctic to tropics in overall integrated ecosystem effects. Even if general production increased, often offset by increased turnover. Some query as to whether the same would hold for managed and natural ecosystems or not.

GP noted that there is very little relationship between temperate and precipitation regimes, except perhaps maybe at the coast. This then gives issues of believability in climate predictions. It would be important for this group to identify those parameters which limit the uncertainty in dose assessment (e.g., drinking water consumption, plant growth rate) and find envelopes in which to work, while talking more qualitatively about what might happen outside of them.

GK suggested that the idea not to consider the specific climatic conditions at a site with time, but to know what processes might come into play at some time in the future. ***GMS*** noted that the period of peak release from the geosphere of relevant radionuclides is typically long enough for many changes to occur within that period.

♣ Indicates the name of the presentation given on the WG3 web page (http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-three.asp?s=8).

SG 2(2): Modelling "accumulation" and "exposure ecosystems" in dose assessment (Ryk Klos, et al., SSM)

SSM is working on the concept of "progressive realism", starting with the most conservative but credible case and then adding more realistic information to address the expected conditions at the site to quantify effects of modelling assumptions. There are three main motivations:

— Accumulation and exposure ecosystems – is there a difference? (accumulation in the evolving ecosystem; doses in an evolved ecosystem);
— Zonation in the biosphere (enhanced accumulation, review of ecosystem models for PA); and
— Review of soil models for long-term dose PA.

RK outlined approaches to address an evolving ecosystem, based on illustrations relevant to conditions in Sweden, e.g., conversion of a wetland to farmland, with long term prior accumulation in the wetland. He then described a 10 layer soil model being applied to address this situation which incorporates dynamic exchange between soil water and soils solids as well as dynamic plant uptake. The model also addresses changes in water table level and the implications for redox conditions. ***RK*** then presented results for a range of radionuclides and acute and continuous source terms. The differences between results for this model and the previously adopted 3 layer mode were also illustrated.

GK noted that it was interesting to investigate what can happen in certain situations, i.e., would such transitions cause radiological issues of concern, or is their effect only minimal?

SG 3(1): Systems descriptions – Forsmark (Sten Berglund, SKB)

SG3 is exploring the use of system modelling of climate and landscape change to understand the possible future biosphere conditions at a site, on a site specific basis.

SB described SKB work carried out on system descriptions and process identification. He outlined the Forsmark site geography and geology of the planned repository for spent nuclear fuel. The two main purposes of carrying out the detailed site characterisation is to gain a full understanding of the processes which go on at the site, and also to support selection of parameters to put into the assessment models. They have carried out site investigations, spanning many disciplines, to understand the present conditions as a basis for describing past and future evolution of the site. The bedrock investigations have led to an understanding of the characteristic features of the hydrogeology, and how they differ at varying depths. The hydrology has been studied to get an idea of likely discharge points and catchment dynamics, for use in transport models. The limnic ecosystems have been studied to look at carbon turnover and system dynamics. They have carried out special studies treating K_d and transfer factors, looking at site specific data and international databases.

SG 3(2): Site development, landscape evolution and reference futures (Tobias Lindborg, SKB)

TL presented SKBs view of the development of reference futures. Though the presentation might seem site specific, much of the information used has come from global information sources. For Forsmark they have looked at historical climate data (from Vostok ice cores and also sediment data) to estimate permafrost depth, ice sheet thickness and relative shore level, and how the climate domain depends upon these. They are focussing on how climate changes might affect processes which occur in different ecosystems (wetlands, agriculture, lakes, sea areas). To parameterise the different climate domains they are using a variety of methods:

— Historical data (proxy data, past carbon accumulations, human land use);
— Substituting time for space (analogues, transects); and
— Modelling (requires knowledge of how parameters change).

From the perspective of a safety assessment, one critical scenario is if a large reservoir were suddenly released. When climate changes, it may not be just parameter values that change, features may appear in the conceptual model as well. [Andersson (ed.) 2010, TR-10-02 – not yet published on the website].

SG 3(3): Future lake in a permafrost landscape at Forsmark (Per-Anders Ekström, for SKB)

PAE described a study to examine the effect of repeated cycles of permafrost on the transport and accumulation of radionuclides in the biosphere. The object under consideration has a large enough water body (lake) so that permafrost does not develop under the water body. Permafrost periods are assumed to occur around AD 9400, 23 000 and 40 000, with transition times flanking them assumed to last 2000 years, during which point all parameters affected by the permafrost were assumed to change continuously between temperate and permafrost values.

