Annex I

Survey Report

User Request Survey on the Emergency Response Activities (ERA) in Regional Association II (Asia)

Theme Leader in Emergency Response Activities
/ Expert Group on Operational Forecasting
Under Working Group on Weather Services

1. Introduction

Results from the 15th Session of Regional Association II (RA II-15, Doha, 13 – 19 December 2012) included a decision to handle Emergency Response Activities (ERA) as part of work by the Expert Group on Operational Forecasting (EG-OF).

ERA was initiated in 1989 as the Environmental Emergency Response (EER) service launched by the Commission for Basic Systems (CBS) to meet broad interest in the atmospheric dispersion of toxic radiological materials following the Chernobyl Nuclear Power Plant accident in April 1986. The Regional Specialized Meteorological Centres (RSMCs) in Beijing (China), Obninsk (Russian Federation) and Tokyo (Japan) were designated at the 49th session of the WMO executive council in 1997, and began operation on 1 July of the same year. The three RA II RSMCs have committed to their respective contributions in the field.

The first time the International Atomic Energy Agency (IAEA) requested ERA support for an actual event was for the Fukushima Daiichi Nuclear Power Plant accident in March 2011. The three RSMCs in RA II provided Atmospheric Transport, Dispersion, and Deposition Modelling (ATDM) predictions to IAEA and WMO Members within their region of responsibility from March to May 2011. The 16th World Meteorological Congress (Cg-16) in 2011 noted the series of operational services and asked CBS to enhance such products and assistance for National Meteorological and Hydrological Services (NMHSs) [WMO No. 1077; Sixteenth World Meteorological Congress 3.1.3.23].

To enable the provision of better assistance to NMHSs, it is necessary to clarify their needs and how they can apply support from WMO ERA to their domestic services. Against such a background, EG-OF planned a user request survey on ERA in consideration of its usefulness not only to Members within their region but also to those in other Regional Associations, as RA II was only one of the regions that experienced the series of real-time operational services associated with the Fukushima Nuclear Power Plant accident. The 17th World Meteorological Congress (Cg-17) held in May and June 2015 noted the user request survey on ERA in RA II and encouraged Members to actively respond [WMO No.1157; Seventeenth World Meteorological Congress 4.1.46].

Before the user request survey, a concise explanatory material on EER was distributed and a questionnaire survey for non-registered Members was conducted within RA II in October 2014. This work coincided with invitation issuance and checking of contact point

information for EER via a letter from the WMO Secretary General sent out on 19 September 2014 [ref. WDS/DPFS-ERA/2014]. One additional member in RA II responded with contact information and joined the EER service framework. As a result of these consolidation efforts, the number of registered Members for EER in RA II rose to 29 of 35. The user request survey of 2016 incorporated these 29 registered Members.

2. Results

2.1 Survey results summary

The theme Leader in Emergency Response Activities (TL-ERA; a member of EG-OF) drafted a survey questionnaire and a brief introduction to ERA. The documents were reviewed by experts from the CBS Expert Team on ERA (ET-ERA), those in RA II, EG-OF coordinators, and the chair of the Working Group on Weather Services (WGWS). On 15 June 2016, the Regional Office for Asia and the South-West Pacific (RAP) of the WMO Development and Regional Activities (DRA) department distributed the brief introduction (Appendix I) to all 35 Members of RA II. RAP asked the 29 registered Members to complete the questionnaire (Appendix II) and return it to the designated EG-OF contact point. A total of 17 responses had been received by November 2016 (Appendix III).

The results of each question are summarized in 2.2 below, and brief remarks and comments on the requests along with questions from Members are noted in 2.3.

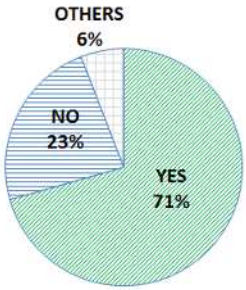
2.2 Results

This section presents responses to questionnaire survey. Two Members (Turkmenistan and Japan) did not answer the majority of the questions. When no appropriate answer was given, a response of "Others" was recorded. The item numbers for the questions below (underlined) correspond to those in Appendix II.

2.2.1 User satisfaction

2 a) Does your organization have specific operations using the environmental emergency response (EER) service by RSMCs?

A total of 12 Members (71%) reported "yes" to this question. Some of such Members planned to use the services in the future, while others indicated specific current usage in their domestic coordination. Four Members (23%) reported not using RSMC products.



2 a) Does your organization have specific operations using the environmental emergency response (EER) service by RSMCs?

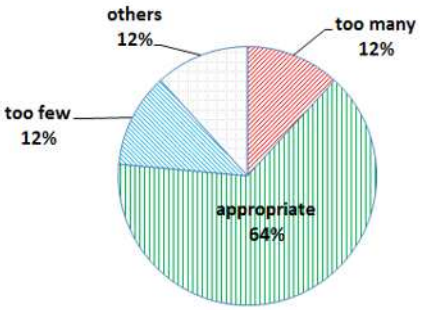
2 b) What is your overall satisfaction rating with regards to the current ERA service?

A total of 10 Members (59%) rated the current ERA service as good, and 4 (23%) rated it as excellent. No ratings of fair, not good, or poor were given. Accordingly, the overall level of satisfaction with the current service can be taken as good or higher. It should be noted that negative answers from respondents not specifying any of the options presented are included in *others*.

2 b) What is your overall satisfaction rating with regards to the current ERA service?

