



International Civil Aviation Organization

**NINETEENTH MEETING OF THE METEOROLOGY SUB-GROUP
(MET SG/19) OF APANPIRG**

Bangkok, Thailand, 3 – 6 August 2015

Agenda Item 7: Regional guidance material

**THE ASIA/PACIFIC REGIONAL GUIDANCE ON THE ISSUANCE OF SIGMET FOR
RADIOACTIVE CLOUD**

(Presented by China)

SUMMARY

This paper presents the revised regional guidance on the issuance of SIGMET for radioactive clouds.

1. INTRODUCTION

1.1 The sixteenth edition to Annex 3, Meteorological Service for International Air Navigation, introduced the Radioactive Cloud (RDOACT CLD) as a phenomenon for the SIGMET in November 2007. The first SIGMET for radioactive cloud was issued in March 2011, in response to the accidental release of a radioactive cloud from the Fukushima Nuclear power plant in Japan. The Fukushima plant was damaged by the great earthquake and tsunami on March 11.

1.2 While Annex 3 is amended to allow for the provision of SIGMET for radioactive cloud, it is also recognized that there would be a need to develop guidance on how to provide this information. Therefore, the Forth Meeting of the Asia/Pacific Meteorological Hazards Task Force (MET/H TF/4) agreed to form an ad-hoc group comprising China (Rapporteur), Hong Kong-China and Japan to develop guidance for possible inclusion in the Regional SIGMET Guide on the issuance of SIGMET for radioactive cloud (Agreed action 4/6 refers).

2. DISCUSSION

2.1 Sources of information to issue SIGMET for radioactive cloud

2.1.1 From the local authority, such as State Emergency, Nuclear and Radiation Safety Center and etc., the Meteorological Watch Offices (MWO) may get the information of the release of radioactive material into the atmosphere.

2.1.2 The World Meteorological Organization (WMO) has designated "Regional Specialized Meteorological Centers" (RSMCs) with the specialization to provide atmospheric transport model products for environmental emergency response (*Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds*, Doc 9691). During nuclear incidents the RSMCs provide real-time 24/7 specialized atmospheric dispersion model products for Environmental Emergency Response (EER). The RSMC's atmospheric transport model products are sent to the WMO Member States, other RSMCs, the WMO and the IAEA. There are 8 RSMCs over the world, and three of them

in Asia/Pacific region, which are Beijing, Melbourne and Tokyo.

