Joint WMO-IOC Technical Commission For Oceanography And Marine Meteorology

Final Report of the Coastal Inundation Forecasting Demonstration Project (CIFDP)-Indonesia

Bali, Indonesia

28-30 January 2019
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REPORT FROM THE FINAL MEETING OF THE CIFDP INDONESIA,
JANUARY 28-30, 2019

1. OPENING OF THE MEETING

The Coastal Inundation Forecasting Demonstration Project - Indonesia (CIFDP-I) final meeting was held in Bali, January 28-30, 2019, hosted by the Indonesian Government’s Badan Meteorological Climatological and Geophysical Agency (BMKG) at the Nusa Dua Beach Resort Hotel. The meeting was opened by the representative to the Director of the BMKG and Permanent Representative to WMO (Mr Prabowo, Deputy Director BMKG), who emphasized that Indonesia is a country with more than 99,000 km of coastline where there was an urgent need - directed by the President of the Indonesia - to improve early warning of coastal inundation events there. Indonesia is highly vulnerable to flooding from both sea and river sources, in addition to issues with land subsidence, and within a tectonically active zone that increases the risk of coastal flooding from tsunamis. Statements from WMO (Dr Sarah Grimes), and the Chair of the CIFDP Indonesia meeting (Mr Paul Davies) and via video, the Co-Chair of the CIFDP (Mr Val Swail) followed. Participants included partner agencies to BMKG: Indonesian Center for Water Resources (Ministry of Public Works), Ministry of Fisheries, Deltares (representative from Indonesia), and the end-user stakeholders such as the National Disaster Management Agency representatives from both Jakarta and Semarang city (most of whom were at the first meeting in 2013), BMKG staff and international experts from the CIFDP-I Project Steering Group (Dr Linda Anderson-Berry, Mr Paul Davies, Professor Kevin Horsburgh and Dr Graeme Smart). Apologies from the Co-Chairs of the CIFDP (Mr Val Swail and Dr Yuri Simonov) were also given with their inability to attend due to unforeseen circumstances. A full list of participants is in Annex 1.

This Report summarises the discussions at the Final Meeting, which concludes 5 years of the project, principally funded by the Indonesian government, with some funding from the World Meteorological Organization to support the participation of the external experts at the project development and review meetings. Support was also provided through an Indonesia-Netherlands Joint Cooperation Programme. The meeting was structured around discussing the key results of the CIFDP with demonstrated benefits to Indonesia, including feedback from the users and lessons learned. The Agenda is in Annex 2.

2. OVERVIEW OF THE CIFDP-I SUB-PROJECT

Established in 2009, the overall CIFDP concept facilitates the development of efficient warning systems to protect coastal communities and support to sustainable development. The Conceptual Design for a CIFDP is illustrated in Figure 1 and is described along with the overall concept in the CIFDP Implementation Plan (revised 2017). It is important to highlight that the CIFDP is about using existing model and data from the hydrology, oceanography and meteorology communities, available by open-access, so there is no hindrance to upgrade and costs. Solutions are adapted for the needs and capacity of the country.
Indonesia is one of 4 national CIFDP sub-projects, launched in Jakarta with an initial Stakeholder Workshop, 3-5 December, 2013, followed by a Phase 2 kick-off meeting 6-9 October 2014, Yogyakarta, and a Phase 2 review and phase 3 kick-off meeting 29-31 March 2017 in Jakarta. The Definitive National Agreement (the DNA) was agreed at the Yogyakarta meeting in 2014, and the DNA including the National Coordination Team was finalized and signed in 2017. The DNA is a formal agreement between the Indonesian government stakeholders (BMKG, Indonesian Geospatial Information Agency, Indonesian Center for Water Resources (Ministry of Public Works), Indonesian Ministry of Marine and Fisheries, National Agency for Disaster Management) and relevant stakeholders to ensure collaboration and sharing of data. Key activities are outlined in Table 1 and the initial elements of the system design is outlined in Table 2. In summarizing the scope of the CIFDP-I, BMKG (Ms Riama) emphasized that the goal of the project was to improve and assist the decision-making for the procedures already in place, by responding to the needs of Indonesia, and the local stakeholders. Other key players have included the WMO, especially through the Secretariat, and experts from JCOMM and CHy, with advice from the overall Project Steering Group (PSG) for CIFDP.