2 c) What does your organization think regarding the current exercises on the EER service?

A total of 11 Members (64%) answered that the number was appropriate, 2 (12%) answered that there were too many, and 2 (12%) indicated that there were too few. It should be noted that 3 of the 4 answering too many or too few did not use the EER service in domestic coordination. The data suggest that the majority of current service users believe the current exercise frequency is generally appropriate.



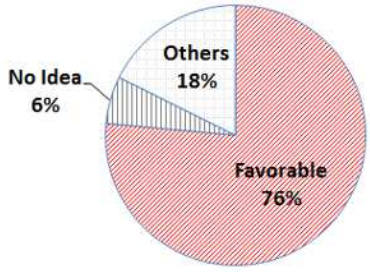
2 c) What does your organization think regarding the current exercises on the EER service?

2.2.2 Contents of the Service

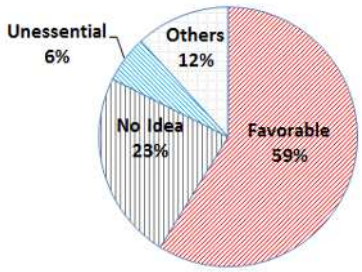
3 a) What does your organization think regarding products listed below?

This question probed interest in and the necessity of products currently evaluated by the ET-ERA. More than half of respondents indicated that such products are useful. The Time of Arrival (ToA) product proved to be the easiest to understand and the most favorable of the three.

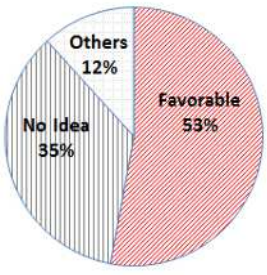
More than a third of respondents had no idea on the usage and/or usefulness of Transfer Coefficient Matrix (TCM) analysis with the ATDM model ensemble, which can be attributed to its status as a very new and unfamiliar technique. Some respondents also chose "no idea" for other candidates. Additional information is provided in 2.3.



3.a.i) Time of Arrival products



3.a.ii) Fixed legend products



3.a.iii) Transfer Coefficient Matrix analysis with the ATDM model ensemble

3 b) Does your organization have specific requests on the contents of the EER service?

The question invited specific Member requests regarding the service. Requests and questions from a total of five Members included three-dimensional ATDM results (and various representations thereof) and ensemble ATDM based on ensemble NWP forecasts from individual NWP centres.

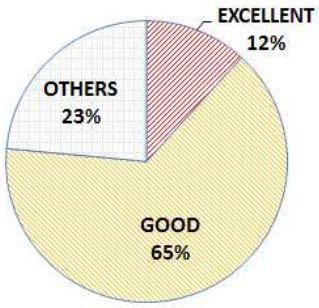
2.2.3 Service Provision Measures

4 a) Does your organization have specific purposes to require continuation of the fax service for EER?

CBS has focused on a gradual migration from facsimile transmission to email and web based services for ATDM prediction. This question probed user preferences regarding service provision measures. A total of 8 Members (47%) reported no longer needing facsimile transmission, while 7 respondents (41%) indicated their necessity of the fax service continuity. The fax service appears to be used as backup for email and web provision. It should be noted that some Members rely exclusively on facsimile transmission based on the results of email and fax transmission tests conducted by the three RSMCs.

4 b) What is your overall satisfaction rating with regards to the service through RSMCs' common web pages?

A total of 11 Members (65%) responded that the service through the common – mirrored web pages is good, with 2 (12%) giving a rating of ''excellent.'' Overall satisfaction with the current web service appeared high. It should be noted that one of the respondents opted for two alternative options, and was included in the *Others* category.



4 b) What is your overall satisfaction rating with regards to the service through RSMCs' common web pages?

2.2.4 Requests/Questions Regarding Activities

This open question inviting requests and queries from Members drew a number of responses as outlined in 2.3 below.

2.3 Commentary on and Responses to User Questions

As some respondents chose ''no idea (need more explanation)'' in response to questions from 3 a i) to 3 a iii), additional information on ToA, fixed legend products, and TCM with the ATDM model ensemble are included. Comments and remarks on the user questions are following.

2.3.1 Time of Arrival (ToA)

Current products for EER consist of (Appendix II-7 of WMO 2010):

1. Three-dimensional trajectories starting at 500, 1500 and 3000 m above the ground, with particle locations at six-hour intervals (main synoptic hours up to the end of the dispersion model forecast);
2. Time-integrated airborne concentrations within the layer 500 m above the ground, in Bq s m^{-3} for each of the three forecast periods;
3. Total deposition (wet + dry) in Bq m^{-2} from the release time to the end of the three forecast periods.

ToA presents a different perspective, and is designed to predict the earliest arrival time of a specific air concentration. Details of the product are as yet undecided (e.g., whether concentration should be instantaneous or time-integrated concentration). Presentation of six-hour colored hatched arrival time areas on 24 hourly charts is currently planned as shown in 3 a) of Appendix I.

