IAEA
Atoms for Peace: The First Half Century
1957–2007

الوكالة الدولية للطاقة الذرية
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Agence internationale de l'énergie atomique
Международное агентство по атомной энергии
Organismo Internacional de Energía Atómica

7th EMRAS Urban Remediation Working Group Meeting

6–10 November 2006
IAEA Headquarters, Vienna

M I N U T E S

1. Scope and objectives of the Meeting

The Urban Remediation Working Group (WG) of the EMRAS project held its seventh meeting during the period 6–10 November 2006, in Vienna, in conjunction with the fourth general meeting of the EMRAS project.

The Urban Remediation WG has the following overall objectives: (1) to test and improve the capabilities of models to characterise the radiation environment, including external exposure rates and concentrations of radionuclides, in urban areas contaminated with dispersed radionuclides as a function of location and time following a contamination event; (2) to use the results to estimate the doses to humans, including the identification of important exposure pathways; and (3) to evaluate reductions of human exposures that could result from specific countermeasures or remediation efforts.

The goal of the WG is to develop the capabilities of models as tools for decision making to address long-term radiological concerns after an urban contamination event has occurred and to assist in identifying required remediation measures.

The main objectives of the meeting were:

(a) to present and review the preliminary results for the Pripyat scenario (Districts 1 and 4 of Pripyat, in Ukraine);

(b) to discuss the proposed hypothetical scenario for deliberate radioactive contamination in an urban environment;

(c) to review the modelling approaches and information sources available for modelling the effects of countermeasures; and

(d) to develop future work plans.

The meeting followed the agenda presented in Appendix A. It was chaired by Ms. K. Thiessen (USA) and was attended by thirteen experts from nine countries (see Appendix B).

2. Work performed

2.1. Pripyat scenario

Preliminary modelling results for the Pripyat scenario from three participants (T. Charnock, UK, W.T. Hwang, South Korea, and J. Tomás, Cuba) were presented and discussed. In particular, the reasons for differences among the model predictions were discussed. Comparisons were also made between the predictions and the available test data. The list of

countermeasures to be modelled was revised. Plans were made to simplify the previous approach (Phases A, B and C) to an approach involving Districts 1 and 4 of Pripyat, both with no countermeasures and with selected countermeasures. The WG also made plans for completing the modelling exercise and the corresponding documentation – a single report of the Urban Working Group.

2.2. Hypothetical scenario

A new draft version of a hypothetical deliberate dispersion scenario was distributed prior to the WG meeting and discussed at the meeting. The draft scenario is based on an unnamed city. A simulated deposition is given for the starting points. The WG made plans to improve the simulation of the starting deposition pattern and revised the list of countermeasures and modelling endpoints to be considered. The WG also made plans for completing the modelling exercise and the corresponding draft Urban WG Report.

2.3. Overview of modelling approaches

The overview of modelling approaches for urban contamination that was developed by F. Gallay (France) was distributed prior to the meeting. This report will be included as an Appendix in the WG report. A brief version of the summary and conclusions will also be included in the main text of the WG report. In addition, the WG discussed approaches for modelling specific decontamination methods or countermeasures and sources of information about countermeasures. A section of the WG report dealing with sources of information about countermeasures has been prepared.

2.4. WG plans and schedules

The WG also discussed the remaining work to be performed before the EMRAS project ends in November 2007, as well as documentation of its activities and preparation of the WG report. The draft WG report to date was distributed and discussed, and plans were made for its completion. The WG has been asked to submit a paper about its work for an IAEA conference to be held in April 2007. In addition to publication of the paper in the conference proceedings, the WG will consider other possibilities for publication of its work.