Regions II	Regions II	Regions II	Regions I/VI
			
Regions III/IV	Regions III/IV	Regions V	Regions I/VI
			

Figure 1: 8 RSMCs



Figure 2: RSMC Beijing

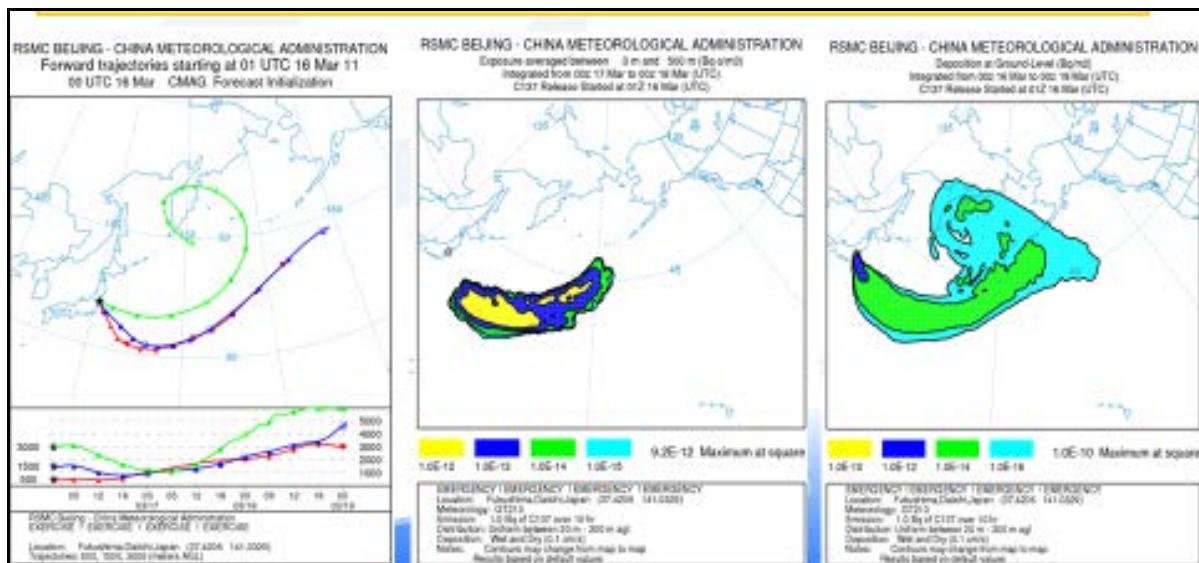


Figure 3: The products issued by RSMC Beijing