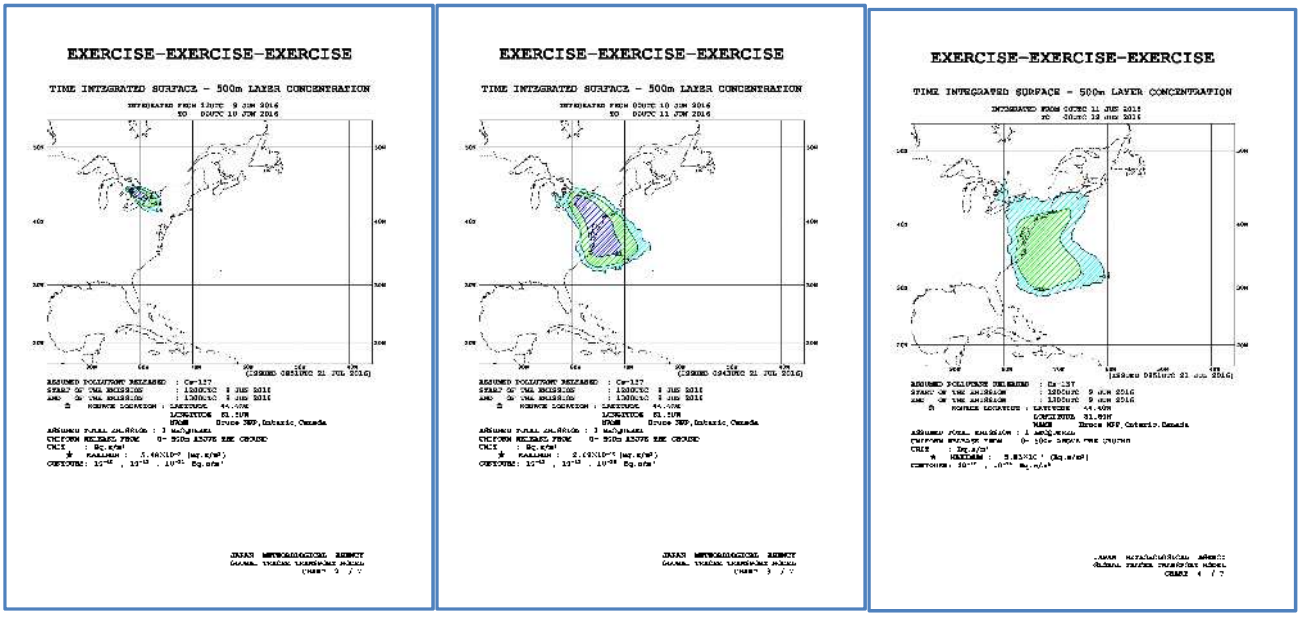
2.3.2 Fixed legend products

Appendix II-7 of WMO (2010) describes:

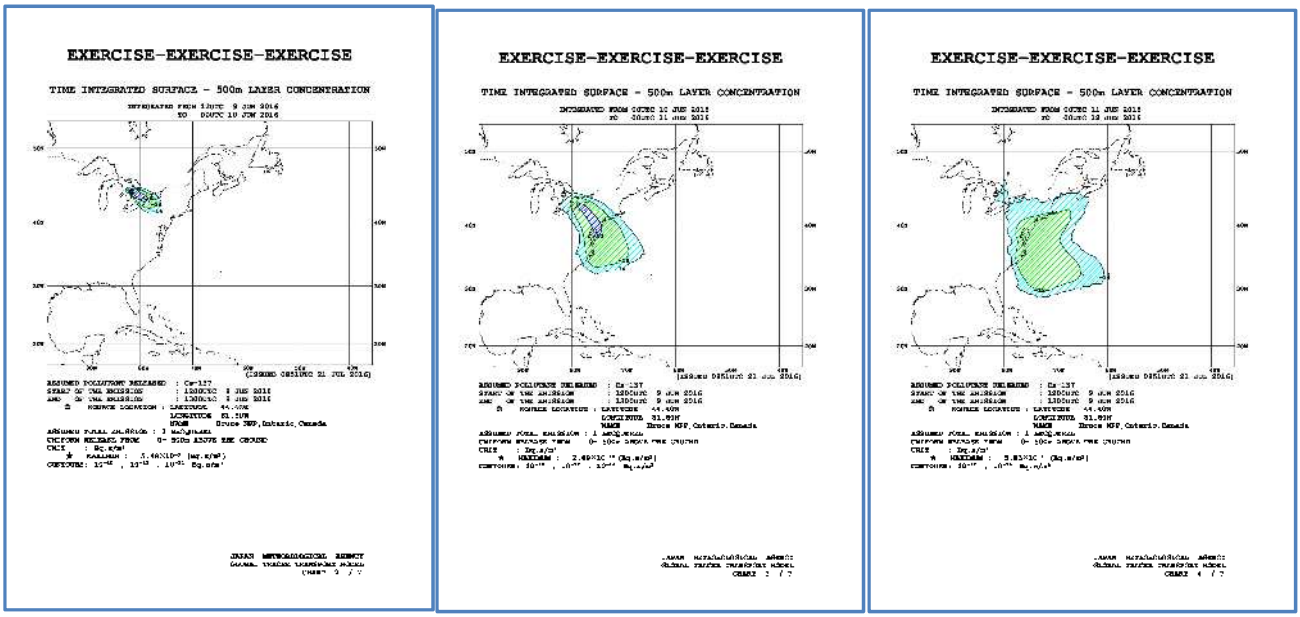
''(ii) Contour values may change from chart to chart''.

Accordingly, contour values for time-integrated airborne concentrations and total depositions may differ among individual forecast periods (up to 24, 48, and 72 hours from the NWP forecast initial time). By way of example, RSMCs may present airborne concentrations using different contour values from chart to chart (as seen in the upper panels below) in accordance with WMO standards (2010). Users may misinterpret

inter-map changes in contouring as sudden spreading of radioactive cloud (as seen in the upper-middle chart) following rapid dilution up to 72 hours from the NWP initial time. The adoption of corresponding contour values facilitates intuitive understanding of charts, as seen in the lower panels.



