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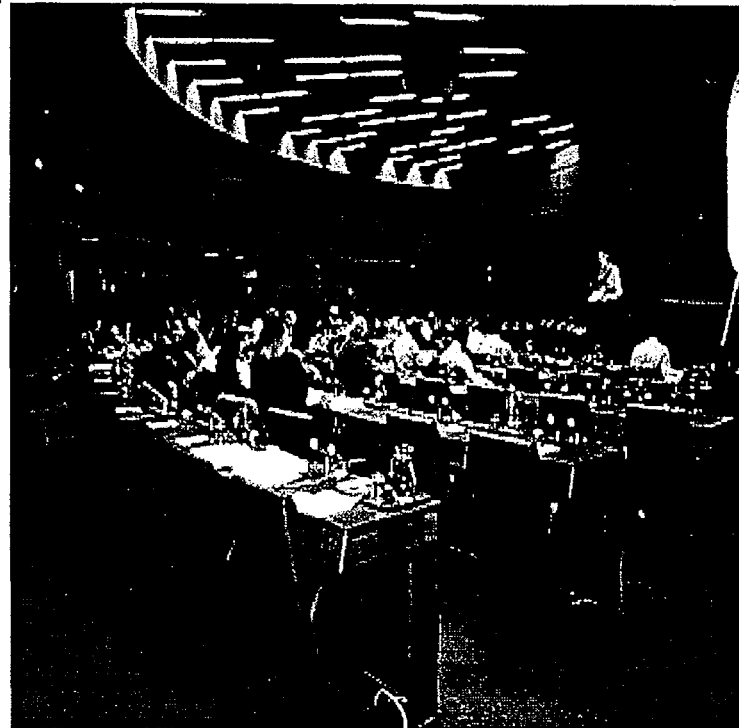
BIOMASS :THE INTERNATIONAL ATOMIC ENERGY AGENCY PROGRAMME ON BIOSPHERE MODELLING AND ASSESSMENT

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The new Agency Programme on BIOSphere Modelling and ASSEssment Methods (BIOMASS) was launched in Vienna in October 96. Around 100 representatives of 30 countries attended the first BIOMASS meeting.

GENERAL OBJECTIVES OF BIOMASS

- *to provide an international focal point in the area of biosphere assessment modelling*
- *to develop methods (including models, computer codes and measurement techniques) for the analysis of radionuclide transfer in the biosphere for use in radiological assessments.*
- *to improve models and modelling methods*
- *to develop international consensus, where appropriate, on biosphere modelling philosophies, approaches, and parameter values*



BIOMASS first meeting 10-11 October

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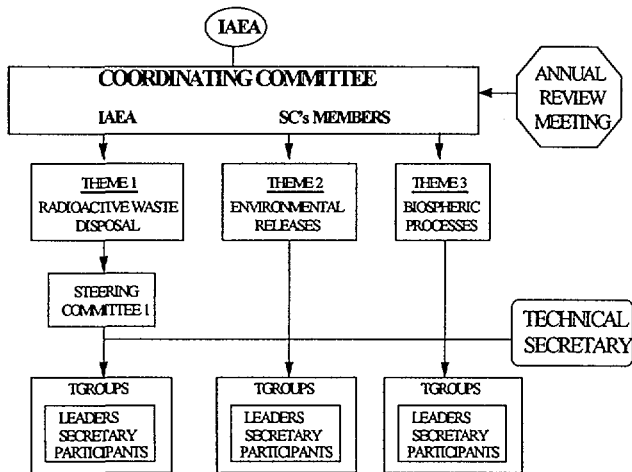
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1. ORGANISATION

The IAEA is responsible for the overall co-ordination of BIOMASS and it will be the lead organisation for all external dealings associated with the study.

BIOMASS is organised in three thematic areas: Radioactive Waste Disposal, Environmental Releases and Biosphere Processes.

ORGANIZATIONAL STRUCTURE



The Co-ordinating Committee is responsible for all decisions relating to the establishment of themes, working groups and their objectives. It will continuously review the overall progress of the study. It will be responsible for all decisions on publications associated with the study. The Co-ordinating Committee will be made up of the IAEA representative (Chairman) and two members from each thematic area.

