

Annex 6

PRINCIPLES OF ENVIRONMENTAL EMERGENCY RESPONSE EXERCISES

1 - Assumption

Exercising of environmental emergency response (EER) procedures is essential for maintaining an adequate state of preparedness and readiness.

2 - Background

During the session of the CBS Expert Meeting on EER activities held in Vienna from 11 to 13 December 1995, it was unanimously recognized that the exercising of EER procedures is essential for maintaining an adequate state of readiness. It was agreed that an ad hoc technical group be tasked to develop a practical RSMC Exercise Program. This technical group was chaired by Mr Jean Coiffier (France). The main objectives for the working group were the following:

- determine the topics that the exercises are expected to consider (communication, operations, product standards, interpretation),
- organize these topics in a structured set (particular aspect or wider testing purpose),
- relate exercises and topics to the level of participant involvement,
- determine a frequency for each category of exercise,
- make recommendations to take advantage of the information gained during these exercises.

| | National | Regional | Global | Special |
|--------------------------|---|--|---|---|
| Coordinator | Appropriate National Authority | WMO Regional Association | WMO/CBS | As appropriate |
| Purpose | To establish and strengthen the linkages between National Meteorological Services and IAEA contacts at national level | To strengthen the linkages between RSMCs, NMSs and IAEA at national and international levels | To strengthen the linkages between WMO, IAEA and other international agencies | To maintain preparedness with respect to pre-identified critical tasks |
| Frequency | At least twice a year | Once a year | 18 months | As required to maintain preparedness with respect to the critical tasks |
| Communications | Notification, and products dissemination | Notification, coordination and products dissemination; should be done frequently for night and day scenarios | Notification, coordination and products dissemination; should be done night and day on a rotation basis | |
| Operations | As required based on national structures and procedures | Comparison and coordination of modelling results | Coordination of modelling results | |
| Product standards | User feedback on standards; coupling of standard products within national systems and databases | User feedback on standards | User feedback on standards | |

| | | | | |
|-------------------------------|--|---|---|--|
| Product Interpretation | Get feedback whether products are understandable | Get feedback if products are understandable; products intercomparison | Get feedback if products are understandable; products intercomparison | |
| Assessment | Internal among national authorities | Done jointly by the RSMCs involved | Done by the WMO expert(s) using the inputs from all the participants | |

2.1 - Recent development

Based on the report of the working group tasked to address the principles and the technical aspects of EER exercises, a summary table was developed. This table, given in the next page, is an attempt to prioritise the critical processes identified by the working group as a function of the scale of the exercise.

Principles of Environmental Emergency Response Exercises

Notes:

The details for special exercises are left open since the emphasis will change from one case to the other. Examples of such exercises are the monthly tests that RSMCs Montreal, Washington and Melbourne are doing for nuclear accidents.

In order for exercises to be useful, a report highlighting the problems encountered and the possible improvements to operational systems should be done after the event takes place. For WMO regional and global exercises, these reports should be circulated so that others can benefit from the findings.

3 - Framework for EER exercises

3.1 - Introduction

EER exercises should be held at approximately regular intervals in order to maintain the efficiency of the EER procedures and the familiarity of operational staff in carrying them out. There are several different stages in the response to an environmental emergency :

- notification of the event,
- delegated authority requests the assistance of a RSMC,
- RSMC notifies its associated RSMC,
- both RSMCs run their models,
- RSMCs produce an initial set of output,
- RSMCs distribute them to NMSs and other relevant authorities,
- RSMCs prepare their comments in a joint statement,
- RSMCs distribute them to the planned recipients.

EER exercises should test all the functions which are required at each stage. However, the exercises can be carried out by different methods for these different stages.

The general framework of an exercise can be summarized by answering the following questions.

- Who are the various participants ?
- What is the complexity level of the exercise ?
- What is the purpose of the exercise ?
- When it is expected to occur ?
- How to evaluate the efficiency of the exercise ?

It is important that only one authority should undertake the task of organizing each exercise. The first task will be to answer these simple questions in order to be able to inform all the participants clearly before the exercise is held, and to draw conclusions after the exercise. It would be preferable to keep such an organizer (one person or several people in a recognized center) out of the direct participants in the exercise.