Three deterministic simulations were carried out, using two different permafrost assumptions and one using a greenhouse assumption. A location was chosen where a talik is more likely to develop, providing a route for focussed hydraulic discharge at the surface, rather than being somewhere that would be totally frozen. When examining the results the issue arose as to whether the transitions in doses is a result of accumulation in previous ecosystems (no) or whether the new ecosystem is somehow 'more dangerous' (yes). For Ra 226, the spikes associated with the periods of temperate climate are combined with land use, so that the biggest doses are calculated when it is possible for a well to be dug. The dose goes up with time because of the system transition, i.e., lake/bay drying up so less turnover of water leading to higher environmental concentrations. There was also an issue to be able to represent re-distribution of sediments.

SG 3(4): ♣Progress report to EMRAS II WG 3, Subgroup 3 (Ari Ikonen, Posiva)

AI noted that, like SKB, Posiva have collated lots of data on the system description and an initial description of the methodology of the site characterisation (BSD-2009, report POSIVA 2009-02). They have also identified processes and parameters potentially affected by environmental change, supported by an overall system transport matrix, with further subdivision in matrices for aquatic, terrestrial and soil sub-systems. Posiva are using knowledge from climate modelling (beginning from global circulation models, GCMs) to identify parameters potentially affected by climate change. As such, Posiva have plenty of data (nearly 900 pages of system description and input data, which are summarised in the main safety case level report), but work needs be done to agree a format in which it should be reported.

In terms of strategy, the model development, assessment, scenarios and data are all steps in an iterative process of site characterisation and understanding, and assessment activities. At the present stage, all aspects have been iterated at least once in the Posiva programme with the site understanding. Even with all the resources of the project there are still some data gaps which need filling with literature data, meaning that they need methodologies for data acceptance and statistical tools. The same applies to specification of ranges or distributions for parameters. Since it can never be possible to know everything about a site, other generic information may be needed, and in any event, a description of a specific site and the literature data applied should be consistent with generic understanding of how such ecosystems behave.

It was noted that how rigorously site-specific an assessment should be will depend on the stage of the repository development programme. The same applies for how much resource to spend; and in the early phases of a programme, overall understanding of the system is more important than single parameter values and gaining the understanding cannot be hastened or distributed to a wider group of experts.

♣ Indicates the name of the presentation given on the WG3 web page (http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-three.asp?s=8).

SG 4: Demonstrating compliance with protection objectives (Maria Nordén, SSM)

SG 4 is exploring common issues in compliance demonstration at the national level, taking into account international recommendations and protection objectives, as provided by the ICRP and IAEA. In particular, consideration is given as to how environmental change affects the safety case for meeting radiation protection objectives.

MN started by presenting examples of international recommendations on protection objectives for radioactive waste disposal and of national requirements and guidance. She noted that the IAEA is in the process of issuing further requirements and guidance documentation on solid waste disposal. ***MN*** also noted that different objectives are adopted over different timeframes and this can have a big impact on how to address environmental change. The WG is interested in the assessment approaches which address environmental change, but there is little experience in demonstrating compliance with protection objectives in the very long term, or indeed a common understanding of what that means. Hence it is hoped that the sharing of experience will be useful in this context.

GMS noted two relatively old IAEA TECDOCs which address safety indicators in different timeframes (IAEA-TECDOC-767 (1994) and IAEA-TECDOC-1372 (2003)[1]) and could be worth revisiting in the light of assessment developments. It was noted again that different approaches may be required at the different stages of repository development.

Cross-cutting issues and questions arising from presentations

The following points derive from discussion after all of the presentations were completed:

— In each country consideration has been given to critical FEPs for their assessment. It may be useful to consider whether the factors are universal or specific to a site, and whether it is a case of changing parameter values or model processes, or entire conceptual approaches.

— Changes in radiation protection science and radiological protection recommendations will occur during the entire period of development and operation of a geological repository.

— There is scope to learn from recent assessments and research through practical examples of how issues have been addressed. The same applies to how that work has been reviewed relative to the need to demonstrate safety. Those assessments will have had specific contexts attached to them (site conditions, protection objectives, stage of repository development, etc.).