Theme 1 Steering Committee is responsible for the organisation of Task Groups and the oversight and funding of Secretariat support. Continuous review of Task Groups progress will be undertaken. The Theme 1 Steering Committee will be made up of the funding organisations nominees and an IAEA representative (the IAEA will act as secretary). Task Group leaders will participate as and when required.

Scientific and Technical Secretariat. The IAEA will be generally responsible for the BIOMASS secretariat. For Theme 1 it will be supported by a consultant company (Quantisci Ltd) which will assist with arrangements for Theme 1 meetings and BIOMASS plenary sessions. Quantisci Ltd. will provide the technical and administrative secretariat for the Task Groups in Theme 1.

2. THEME ACTIVITIES

2.1 THEME 1: RADIOACTIVE WASTE DISPOSAL (REFERENCE BIOSPHERE)

The current objective of Theme 1 is to develop the concept of "Reference Biosphere" into a practical system for application to the assessment of the long-term safety of geological repositories for radioactive waste.

Introduction

Biosphere analysis in the safety assessment of geological repositories involves consideration of radionuclide migration and potential radiological exposure pathways for times far into the future. It was suggested at the outset of BIOMOVs II that the uncertainties associated with such time scales warranted the development of an internationally agreed set of "reference biosphere". This would provide a consistent basis for: the comparison of performance assessments for alternative disposal facility designs and locations; and the demonstration of compliance with regulatory safety criteria. The Reference Biosphere Working Group was established to respond to this challenge.

The BIOMOVs II Working Group noted that there are significant differences between existing modelling approaches, concluding that any reference biosphere model associated with a reference biosphere system would need to be based on a systematic justification of its composition and structure. It was therefore recognised in the early stages of the work programme that adoption of an agreed "reference methodology" was critical to achieving harmonisation in modelling approaches.

The results of the Working Group are set out in full in BIOMOVs II Technical Report 6. While this report provides an appropriate basis for biosphere model development, the Working Group recommended a number of future activities involving testing and augmentation of the methodology, as follows:

- to develop further the principles for defining critical groups relevant to long-term radiological assessments;
- to develop principles for applying field and other data to parameters used in biosphere assessment models for radioactive waste disposal;
- to apply the methodology in the light of a range of basic system descriptions and alternative assessment contexts;
- to develop more fully and formally a set of conceptual models according to the methodology, including clarification of the ways in which FEPs are represented and defining the corresponding databases.

These proposals were fully taken into account in developing the outline Task Specifications for Theme 1 as set out in the BIOMASS Research Programme description dated 30 August 1996.

Results of Theme 1 discussions at the first BIOMASS meeting, 10 - 11 October 1996

The basic objectives of Theme 1 of BIOMASS fall into three categories:

- **Completion** of the Reference Biosphere Methodology through specification of principles for definition of critical groups and application of data to assessment models.
- **Implementation** of the methodology in order to derive appropriate Reference Biosphere descriptions and models as a

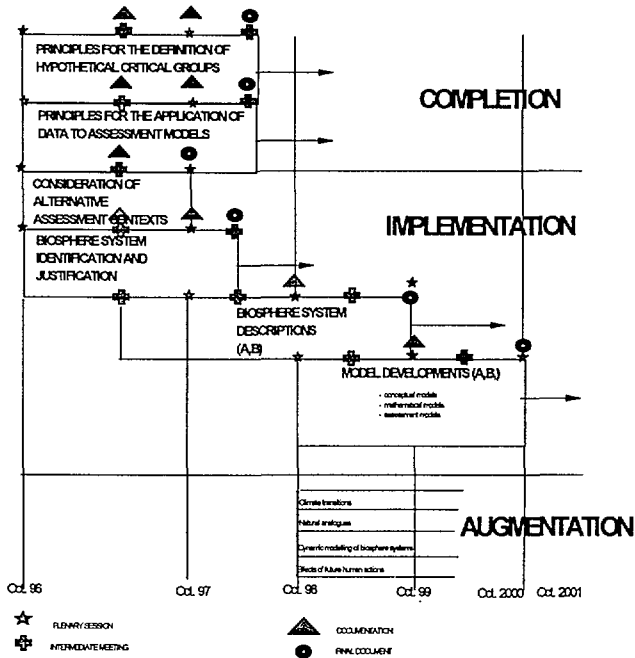
basis for post-closure performance assessment. This is the central goal of Theme 1.