3. Outcomes

3.1. Pripyat scenario

— Three participants (T. Charnock, W.T. Hwang, and J. Tomás) presented their preliminary calculations, including the effects of various remediation efforts (T. Charnock). V. Golikov (Russia) had submitted calculations at the previous meeting but was unable to attend this meeting. Results for selected endpoints were compared among modellers (Fig. 1), and reasons for differences were discussed. Major differences seemed to be how the short-lived radionuclides were treated and which contributing surfaces were included in the estimation of total dose rates. To enable easier comparison among models, participants will be asked to include the dose rate attributable to each major surface and each radionuclide, as well as the percentage of the total dose rate attributable to each surface or radionuclide. The formats for model predictions will be revised accordingly. An example of the effect of a specific countermeasure on the predicted total dose rate is shown in Fig. 2.

— Test data (measurements) for a few points are available for dates in the late 1990s. In addition, the originators of the Pripyat scenario made some additional measurements in July 2006 (A. Arkhipov and S. Gaschak, Ukraine). Model predictions were compared with the measurements where possible (Fig. 1). One interesting feature noted when the 2006 measurements were made was the accumulation of detritus in the uninhabited city, something that would be less likely in an inhabited location but which could contribute to higher than expected levels of contamination remaining over time.

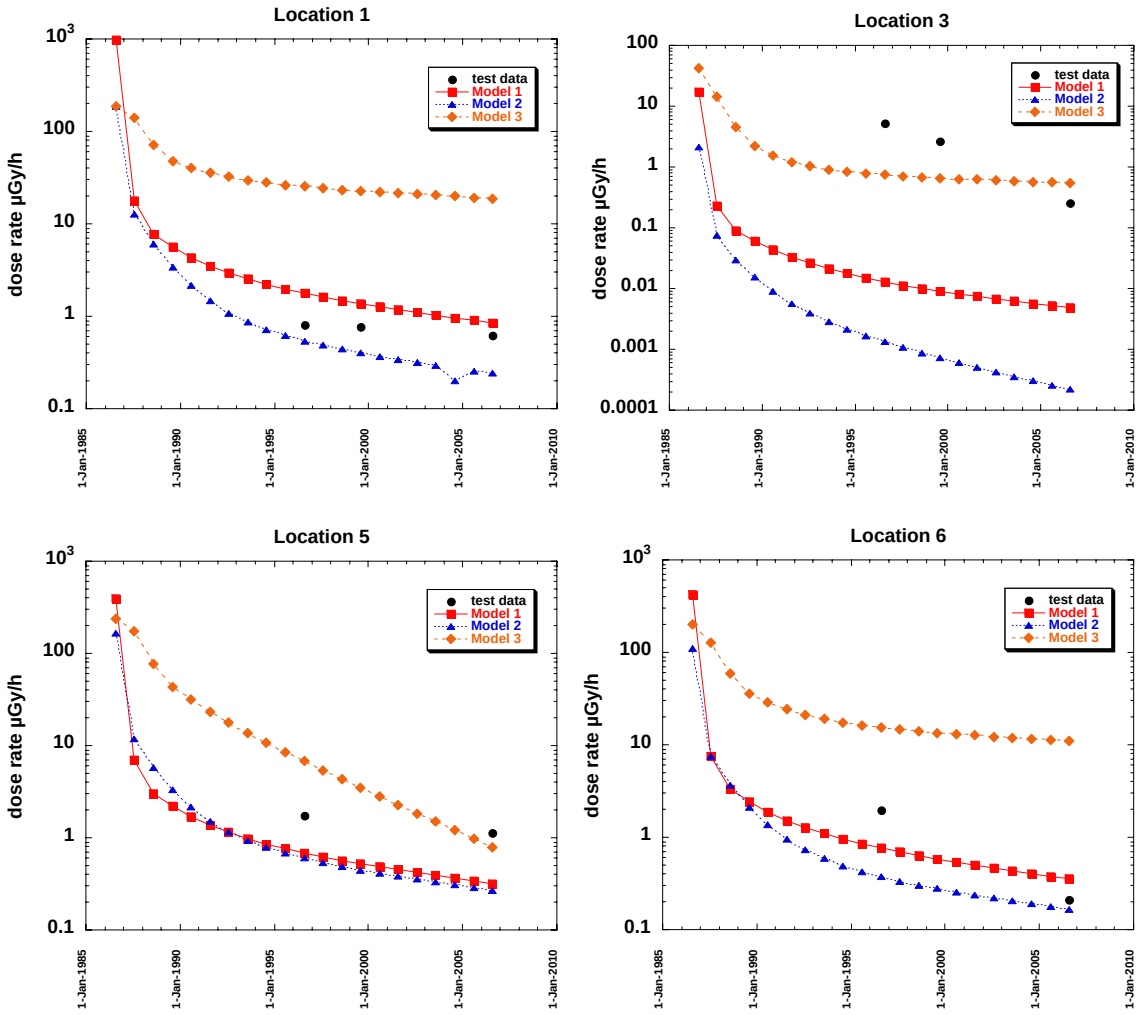