Time-integrated airborne concentrations up to 24 hours (left), up to 48 hours (middle), and up to 72 hours (right) after the NWP initial time. The contours indicated are 10^{-10}, 10^{-12}, 10^{-14} Bq s/m^3 for the left and right panels, but 10^{-11}, 10^{-13}, and 10^{-15} Bq s/m^3 for the middle one.



The same figures but the all panels use the same contour values of 10^{-10}, 10^{-12}, and 10^{-14} Bq s/m^3

2.3.3 Transfer Coefficient Matrix (TCM) analysis with the ATDM model ensemble

In the early stages of accidental toxic material release, exact amount and release time are usually unknown. However, the accuracy of such information has a dominant impact on the results of ATDM forecasts. When the results of related isotope monitoring become available, ATDMs can be useful in the estimation and quantification of data on release at

the source. One such technique, known as TCM (transfer coefficient matrix) evaluation, was developed by Draxler and Rolph (2012).

ATDM forecasts are also influenced by NWP forecast quality and modeling techniques in ATDMs. The results of estimation regarding release times and amounts are also significantly dependent on these variables (WMO 2013). Accordingly, evaluation of the impacts and influence of different NWPs and ATDMs on transport and dispersion modeling results is important. ET-ERA plans to conduct an experiment on TCM analysis with an ATDM model ensemble in the near future.

2.3.4 Responses to user requests and questions

"Making the booklets or leaflet to provide a sample to introduce what is the standard procedure for respond the EER warning / exercise." (Macao, China)

Concise examples are presented in a leaflet titled "The Environmental Emergency Response for WMO Members in Regional Association II (Asia)" distributed to RA II Members by RAP in October 2014.

Related information is available in WMO Technical Document 778 (TD778) titled "Documentation on RSMC Support for Environmental Emergency Response" at http://www.wmo.int/pages/prog/www/DPFSERA/td778.html.

"ATDM forecast should be longer than 72 hours or above and running the model at least twice a day would be good." (Thailand)

Longer ATDM forecasts have been discussed by ET-ERA and its predecessors. However, the accuracy of NWPs used for ATDMs decreases with longer forecast times.

As for the frequency of the service, there was a description regarding a 12-hourly update of ATMD forecasts in TD778, but this was withdrawn in March 2011 in line with a suggestion by WMO DPFS.

"If the new Transfer Matrix Coefficient analysis products are provided in future, could WMO provide the product standards and the TCM coefficient and programs?" (China)

The TCM system is being evaluated by ET-ERA (including product standards). An example of how a web-based TCM system may look is provided on the NOAA Air Resource Laboratory (ARL) website at https://ready.arl.noaa.gov/READY_fdnpp.php.

We have no idea regarding if ARL can make available their programs for others.

"How local data can be ingested" (Pakistan)

There is currently no formal procedure for the adoption of local monitoring data. Application to post analysis (as per TCM) may be implemented in the future.

"We would like to propose to increase EER exercises in RA II at biannual basis." (Saudi Arabia)

RA II RSMCs participate in one of the WMO quarterly EER exercises (conducted in February, May, August and November) in each year. As IAEA did not ask the RSMCs to distribute ATDM charts to Members during the exercises (i.e., the quarterly test in May and Convex-2d in October 2016), no ATDM forecast distribution was seen in RA II for this year.

"Support and assist member states in RA II for the provision of products and services, in accordance with their responsibilities, at national level. RSMCs in RA II can play a major role in capacity development of members in RA II." (Saudi Arabia)

This was recognized at the 15th session of CBS [4.4.37, WMO 2012]. The issue was also discussed at the ET-ERA meeting in 2013, resulting in the note, "Face-to-face training workshops require significant human and budgetary resources, and that may not reach a large audience, the meeting agreed that e-learning modules and web-based courses may be more appropriate." Web-based materials are currently available as per Technical Document 778 at http://www.wmo.int/pages/prog/www/DPFSERA/td778.html

3. Concluding Remarks on the Survey

EG-OF sincerely appreciates the Member responses. This survey was the first attempt, and the results have helped to clarify matters regarding user satisfaction, impressions of service content and opinions on related provision measures as well as associated requests and questions. The positive evaluation provided by the majority of respondents is truly encouraging, and the suggestions/opinions on current and potential future activities are very much appreciated.

The results can be summarized as follows:

- ✓ Most respondents indicated a need for ERA products for their activities, and reported relatively high levels of satisfaction with the current service.
- ✓ User impressions of ET-ERA's candidate products were relatively positive.
- ✓ Nearly half of all respondents requested ongoing fax service. Impressions of the current web service were relatively good.

Opinions and suggestions from Members will be conveyed to the relevant entities of WMO. Such feedback is invited to support the improvement of future WMO ERA activities.

