WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY

AD HOC TASK TEAM MEETING ON JCOMM COORDINATION FOR MARINE ENVIRONMENTAL EMERGENCY RESPONSES

Vienna, Austria, 1 August 2013

FINAL REPORT

JCOMM Meeting Report No. 109

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NOTES

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C O N T E N T S

GENERAL SUMMARY OF THE MEETING

1 OPENING OF THE SESSION

1.1 Opening

1.1.1 The Ad hoc Task Team meeting on JCOMM Coordination for Marine Environmental Emergency Responses was opened at 0900 hours on Thursday 1 August 2013, at the Headquarters of the International Atomic Energy Agency (IAEA), Vienna, Austria. The meeting was chaired by Mr Nick Ashton, chair of the Task Team.

1.1.2 Mr Guenther Winkler, Response System Officer of the Incident and Emergency Center (IEC), IAEA, welcomed all participants. He briefly introduced the Joint Radiation Emergency Management Plan (the Joint Plan) that describes; the planning basis; the organizations involved in response, their roles and responsibilities, and the interfaces among them, between them and States; operational concepts; and preparedness arrangements. Mr Winkler noted that these arrangements are reflected in the emergency management plans of the various organizations including WMO, and that the IAEA is the main coordinating body for the development and maintenance of the Joint Plan.

1.1.3 Mr Winkler informed the meeting that, in the period following the accident at TEPCO's Fukushima Daiichi Nuclear Power Plant, considerations emerged on marine modelling capabilities accessible in the IEC as part of the emergency response arrangements. Noting the close relevance and potential synergies between IAEA's and WMO/JCOMM"s efforts to address marine radioactive material discharge issues, Mr Guenther encouraged active discussion and close collaboration between the organizations to develop concepts and requirements for related operations (see Agenda item 3).

1.1.4 The list of participants is provided in ***Annex I***.

1.2 Adoption of the agenda

1.2.1 The Team adopted the agenda for the meeting, as reproduced in ***Annex II***.

1.3 Working arrangements

1.3.1 Following the usual practice of JCOMM, the meeting (including the documentation) was conducted in English only. All documents and information were provided through the meeting web site: http://www.jcomm.info/TT-MEER-1.

2 REVIEW DECISIONS AND PLANS MADE AT THE RELEVANT JCOMM EXPERT TEAMS

Outcome and Decisions of SCG-7 relating to the work of ad hoc Task Team

2.1 Mr Nick Ashton, vice-chair of the JCOMM Services and Forecasting Systems Coordination Group (SCG) and chair of the ad hoc Task Team, recalled the decision at the fourth session of JCOMM through Recommendation-4 (JCOMM-4); an ad hoc Task Team should develop the implementation strategy and plan for an international coordination framework to support response to marine environmental emergencies, with a focus on maritime discharge of radioactive hazardous substances. The intersessional Workplan for 2012-2017 included a set of plans to follow up this Recommendation (Projects #24, #25 and

#30 of the 2012-2017 SFSPA Projects and Work Plans for the Intersessional Period. See http://www.jcomm.info/SPAWP).

2.2 Subsequently, the SCG at its 7th session (SCG-7, 4-6 March 2013, Tokyo, Japan: http://www.jcomm.info/SCG7) established the ad hoc Task Team under its guidance, to; 1) review available technologies for modelling, forecasting, and operational support of radioactive material discharge in marine environments, with a view to exploring the feasibility of providing enhanced coordination in basin scale; 2) submit a proposal to streamline the global coordination of marine environmental emergency responses, to ensure that existing capabilities within the Marine Pollution Emergency Response Support System for the high seas (MPERSS, including SAR) are not compromised by any reapportionment of resources. The selected Task Team members, from the JCOMM Expert Team on Maritime Safety Services (ETMSS) and the JCOMM Expert Team on Operation Ocean Forecasting Systems (ETOOFS), are to undertake the agreed set of tasks addressing both technical and (international) operational aspects.

2.3 The Team's Terms of Reference and membership are reproduced in ***Annex III***. The SCG requested the Task Team to report to the Group on the results/deliverable by mid 2014 and then by December 2014, upon the agreed timeline within the ToR and Project #30 of the SFSPA Work Plans, in order to submit the result of the Team's work to the WMO Congress in May 2015. **(Action by ad hoc Task Team; Action by N.Ashton for reporting to SCG)**.