Fig. 1. Initial model predictions for total dose rate (all surfaces, all radionuclides) at four locations in District 1 of Pripyat, compared with measurements made in 1996, 1999, and 2006.

— The version of the Pripyat scenario distributed to participants in May 2006 was based on a phased approach. Phase A was intended to provide an opportunity to model the changes over time of external exposure rates and concentrations of radionuclides in different compartments of an urban environment due primarily to natural processes. Phase B provided an opportunity to model changes over time of similar endpoints in a situation that includes the effects of human activity. Phase C provided an opportunity to model the effects of various remediation efforts on the changes over time of the radiological situation. Phase A used information on District 1 of Pripyat, while Phases B and C used information on District 4 of Pripyat. At the November 2006 meeting, it was decided to simplify the phased approach and simply ask for predictions for the designated locations in Districts 1 and 4, both with no countermeasures and with selected countermeasures.

— The list of countermeasures to be used was revised. The time (days after the accident) of application of each countermeasure was specified.

— A revised schedule for completion of the Pripyat scenario was developed. K. Thiessen will prepare and distribute revised formats for model predictions as soon as possible. She will also revise the scenario description and draft WG report to reflect the revised list of countermeasures and the changes in how the predictions are to be submitted. All calculations are to be submitted by **31 March 2007**. Documentation of the models and parameter values should be submitted by **11 April 2007**.