References

Draxler R. R., and G. D. Rolph 2012: Evaluation of the Transfer Coefficient Matrix (TCM) approach to model the atmospheric radionuclide air concentrations from Fukushima. *J. Geophy. Res.*, VOL. 117, D05107, doi:10.1029/2011JD017205, 2012. http://dx.doi.org/10.1029/2011JD017205

WMO, 2010, updated in 2015: Manual on the Global Data-processing and Forecasting System. *WMO document*, No. 485. http://library.wmo.int/opac/index.php?lvl=notice_display&id=12793

WMO, 2011: Sixteenth World Meteorological Congress, Geneva, 16 May – 3 June 2011 *WMO*-No. 1077. http://library.wmo.int/opac/index.php?lvl=notice_display&id=6907#.WDKfMn3Qhbs

WMO, 2012: Commission for Basic System Fifteenth session, Jakarta, 10–15 September 2012 *WMO*-No. 1101. http://library.wmo.int/opac/index.php?lvl=notice_display&id=14292#.WBxk8MnpzIU

WMO, 2013: EVALUATION OF METEOROLOGICAL ANALYSES FOR THE RADIONUCLIDE DISPERSION AND DEPOSITION FROM THE FUKUSHIMA DAIICHI NUCLEAR POWER PLANT ACCIDENT. *WMO document,* No.1120. http://library.wmo.int/opac/index.php?lvl=notice_display&id=15838#.WBximsnpzIU

WMO, 2015: Seventeenth World Meteorological Congress, Geneva, 25 May – 12 June 2015 *WMO*-No. 1157. http://library.wmo.int/opac/index.php?lvl=notice_display&id=18648#.WDKgnH3Qhbs

Brief Introduction on the WMO ERA

for the Emergency Response Activities (ERA) in Reginal Association II (Asia)

Masami SAKAMOTO

(Japan Meteorological Agency,

Theme Leader in Emergency Response Activities / Expert Group on Operational Forecasting)

1. Introduction

After the Chernobyl nuclear power plant (NPP) accident in April 1986, the Commission for Basic Systems (CBS) of the World Meteorological Organization (WMO) had a series of discussions and decided to launch an atmospheric transport and dispersion modelling (ATDM) service to meet the broad interest in the atmospheric diffusion of toxic radiological materials. The environmental emergency response (EER) services started in 1989. The 49th session of WMO executive council in 1997 approved three Regional Specialized Meteorological Centres (RSMCs) for EER in Regional Association II (Asia) [see Table 1]. In 2011, the three RSMCs provided ATDM forecasts and joint statements in response to the Fukushima Daiichi NPP accident, and this was the first real operational service since the EER service started. The 16th World Meteorological Congress (Cg-16) in May 2011 noted the contributions by the RSMCs, and a representative of the International Atomic Energy Agency (IAEA) offered an appreciation.

Table 1. WMO RSMCs for EER in Regional Association II (Asia)

	Hosting Organization (Nation / State)
RSMC Beijing	China Meteorological Administration (China)
RSMC Obninsk	Russian Federal Service for Hydrometeorology and Environmental Monitoring (Russian Federation)
RSMC Tokyo	Japan Meteorological Agency (Japan)

The Emergency Response Activities (ERA) programme is primarily designed to provide ATDM service as part of the World Weather Watch (WWW). The CBS Expert Team on ERA (ET-ERA), which was set up under the CBS Open Programme Area

Group on Data-processing and Forecasting Systems (OPAG-DPFS) in 2012, discusses ERA related issues and defines the processes and procedures for the provision of ERA products and services.

2. Operational Services and Exercises

The RSMCs provide users with the ATDM charts and a joint statement on weather and ATDM forecasts over the influenced area. Descriptions on the ATDM charts at each centre are found in Annex 4 of WMO technical document 778: http://www.wmo.int/pages/prog/www/DPS/WMOTDNO778/Annex4.html

WMO and IAEA conduct quarterly regular exercises to prepare the nuclear and radiological emergencies on third Tuesdays in February, May, August, and November. The schedule and target regions for the regular exercises are decided by the beginning of the year. Other than the quarterly exercises, IAEA conducts international exercises named ConvEx, and WMO has been participating in ConvEx-2d and ConvEx-3. [Exercises planned this year (2016) are listed in Table 2.] For all exercises described above, RTH-Offenbach (hosted by the German Weather Service) broadcasts exercise information using the header “WNXX01 IAEA” through the Global Telecommunication System (GTS).

Table 2. Planned EER exercises in 2016

Date	Exercise Type	Target Region
18 February	Quarterly Test	RA I (Africa) and RA VI (Europe)
17 May	Quarterly Test	RA II (Asia)
16 August	Quarterly Test	RA III (South America) and RA IV (North and Central America)
5 October	ConvEx-2d	Primary Target: RA VI (Europe)
15 November	Quarterly Test	RA V (Southwest Pacific)

3. Expert Team Activities on ERA

ET-ERA meets once every two years to discuss issues related to ERA. The team consists of experts from RSMCs, RTH-Offenbach, international organizations (IAEA, ICAO, CTBTO and WHO), and some national weather services.

ET-ERA has been working on the migration from fax service delivery to the service through the Internet (email and web). The implementation of the migration has been a

challenge, and the team discussed whether or not the facsimile transmission should be discontinued. The team concluded at the meeting in December 2015 that the facsimile transmission system is still needed to reach some of the NMHSs with limited capabilities and it can also serve as backup to e-mail, in case of Internet failure.

ET-ERA is discussing new types of products to provide to users in the future, and continues experiments to meet user requirements. Experimental products to be provided in the near future are described below.

3 a) Time of Arrival (ToA)

This is the product designed to indicate arrival times of a specific (instantaneous or time-integrated) atmospheric concentration level over geographic areas. ET-ERA conducted ToA product experiments in June and October 2015, and decided to continue effort in further developing of this product. Details of the product are undecided yet, but currently 6 hourly colored hatched arrival time areas are planned to be indicated in 24 hourly forecast charts.