Figure 1: Concept of the Coastal Inundation Forecasting Demonstration Project (CIFDP).
<table>
<thead>
<tr>
<th>Event</th>
<th>Date/Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Stakeholders Workshop</td>
<td>3-5 December 2013, Jakarta, Indonesia</td>
</tr>
<tr>
<td>Definitive National Agreement (DNA); National Coordination Team (NCT)</td>
<td>DNA/NCT signed 29 March 2017: BMKG, Indonesian Geospatial Information Agency, Indonesian Center for Water Resources (Ministry of Public Works), Indonesian Ministry of Marine and Fisheries, National Agency for Disaster Management</td>
</tr>
<tr>
<td>Phase 1 Review and Phase 2 kick-off</td>
<td>6-9 October 2014, Yogyakarta, Indonesia</td>
</tr>
<tr>
<td>Phase 2 Review and Phase 3 kick-off</td>
<td>29-31 March 2017, Jakarta, Indonesia</td>
</tr>
<tr>
<td>Summary of Training carried out</td>
<td>Training on WW3 by NOAA Expert - December 2014 Delft3D Basic Training by Deltares - July 2015 (5 days training) Joint Development Training for Coastal Inundation by Deltares, 2016 (2 weeks training)</td>
</tr>
<tr>
<td>User Requirements Plan (URP)</td>
<td>presentation online at <a href="https://www.jcomm.info/index.php?option=com_oe&amp;task=vieDocumentRecord&amp;docID=15756">https://www.jcomm.info/index.php?option=com_oe&amp;task=vieDocumentRecord&amp;docID=15756</a></td>
</tr>
<tr>
<td>Funding</td>
<td>Indonesian government Indonesia-Netherlands Joint Cooperation Project World Meteorological Organization (for meeting support)</td>
</tr>
<tr>
<td>System Developer (SD)</td>
<td>BMKG; PUSAIR; Deltares; NOAA (WaveWatch-3 implementation)</td>
</tr>
</tbody>
</table>

Table 1: History of Key Activities in CIFDP-I December 2013 to January 2019.
### Table 2: Initial System Design for CIFDP-I

<table>
<thead>
<tr>
<th>SS Model</th>
<th>Delft 3D (hydrodynamic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Wave Input</td>
<td>N/A</td>
</tr>
<tr>
<td>- Wind Input</td>
<td>GFS/WRF; parametric TC</td>
</tr>
<tr>
<td>- Ensembles</td>
<td>Desirable - testing</td>
</tr>
<tr>
<td>Wave Model</td>
<td>WaveWatch3, nested SWAN; coupled</td>
</tr>
<tr>
<td>River Discharge</td>
<td>SOBEK – Jakarta</td>
</tr>
<tr>
<td></td>
<td>W-FLOW – Semarang</td>
</tr>
<tr>
<td></td>
<td>QPF, TRMM, radar</td>
</tr>
<tr>
<td>Tides</td>
<td>TBD: SCS, BoM, global model; 1/12 deg TMD</td>
</tr>
<tr>
<td>SSHA</td>
<td>Australian Bureau of Meteorology operational forecast</td>
</tr>
<tr>
<td>Integrating System</td>
<td>Delft FEWS</td>
</tr>
<tr>
<td>Bathymetry</td>
<td>J-FEWS + best available – NCA</td>
</tr>
<tr>
<td>DEM</td>
<td>J-FEWS + best available – NCA</td>
</tr>
</tbody>
</table>


The typical forecast period for CIFDP is up to week. The CIFDP also fits within the WMO Cascading Framework, where global centres (e.g. ECMWF, US National Weather Service, UK Met Office) feed into Regional centres and to the national level.

Impact Based Forecasting is also a key component – it is important to communicate the impact of the forecast so that local stakeholders understand the impact of the warning.
3. SUMMARY OF THE CIFDP-I IMPLEMENTATION

Ms Nelly Riama and Dr Andri Ramdhani (BMKG), in addition to the Indonesian Geospatial Information Agency (BIG), and Indonesian Center for Water Resources (Ministry of Public Works) - PUSAIR-explained the development and implementation of the CIFDP-I, and described the training that had taken place so far. The details of the implementation are shown in the presentations which are available at https://www.jcomm.info/index.php?option=com_oe&task=viewEventDocs&eventID=2389.