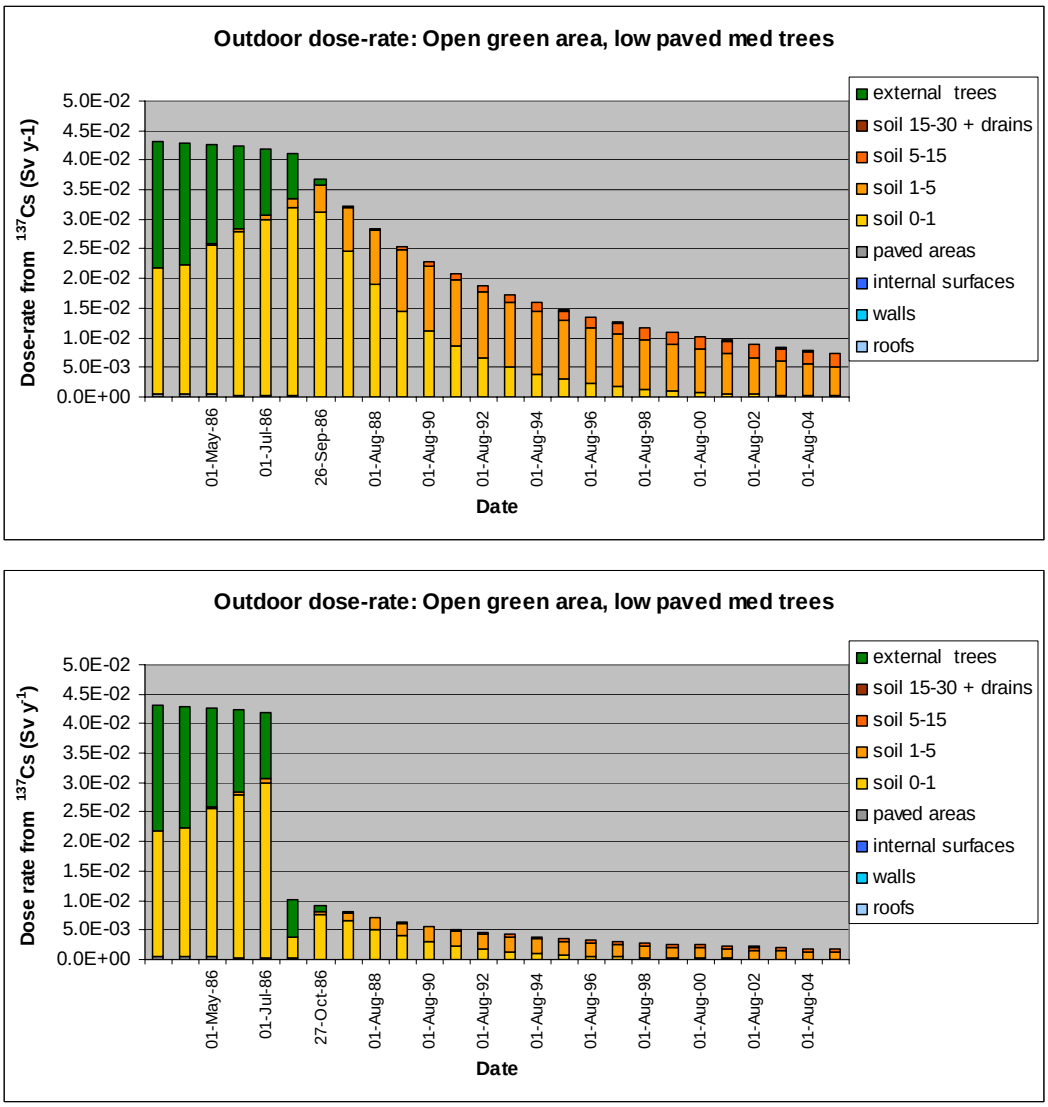

Fig. 2. Example of modeling results for total dose rate over time from Cs-137 at Location 1 in Pripyat, with no countermeasure application (top) and with removal of the top layers (1-15 cm) of soil (bottom) at 6 months after the accident.

— The sections of the Urban WG report dealing with the Pripyat scenario will be revised prior to the WG meeting to be held **18–20 April 2007**. Remaining parts of the WG report will be completed following the meeting. At the meeting, participants will be asked to describe lessons learned from the modelling exercise and comparisons, together with any revisions in models or parameter values that are indicated or actually made, based on those comparisons.

3.2. Hypothetical scenario

— After discussions of an initial hypothetical scenario at the June 2006 meeting, the WG agreed that more urban characteristics (e.g., part of the downtown area of a large city) would be preferable to the town used in the initial draft scenario. The WG chair identified a new site and prepared an improved scenario based on a real (but unnamed) city, with modification of the information to fit the WG's needs or where actual information was not readily available. This draft scenario was distributed to WG participants prior to the November 2006 meeting.

— At the June 2006 meeting, the WG agreed that a realistic simulation for the starting dispersion and deposition is desirable. For the draft scenario discussed at the November 2006 meeting, the dispersion and deposition were simulated using the Hotspot code

(D. Trifunovic, Croatia). Following the meeting, further simulation of the deposition pattern is being made with the IAMM code (Inhabited Areas Monitoring Module; C. Kaiser, Germany), in addition to correction of some of the location information used in the October 2006 version of the draft scenario. Following completion of the simulation by D. Trifunovic and C. Kaiser, a revised scenario based on the new input information will be distributed shortly after the Nov 2006 meeting.