Outcome and Decisions of ETOOFS-4 relating to the work of ad hoc Task Team

2.4 Dr Pierre Daniel presented a summary of the discussion at the 4th session of the ETOOFS (ETOOFS-4, 25-29 March 2013, College Park, USA: http://www.jcomm.info/ETOOFS4) on relevant issues. The main contribution of the ETOOFS to the Task Team would be through the implementation of SFSPA Work Plan Projects #24 (to identify and support the technical development of marine environmental emergency response) and #25 (to improve JCOMM's coordinating capabilities for marine environmental emergency response including radioactive hazard), the ETOOFS made the following recommendations:

- As a first step, the ad hoc Task Team should identify which groups (national, regional and international levels) are active in the related areas, in order to comprise them in the consultation and planning process. In doing so, the Team advised to generate a list of people entrained, for example, from the list of participants in the IAEA meeting held in Monaco in 2011, to draft a proposal for a Coordinated Research Project (CRP) **(Action by I.Osvath, H.Tolman)**.

- User needs (end and intermediate users) should be identified in drafting such a proposal;

- Given the limited time for the work of the ad hoc Task Team, it was advised to firstly identify/review available technical capabilities (characteristics, inputs, outputs, etc.), taking into account future/extended work for evaluating the performance of each model at a later stage. Partial contents of the Guide to Operational Ocean Forecasting (in progress, by ETOOFS) would largely cover this task;

- The ad hoc Task Team would have either face-to-face meetings or videoconferences at a regular time intervals, to progress the work. It was proposed that the first meeting of this kind would be held in June/July 2013. **(Action by WMO Secretariat – completed through this meeting)**

2.5 Detailed discussions and decisions as to the above recommendations are given under agenda item 5.

3 REVIEW OUTCOME OF THE IAEA CONSULTANTS MEETING ON MARINE AND AQUATIC MODELLING FOR RADIOLOGICAL EMERGENCIES, AND FUTURE INTER-AGENCY COOPERATION

3.1 Drs Pierre Daniel and Boram Lee presented a brief summary of the discussion during the IAEA consultants meeting (29-31 July 2013, Vienna, Austria), focusing on the joint discussion taken place on 31 July 2013 and on the potential areas of JCOMM-IAEA collaboration. This summary is reproduced in ***Annex IV***.

3.2 Through discussions with Mr Joseph Chaput (IAEA) and Ms Iolanda Osvath (IAEA), the Task Team agreed on the following points and recommendations to the IAEA:

- In the planning process of IAEA/IEC, focus should be on global solutions for operational support, which address both the point (direct to sea) and deposition (i.e., from a plume) input. Where possible, the use of local high-resolution ocean models should be encouraged;

- Understanding that the needs/requirements are emerging from the operational need, a simple and clear list/description of mandatory products should be firstly identified, with simplified and agreed format between users (IEC technical team) and information providers.

- An interdisciplinary approach is crucial for marine modelling to be successfully employed in the operational warning; for example, investigation into underground water and river modelling;

- The participants noted options for implementing marine modelling in the IEC, and agreed on the consensus during the consultants meeting; that the IEC could arrange for an expert capability hosted offsite. The participants noted that such an arrangement is similar to the existing one between IAEA and WMO for the provision of atmospheric transport model products, and therefore agreed that the WMO Emergency Response Activities (ERA) can offer a useful implementation framework for a marine modelling component in the future.

- The participants noted that the ongoing process might require participation of (a) UN agency(ies) with ocean-related mandates, such as IOC of UNESCO, therefore recommended that the IAEA should communicate with the IOC of UNESCO to explore potential roles of IOC in developing the concept of operation as well as in the implementation.

- The scientific and technical development should be undertaken in parallel, with involvement of IAEA's Environmental Laboratories (IAEA-EL), to address longer-term issues such as; development of high resolution dispersion models, implementation of nested models for different space-time scales, potential use of risk mapping as advisory information (e.g., provision of a probability map of future distribution based on historical data).

3.3 The participants welcomed IAEA/IEC's plan to develop a concept of operations for the use of marine modelling, after the internal deliberation on the results of the

consultants meeting. The participants noted that this plan coincides with the workplan for the ad hoc Task Team, particularly to review available technologies for modelling, forecasting, and operational support of radioactive material discharge in marine environments. Therefore the ad hoc Task Team agreed that the relevant JCOMM Expert Teams and/or WMO programmes should assist the IEC in drafting the concept, where appropriate, through the experts engaged in both WMO/JCOMM and IAEA efforts **(Action by ad hoc Task Team)**.

3.4 The participants noted that the IEC technical teams would require training and guidance on how to interpret and communicate (e.g. convey the associated uncertainties) outputs from various ocean models. It was recommended that, once the overall concept and plan for development were agreed, the Team would provide necessary advice and support for associated activities through appropriate JCOMM Expert Teams and relevant WMO programmes **(Recommendation to ad hoc Task Team, SCG & relevant WMO programmes)**.