3.2 - Identification of the participants

3.2.1 - International organizations

The World Meteorological Organization (WMO) and the International Atomic Energy Agency (IAEA) are the main international bodies which are naturally interested in participating in exercises which are organized to test the EER procedures. Other international organizations like the International Civil Aviation Organization (ICAO), the World Health Organization (WHO), or the United Nations Department of Humanitarian Affairs (UNDHA) could be interested in participating to EER exercises. Nevertheless, the CBS expert meeting on EER activities recommended that these organizations approach WMO and state their own requirements.

3.2.2 - National Meteorological Services (NMS)

The NMSs are the normal participants in EER exercises. On the one hand several NMSs are designated as RSMCs providing EER products in case of an emergency ; on the other hand, NMSs are the recipients of the products issued by the RSMCs and are the direct interlocutors of the final users. So they have to be closely involved in EER activities and their participation in EER exercises is essential. Furthermore NMSs are in the best position to identify the final users and to be aware of their requirements according to the national organization of the nuclear safety. Nevertheless it is important to point out that in several NMSs, the Centre devoted to EER activities can be different from the one in charge of general forecasts.

3.2.3 - Delegated Authorities (DA)

At present, the Delegated Authorities are the bodies that are authorized to ask for assistance of the RSMCs when they require advice on the expected path of the pollutant, when it is known, or believed, that a nuclear release has occurred. The situation varies from a country to another ; there are many cases where Delegated Authorities are the NMSs but it is not a general rule.

3.2.4 - IAEA contact points

The IAEA contact points are generally national bodies or services in charge of the nuclear safety. For the purpose of this document, they are identified as the final users. As products elaborated by RSMCs and NMSs are expected to be used for optimizing national strategies when confronted by a possible accident, the involvement of national contact points in EER exercises is emphasized. They have to maintain relationships with their NMS in order to explain their own requirements and to know what kind of information can be made available by the RSMCs and NMSs (pollution charts, meteorological charts, special messages).

3.2.5 - Other participants

The national counterparts of international bodies (for example ICAO, UNDHA, WHO) may be interested in obtaining EER information. They could also be involved in EER exercises insofar as they

inform WMO, IAEA and the NMS of their country about their willingness to participate and formulate their particular requirements.

3.3 - The scale of complexity of the exercises

3.3.1 - National exercises

Organizing national exercises remain the responsibility of each country. Even if such exercises are not to be considered here, according to the terms of reference of the working group, it is important to point out that national exercises can give a good opportunity for extending the experimentation to a larger framework. That is why informal exchange of information on the planned national exercises could help in the choice of dates for more important exercises.

3.3.2 - Bilateral exercises

Bilateral exercises result from special arrangements between a National Meteorological Service (NMS) or Delegated Authority (DA) of a country and a given RSMC and remain under their responsibility. The remarks made for national exercises apply to bilateral exercises.

3.3.3 - Regional exercises

Regional exercises involve participants of several countries belonging to the same Regional Association (RA) and necessarily imply a coordination between associated RSMCs. Such exercises can be initiated by a country or by a group of countries aiming to test EER procedures. Furthermore, such exercises may give NMSs an opportunity for testing the transmission of products to national users and for seeking feedback from them. Nevertheless, during regional exercises RSMCs have relationships with three kinds of interlocutors only : the DA and IAEA which are allowed to ask for assistance and the NMS where the products have to be sent. It is the NMS's responsibility to transmit pertinent information and/or products toward selected national partners. For radiological emergencies it is the responsibility of IAEA to transmit products to other international agencies and its national contact points.

3.3.4 - Global exercises

Global exercises involve participants from the designated RSMCs, WMO, IAEA, and the NMSs. They offer an opportunity for a comparison of the products issued by several RSMCs with the same release hypothesis and for an assessment of their similarities and discrepancies. However, the participation in such exercises can be problematic for some participants because of the different working hours around the world .

3.3.5 - Special exercises

Special exercises can be organized when international bodies (like ICAO, WHO or UNHCR) want to test the usefulness of the products issued by the RSMCs or the efficiency of their transmission toward special categories of users. Such exercises can be organized at a regional or global level, following the same general rules as for the normal ones. Nevertheless, it would be useful for these bodies to contact WMO and IAEA to clearly define with them the framework of the exercise.

3.4 - Topics to be considered by the exercises

3.4.1 - Communications

This is one of the most critical parts of the whole EER system. It is essential to make sure that demands for assistance coming from DAs and IAEA or event confirmation issued by IAEA reach the RSMC in due time. It is also important to transmit in due time the pertinent information, elaborated by the RSMCs toward the final users.