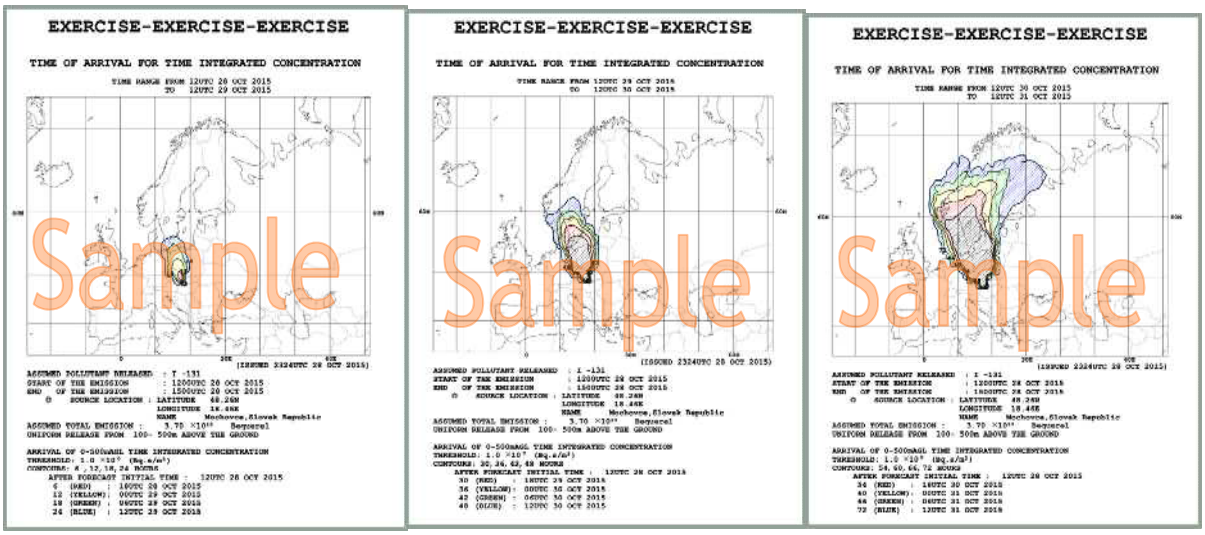


Figure 1. Samples of the time of arrival products (time-integrated concentration).

3 b) Fixed Legends

Currently forecasts for the time-integrated air concentration and total deposition are presented using different legends among three time zones up to 24, 48, and 72 hours after the NWP forecast initial time at each centre [according to the appendix II-7 of WMO No. 485]. A representative of IAEA at ET-ERA meeting in 2015

3 c) the Transfer Coefficient Matrix (TCM) technique with the ATDM model ensemble

The 17th World Meteorological Congress (Cg-17) in 2015 noted two types of techniques to be developed for the ATMD services. These were the Transfer Coefficient Matrix (TCM) technique and Ensemble approach to ATDM [see 4.1.47 and 4.1.48 of WMO (2015)].

In most cases of accidental releases of radioactive materials, the release rates are unknown, only time series of radiological monitoring can be available. Unfortunately results of ATDM forecasts and analyses are heavily dependent on the release rates. With the TCM technique, a posterior analysis of toxic material dispersion can be estimated changing and adjusting release rates at a site [see Draxler and Rolph (2012)].

On the other hand, dispersion forecast results are also very dependent on NWP models and ATDMs at forecasting centres. There must be ambiguity stemming from differences of weather and ATDM forecasts. To identify the variations among centres, ET-ERA plans to have a joint experiment for TCM techniques with an ATDM multi-centre model ensemble. The model ensemble comparison is planned using the web application at the Joint Research Centre of the European Commission (JRC-EC).

4. Summaries

EER services started in 1989. The activities for the Fukushima Daiichi NPP accident were highly appreciated at Cg-16 in 2011. The CBS ET-ERA is discussing future ATDM services. Opinions and suggestions on the activities from Members will be appreciated.

References

Draxler R. R., and G. D. Rolph 2012: Evaluation of the Transfer Coefficient Matrix (TCM) approach to model the atmospheric radionuclide air concentrations from Fukushima. *J. Geophy. Res.*, **VOL. 117**, D05107, doi:10.1029 / 2011JD017205, 2012.

WMO 2010 (final update in 2015): Manual on the Global Data-processing and Forecasting System Volume I – Global Aspects (WMO-No.485)

WMO 2015: Seventeenth World Meteorological Congress, Geneva, 25 May–12 June 2015, abridged final report with resolutions (WMO-No.1157)

SURVEY QUESTIONS

Regarding Emergency Response Activities (ERA) in Reginal Association II (Asia)

1. Respondent

Name of County/Territory: _____

Name of Organization: _____

Name of Respondent: _____

Title: _____

Email: _____

Phone: _____ Facsimile: _____

2. User satisfaction

2 a) Does your organization have specific operations using the environmental emergency response (EER) service by RSMCs? (Please check one of below and describe the usage of the EER service in your operations if you have)

1. yes ☐ / 2. no ☐

Your operational usage:

_____

_____

_____

2 b) What is your overall satisfaction rating with regards to the current ERA service? (Please check one of below and provide us your opinions if you have)

1. excellent ☐ / 2. good ☐ / 3. fair ☐ / 4. not good ☐ / 5. poor ☐

_____

_____

_____

_____

2 c) What does your organization think regarding the current exercises on the EER service? (Please check one of below and provide us your opinions if you have)