3.5 The participants recognized the need for further collaboration among JCOMM (WMO-IOC) and IAEA-EL to address the long-term issues for marine modelling as well as the operational application of the modelling products, such as:

- Improving operational response system for marine dispersion;
- Coupling high resolution radionuclide dispersion models with existing operational models;
- Developing scenarios and risk maps for nuclear facilities, marine assessment, etc.;
- Developing elaborated advisory products to IEC from marine / aquatic / radio-nuclide modelling, beyond the immediate requirements for emergency response.

3.6 It was agreed that the ad hoc Task Team, then a team/group that would be assigned with relevant tasks after the completion of Task Team's work, should continue discussion with the IAEA-EL in this regard **(Action by ad hoc Task Team, SCG/ETMSS/ETOOFS & IAEA-EL)**. The Team also requested the WMO Secretariat to work with the IAEA-EL to arrange a high-level discussion/agreement to support this technical collaboration **(Action by WMO Secretariat)**. The participants noted that the enhanced collaboration with the IAEA-EL might also provide an extended scope for potential engagement of IOC in the inter-agency collaboration.

4 REVIEW INITIAL FEEDBACK TO THE SURVEY ON THE STATUS OF THE MARINE POLLUTION EMERGENCY RESPONSE SUPPORT SYSTEM

4.1 The participants recalled that the WMO Secretariat issued a survey on the status of the Marine Pollution Emergency Response Support System (MPERSS) in May 2013. The purposes of this survey were; 1) to renew information on the current international framework (MPERSS); 2) to collect information on available technologies for modelling, forecasting, and operational support of radioactive material discharge in marine environments, and; 3) to diagnose the level of national interest and commitment to the currently established framework.

4.2 Dr Boram Lee provided a brief summary of the survey results:

- An online survey was conducted for the AMOCs through: http://www.jcomm.info/MPERSSreview.

- The AMOCs of nine (9) Marine Pollution Incident (MPI) Areas out of twenty (20) responded to the survey, as of July 2013; including Australia for Area X; Brazil for Area V; China for Area XI(A); France for Areas II and III(A); Greece for Area III(B); Japan for Area XI(B); New Zealand for Area XIV; and UK for Area I.

- For Area IX, a response from Iran was received instead of the current AMOC (Saudi Arabia). The WMO Secretariat was requested to communicate with Iran and Saudi Arabia to understand the reason and to clarify the regional arrangement **(Action by WMO Secretariat)**. It was suggested that, unless there is a clear request from the region, Iran might become a Supporting Service for MPI Area IX **(Recommendation to WMO / MPERSS coordination)**.

- The response for Areas IV, XII and XVI were under preparation by USA.

- The responses indicated disparities among responsible countries in the level of technical capabilities (for modelling), and the level of interest/commitment in the overall MPERSS coordination. It implied that the geographical distribution of MPIs, which is identical to the METAREAs for marine weather information support for the Global Maritime Distress and Safety System (GMDSS), may not serve properly the purposes of MPERSS.

- Several AMOCs currently use same sources for input/products, and/or operate same models with certain level of local adaptation to provide information. Taking into account also the recent development in marine pollution transport models as well as object drift models, alternative approaches for global geographical coordination may be sought in the future: i.e. the (spatial) coverage of one capable centre may be extended to several (current) MPIs, under a global coordination for multi-modelling practices.

4.3 The ad hoc Task Team agreed that those gaps in geographical arrangement should be firstly addressed, in preparing a proposal for new framework in support of marine environmental emergency responses. It considered that the environmental emergencies comprise various types of accidents and hazards therefore a framework may not ideally address all requirements for different types of emergency responses (for example, for SAR and for marine radioactive material discharge). Nevertheless, the ad hoc Team agreed that a proposal should be drafted with primary consideration on the areas where user needs/requirements have been identified so far, such as marine radiological and nuclear emergencies, with a view to comprising requirements for other type of emergency responses **(Recommendation to ad hoc Task Team)**.

4.4 The ad hoc Task Team agreed that collected information, particularly those of available metocean information/data and models, would provide useful information for the work of the Task Team. It requested the WMO Secretariat to communicate with AMOCs who has not replied to the survey and obtain their responses, so that the operational information (especially contact information) would be kept updated as long as the MPERSS framework remains operational **(Action by WMO Secretariat)**.