As the EER products are normally sent to IAEA and the operational branch in charge of EER in the NMSs by e-mail or fax, there is a need to frequently carry out transmission exercises (night and day) to update regularly the list of contacts (email address and fax numbers) and to check that the information reaches the expected recipient. When communication tests are performed between two parts of the EER system it is essential that the recipient immediately confirms the reception of the message or document. After such exercises, all the information concerning the validity of the e-mail address and fax numbers should be sent to the WMO Secretariat in order to update the reference list of the NMSs' contact information.

All the parts of the EER communications have to be tested :

- between DA and RSMCs,
- between IAEA and RSMCs,
- between different RSMCs,
- between RSMCs and NMS,
- between IAEA headquarters and the national contact points,
- between IAEA and other Agencies,
- between NMS and the contact points.

It should be noted that such exercises are not suitable for measuring the time it takes to send all the products and statements to the users. Such measurements should be made during global exercises when the communications equipment and lines have to deal with a much larger number of copies.

In addition to the fax dissemination, it would be interesting to test the ability of alternative means like GTS or Internet to world-wide deliver RSMCs' products, as soon as the important technical problems are resolved.

Another aspect of the communication tests should be to evaluate whether the recipient understands the content of a message or document. However such investigation may involve other people than those directly in charge of transmitting messages.

3.4.2 - Operations

It is necessary to evaluate how quickly an operational meteorological service can respond to an environmental emergency. The work can be divided into several steps (reception of the first notification, reception of a fax indicating the time and location of the event, initiating trajectory and dispersion model runs, eventual mobilization of specialist staff, interpretation of the results, discussion with the associated RSMC, preparation of the joint statement, sending the products).

It would not be reasonable to evaluate the efficiency of every step separately, as each center has its own way of working. However it would be useful for an exercise to establish which are the critical tasks. Comparison of the current practices of various RSMCs and the exchange of operational staff during EER exercises would help to improve the respective ways of working.

3.4.3 - Product standards

Designated RSMCs agreed to issue a standard set of products and to present them in a standardized form in order to improve their legibility and hence to make it easier for the NMSs and the end-users to interpret them. In the future, it could be decided to make modifications to the standard set and to test their pertinency from the feedback given by the final users.

As the RSMCs use various different graphical software systems, it is very difficult to exactly fit the drawing to the prescribed form but it is necessary to check their legibility in order to continuously improve their presentation.

The transmission of special products, out of the standard set, could also be considered, when specific requirements are formulated, particularly in the course of special exercises.

3.4.4 - Interpretation of the products

The interpretation of EER products is not an easy task. There are at least two sets of products (two RSMCs provide charts) which can differ both because physical processes are not treated in the same way and because the driving atmospheric models behave differently. Consequently, exposures or depositions should be examined together with other atmospheric model outputs.

It should be noted that the intercomparison and interpretation of the products given by different models in different RSMCs can be carried out without organizing full exercises implying the transmission of products and statements to a large number of final users. However, it remains useful to perform full exercises involving several users in order to get feedbacks from them and to know whether the products and explanations are suitable or not.

4. Steps in performing exercises

It is necessary to define one body and one person responsible for the organization of the exercise and for determining its general framework. During the exercise, this person will remain reachable in order to be able to give information or clarification to the various participants. He will also be responsible for collecting the returns of the exercise in order to prepare the final report.

4.1 Preparation before the exercise

The responsibility for organizing national or bilateral exercises is to be decided by the countries concerned. Responsibility for regional or global exercises should be taken by a RSMC or a NMS, and be approved by WMO. After informal discussion with the possible participants the organizer nominates a contact person for this exercise and provides the WMO Secretariat with this information. The contact person is then responsible for preparing an announcement form explaining the framework of the exercise (scale of complexity, participants, topics to be considered, planned time schedule, expected returns) and for sending them to the expected participants about one month before the planned date. An example of this form is given in the Annex to this present report.

4.2 During the exercise

The contact person triggers initiation of the exercise. Then he follows the various steps of the exercise and registers all the particular or unexpected events. He maintains contact with the main participants in order to be able to give information to any participant about the progress of the exercise. When it is time to finish, the contact person will announce the end of the exercise to all the participants.

4.3 After the exercise

The contact person is responsible for gathering the information coming from the participants. As it is important to evaluate the efficiency of the exercise with respect to its announced objectives the contact person is responsible for preparing a short report which will be sent to the participants about one month after the exercise.