- **Augmentation** of the scope of the methodology to incorporate specific issues that have not been addressed in its implementation to date. Such issues could include climate transitions, use of natural analogues, dynamic modelling of biosphere systems and the effects of future human actions.

These objectives were presented at the meeting along with a schedule of activities based on the formation of six Task Groups. The schedule is given in *Figure 2*. The six Task Groups are as follows:

1. Principles for the Definition of Hypothetical Critical Groups. Task Group Leader: John Kessler, EPRI (USA).
2. Principles for the Application of Data to Assessment Models. Task Group Leader: Pascal Santucci, IPSN (France).
3. Consideration of Alternative Assessment Contexts. Task Group Leader: Morimasa Naito, PNC (Japan).
4. Biosphere System Identification and Justification. Task Group Leader: Marianne Menut, ANDRA (France).
5. Biosphere System Descriptions. Task Group Leader: Paloma Pinedo, CIEMAT (Spain).
6. Model Developments. Task Group Leader: Mike Egan, AEA Technology (UK).

THEME 1: RADIOACTIVE WASTE DISPOSAL TASK SCHEDULE



According to the schedule, the first four Task Groups were planned to begin work in the Autumn of 1996. For these four Groups, the Task Group Leaders made presentations at the meeting to provide further explanation of the objectives of the work, and discussions were held to consider how to develop the work programme. The intention is to develop documents providing practical recommendations for each Task Group area. Considerable interest was shown among representatives from many organisations from around the world. These included many who had been involved in BIOMOVs II as well as others who had not.

It was recognised that the activities of all four Task Groups are closely linked and common interest was shown by participants in the activities of all four Groups. Furthermore, the links to Task Groups 5 and 6 were emphasised.

In order to better determine the detailed interest of participants in the proposed Task Group activities, it was decided to distribute a questionnaire about Theme 1. This has been distributed separately by the Theme 1 Secretariat, QuantiSci Ltd

At this stage, participation is open to any organisation.

The following outline schedule is proposed for the first year of BIOMASS Theme 1.

- November 1996: Distribution of further information and questionnaire concerning Task Group 1 - 4 activities.
- 17 January, 1997: Participants to have returned questionnaires (over 100 potential participants have been sent this already. If you would like to receive a copy please contact the BIOMASS Theme 1 Secretariat at QuantiSci).
- January - March 1997: Draft material to be produced for distribution prior to a combined Task Group meeting.
- 7 - 11 April 1997: Provisional date for combined Task Group meeting. The probable location is one of the Oxford University colleges, UK.
- April - September 1997: Draft Task Group reports produced and distributed.
- October 1997: Plenary BIOMASS meeting, to discuss draft Task Group reports.

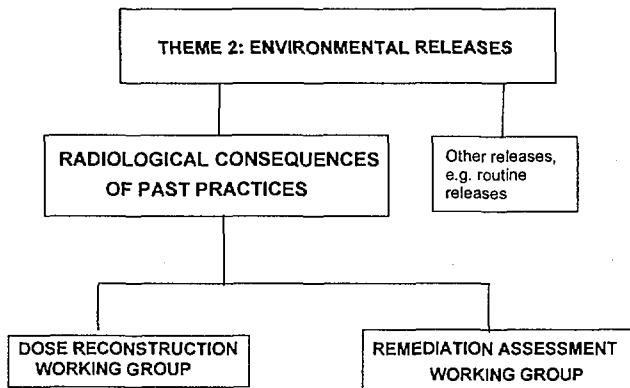
Comments and questions should be addressed either to the Working Group Leaders or to the Scientific Secretary:

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2.2 THEME 2: ENVIRONMENTAL RELEASES

The objectives of Theme 2 are to provide an international forum for activities aimed in increasing the credibility and confidence in methods and models for the assessment of radiation exposure related to environmental releases. Due to the growing interest in the legacy of past practices, two working areas have been identified: dose reconstruction and assessment of the efficiency of remedial measures.