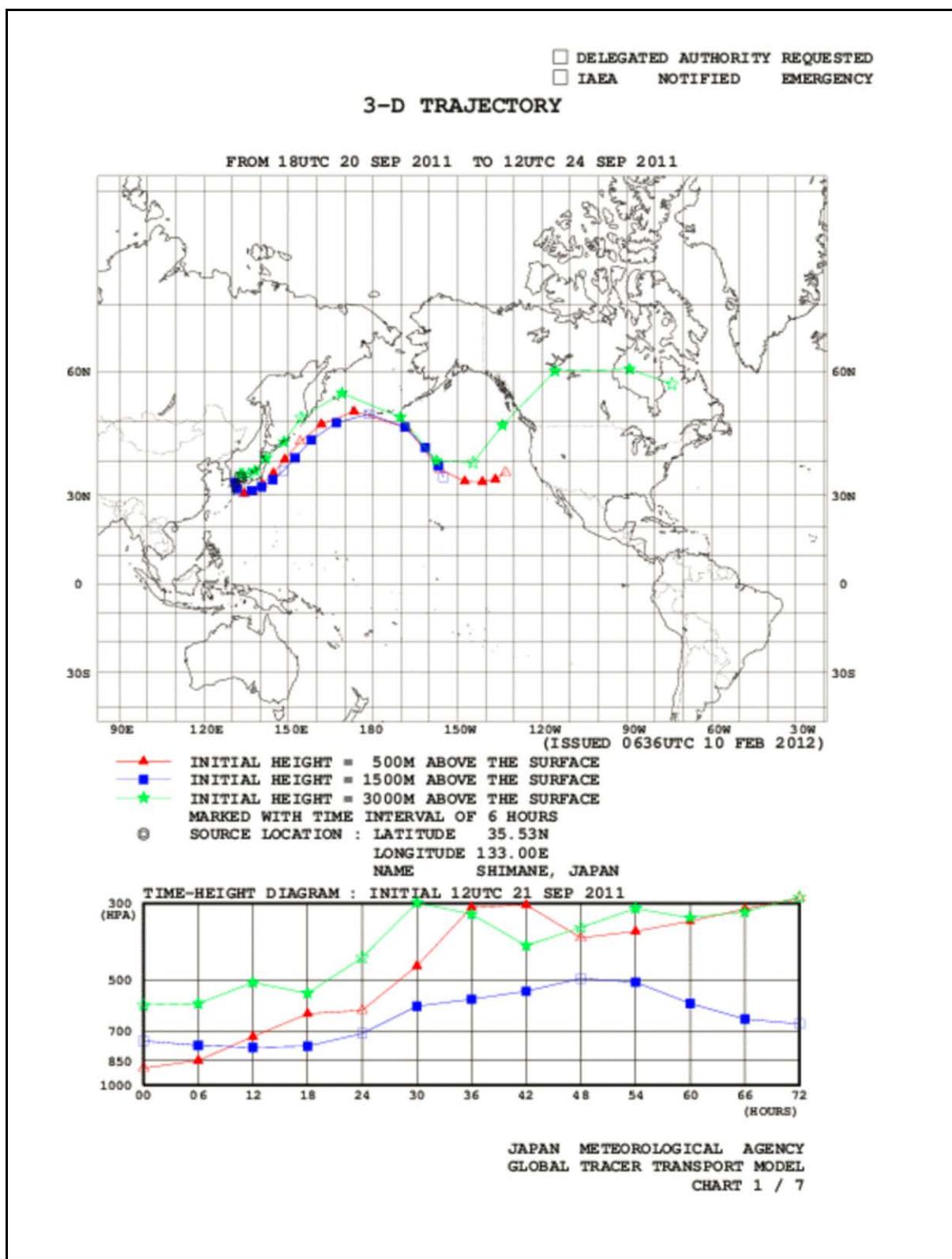


Figure 4: The charts of 3-D trajectories issued by RSMC Tokyo

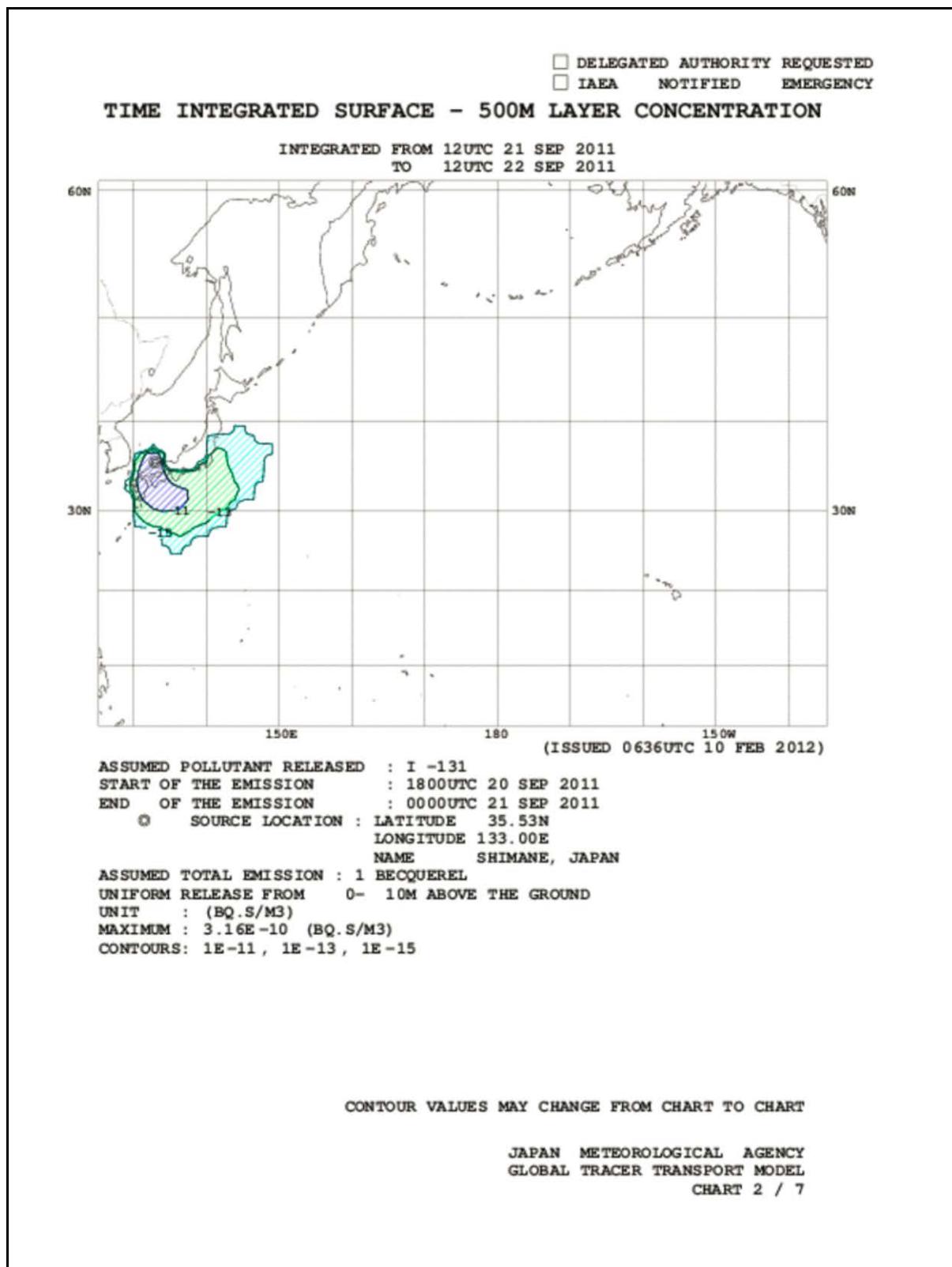


Figure 5: The chart of time integrated pollutant concentrations issued by RSMC Tokyo