5 - Possible objectives for forthcoming exercises

Most of the exercises which have been organized up to now have used the standard procedures which are explained in the global and regional arrangements. Several proposals have been made in order to compare the results given by different models under specified conditions. However, it should be noted that several tests could be conducted without invoking EER procedures. Modelling experts could be invited to organize themselves to run the same case on their models to compare the output and to report on the results. Some of the proposals which are listed below concern aspects which can be treated outside the usual exercises. It would be also benefit for modellers in the different RSMCs to define a comparison methodology in order to state the common hypothesis and to test model performance.

5.1 - Exercises with update

It is proposed to perform an exercise following the standard EER procedure but with an update 12 or 24 hours after the first release, assuming that only meteorological data differ. Such an exercise will test capabilities of all RSMCs in a follow-up response ; in addition it will determine how well the RSMCs can handle shifts and after hours involvement and help services to determine weak points in their plans. Several variations can be introduced in such exercises. The update can provide new information about the source or a notification of an accidental release 24 hours prior to present time.

5.2 - Undeclared time of release

A small number of exercises could also be planned within the same general framework, but with the restriction that the exact time of the release is not announced, thus introducing an element of surprise. In this case the announcement form will only mention a reasonable time window. It is realized that such tests may cause too much inconvenience associated with night (although geographically relative) shifts, but they reproduce the real conditions and may help to incorporate many EER procedures into the general shift work. As such exercises are supposed to induce disturbances and extra charges for RSMCs, they have to be carefully prepared in order to be sure that the RSMCs are confronted by the same kind of problems and to avoid penalizing one of them.

5.3 - Exercises occurring during particular meteorological events

As exposures and deposition given by the various models are very sensitive to the precipitation, it is proposed to carry out an exercise by choosing within a time window (as mentioned before) a release time when moderate precipitation is expected at the source location. Such an exercise will provide insight into the respective results and how they differ from one RSMC to another and how well the precipitation is handled by each model. In addition it will help RSMCs to try to explain model differences in their joint statements when precipitation is causing the difference. Other specific meteorological situations (eg. with an important wind shear) could be also tested in the same way.

5.4 - Exercises of opportunity

It has been mentioned that several RSMCs are responsible for providing guidance to transport authorities and airline companies in case of volcanic eruptions ; when such an event occurs the responses which are given can be considered as exercises to test EER procedures. If the event is well documented by the responsible RSMC, the information could be sent to all the specialized RSMCs in order to compare the various models. However, because of the specificity or the pollutant, the results have to be cautiously interpreted.

6 - Frequency of the exercises

The frequency of the exercises is governed by :

- the complexity of the preparation and hence the complexity of the functions to be included,
- the need for all participants to be familiar with the procedures,
- the cost of conducting the exercise.

The scale of an exercise (global, regional ..) is a determining factor in the complexity : the larger the area covered, the larger is the complexity. The scale of the activity also goes up considerably once the RSMCs begin to distribute their outputs. That is why a number of the functions can be tested by internal action rather than by full scale exercises.

6.1 - Global exercises

Owing to the importance of the preparation there is a general agreement to organize global exercises on a yearly basis. It seems natural to give to WMO the responsibility to organize such an exercise. Nevertheless, as WMO has no direct contact with the final users (IAEA contact points) IAEA has an

important part to play for evaluating the efficiency of the links between IAEA and its national contact points as well as between the NMS and contact points or other local users.

6.2 - Regional exercises

It is estimated that regional exercises, involving fewer participants, but including the dissemination of the information at least to the NMSs, could be organized twice a year. Nevertheless, it should be noted that special requirements formulated by NMSs for regional exercise could be taken into account for extending it on a global level.

No specific rule is given for exercises involving two associated RSMCs but such exercises with possible exchange of operational people are strongly recommended in order to make every centre familiar with the tools and practices of the neighbouring one and then to improve their cooperation and their performance for issuing a joint response in the case of a real EER accident.

6.3 - Transmission exercises

It is recognized that many transmission exercises have to be performed in order to update the list of the recipient's email addresses and fax numbers. A frequency of four times a year is proposed for this very simple test of determining the validity of the NMSs' fax numbers. There is a proposal for entrusting the WMO Secretariat with the organization of such exercises at a global level. Nevertheless they can also be organized alternatively by RSMCs at a regional level. Results of these exercises have to be sent two weeks later to the WMO Secretariat in order to update the reference list and to get information from the NMSs which cannot be reached.

7 - The EER Exercise Announcement Form

An exemple of the Announcement Form is given in Annex 7.