4.5 The participants also noted that all updated information through the survey is now documented in the new MPERSS web page under the JCOMM.info: http://www.jcomm.info/MPERSS, following the decision made at the 7th session of SCG (SCG-7, 4-6 March 2013, Tokyo, Japan), and agreed that the official address for MPERSS information (http://www.maes-mperss.org) should be immediately re-directed to this new

page, and the new page should be maintained by the WMO Secretariat with advice from the ETMSS **(Action by WMO Secretariat & ETMSS until the current MPERSS' lifetime)**. The current MAES-MPERSS web page (maintained by Meteo-France) would be sustained for a defined time in order to ensure continuity in information provision.

5 REVIEW TERMS OF REFERENCE AND WORKPLAN

5.1 Based on the Team's ToR Mr Nick Ashton summarized the agreed tasks and timelines as follows, to be undertaken by the Team members from relevant JCOMM Teams/Groups:

Groups involved	Work	Deadline
Tasks related to radioactive material discharges:		
TT/ETOOFS	– Review existing capability – Lead on requirements for further modelling developments which may be needed to improve services – this may require a timescale beyond 2014, but by end of 2014 current "best practice" should be adopted with an indication of further requirements.	Mid 2014
TT/ETOOFS/SCG	– Liaison/collaboration with international bodies such as IAEA and UNSCEAR to establish end user requirements for model output	Mid-2014
TT/ETMSS/SCG	– Review the appropriateness of the AMOC network in relation to Radioactive material discharges, alongside the appropriateness of the current network of RSMCs	End 2013
Tasks addressing traditional MEER work:		
TT/ETMSS/SCG	– Liaise with IMO to identify regional groups most heavily engaged with MEER activities and engage with those groups to identify user needs for conventional met inputs	Mid 2014
TT/SCG	– Liaise with SAR authorities to identify requirements for metocean services to be provided by NMHSs – Review current status of AMOCs under the current MPERSS system, in the light of: a) Responses to the MPERSS survey b) End user requirements identified by engagement with regional groups	End 2014 End 2014
TT/SCG	– In light of the MPERSS survey, and consideration of changes to the current network of AMOCs, consider the likely requirement for capacity development in any areas of the world lacking such capability.	End 2014

5.2 The ad hoc Task Team reviewed an outline prepared by the WMO Secretariat, of a proposal for future JCOMM activities on Marine Environmental Emergency Responses (MEER). Based on the Team's ToR and the discussions made during the meeting, the ad hoc Task Team and invited experts agreed on the table of contents, respective responsibilities and timeline as described in ***Annex V*** **(Action by ad hoc TT members).**

5.3 The ad hoc Task Team requested the WMO Secretariat to prepare an online working tool for the drafting process, and to facilitate regular review/discussion of the Team

members either by teleconference or through online conference **(Action by WMO Secretariat)**.

5.4 The participants identified several potential issues, as described in the following paragraphs, to be considered during the drafting process.

Consideration on existing capabilities

5.5 The participants noted that the existing ocean forecasting capabilities represented by the operational oceanography communities (i.e. GOOS Regional Alliances, GODAE, etc) should be considered in drafting the new approach for the JCOMM marine hazards related services **(Recommendation to ad hoc TT)**.

Identification of users, stakeholders and requirements

5.6 The participants agreed that the primary consideration should be given, as the first step, to identifying (immediate) users of metocean information for environment emergency responses - including any authoritative parties - and clear requirements for specific information. For radiological and nuclear emergencies, the IAEA/IEC was clearly identified as the immediate user, while further investigation should be made for marine pollution (e.g. oil spill). It was recommended that the work of ad hoc Task Team should focus on firstly those areas where the user requirements are clearly defined, and extend its work to other areas along the progress through the consultation process with other partner organizations **(Recommendation to ad hoc TT).**

5.7 The participants requested Mr Nick Ashton to collect information on authorities/users for marine pollution (e.g. regional groups including the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea, REMPEC), and Dr Pierre Daniel on user information and requirements for SAR **(Action by N.Ashton and P.Daniel)**, for future consultation**.**

5.8 The participants also emphasized that the proposition for future framework should include ways to ensure usability of information service / products, through continuous interaction with users to review/update requirements **(Recommendation to ad hoc TT)**.

5.9 The participants emphasized that the immediate and primary focus should be on providing service with existing capabilities. In a longer term model development may be carried out for improved service provision, either in parallel with or as a second step to the work related to the support for operational services **(Recommendation to ad hoc TT)**.