Dose Reconstruction Working Group Meeting

The Dose Reconstruction WG held its initial meeting in Vienna in October. The first test exercise for this WG will be based on an accidental short-term release of radioiodine at Hanford, Washington, in the US. The Hanford scenario was developed by Bruce Napier of Battelle Pacific Northwest National Laboratories, who presented the scenario to a joint session of the Remediation WG

and the Dose Reconstruction WG. During the discussion that followed, several additional items of information were requested; these items are being distributed to participants. A summary of the scenario is provided below.

A preliminary schedule was developed for the Hanford test exercise. The scenario will be submitted in January 1997, both in paper and electronic form, to those who have already expressed their interest. Those who wish to be included in the distribution list, please contact the Scientific Secretary of the working group. Modellers will be asked to submit model predictions, together with descriptions of their models and approaches, to the IAEA by 25 April 1997. A WG meeting will be held 9-11 June 1997 in Mol, Belgium for formal discussions of the modelling results and preparation of a draft report. Participants' results will be distributed in advance of the WG meeting, and informal discussions by e-mail or other means are encouraged.

A number of other scenarios proposed for later test exercises were discussed. Three scenarios that currently exist in draft form will be distributed to WG participants for comments. These are the Techa River scenario, dealing with historic releases of Sr-90 in the Ural region of Russia; the Flood-Plain scenario, dealing with washoff of Chernobyl-origin Sr-90 and Cs-137 from the flood plain of the Pripjat River in Ukraine; and the Iput River scenario, a multiple-pathways scenario based on Chernobyl fallout data in the Bryansk region of Russia. Other scenarios that have been suggested include the dose reconstruction at Fernald, Ohio; additional years of predictions and measurements for the VAMP CB (Central Bohemia) and S (southern Finland) scenarios; and releases from a power plant in the Slovak Republic.

Technical comments regarding the draft scenarios are invited, as well as suggestions as to which scenarios should be used for further test exercises by the Dose Reconstruction WG. A second scenario will be selected at the WG meeting in June. It will not be possible to carry out all of the proposed scenarios during the course of BIOMASS. However, if sufficient interest exists among participants and scenario originators, it might be

possible to prepare some of the additional scenarios for publication (with test data) as technical reports.

Interest has also been expressed in having some discussion within the WG of philosophies and approaches concerning dose reconstruction. This is an issue of concern to a broader group than simply the modelling community, but one which could affect some aspects of how modelling would be carried out. We invite comments and expressions of interest in this topic also, with the goal of developing a report on these issues, in parallel with the modelling exercises.

Comments and questions on any of the activities of the WG should be submitted to the Working Group Leader

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or to the Scientific Secretary for the WG,.

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Comments or questions on the Hanford scenario may also be submitted directly to Bruce Napier.

Summary of the Hanford scenario

The Hanford test scenario describes an inadvertent acute release of I-131 to the environment that occurred in September 1963. Monitoring data were collected in the region for a two-month period following the release. The scenario can be used for several different purposes:

- (1) testing of various environmental transport and dosimetry models (e.g., atmospheric transport and deposition, food chain transport, human intake) by comparison of model predictions with measurements;
- (2) comparison of assessment methods for a given endpoint;
- (3) comparison of methods and approaches for selection of parameter values or performance and interpretation of uncertainty and sensitivity analyses; and
- (4) examination of approaches to accident management.

The Hanford scenario provides several different possible starting points and endpoints. The advantage is that individual participants can choose the parts that interest them or for which their models are designed. The disadvantage is that some of the possible starting points are of necessity the endpoints (or related to the endpoints) for other parts of the scenario, and thus we do not have the opportunity for testing blind predictions against test data. Therefore, we ask that participants evaluate their own performances with respect to their goals, the applications of their models, and the data that they used or had available to them. Reports will be organised by section or compartment of the test exercise, with emphasis on individual evaluations and (to the extent possible) comparison of different approaches to each part of the overall problem.

Participants should plan to submit the following information to Kirsti-Liisa Sjoebloom at the IAEA by 25 April:

- (1) Section(s) of the test exercise being modelled.
- (2) Description of approach(es) and model(s), including all assumptions, rationales for selection of parameter values, etc.
- (3) Description of any calibrations or preliminary calculations carried out.
- (4) Model predictions for each section being modelled.
- (5) Description of the uncertainties (95% confidence interval) for each model prediction,

including how the uncertainty was estimated and, if known, the dominant contributors to the uncertainty.