1. too many (frequent) ☐ / 2. appropriate ☐ / 3. too few (need more) ☐

3. Contents of the Service

3 a) What does your organization think regarding products listed below? (Please refer to sec. 3 of the attached document "Brief Introduction of WMO ERA" and check one option for each)

3.a.i) Time of Arrival products

1. favorable ☐ / 2. no idea (need more explanation) ☐ / 3. unessential ☐

3.a.ii) Fixed legend products

1. favorable ☐ / 2. no idea (need more explanation) ☐ / 3. unessential ☐

3.a.iii) Transfer Matrix Coefficient analysis with the ATDM model ensemble

1. favorable ☐ / 2. no idea (need more explanation) ☐ / 3. unessential ☐

3 b) Does your organization have specific requests on the contents of the EER service? (If you have, please provide us with your opinions)

4. Service Provision Measures

4 a) Does your organization have specific purposes to require continuation of the fax service for EER? (Please check one of below and describe your necessity when appropriate)

1. no ☐ / 2. yes ☐

Your necessity for the fax-service continuation:

4 b) What is your overall satisfaction rating with regards to the service through RSMCs' common web pages[1]? (Please check one of below.)

1. excellent ☐ / 2. good ☐ / 3. fair ☐ / 4. not good ☐ / 5. poor ☐

5. Requests (or questions) for the Activities

5) Could you inform us of your request regarding the atmospheric transport and dispersion modelling (ATDM) services within WMO ERA?

(You may ask any questions regarding ERA.)

END

Thank you very much for completing this questionnaire. Please reply the form (this file) to the contact point below by the end of September (Friday, 30 September 2016).

[Theme Leader in Emergency Response Activities (Mr. Masami SAKAMOTO):
Fax: +81 3 3211 2032, email: masami.sakamot-a@met.kishou.go.jp]

[1] RSMCs' common webs are maintained to provide users with ATDM forecast results on-line. RSMCs currently send users emails and faxes, in which URLs of the common webs are included with a relevant user ID and a pass word.

Answers by NMHSs (2. User satisfaction 1/2)

County / State	2 a)	
China	1.yes	We provide the government with the support of the nuclear emergency response and provide the public with nuclear accident atmospheric dispersion forecasts. For example, during Japan's Fukushima nuclear accident, we provided decision-making reference to the government and provided explanation to the public..
Hong Kong, China	1.yes	To help assess the potential environmental impact of nuclear accidents.
Iran, Islamic Republic of	1.yes	IN case of Request from users or having the required release information from internal or external sites
Japan	2.no	The Japanese government is not using the EER service, because it has its own atmospheric dispersion models available for the purpose. Therefore the questions below are not applicable.
Korea, Republic of	1.yes	For reference materials
Kyrgyzstan	1.yes	
Macao, China	1.yes	We will request the atmospheric transport and dispersion modelling products from three RSMCs for internal analysis, and also test the internal notification systems.
Mongolia	1.yes	
Myanmar	1.yes	Department of Meteorology and Hydrology (DMH) is operating the usage of the EER service in hydro-meteorological disasters and geological disasters (Earthquake, Land slide, and Tsunami).
Pakistan	1.yes	
Russian Federation	1.yes	Informational support of a national bogies (Ministry of emergency and other) responsible for decision making in case of emergencies lead to environmental contamination
Saudi Arabia	2.no	
Thailand	2.no	
Turkmenistan	N/A	
United Arab Emirates	1.yes	
Uzbekistan, Republic of	2.no	Does not guide
VIET NAM	1.yes	We use the website "http://ra2-nwp.kishou.go.jp/cityfc/VietNam/VietNam.html" with an account that RSMCs Tokyo provided.

Answers by NMHSs (2. User satisfaction 2/2)

County / State	2 b)		2 c)	
China	2.good		2.appropriate	Exercise and offered sufficient information for analysis and processing.
Hong Kong, China	2.good		2.appropriate	
Iran, Islamic Republic of	2.good	It is almost new compared to other WMO activities and in the future will be enhanced with more training and development	2.appropriate	
Japan	N/A		N/A	
Korea, Republic of	2.good		2.appropriate	
Kyrgyzstan	2.good		2.appropriate	
Macao, China	2.good		2.appropriate	
Mongolia	2.good		1.too many	
Myanmar	2.good		2.appropriate	
Pakistan	1.excellent		2.appropriate	
Russian Federation	2.good		2.appropriate	
Saudi Arabia	1.excellent		3.too few	We would like to propose to increase EER exercises in RA II at biannual basis.
Thailand	N/A	The ATDM service is good but the service from ERA in not covered, especially the products and the right time that meet the requirement of each country for futher data use planning.	2.too many	The current exercises are appropriate but TMD has not yet involved in the exercise.
Turkmenistan	N/A		N/A	
United Arab Emirates	1.excellent		2.appropriate	
Uzbekistan, Republic of	2.good		3.too few	Exercise and offered sufficient information for analysis and processing.
VIET NAM	2.good		2.appropriate	

Answers by NMHSs (3. Contents of the Service 1/1)