2.1.2.1 Standard products of RSMC provide seven maps consisting of:(according to the *RSMC SUPPORT FOR ENVIRONMENTAL EMERGENCY RESPONSE* (WMO/TD-No.778))

- (a) Three-dimensional trajectories starting at 500, 1 500 and 3 000 m above the ground, with particle locations at six-hour intervals (main synoptic hours up to the end of the dispersion model forecast);
- (b) Time-integrated airborne concentrations within the layer 500 m above the ground, in Bq s m⁻³ for each of the three forecast periods;
- (c) Total deposition (wet + dry) in Bq m⁻² from the release time to the end of each of the three forecast periods.

2.1.2.2 The shortages of the products of RSMCs:

- (a) It would be uncertain about the concentrations in the products of RSMCs. The default value (radioactive release of 1 Bq (Becquerel) over six hours) would be used in transport/dispersion models, due to little or no information (except location) available to the RSMC at an early stage. RSMCs are, however, requested to conduct subsequent model runs with more realistic parameters as they become available (products based upon updated parameters will be provided on request only or confirmed from IAEA or a Delegated Authority).
- (b) The temporal resolution of RSMCs is not sufficient for issuing SIGMET. The intervals of forecast trajectories are 6 hours. The intervals of forecast 24-hourly average exposure maps are available every 24 hours. But the period validity of SIGMET for radioactive cloud is valid for only 4 hours.
- (c) The products of RSMC are lacking of vertical extent information of radioactive materials. Although a time-height (m or hPa) diagram is provided to indicate vertical movement of trajectory parcels (not the forecast concentration), the vertical extent of radioactive cloud is still unknown.

2.1.3 Other relevant information of radioactive materials release incident: information from owner or operator of the nuclear facility, local radioactive measurements, dispersion modeling results, Information from International Atomic Energy Agency (IAEA).

2.2 Criteria to issue SIGMET for radioactive cloud by MET/H TF ad hoc group

2.2.1 For safe protection of human (pilots, crews, passengers), a threshold of total concentration that would start impacting health is necessary. Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) is tasked to establish that. As could be seen from the discussion of the previous IAVWOPSG (IAVWOPSG/8), efforts are still on-going to establish that.

2.2.2 According to the survey undertaken in 2014 in response to MET/H TF/3 Action Agreed 3/1, only 1 State has specified thresholds for issuance of SIGMET (MET/H TF/4 – WP/03).

2.2.3 To err on the safe side, MWOs should issue the SIGMET for radioactive cloud, once the release of radioactive materials can be confirmed and is likely to affect its FIR. However, it is noted that RSMCs would need time to prepare the EER products upon which decisions would be based.

2.2.4 Some initial thoughts on the interim regional guidance on the issuance of SIGMET for radioactive cloud were presented by the ad-hoc group comprising China (rapporteur), Hong Kong-China and Japan at the MET/H TF/5 meeting in March 2015 (MET/H TF/5 – IP/03) and are repeated below.

“Drawing from the Fukushima experience, the SIGMET information should

be consistent with the action taken by the national/local radioactive protection authority, otherwise the inconsistency may cause significant disturbance. For States where there is no national/local radioactive protection authority, the ad-hoc group noted the establishment of an urgent protective action zone as recommended by IAEA in its requirements document *IAEA GS-R-2 Preparedness and Response for a Nuclear or Radiological Emergency*, which is 5 to 30 km radius, and would suggest to adopt a 30 km radius as a default.

Once EER product and a reasonable estimate of the source term are available, for States where there is no national/local radioactive protection authority, the EER product, supplemented by local information where available could form the basis of the SIGMET. Again drawing from the Fukushima experience, a 0.1 micro Sv per hour could be considered for adoption as the threshold for the boundary of radioactive cloud.”

2.2.5 MET/H TF/5 decided that additional comments be sought from the MET/H TF with respect to the above draft guidance material and the draft guidance be revised and developed further as necessary, before submission for review by MET SG/19 and consideration of further action (MET/H TF/5 – Decision 5/3). The draft was subsequently circulated and only 1 comment was received, which made reference to the volcanic ash advisory as described in the Concept of Operations (ConOps) for Radioactive Material Information Services in Support of International Air Navigation accepted by the IAVWOPSG in February 2014 as well as introduced at the ICAO/WMO Meteorological Divisional Meeting in July 2014.