Consideration of other marine hazards

5.10 The participants generally agreed that marine hazards that are not within the current scope of MPERSS, such as Harmful Algal Bloom (HAB) would be useful to be considered in a future framework, as this might be of interest to users – e.g. FAO for consideration on food security and IAEA-EL. In this context, consideration on a longer-term development should ensure that coastal modelling would be applied for operational service. In the meantime, the participants agreed that specific work on this area may not be undertaken within the timescale for a submission to WMO; the participants recommended that a proposal to WMO should make reference that resource needs to be made available to identify the requirement for specific work, modelling or outputs to assist authorities in the management of HAB issues, and leave room for future amendment in this area **(Recommendation to ad hoc TT).**

Timescale and Resources

5.11 Given the timescales and resource availability, the ad hoc Task Team considered that only the two areas of work outlined might be completed to contribute to the WMO congress in 2015 - the review of MPERSS/role of AMOCs and any suggested changes, together with an adoption of current best practice modelling for nuclear radioactive releases. In this context, the ad hoc Task Team agreed to focus on these areas in the draft proposal, while remaining flexible for further amendment and inclusion of extended work at the later stage **(Recommendation to ad hoc TT)**.

Consideration on the procedure beyond WMO governing body

5.12 The participants noted that due consideration should be paid to any implication to the current practices once a new framework would be approved by the WMO Congress; for example, to partner intergovernmental organizations and to WMO Members / IOC Member States in implementing the MARPOL Convention. **(Recommendation to ad hoc TT)**.

5.13 At present, the current MPERSS is recognized as a “recommended practices” but not a mandatory service – MPERSS principles are included in the Guide to Marine Meteorological Services (WMO-No.471). A new framework primarily responding to operational requirements will need to be recognized as part of relevant intergovernmental protocols and contingency plans (e.g. the Joint Radiation Emergency Management Plan for the respective parts of procedure), after rigorous trials/test and review. The ad hoc Task Team and WMO Secretariat were requested to take these points into account, within the draft proposal **(Recommendation to ad hoc TT and WMO Secretariat).**

6 ANY OTHER BUSINESS

6.1 No particular issue was addressed under this agenda item.

7 CLOSURE OF THE MEETING

7.1 In closing the meeting, Mr Nick Ashton, chair of the ad hoc Task Team, expressed his appreciation to all participants for their active participation and contribution to the Team’s tasks.

7.2 Mr Ashton then expressed his sincere appreciation to IAEA/IEC and Mr Joseph Chaput, for hosting the meeting and participating in the discussion, which enabled both IAEA and WMO to activate inter-agency discussion and move forward with the joint efforts for an operation of marine environmental emergency response.

7.3 The Ad hoc Task Team meeting on JCOMM Coordination for Marine Environmental Emergency Responses closed at 1630 hours on Thursday 1 August 3013.

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Annex I

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Annex II

AGENDA
(as agreed at the meeting, 1 August 2013, Vienna, Austria)

1 Opening of the session

2 Review Decisions and Plans made at the relevant JCOMM Expert Teams

3 Review outcome of the IAEA Consultants meeting on marine and aquatic modelling for radiological emergencies, and future inter-agency cooperation

4 Review initial feedback to the survey on the status of the Marine Pollution Emergency Response Support System (MPERSS)

5 Review Terms of Reference and Workplan

6 Any Other Business

7 Closure of the meeting

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Annex III

TERMS OF REFERENCE
FOR THE AD HOC TASK TEAM ON JCOMM COORDINATION FOR
MARINE ENVIRONMENTAL EMERGENCY RESPONSES
(as agreed at SCG-7, 4-6 March 2013, Tokyo, Japan)
(Reviewed & agreed without change at the Task Team meeting, 1 August 2013, Vienna, Austria)

At the 4th session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM-4, May 2012), Members / Member States agreed that JCOMM should take a proactive role in supporting Members / Member States to respond to marine environmental emergencies. This should include supporting responsible centres to extend their technical capabilities, exchange diagnostic and forecast data, as well as provide enhanced coordination for services and information provision in a way that meets requirements as defined by the International Atomic Energy Agency (IAEA) and International Maritime Organization (IMO).

A system that tracks oceanic radioactive plumes using dispersion modelling should leverage the existing framework for tracking atmospheric radioactive hazards in operational NWP centres, operated in conjunction with atmospheric dispersion modelling infrastructures and expertise.