(6) Evaluation of the model performance with respect to the available measurements and the participant's goals in the exercise.

(7) Description of any changes made or recommended based on the test exercise.

Remediation Working Group meeting

At the working group meeting the first proposed scenario was introduced by Theo Zeevat. It is concerned with remediation at a radium extraction site in Belgium operated there from the early 1920s to the 1960s. During its operation, liquid effluents were released into a nearby brook (Bankloop), and radioactivity remains in five nearby disposal sites. The scenarios are focused on contamination in an approximately 100 ha area bounded by the Kleine Nete (River) and a road (Roerdompstraat). The spread of contamination was aided by flooding and by deposition of sediments on to the banks of the Bankloop.

The type A scenario focuses on remediation of the 100-ha area of contamination, which consisted of deep ploughing (1 meter minimum) and filling up the old Bankloop brook. Prior to this action, other ground work resulted in rerouting the Kleine Nete and Bankloop streams and construction of a drainage channel. The type A scenario will consist of using existing measurements of the Ra-226 contamination in the soil (performed prior to the remediation) and comparing assessment results with measurements following the remediation. The assessment exercise will be to "predict" concentrations in pasture and milk for two different time periods following remedial actions. Then comparison with results of follow-up surveys in the 1970s will be made. Post remediation information includes Ra-226 concentrations in milk.

The type B scenario would be contingent on the results of the type A effort. As a starting point, the current situation would be addressed and characterised (without further remedial action). This would be done to identify the major exposure pathways and any feasible remedial action

alternatives. Without the constraints necessary in the type A study, the type B scenario would utilise additional, more recent data. This would include more detailed information such as land use, spatial distribution of Ra-226 contamination, site-specific transfer factors for radium in the biosphere media, occupancy times, etc. Then based on the assessment using this data, a range of remedial actions would be considered involving source removal, material separation (chemical, biological) or immobilisation. The exact extent and type of data necessary for the type B scenario will be determined after the results of the type A scenario assessment have been obtained.

The type B scenario discussed above also involves the Olen site and extends to the evaluation of the effectiveness of the remedial actions. The participants in this working group were asked to provide other proposals for remedial action, as well as the suggested Olen type B assessment scenarios.

Other scenario proposals were at the meeting discussed. The most interesting was the case of lakes in the Bryansk Region of Russia which show high levels of Cs-137 contamination and for which remediation is being considered.

The proposed schedule for the Theme 2 Remediation Working Group effort is:

<u>Milestone</u>	<u>Time Frame</u>	<u>Action by</u>
Final description of Type A Scenario	End of 1995	Working Group Leader (WGL)
Transmittal of Results for Scenario A	May 26, 1997	Participants
Comments for Scenario B to WGL	May 26, 1997	Working Group Participants
Follow up Meeting* at SCK/CEN, Mol, Belgium	June 9-10, 1997	All participants

* Includes site visit

Responsibilities for Type B Scenario work would be apportioned as follows:

<u>Topic</u>	<u>Action by</u>
Selection & application of remedial action effectiveness (individual and/or collective dose)	Participants
Time frames to be used	Participants
Parameters for impact scenarios	WGL and participants

Identification of major pathways

WGL and
participants

Remedial action modelling and attendant
"arbitrary assumptions"

Participants

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2.3 THEME 3: BIOSPHERE PROCESSES

The objective of Theme 3 is to improve knowledge of the transfer of radionuclides, in particular parts of the biosphere, identified as important in the radiological impact assessment context. The identified topics will be explored by using a range of methods including reviews of the literature, model inter-comparisons and, where possible, model testing against independent sources of data. One of the aims of Theme 3 is to develop radiological assessments bringing together the best expertise from data gathering and data interpretation as well as in conceptual and mathematical model development, so as to improve the evaluation of radiological impacts which cannot be measured directly in the field.

At the final BIOMASS plenary session presentations were made on potential projects to be considered within Theme 3. These were:

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- 1.- Modelling of Tritium in the Environment Tritium environmental modelling,
- 2.- Modelling associated with Uranium Mining and Milling,
- 3.- Modelling of Forests,
- 4.- Fruit Tree Modelling,
- 5.- Experimental (Lysimeter) Study.

The presentations were followed by discussion and participants were asked to indicate their potential interest in the topics.