County / State	3 a.i)	3 a.ii)	3 a.iii)	3 b)
China	1.favorable	3.unfavorable	1.favorable	It will be better to provide the ensemble ATDM products. RSMC Beijing can provide these products, which have 15 members and are generated from the ensemble T639 and GRAPES_MESO systems.
Hong Kong, China	1.favorable	1.favorable	1.favorable	It would be highly desirable to have some tailored products to help assess potential radiological impact to aviation, such as maximum activity concentration / dose rate in air, 3-dimensional grid point values of the model output that can cover flight levels, etc.
Iran, Islamic Republic of	1.favorable	2.no idea	1.favorable	Not more than available for the time being and may be in the future.
Japan	N/A	N/A	N/A	
Korea, Republic of	1.favorable	1.favorable	2.no idea	
Kyrgyzstan	1.favorable	1.favorable	1.favorable	No
Macao, China	1.favorable	1.favorable	2.no idea	
Mongolia	1.favorable	2.no idea	1.favorable	No
Myanmar	1.favorable	2.no idea	2.no idea	DMH have specific requests on the Cyclone warning, Tsunami Warning and Landslide warning of the EER service. DMH needs timely warning during the hazards.
Pakistan	1.favorable	1.favorable	1.favorable	No
Russian Federation	N/A	2.no idea	2.no idea	
Saudi Arabia	1.favorable	1.favorable	2.no idea	No
Thailand	2.no idea	1.favorable	1.favorable	TMD requires the atmospheric transport products in various levels ranging from surface to 500hPa or above including particle dispersion.
Turkmenistan	N/A	N/A	N/A	
United Arab Emirates	1.favorable	1.favorable	1.favorable	None
Uzbekistan, Republic of	1.favorable	1.favorable	2.no idea	No
VIET NAM	1.favorable	1.favorable	1.favorable	We need to send our people to join in EER training courses, conferences and seminars.

Annex I

Answers by NMHSs (4 Service Provision Measures 1/1)

County / State	4a)		4b)	
China	2.yes	We hope to continue with the fax service, because the e-mails are sometimes blocked. Meanwhile we also need to receive the important/particular information through fax in some special cases.	1.excellent / 4. not good	This enables to analyze the situation online and sharing the experiences of other participants.
Hong Kong, China	1.No	While it is not a strict necessity, it would be desirable to maintain the fax service as a backup channel for communication, as well as to receive notifications and products.	2.good	Based on the experience in the past couple of exercises, the web pages are found to be rather useful for accessing the products.
Iran, Islamic Republic of	1.No	No Necessity	2.good	
Japan	N/A		N/A	
Korea, Republic of	2.yes	Fax transmission system is necessary as backup to e-mail and it is better to recognize Environmental emergency situation.	2.good	
Kyrgyzstan	1.No		2.good	
Macao, China	2.yes	We recommend that the facsimile transmission system is still needed to be continued, in case of Internet service failure.	2.good	
Mongolia	1.No		2.good	
Myanmar	2.yes	DMH necessitate the fax-service continuation because internet communication system is problem in Myanmar to open the URLs and use the web pages/emails.	2.good	
Pakistan	1.No		2.good	
Russian Federation	1.No		2.good	
Saudi Arabia	1.No		1.excellent	
Thailand	2.yes	Facsimile transmission system is still necessary for backup system.	N/A	
Turkmenistan	N/A		N/A	
United Arab Emirates	2.yes	We support it as a back up means of delivery of the Service.	2.good	
Uzbekistan, Republic of	2.yes	Enhance of readiness for emergency situations and to strengthen monitoring of atmospheric air.	1.excellent	This enables to analyze the situation online and sharing the experiences of other participants.
VIETNAM	1.No		2.good	We usually use the seasonal and monthly outlook from these webpages.

Answers by NMHSs (5 Requests (or questions) for the Activities 1/1)

County / State	5)
China	If the new Transfer Matrix Coefficient analysis products are provided in future, could WMO provide the product standards and the TCM coefficient and programs?
Hong Kong, China	(a) It would be highly desirable to have 3-dimensional grid point values of the model output that can cover flight levels (e.g. in GRIB or other digital data format) for facilitating further analysis and post-processing of the products. (b) It would be desirable to have more detailed information / procedure regarding request for non-nuclear environmental emergency response ATDM service.
Iran, Islamic Republic of	In the future with more exercise and working on the matter as a new task in our met service, we will come across with some technical and scientific issues and we should contact to make better services
Japan	
Korea, Republic of	
Kyrgyzstan	
Macao, China	Making the booklets or leaflet to provide a sample to introduce what is the standard procedure for respond the EER warning / exercise.
Mongolia	No
Myanmar	
Pakistan	1. Why the products are not posted on a special ERA website? 2. How local data can be ingested
Russian Federation	
Saudi Arabia	Support and assist member states in RA II for the provision of products and services, in accordance with their responsibilities, at national level. RSMCs in RA II can play a major role in capacity development of members in RA II.
Thailand	1. To distribute more products to members for utilizing in their works extensively. 2.To train members for having understanding of the products appropriately. 3. To present the products consistently in both usual and emergency situations. 4. ATDM forecast should be longer than 72 hours or above and running the model at least twice a day would be good.
Turkmenistan	The National Committee of Hydrometeorology under the Cabinet of Ministers of Turkmenistan does not study and does not monitor the spread of toxic radioactive materials. The function of our Committee include monitoring the weather and weather forecasting.[1]
United Arab Emirates	We just would like to thank you and acknowledge your efforts.
Uzbekistan, Republic of	Sending information not just through fax and e-mail too.
VIET NAM	- Ask the ERA to train our people to get use of the ATDM model - Explore the capacity of setup and running a ATDM model in Viet Nam

[1] The National Committee of Hydrometeorology under the Cabinet of Ministers of Turkmenistan replied this by an email message, not in the form.