To pursue this objective during the intersessional period (2012 – 2017), the ad hoc Task Team will undertake the following work, and will report directly to the Services and Forecasting Systems Coordination Group (SCG). The Task Team will be active during the defined period to accomplish the tasked described below, mainly through the online correspondence, and in general with no resource implications to JCOMM:

1. Review available technologies for modelling, forecasting, and operational support of radioactive material discharge in marine environments, in view of exploring feasibility of providing enhanced coordination in basin scale; **by mid 2014**;

2. Assist the SCG to liaise with international organizations, including IMO, IAEA and others, on the requirements for the delivery of information in support of radioactive material discharge; **continuous until end 2014**;

3. Submit the SCG a draft proposal for an international framework for responses to marine radioactive material discharge, as well as a JCOMM work plan that describes; 1) requirements and gaps; 2) primary users of such a service; 3) key players and responsible parties in JCOMM coordination/contribution; and, 4) process and timeline to implement the proposed practice; **by mid 2014**;

4. Review the current framework for Marine Pollution Emergency Response Support System for the high seas (MPERSS), particularly the role of the Area Meteorological and Oceanographic Coordinators (AMOCs) and their applicability, in the context of support to any response to radioactive material discharge; marine pollution monitoring and response or marine SAR; **by end 2014**;

5. Submit the SCG a proposal to streamline the global coordination of marine environmental emergency responses, to ensure that existing capabilities within MPERSS (including Search and Rescue) are not compromised by any reapportionment of resources; **by end 2014**.

Task Team Members:

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Henri Savina (France)
Bruce Hackett (Norway)
Giovanni Coppini (Italy)
Marina Tonari (Italy)
Pierre Daniel (France)
Yoshiaki Kanno (Japan)

Annex IV

REVIEW OUTCOME OF THE IAEA CONSULTANTS MEETING ON MARINE AND AQUATIC MODELLING FOR RADIOLOGICAL EMERGENCIES
(29 – 31 July 2013, Vienna, Austria)

The Incident Emergency Center (IEC) of IAEA wants to improve its existing capability to conduct assessment and prognosis of marine releases during a radiological event including both direct releases to water from a nuclear power plant and releases caused by plume deposition onto water surfaces.

The consultancy explored available methodologies to conduct such modelling, discussed the existing expert groups and organizations in this field and drafted a note recommending future actions to the IEC to increase its capability in this area (both in the near term and the long term).

The consultancy discussed the characteristics of the services and types of output from marine models that could be provided to a technical team in the IEC during an event in order for them to provide useful analysis and insight on the potential evolution of marine conditions like the established process for atmospheric modelling, marine models will be primarily used by IEC to provide general awareness on where material may go during an event. In addition, the consultancy meeting discussed what types of information could be provided by IEC to Member State partners for their own planning and understanding purposes during an event.

Various information requirements exist for any marine model to be successfully used during an emergency. It was determined earlier in the meeting that, to produce usable model products during an event, specialized and specific information about the NPP site as well as the surrounding ground water / the local rivers would be required. Due to the significant information requirements the development any aquatic modelling capability in the IEC was determined to be potentially a very challenging endeavour. It was decided that the **IEC should initially focus on the most advanced marine modelling capabilities which are already operational in nature (although improvements can always be made) and cover the majority of the globe.** These capabilities are specific mostly for oceanic transport. Investigation into underground water modelling and the modelling of surface waterways should take place in the future.

A set of requirements for operation needs to be developed, consisting of; 1) products (e.g. maps, statements), and; 2) forecast period and interval for model run.

Considering that that the movement of marine models is generally slower than plume models, the participants generally agreed that marine models should be rerun with new information at fixed intervals of 12-24 hours. While it was recommended to use a high resolution model (both spatial and temporal) to produce information for IEC, the requirements for resolution should be driven by the scenario (e.g. location of the source (near coastlines, offshore), intensity of tidal effect). Additional detail (i.e., a source term) will be required if more detailed results are desired. Models which address both a point (direct to sea) and deposition (i.e., from a plume) should be used during an event as the dispersion profile is very sensitive to costal distance.

Introduction of a marine modelling capability in the **IEC will need to consider how to interpret the output, and variability of output between different models**. In case of plume modelling, the default scenario is based on a hypothetical source (1 Bq/h illustrative source term, as the source information may remain unknown by the time of IAEA notified

emergency). Uncertainties due to the default scenario conditions must be considered, and the interpretation should be done with the help of an experienced experts. This being said, model outputs offer the best available guide in a first response situation. Such an approach can be applied to marine modelling for situational awareness purposes.

The output of marine models should be in a simplified format that is easy to understand by the IEC technical team. In this context, guidance on interpreting results will help the IEC to improve the use of marine modelling information. **IEC technical team will require specific training on the interpretation of such models in order to properly convey the associated uncertainties (this is not dissimilar to the current training on plume models).**The participants agreed that organizations do exist which currently have the capability to conduct modelling of the transport of pollutants in the ocean. Several of these organizations have used this capability in the time frame following the Fukushima accident to provide information to concerned parties regarding arrival time of contamination to international shores and to identify the general regions where contamination was most likely to go.