— The WG selected a set of conditions for the hypothetical release at the June 2006 meeting, and the draft scenario was designed accordingly. The WG agreed to state clearly in the scenario description and WG report that this scenario is only one example of a deliberate dispersion event. It is considered a reasonable, albeit artificial, situation. A number of assumptions and simplifications have gone into it and will be noted. The WG report will include a brief statement about the development of this particular example and some of the types of things that should be considered for other situations.

— The goal for completion of an improved deposition map is the end of November 2006. The WG plans to complete and distribute the revised scenario description (city information, dispersion simulation, list of exposure situations for modelling, list of countermeasures to include) by the end of December 2006. Model calculations are requested by **31 March 2007**, and model documentation by **11 April 2007**, for discussion at the **18–20 April 2007** meeting.

— The sections of the Urban WG report dealing with the hypothetical scenario will be revised prior to the WG meeting to be held 18–20 April 2007. Remaining parts of the WG report will be completed following the meeting. At the meeting, participants will be asked to describe lessons learned from the modelling exercise.

3.3. Overview of modelling approaches

— A review of modelling approaches for the assessment of recovery options in contaminated urban environments was prepared by F. Gallay (France) and distributed to WG participants prior to the November 2006 meeting. This literature survey, which was prepared as an IRSN report, is available in French and English versions. A summary of the review has been incorporated into Chapter 2 of the WG report. The entire review will be provided as an appendix to the WG report and also included on a CD accompanying the Urban WG report.

— An additional part of Chapter 2 of the WG report is a short summary of information sources (published information and online sources) for use in modelling countermeasures (e.g., decontamination factors and the situations for which they are relevant). This was prepared by T. Charnock (UK) and K. Andersson (Denmark). Additionally, the appendix to the WG report includes information on countermeasures used in Pripyat and surrounding areas, as compiled by B. Zlobenko (Ukraine) and V. Golikov (Russia).

3.4. Preparation of Urban WG report

— The available draft material for the WG report was prepared in a single draft WG report before the November 2006 meeting, which was distributed and discussed at the meeting. Parts that were prepared before the meeting included descriptions of the modelling exercises, and information about modelling approaches and modelling of countermeasures.

— Following discussion of the draft WG report at the November 2006 meeting, plans were made to revise and complete the various sections of the report. K. Thiessen will revise the scenario descriptions (the short versions in the main text and the full versions in the appendix). The sections describing each exercise will be completed following the April 2007 meeting. Chapter 2 still needs short descriptions for the models used in the exercises; full descriptions will be provided in the appendix.

— The WG had some initial discussion about the content of Chapter 5, including lessons learned, recommendations, and conclusions. A list of the items discussed will be included in the next version of the draft WG report to provide a starting place for discussions at the April 2007 meeting. The next version of the draft WG report will be completed **before 31 March 2007**. All remaining sections of the report will be completed following the April 2007 meeting, based on the discussions held at the meeting.

3.5. Plans for April 2007 meeting and beyond

The WG's next meetings will take place 18–20 April 2007 and 5–9 November 2007. The November 2007 meeting will be held in conjunction with the final plenary meeting of the EMRAS programme. The April 2007 meeting will take place the week prior to an IAEA conference on Environmental Radioactivity. The WG has been asked to submit an abstract for presentation at the conference, in a session that includes the EMRAS program. K. Thiessen will prepare an abstract for submission; the abstract will be distributed to WG participants prior to its submission.

At the April 2007 meeting, the WG will address the following issues:

— Discussion of the modelling results for the Pripyat scenario, especially in comparison with the test data; completion of this section of the WG report with agreed lessons learned and conclusions;

— Discussion of modelling results for the hypothetical scenario; completion of this section of the Urban WG report, and discussion of preliminary lessons learned and conclusions;

— Completion of the overview of modelling approaches.

— General conclusions of the WG, including general findings of relevance for other WGs.