The forecast systems were developed to take account of coastal inundation resulting from tides, waves, storm surge and river flooding. The target areas were the cities of Jakarta and Semarang. BMKG was the primary developer, with the hydrological components being developed by PUSAIR. The model Scheme for CIFDP-I included:

1. BMKG INA Waves (based on WAVEWATCH III (WW3): Global to Regional (Indonesia Region))

2. Coupling Wave-Hydrodynamic Models
   2.1 Nested WW3 – SWAN model (Northern coast of Java)
   2.2 Coupled Delft3D Flow – SWAN (Delft3D Wave)(Jakarta & Semarang)
   **Output:** Tide + Storm Surge + Wave

3. Integrated with River Flood Model - Delft FEWS & SOBEK Model (J-FEWS Project/JCP) (Jakarta)
   **Output:** Coastal Inundation Maps

The inundation forecasting process is well visualized by the following **Figures 2-5**, which describe the various models for the forecast and integration, the wave and hydrodynamic coupling process, the further integration with the river flood model, and finally the system flow for the operational inundation forecast system. **Figure 6** shows an example of a forecast output inundation map for Jakarta.
Figure 2. CIFDP-I Models
2. COUPLING WAVE-HYDRODYNAMICS MODELS

Figure 3. Coupling wave-hydrodynamic models
3. **Integration With River Flood Model**
(Delft FEWS with SOBEK Model)

*Tide + Storm Surge + Wave*

![Diagram showing the integration of ocean and river flood models](image)

**Figure 4.** Integration of ocean and river flood models
Figure 5. Schematic of forecast process
The key points from the presentations describing development of the operational forecast system are summarized below. More details, examples of various outputs and the forecaster operational “dashboard” and validation of forecast results are given in the various presentations [https://www.jcomm.info/index.php?option=com_oe&task=viewEventDocs&eventID=2389](https://www.jcomm.info/index.php?option=com_oe&task=viewEventDocs&eventID=2389)

- The CIFDP models and system were developed on BMKG High Performance Computing.
- Meteorological forcing for the forecast was the ECMWF (0.125°).
- The wave spectrum from BMKG – Ocean Forecast System (OFS) (0.125°) - was used as the boundary condition for the SWAN model.
- Astronomical tidal forcing was obtained from BIG tide stations.
- The model domain was a series of nests, with the largest domain being the South China Sea (SCS). A Java Sea domain was nested into that (Pantura model), with detailed domains for Jakarta and Semarang nested inside the Pantura.
- The SCS Parameterization used wind and pressure forcing from ECMWF.
- The Java Sea Parameterization (Pantura) used wind and pressure forcing from ECMWF boundary condition nesting from SCS Model (boundary time series); and boundary wave model (SWAN) coming from BMKG OFS (wave spectrum).
- The detailed Jakarta and Semarang parameterization used wind and pressure from ECMWF; boundary condition nesting from Java Sea Model (boundary time series); and boundary wave model (SWAN) coming from Pantura domain.
- For the Jakarta domain, river discharge was provided from SOBEK Model (PUSAIR).
- Updated Bathymetry was available from BATIMETRI NASIONAL (Indonesia Agency for Geospatial Information), with a resolution of 6 arc-seconds (~180 meters).
- DEM/topography was taken from the most recent version of the J-FEWS data.
- Data exchange of real-time tide and astronomical components was established via ftp for Sunda Kelapa, Kolinamil, Semarang, and Pasar Ikan (DKI Jakarta). The astronomical component forcing the tidal forecast was updated once a year.
- Inundation calculations were produced from the J-FEWS model integration with the hydraulic model and the water level forecast provided by BMKG.
- For Jakarta, the forecast system used the updated land reclamation area updated breakwater area.
- The CIFDP system was running once a day at 00 UTC; with output available by about 09 – 10 UTC.
- Sea surface height anomaly was not considered to be a major contribution to the flooding levels on the Java coast so was not included in the forecast system at this time.
- Model validation is very important. While verification data was somewhat limited, the validations carried out showed very promising results; several examples of forecast test cases are shown in the presentations from the meeting.
- Several training events were held throughout the project, as shown in Table 1, including training on the WAVEWATCH III model by NOAA, on the Delft3D hydrodynamic model, as well as Joint Development Training for Coastal Inundation by Deltares.

4. DISCUSSION ON END USER PERSPECTIVES

Stakeholder and end user perspectives and feedback were gathered and analyzed through a structured survey questionnaire, a stakeholder workshop at the initiation of the project in 2013 and a stakeholder workshop at the finalization of the project in 2019. Information collected provided an understanding of legislation and policy frameworks in place for warnings responsibilities and emergency and disaster management; institutional capacities and communications capabilities across partners and in end user communities; and, linkages with other national and international priorities and commitments - including climate change, national security, the Sendai Framework for DRR and Sustainable Development Goals. Versions of the same questionnaire have been applied in other sub-projects.