The meeting discussed options for implementing marine modelling in the IEC during an RN event. Three options were determine possible:

- Option 1 - The IEC could acquire a local capability hosting at the Agency
- Option 2 - The IEC could arrange for an external expert capability hosted offsite
- Option 3 - The IEC could acquire both a local capability and an external expert support capability

As marine modelling would be a new area for the IEC to investigate it was the general consensus of the meeting participants that Option 2 is the most ideal option for the IEC at this point in time. Adding a supplementary capability that is locally hosted (or available via a web interface similar to IXP) could be investigated in the future as the IEC develops experience using marine modelling tools.

Based on the results of this meeting, **the IEC will develop a concept of operations for the use of marine modelling during an RN event**, covering:

- The envisioned use of marine modelling during an emergency;
- The scope of capability desired from marine models within the first 24 hours, week and month (as capabilities may increase over time during an event);
- How models will be presented to the public and technical audiences;
- How the use of both marine models and marine measurements will be managed during an event.

The current approach of IEC to cover plume modelling on a global scale is using localized and specialized resources (via the RSMCs of the WMO). It was considered as a useful implementation framework for marine modelling information, with consideration on the coverage of potential regions in the world where marine modelling may be needed during an RN event. Discussions with external organizations coordinating such support (ie. JCOMM) could be used to help define the scope of such service.

Baring such an arrangement in mind as a future option, the following information were identified by IEC as a provisional list of requirements:

- Additional support possible by 24/7 contact, with marine modelling capability, to assist with the interpretation of such models;

- Additional support from a 24/7 contact, if/when the IEC requires a specialized modelling need during an event

Understanding that the needs/requirements are emerging from the operational need, it was agreed that **the scientific and technical development should be undertaken in parallel, as a matter of priority, to address longer-term issues**, for example; 1) evaluation of model performance and intercomparison, against various scenarios; 2) potential use of risk mapping as advisory information (e.g., provision of a probability map of future distribution based on historical data). The participants recognized the need for further discussion between WMO/JCOMM and IAEA Environment Laboratories (Monaco) in this regard.

Annex V

DRAFT OUTLINE OF A PROPOSAL ON FUTURE JCOMM ACTIVITIES ON MARINE ENVIRONMENTAL EMERGENCY RESPONSE (MEER)
(as agreed at the Task Team meeting, 1 August 2013, Vienna, Austria)

* The document below will be published as JCOMM Technical Report Series.
* The executive summary (including recommendations) will be submitted to the WMO Congress in 2015, as a proposal for future framework, as formal session document.
* The entire document (JCOMM Technical Report) will be submitted to the WMO Congress in 2015 as background document.

Provisional Contents	Responsibility / Recommendations / Actions
Executive Summary & Recommendations Recommendations/Proposal should include: - A future framework for MEER under WMO to support/facilitate relevant work of Members, to efficiently respond to emerging environmental emergency issues - A proposed framework to fulfil requirement for capacity development (regions/basins) - Proposed actions to respond to end user requirements identified by engaged user-representing organizations/agencies	Responsible: NA Input by: BL By: March 2015 Action: to finalize the section after the sections 1-3 finished Internal circulation (TT) for the final, Feb'14
Section 1: Background 1.1 Global/international frameworks: - International Convention for the Prevention of Pollution from Ships (MARPOL) - Interaction/cooperation with the International Maritime Organization (IMO) Marine - Environment Protection (MEPC) and Maritime Safety Committees (MSC) - Interaction/cooperation with the International Atomic Energy Agency (IAEA), - particularly with IAEA Environment Laboratories - European Maritime Safety Agency (EMSA) - Regional Marine Pollution Emergency Response Centre for Mediterranean Seas… (REMPEC) - others	Responsible: NA Input by: PD, GC, BL By: end 2014 Action: to call for input from ETMSS members, Sep'13 To organize a discussion with related agencies to collect input on MEER-related activities and requirements, by Apr'14 Internal circulation (TT) for the first draft, Nov'13. *On cooperation with IAEA, the IAEA/IEC (J.Chaput) will be consulted after the concept of operation is internally approved. (by end 2013).

