

BIOCLIM – BioMoSA: The Basis for a Joint Final Seminar

Two European Commission projects inaugurated under the 5th Framework Programme were completed at the end of December 2003. Both **BIOCLIM** (Modelling Sequential Biosphere Systems under Climate Change for Radioactive Waste Disposal) and **BioMoSA** (Biosphere Modelling for Safety Assessments of Radioactive Waste Disposal) made complementary contributions to the field of solid radioactive waste management. In particular, both projects aimed to improve long-term post-closure radiological safety assessments of potential deep geological repositories for solid radioactive wastes and both are addressing the characterisation of the biosphere in the context of such assessments.

BIOCLIM OBJECTIVES: Over a period of three years, a number of climate models operating at different spatial and temporal scales have been developed and adapted to produce a suite of scenarios for simulating climatic and vegetation changes over the next few hundred thousand years for three main, and two additional, regions of Europe (i.e. Central England, North East France and Central-Southern Spain, plus the Czech Republic and Germany). The climate models have been used to provide climate characteristics both for discrete time slices and for a continuous period of 200,000 years. Methodologies have been devised to utilise the output from the climate models for biosphere assessments in order to represent a range of biosphere conditions associated with particular climate classes and the transitions between them. Different methods to downscale global climate model output to regional scales have also been investigated, developed and applied to the climate model output. The research programme has built upon, and extended, the approach to biosphere system description developed in the IAEA BIOMASS Reference Biosphere Methodology by addressing how current regional biospheres systems of concern might evolve with climate change.

BioMoSA OBJECTIVES: Over the last two years, biosphere assessment models for present day time-invariant conditions have been developed for five specific sites in Europe each with different present day climate and environmental characteristics (i.e. sites in Belgium, Hungary, Germany, Spain and Sweden). Calculations to assess potential doses to members of the specified human communities at each site have been undertaken and the results have been compared for the different sites and with results obtained from a range of generic biosphere models. Model uncertainties and parameter sensitivities have been investigated. Conclusions have been drawn concerning the need, or not, for site-specific biosphere models and the important parameters that need to be included in biosphere assessments.

Although both projects explored some of the current uncertainties in biosphere characterisation, the issues addressed were rather different. BIOCLIM was concerned with determining qualitatively how current biosphere systems might evolve under climate change, whereas BioMoSA was focused mainly on the development and application of quantitative, computational models of radionuclide transport and radiological impacts for present day, non-evolving biosphere system states.

EC Projects - BIOCLIM and BioMoSA

Whereas BioMoSA addressed the modelling of time-invariant biosphere system states, the main thrust of BIOCLIM was to examine and characterise those aspects of environmental evolution that could give rise to significant factors that affect radiological impacts in the biosphere. It is argued that whilst many of the factors influencing radionuclide migration and accumulation can be investigated using the type of time-invariant models that have been developed in BioMoSA, there are some impacts that can only be evaluated through explicit study of biosphere evolution. In particular, radiological impacts arising from the *transitions* between the different biosphere system states whose features, events and processes cannot be readily captured in time-invariant models.

Given the different, yet complementary, approaches adopted in the two projects, it was considered appropriate by the EC project officer, the two project coordinators and the project participants that it would be useful to hold a joint seminar at the end of November 2003 so that results from both project could be presented and discussed. It was also agreed that the meeting should be open to others not involved with the projects but who have an interest in long-term radiological assessments.

The aim of the Joint Final Seminar was therefore to present the findings and conclusions arising from these two collaborative EC research projects concerned with methods of characterizing the biosphere over the long timescales involved in post-closure radiological safety assessments of potential deep geological repositories for solid radioactive wastes. It is hoped that the results from the two projects will help to improve biosphere assessment methods and enhance confidence in the modelling tools used. The seminar was designed to allow those with a wide perspective on assessments to evaluate and discuss the outputs from the two projects and the potential application of the results in biosphere assessments.