2.3 Proposal by IAVWOPSG

2.3.1 Meanwhile, it was noted that ICAO Secretariat had issued IAVWOPSG Memo/64 dated 29/7/2014 (refer to <http://www.icao.int/safety/meteorology/iavwopsg/Memos/64.pdf>). It was noted that after the coordination activities, the Secretariat had come up with a draft guidance as below which is very much similar to part (a) of the proposal by MET/H TF/5 but with further clarification on the vertical extent:

- horizontal radius of 30 km (16 nm); and
- vertical extent from the surface (SFC) to the upper limit of the flight information region/upper flight information region (FIR/UIR) or control area (CTA) as applicable.

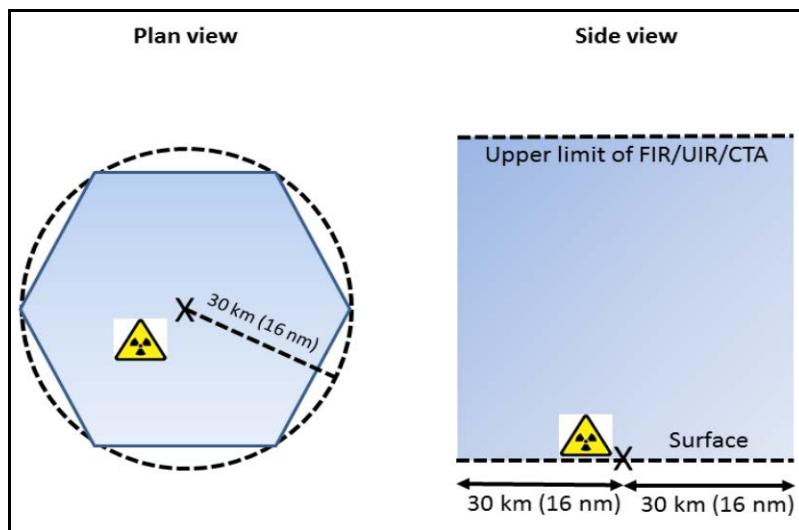


Figure 6: Example schematic (extract from IAVWOPSG-Memo/64)

2.3.2 However, there remain some concerns over the draft guidelines proposed by the Secretariat as well as some procedural issues such as:

- need for aviation-specific threshold for the SIGMET to be fit for purpose which could be rather different from ground-level exposure threshold;
- need for consistency on location and intensity of the release which would require agency coordination both inside and outside the State;
- need for clarification as to whether an MWO is required to produce SIGMET for observed or forecast extent of RDO CLD;
- need for guidance to be provided by RSMCs and the associated time frame;
- Need for MWO to notify the RSMC

2.4 While there are much similarity in the draft guidelines by the ad hoc group and that by the Secretariat, the draft guidelines by the ad hoc group would respect the protective area as determined by the national/local radioactive protection authority, thus ensuring consistency in the warning message. Only for States where there is no national/local radioactive protection authority, a protective area with horizontal radius of 30 km (16 nm) would be adopted. This should partially address the concerns raised in respect of the draft guidelines by the Secretariat.

2.5 The workstream on Release of Radioactive Material (RRM) under the MET Information and Service Development Working Group (WG-MISD) of the MET Panel is developing the guidance material. In particular, work is underway to refine the Concept of Operations (ConOps) for Radioactive Material Information Services in Support of International Air Navigation. It is thus suggested that the draft proposal by the ad hoc group in paragraphs 2.2.4 above be forwarded to WS-MISD RRM for consideration. To further clarify the role of MWOs and related agencies, consideration could be given to develop a Asia/Pacific Regional Guidance on Issuance of SIGMET for Radioactive Cloud as an interim solution before such guideline is available from WG-MISD RRM.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
 - b) provide comment on the draft guideline by the ad hoc group and its appropriateness to forward it to WG-MISD RRM for consideration;
 - c) discuss the need to develop further the draft guideline into a Asia/Pacific Regional Guidance on Issuance of SIGMET for Radioactive Cloud as an interim solution while a formal guidance from WG-MISD RRM is awaited; and
 - d) discuss any relevant matters as appropriate.
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