— Plans for completion of the WG report and ideas for a follow-up project;

— Publication of the WG's paper in the conference proceedings and other possibilities for publication of its work.

The tentative agenda for the April meeting will be sent by K. Thiessen in late March 2007 or early April 2007 (K. Thiessen, B. Batandjieva).

Proceedings of the November 2006 Urban WG meeting were distributed on a CD following the meeting (B Batandjieva). The IAEA's file-sharing website (http://www-ns.iaea.org/downloads/rw/fileshare/wss/default.asp?fd=163) will be utilized for distribution of updated and revised documents.

APPENDIX A

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Urban Remediation Working Group
4th EMRAS Combined Meeting
IAEA Headquarters, Vienna, 6–10 November 2006
A G E N D A

Monday, 6 November 2006

09:30–13:00	**Plenary Session** (Main Meeting Room C02–I)	
13:00–14:00	*Lunch*	
14:00–15:30	**2. Welcome to Urban WG participants**	K. Thiessen (USA),
	2.1. Adoption of agenda	Working Group Leader
	2.2. Objectives and expected outcomes of the meeting	
	3. Current status of the Urban WG activities and key milestones for 2007	K. Thiessen (USA)
	4. Pripyat scenario:	
	4.1. Presentation of modelling approaches and initial results for Pripyat scenario	T. Charnock (UK), W.T. Hwang (S. Korea), J. Tomas (Cuba)
15:30–16:00	*Coffee break*	
16:00–17:30	4.2. Test data for Pripyat	A. Arkhipov, S. Gaschak (Ukraine)
	4.3. Comparison of initial results with test data	K. Thiessen (USA)
	4.4. Discussion of Pripyat scenario and formulation of lessons learned	(All)
17:30–19:30	***R E C E P T I O N*** *(hosted by the IAEA, C02 Coffee Bar, just outside the Main Meeting Room)*	

Tuesday, 7 November 2006

09:00–10:00	**Plenary Session** (Main Meeting Room C02–I)	
10:00–13:00	**6. Hypothetical scenario:**	K. Thiessen (USA),
	6.1. Presentation of hypothetical scenario	D. Trifunovic (Croatia)
	6.2. Discussion and finalization of the description	
13:00–14:00	*Lunch*	
14:00–15:30	**7. Countermeasures:**	(All)
	7.1. Sources of information about countermeasures	T. Charnock (UK), K. Andersson (Denmark)
	7.2. Discussion of countermeasures, modeling approaches for countermeasures	(All)
15:30–16:00	*Coffee break*	
16:00–17:30	**8. Discussion of modeling approaches (including bibliographic survey) and formulation of lessons learned**	(All)

Wednesday, 8 November 2006

09:00–10:00	**Plenary Session** (Main Meeting Room C02–I)	
10:00–12:30	**10. Plans for completion of scenarios (including consideration of countermeasures)**	K. Thiessen (USA)
	10.1 Pripyat scenario	(All)
	10.2 Hypothetical scenario	(All)
	8. Discussion of modeling approaches (continued)	(All)
12:30–13:30	*Lunch*	
13:30–17:30	**8. Discussion of modeling approaches (continued)**	(All)
14:00–16:00	**Meeting of the Steering Committee, room to be specified**	

Thursday, 9 November 2006

09:00–12:30	**11. Working Group draft report, discussion and plans for completion**	(All)
12:30–13:30	*Lunch break*	
13:30–15:30	**12. Discussion of the way forward for the WG and coordination of the outcomes with all EMRAS WGs**	(All)
	13. Remaining issues and plans for 2007	(All)
15:30–16:00	*Coffee break*	
16:00–17:30	**14. Work on draft WG document – preliminary conclusions and lessons learned**	(All)

Friday, 10 November 2006

9:00–12:30	**Plenary Session & Close of Meeting** (Main Meeting Room C02–I)

APPENDIX B

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