— It should be possible to test the significance of different FEP treatments and/or the importance of particular assumptions by developing scenarios and applying different assessment models, or new ones, to those scenarios.

— We may be interested in changes to the biosphere before release commences and changes which occur after release commences, which may result in redistribution of activity which has already been released. The two types of change need not necessarily be addressed in the same way. For example changes prior to release might be addressed using analogues whereas as changes after release might need to be addressed in a more quantitatively dynamic manner.

— Study of dynamics and snapshots of situations can both help in demonstrating safety.

— How long is a transient and what do we mean by equilibrium? Analogues are not in equilibrium, all are dynamic to some degree, even if we can only observe them directly with a snapshot taken today.

[1] Both TEDCDOCs are available for download from the IAEA Publications website: http://www-pub.iaea.org/MTCD/publications/PDF/te_767_web.pdf and http://www-pub.iaea.org/MTCD/publications/PDF/te_1372_web.pdf, respectively.

— How can we determine the relevant temporal and spatial averaging required for particular assessment endpoints?

— There may always be a credibility issue with long term assumptions for environmental change, especially as mediated by human actions, so refer to this work as describing or developing "reference futures".

— It should be possible to identify the uncertainties on major factors and on what timescale they occur, and possibly present a timeline for them (site generic, but as an example for site specific application).

— What are the constraints which limit the range of possibilities? Should we develop a range of "what if" questions to identify the envelope of possible outcomes? Some questions might be relevant just to the biosphere, some to other aspects of the other systems, and some will cross-cut disciplines involved in the assessment. There is a biosphere-geosphere interface.

— One approach could be to identify conservative constraints using very stylised approaches. The corresponding criteria against which to consider the results, in terms of safety demonstration, would be correspondingly rough indicators of safety, such as comparisons with radionuclide fluxes (there is substantial literature in Sweden/Nordic flagbook etc., and e.g., Miller, W., Smith, G.M., Savage, D., Towler, P., and Wingefors, S., (1996). Natural Radionuclide Fluxes and their Contribution to Defining Licensing Criteria for Deep Geological Repositories for Radioactive Wastes. Radiochimica Acta 74, 289–295.

— If all of these ideas were put together, we might say we are developing Constrained Conservative Reference Futures (CCRF).

DPS gave a presentation on consideration of [♣]Spanish climate conditions within biosphere modelling which illustrated many of the cross-cutting issues, noting the following useful generalisations which may help to constrain the uncertainties:

— Warmer climate regimes may provide for a greater diversity of agricultural practice, as well as influencing human diet and behaviour (e.g., in water consumption).

— Colder climate regimes will tend to restrict the range of possible agricultural practices to crops tolerant of a shorter growing season, with increased emphasis (in communities dependent on local resources) on bringing animals inside during the winter, greenhouse cultivation and reliance on food products from natural and semi-natural ecosystems. There may also be increased seasonal differences in surface hydrology (snow melt, ice dams etc.) and human behaviour (e.g., diet, time spent indoors or outdoors).

— More arid climate regimes imply a greater soil moisture deficit and corresponding increased requirement for groundwater and surface water resources to be used in support of irrigation.

— More humid climate regimes may increase the availability of local water resources and rates of erosion, with the potential for increased dilution and dispersion of contamination.

DPS also noted that while processes giving rise to change may be continuous, they may have an abrupt effect on the system of interest.

Integration and synthesis of subgroup activities

Separate SG meetings were then held to carry forward the above mentioned material and further develop the work programme. Key points from plenary discussion thereafter were as follows:

[♣] Indicates the name of the presentation given on the WG3 web page (http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-three.asp?s=8).

— We are working towards one approach to developing reference futures which apply to the whole PA not just biosphere, and the approach evolves as the repository development programme evolves from concept, to site selection, to licence application, construction then operation, then closure and decommissioning. The approach is based on scientific understanding, investigation and research, research level representation of systems and then abstractions for assessment models.

— It is helpful to retain the SG activities, as a matter of organisation and avoiding everybody trying to do everything at once. However, they are complementary, with difference emphasis coming at different stages of repository development.