Survey results and initial stakeholder discussion indicated that, while there was legislation in place and a National Platform for DRR, there was generally a low level of awareness of these official processes, particularly at Provincial and local levels. Emergency warning procedures included multi-format messages with multi-media dissemination, but capacity and resources to respond - particularly at the community level - was often limited. Well-developed and annually tested emergency management plans
were available in some coastal communities, however, focus was more on rescue than emergency planning. There was a general lack of knowledge about hazards, risks and procedures to evacuate. NGO’s were actively engaged at community levels. Working stakeholder networks and partnerships and communication platforms among the range of institutions with a role in end-to-end warning systems were generally not structured or formalized.

Since the beginning of CIFDP-I communication networks have advanced significantly, particularly through the widespread access and use of social media and people’s use of mobile and smartphones.

New DRR legislation is being developed and will be passed as a Presidential decree in early 2019. This will formally establish warnings partnership networks with defined roles and responsibilities. Planning for the development of multi-hazard early warning systems has also been commenced.

Stakeholder feedback during the final stakeholder workshop noted that throughout CIFDP I there has been some improvement in hazard awareness at all levels but acknowledged that there is still a need for resources to support community education programs and community emergency management planning that will focus more on preparation and mitigation and build community resilience.

People living in coastal communities are often familiar with coastal hazards and have responded to events based on experience rather than the official warnings. To build trust in official warnings services and promote effective response actions at the grass-roots level stakeholders recommended that simple tailored warnings messages should be co-designed with the support of the community and local champions. Stronger partnerships with NGO’s at a national level would be helpful.

CIFDP technical and scientific advances that have resulted in improvements in coastal inundation forecasting and warning capabilities have also produced information to improve the accuracy of hazard risk assessments and risk maps. These are available but generally not accessible to the user community because of limited data sharing arrangements. Stakeholders consider it is essential that validated and quality checked information be easily accessible for end users.

Stakeholders are in general agreement that their engagement and cooperative working relationships have benefitted through their involvement in CIFDP-I. They acknowledge that this has been critical to the progress of the project and ultimately in improvements in community safety in the event of coastal inundation. There is enthusiasm to continue this. Processes should continue to be developed to provide an ongoing platform for understanding, communicating and addressing stakeholder needs.

5. FUTURE ENHANCEMENTS FOR EARLY WARNING SYSTEMS IN INDONESIA

While the CIFDP-I sub-project is now complete (no longer ‘Demonstration’) and the early warning system will become fully operational in April 2019, the forecast and warning system must continue to develop and evolve to meet the requirements of Indonesia.

As noted in the presentation of the forecast system described above, and the feedback from the end user stakeholders, there were areas which were not able to be fully addressed during the time frame of the project, due to logistics and capacity issues within the country. The meeting developed a list of
priorities for further development in-country which would enhance the operational forecast and dissemination to the end user community. The key recommendations included the activities described below, in a rough order of priority.

It was generally agreed that the single-most important gap in the implementation of the new INA-CIF was the lack of adequate bathymetry data, and issues with sharing that data when available. This also applies to the Digital Elevation Model (DEM) data, especially for the coastal regions. These baseline data are critical to being able to predict where the water will go, and therefore which areas will be inundated and to what depth. LiDAR flights were suggested to improve the DEM; the latest data from BIG also needs to be incorporated, emphasizing the need for the data sharing agreements. Regular updating of both bathymetry and DEM was considered to be very important, since sediment is constantly deposited in the river deltas, changing the bathymetry, and the north coast of Java is subject to significant subsidence, up to 20 cm per year. While it is impractical to update the bathymetry after every storm, or even annually, it was recognized that updating whenever possible would significantly improve the forecasts.

As an action related to this data sharing issue, it was noted that the current NDA between the Indonesian agencies (signed in 2017) only lasts for 3 years. A new agreement of cooperation between the relevant agencies to continue was recommended.

A second key priority for enhancing the CIF system is the incorporation of improved river flooding contributions to the overall coastal inundation forecast. So far, the J-FEWS system has not been adopted by BMKG; the Flood Forecast Guidance System (FFGS) for Jakarta could also be integrated into the system.