1.2 JCOMM activities and roles in support of marine environmental emergency responses - MPERSS - Coordination with WMO Emergency Response Activities (ERA) Programme / CBS Coordination Group - Nuclear Emergency Response Activities (considering coordination with other emergency activities for oil spill / burning, radiological accident in marine and coastal zones, etc) - Other relevant activities for marine environmental emergency responses such as IOC's Harmful Algal Bloom (HAB) Programme - Available modelling capabilities to be considered (e.g. GODAE, EuroGOOS, etc.)	Responsible: NA Input by: PD, HS, BL, GC By: end 2014 Action: to call for input from ETMSS members, Sep'13 Internal circulation (TT) for the first draft, Nov'13 To draft a section on current MPERSS status, based on the survey, Nov'13
Section 2: Emerging issues of marine environmental emergencies 2.1 Radioactive Material Discharges - Review existing capabilities (also considering relevant modelling such as for radio-nuclide, Atmospheric dispersion?), highlighting gaps from experience (e.g. Fukushima case) - Requirements for further modelling developments for improved services - Review the appropriateness of the current MPERSS network for this matter, and the roles of AMOCs (in connection with section 1.2, to lead to a proposed structure/framework for future)	Responsible: PD Input by: MT, HT, YK, NA By: June 2014 Action: to consolidate / document user requirements from IAEA and other bodies, Sep'13 at GODAE workshop, to be followed by continuing discussion until Apr'14 To document "best practice" of radioactive material discharge modelling, Sep'13 To draft a section on AMOC/RSMCs roles **(INCLUDING A PROPOSED STRUCTURE FOR FUTURE),** Dec'13 Internal circulation (TT) for review, Apr'14 *Input on radio-nuclide modelling and related part will be received from / advised by IAEA.

2.2 Oil and other noxious substance spills - Review existing capabilities, highlighting gaps from experience - Requirements for further modelling developments for improved services - Review the appropriateness of the current MPERSS network for this matter, and the roles of AMOCs (in connection with section 1.2, to lead to a proposed structure/framework for future) 2.3 Accidents related to persons and objects (SAR) - Review existing capabilities, highlighting gaps from experience - Requirements for further modelling developments for improved services - Review the appropriateness of the current MPERSS network for this matter, and the roles of AMOCs (in connection with section 1.2, to lead to a proposed structure/framework for future) 2.4 Other marine environmental hazards	(for 2.2-2.4) Responsible: BH Input from: PD, MT, GC, BH, HT, HS(for connection w/1.2) By: June 2014 Action: To document status, based on the survey and other references, Mar'14, To document "best practice", Mar'14 To draft a section on AMOC/RSMCs roles **(INCLUDING A PROPOSED STRUCTURE FOR FUTURE),** Apr'14, Internal circulation for review (TT), Apr'14
Section 3: Strategy for JCOMM to support Marine Environmental Emergency Response (MEER) - Required services by Members / Member States - Required role of JCOMM to facilitate the work of Members / Member States - (Summary of) a proposed future MEER framework, to be supported by WMO / JCOMM - Consideration on (an) optimal framework(s) for MEER service provision to address various marine environmental issues - Addressing capacity development - Addressing user requirements and continuous improvement (*QM) - Addressing clear and close working relationship with agencies (e.g. IMO, IAEA, etc.)	Responsible: NA Input by: PD, HS, BL By: Mar 2015 Action: 1st draft of this section by Sep'14 Review by SCG → MAN by Nov'14

ANNEX VI

ACRONYMS AND OTHER ABBREVIATIONS

AMOCs	Area Meteorological and Oceanographic Coordinators (MPERSS)
CRP	Coordinated Research Project
EMSA	European Maritime Safety Agency
ERA	Emergency Response Activities (WMO)
ETMSS	Expert Team on Maritime Safety Services (JCOMM)
ETOOFS	Expert Team on Operation Ocean Forecasting Systems (JCOMM)
GOOS	Global Ocean Observing System (IOC-WMO-UNEP-ICSU)
HAB	Harmful Algal Bloom
IAEA	International Atomic Energy Agency
IAEA-EL	IAEA Environment Laboratories
IEC	Incident and Emergency Center (IAEA)
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
MARPOL	International Convention for the Prevention of Pollution from Ships
MEER	Marine Environmental Emergency Responses
MEPC	Marine Environment Protection Committee (IMO)
MPERSS	Marine Pollution Emergency Response Support System for the high seas
MPI	Marine Pollution Incident (MPERSS)
MSC	Maritime Safety Committees (IMO)
NPP	Nuclear Power Plant
QM	Quality Management
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
RSMCs	Regional Specialized Meteorological Centres (WMO)
SAR	Search and Rescue
SCG	Services and Forecasting Systems Coordination Group (JCOMM)
SFSPA	Services and Forecasting Systems Programme Area (JCOMM)
ToR	Terms of Reference
TT	Task Team