— We aim to identify factors which constrain an assessment in terms of uncertainties. Output from the group could include a flowchart of the stages of "CCRF" development, possibly starting from the system identification and environmental change diagrams in IAEA-BIOMASS-6[2] (Figures A5 and A6), but building substantially to take account of stages in repository development.

Work Plan

Each SG has its own programme of actions, as given in the ♣WG3 Work Plan (Version 2) and as extended from the current meeting discussions.

A draft interim report of the WG3 activities will be prepared for presentation and WG discussion at the next (third) EMRAS II Technical Meeting (see below).

TL (WG3 Leader) and Graham Smith will prepare an outline structure for the interim report by 10 November 2010 for distribution to participants.

Each SG agreed to document its work to date and, so far as possible, on-going modelling and other activities and provide this to the WG3 Leader by latest 1 January 2011 for incorporation into the draft interim report.

It is planned to finalise the interim report in the light of WG discussion and plenary feedback by the end of February 2011.

TL will continue to explore possibilities for widening WG3 participation.

Suggestions were invited for hosting of the 2011 WG3 Interim Meeting.

Meeting Closure

All participants expressed their appreciation to colleagues from the Helmholtz-Zentrum, München for effective organization and hosting of the meeting.

TL thanked all for the constructive and enthusiastic inputs and closed the meeting.

Next Meeting

The next (fourth) WG3 Meeting will take place as part of the Third EMRAS II Technical Meeting, being held at IAEA Headquarters in Vienna, 24–28 January 2011.

---

[2] Available for download from the IAEA Publications website: http://www-pub.iaea.org/MTCD/publications/PDF/Biomass6_web.pdf

♣ Indicates the name of the presentation given on the WG3 web page (http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-three.asp?s=8).

WG3 MEETING AGENDA		
Tuesday, 5 October 2010		
09:00–09:15	Opening of the Meeting and Introductions	T. Lindborg, WGL (SKB, Sweden)
09:15–09:30	Review of Meeting Objectives and Preliminary Agenda	
	Presentations and Discussion of Progress with Subgroup (SG) Activities	
09:30–11:00	*SG1 Analogue Approach:* This SG focuses on the use of data for present day conditions at other sites with different climate and other characteristics which are considered as suitable analogues for future conditions at the site in question.	J.C. Kaiser (Helmholtz-Zentrum, Germany)
11:00–11:30	***COFFEE BREAK***	
11:30–12:30	*SG2 Soil-Plant Processes:* This SG focuses of the important features of the soil plant system. This was considered important because of the role of the foodchain in the most significant exposures for the most significant radionuclides, such as Cl-36 and I-129, as determined from previous assessments. Of special interest is how environmental change affects processes and parameters.	G. Olyslaegers (SCK/CEN, Belgium)
12:30–14:00	***LUNCH BREAK***	
	Presentations and Discussion of Progress with Subgroup (SG) Activities (continued)	
14:00–15:15	*SG3 Dynamic analysis of future biosphere systems at specific sites:* This SG is exploring the use of system modelling of climate and landscape change to understand the possible future biosphere conditions at a site, on a site specific basis.	S. Berglund (SKB, Sweden)
15:15–15:30	***COFFEE BREAK***	
15:30–16:30	*SG4 Demonstrating compliance with protection objectives:* This SG is exploring the implications for demonstrating compliance with protection objectives at different stages of repository development of different approaches to addressing environmental change.	M. Nordén (SSM, Sweden)
16:30–17:30	Discussion of cross-cutting issues and opportunity to present new information	

Wednesday, 6 October 2010	
09:00-10:30	Subgroup work
10:30–11:00	***COFFEE BREAK***
11:00–12:30	Subgroup work
12:30–14:00	***LUNCH BREAK***
14:00–15:30	Subgroup work
15:30–16:00	***COFFEE BREAK***
16:00–16:30	Subgroup eork
17:00-17:30	Summary presentation in Plenary of Subgroup progress

Thursday, 7 October 2010	
09:00–10:30	Discussion of integration and synthesis of subgroup activities
10:30–11:00	***COFFEE BREAK***
11:00–12:30	Development of Work Plan to Achieve a Draft WG3 Document for Presentation at the next (3rd) EMRAS II Technical Meeting (being held at IAEA HQ, Vienna, 24–28 January 2011)
12:30–14:00	***LUNCH BREAK & END OF MEETING***