Subsequently, at the first meeting of the Co-ordination Committee it was decided that the projects on Tritium Modelling (WG leader - Yves Belot, France), Fruit Tree Modelling (WG leader - Gerhard Pröhl, Germany), and the Experimental Study (WG leader - Adrian Butler, UK), should go ahead. Plans will be made to start work on these topics during the next months.

It was considered that the Uranium Mining and Milling proposal needed more elaboration to emphasise differences from the BIOMOVs II study and that before proceeding on Forest Modelling the nature of the work funded by the European Commission (EC) on the subject should be determined. Important factors in decisions to proceed with these projects are: sufficient technical justification, the availability of resources for technical secretariat support, and sufficient interest from BIOMASS participants.

Tritium Working Group.

Following the decision at the Co-ordinating Committee Meeting that a Tritium Working Group (TWG) should be formed, a meeting was held in Vienna during 17-19 December 1996 to plan activities. A proposal document was prepared, discussed and finalised at the meeting. The objectives and approaches to the activities of the TWG have been defined. The programme will address important radiological issues associated with routine releases and with waste management. It is the overall aim to consider the total environmental impacts of such releases in an integrated way and therefore atmospheric, terrestrial and aquatic

pathways will be studied. It is proposed that the TWG will be a forum for discussing: the approaches and principles used to develop models; the approximations used; and the adequacy of models to describe real situations. The efficiency of the group will also be increased by the interaction of both modellers and experimentalists. Five main activities will be organised namely atmospheric modelling, hydrological transport modelling, coupling atmospheric and hydrological models, acquisition of experimental and field data to improve understanding of relevant processes and the collation of data sets suitable for validating tritium models.

To date, representatives from at least 13 different organisations and 9 countries have indicated that their interest in participating in the exercise. The TWG welcomes other participants and anyone with an interest in the work is invited to contact either the Working Group Leader

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or to the Scientific secretary for the WG,

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The first scenario has been drafted and this is included in the IAEA document entitled: Tritium Working Group Scope, Objectives and Approaches. Preliminary calculations for this first scenario are requested to be sent by the end of March 1997. A projected second scenario has also been included in this document. This scenario will be discussed, developed and drafted at the first TWG meeting (see forthcoming Events).

Proposals for additional topics

Proposals for additional topics to be considered in Theme 3 can still be made. Tentatively a similar arrangement will be made for their consideration at the October 1997 BIOMASS meeting.

The proposals can be addressed to:

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3. BIOMASS INFORMATION ON THE INTERNET

The BIOMASS Co-ordinating Committee and Theme 1 Steering Committee are setting up a "BIOMASS Information System".

The System will be available to all those have access to an e-mail address and a World Wide Web (WWW) browser through the IAEA home page. Its aim will be to use the capabilities of the WWW:

to provide background information to interested parties about BIOMASS;

to provide interested parties with an opportunity to register their interest in the programme;

to provide registered participants with detailed information concerning the programme;

to promote the rapid exchange of technical information between BIOMASS participants.

The BIOMASS Home Pages will provide a general introduction in the form of text and graphics to the background, aims and organisation of BIOMASS. Pages will be developed for each of the three Themes and provide more detailed information concerning each Task/Working Group. A pro forma will also be provided for interested parties to complete if they wish to register their interest in any of the BIOMASS Themes.

A prototype of the System will be presented for comments at the Theme 1 meeting in Oxford and Theme 2 meeting in Mol. A more advanced version will be presented at the next BIOMASS Plenary meeting in Vienna in October 1997.

4. FORTHCOMING EVENTS

Theme 1

Theme 1 Task Group Leaders meeting in Vienna (Austria) 3 - 7 February 1997.

Theme 1 meeting in Oxford (UK) 7 - 11 April 1997.

Theme 2

Theme 2 meeting in Mol, Belgium 9-13 June 1997, Remediation WG 9-10 June and Dose Reconstruction WG 11-13 June.

Theme 3

Tritium Working Group Meeting in Cadarache, (France) 22-24 April 1997

Fruit Trees Working Group Meeting in Vienna in Spring 1997.

The next BIOMASS Plenary meeting will be held in Vienna 6-10 October. More information about the meeting including a preliminary Agenda will be sent out on June 1997.