The initial scope for the CIFDP-I was for the cities of Jakarta and Semarang. While the Jakarta implementation is set to become operational in April 2019, that for Semarang remains to be completed, and is a key priority. In particular, a FEWS-Semarang may be one of the new topics in INA-CIF. Extension of the INA-CIF system to other cities, such as Surabaya, or other coastal areas of north Java are also considered.

The capability to produce ensemble forecasts was seen as a potentially important enhancement. All forecasts have inherent errors, so simple deterministic forecasts can often provide inaccurate guidance. The use of ensemble methods allows the forecasters to quantify the uncertainties in the forecast. It was recognized however, that production of such probabilistic forecast information had its own set of communication issues, since users tend not to understand the information expressed in this way.

To ensure sustainability of the new CIF system, BMKG needs to continue modelling and development activities. Donors are looking for the sustainability strategy being built into the project. Once the systems become operational, there needs to be regular planned re-evaluation of the system (criteria, ensemble, setting up goals for intended key achievements, end users) to assess impact and effectiveness, and propose modifications if necessary. BMKG noted that they have, and will continue to have, diversified work, updates, modelling, training, liaison with the users.
Much of the discussion on future enhancements focused on forecast products and dissemination.

Dissemination of information is a critical need in the ongoing INA-CIF. BMKG expressed the need to discover the most suitable route to disseminate information in this end to end system. Regional Disaster Management of Jakarta has used SMS for flood early warning starting in 2016, with a reach of approximately 5000 people. Social media is also an outlet to receive early warning, with about 200,000 followers. The question was raised concerning tourist areas. Other dissemination platforms include the “Smart fisherman” developed by the Ministry of Marine and Fisheries (not limited to fisherman but also used as an application beyond). Further discussions are required as to the best ways to do this. Interaction between the forecast and warning producing and disseminations agencies must continue, to ensure the ‘last mile’ is established for dissemination of information to make sure the end to end system is routinely reviewed, validated and working.

Information to the public needs to be short, clear, and easily understood by the people, i.e. simple tailored messaging with the support of the community in co-design of the communication. Required communication systems must be in place - alarm system, sirens, SMS, twitter, etc. The is a strong need for all the partners, across all areas, to be working together and to build trust to do this, including the use of local champions in the community.

Awareness education for local coastal people was considered to be critical for the warnings to be effective in saving lives and property. This required Improvement in the user uptake, and improving awareness at all levels, including grassroots. Understanding what partners need or want (e.g. local government and NGO needs) is vital. Strengthening preparedness and increased awareness of the people to respond to early warnings is key, including changing behaviors of people - most people want to stay at home until it is too late. This needs to be coordinated between the forecast agencies, the disaster management agencies and the local NGOs. Educational information is produced by the various agencies, including WMO Expert Teams and WMO Public Weather Services. Stakeholders need to continue to implement, and engage local communities for receiving training and awareness. BMKG remain committed to ensuring the early warnings work, monitoring it, and as well maintaining the liaison with stakeholders. It was suggested to bring together coastal communities in Semarang and Jakarta for their views, and therefore understanding how they prefer communications.

There is an opportunity of the UN Decade of Ocean Science for Sustainable Development, including themes for bolstering observations in tropical areas, and strengthening multi-hazard early warning systems, possibly extending to include tsunami early warning. Extension of the INA-CIF could be considered an Indonesian and WMO contribution to these themes in the Decade, with the support of the current JCOMM Expert Team for DRR, and CHy (noting that their current format may change in the WMO reform although the mandate to support DRR work will continue). Indonesia also expressed a desire for the PSG to continue advice and monitoring as the INA-CIF becomes operational in 2019, and beyond.

The list of potential forecast and dissemination enhancements described above clearly demonstrated the interest from the end user community in the project and products. The strong consensus of the
meeting was that the current CIFDP system, once operational in April, would be an excellent platform upon which to base improved forecast and warning systems in Indonesia, and they felt that the CIFDP-I had been a considerable achievement. They also noted that, in addition to the implementation of the new INA-CIF system in Indonesia, that the project had contributed greatly to increased communication and cooperation, particularly for BMKG and the Disaster Management Agencies, and strengthened partnerships between local stakeholders across the various agencies in Indonesia, ranging far outside the actual CIFDP-I.

Dissemination of CIFDP-I story

The ‘story’ of the CIFDP-I, that is, a functional platform has been developed to produce and disseminate new early warning information on coastal inundation for Jakarta and Semarang City, which will become operational in April 2019, should be conveyed widely to ensure the ongoing value of the project. Similar to the other completed CIFDP projects (Bangladesh and Caribbean), given the time frame of 5 years, having never been tackled before as a new concept to bring together the hydrological, oceanographic and meteorological communities along with partner agencies and end-users, this is a successful ‘story’ to share widely. The other positive aspect is that the early warning platform has the potential to be further enhanced in time as new information becomes available, and as well, to be linked to tsunami early warning. Another noteworthy point to relay is that Indonesia was the only CIFDP sub-project to self-fund the majority of the work, a reflection of the high value placed on this by the Indonesian Government.

Dissemination to various audiences could include from local stakeholders helping to convey early warnings, local communities receiving warnings, to the international scientific and DRR communities (involved in design and implementation of early warning systems). Indonesia may want to consider donor communities (interested in funding early warning projects).

Table 3 shows suggestions for avenues of communication.

<table>
<thead>
<tr>
<th>Type of Communication</th>
<th>Intended Audience</th>
<th>Story Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMO News Release (February 2019)</td>
<td>International meteorological community</td>
<td>Conclusion of the CIFDP Indonesia (January 2019) and the success of the overall story.</td>
</tr>
<tr>
<td></td>
<td>International and relevant donors</td>
<td></td>
</tr>
<tr>
<td>WMO Bulletin (2019)</td>
<td>International meteorological community</td>
<td>Success of the overall story, incorporating the CIFDP-I and other completed sub-projects (CIFDP-C and CIFDP-B) and transition to future ongoing Coastal Inundation Forecasting (CIF) projects</td>
</tr>
</tbody>
</table>
Table 3: Recommended avenues of communication for the CIFDP-I ‘story’.

Conveying the reasons for early warning, and helping the general public understand what to do in the event of an early warning is critical to the ultimate value and continuation of the coastal inundation forecasts.

6. ANY OTHER BUSINESS

No further comment.

7. CLOSING

On closing the meeting, WMO (Dr Grimes) pointed out the positive strengthened partnerships between BMKG, PUSAIR and local stakeholders including NGOs, Disaster Management Agencies and other end-users during the course of the CIFDP-I. These partnerships will be instrumental to the effectiveness of an end-to-end early warning system, particularly ensuring that the relevant information reaches the
vulnerable communities in coastal areas. BMKG has committed to continuing this effort with a comment about the need to monitor the success of the system and products, ensuring the warnings work and remain relevant to the user needs.

The Chair of meeting, Mr Paul Davies, also reiterated the positive outputs and strengthened partnerships on completion of the project. WMO and Chair of the Meeting both thanked BMKG for their hosting and as well, their commitment along with the local stakeholders to see the project to completion over 5 years, whilst encouraging the partnerships to continue. Mr Paul Davies also thanked those not present, especially Mr Val Swail for his dedication to the CIFDP activities, ensuring Indonesia stayed on track with a vision to improve coastal warning. He also thanked those who have worked in the project from the beginning who may no longer be involved, such as Professor Don Resio (former Co-Chair CIFDP), Dr Boram Lee (former WMO Secretariat to the project) and Dr Andi Sakayo (former BMKG Director General). BMKG (Ms Anni Arumsari Fitriany and Ms Nelly Florida Riama) both thanked the PSG experts and WMO for their advice, guidance, support and long-term commitment to the work and Indonesia.
ANNEX 1: List of Participants

Indonesia BMKG:

- Mr. Mulyono R Prabowo, Deputy Director and the Representative of Head of the Agency for Meteorology, Climatology and Geophysics
- Dr. Widada Sulistya, DEA of Deputy for Instrumentation, Calibration, Engineering and Communication Network
- Ms Nelly Florida Riama, Director for Marine Meteorology Center
- Dr Andri Ramdhani, Marine Meteorology Center
- Mrs. Noer Nurhayati, from Center of Training and Education
- Ms Anni Arumsari Fitriany, International Cooperation

Indonesian Representatives from:

- Dr Andi Sakaya of Agency for Assessment and Application of Technology (AAPT); former Director BMKG; former PR Indonesia to WMO, and former President RAV to WMO.
- Indonesia Geospatial Information Agency (BIG)
- Indonesia Ministry of Marine and Fisheries (KKP)
- Regional Disaster Management Agency (of Jakarta and Semarang City)
- Center for Water Resources (Ministry of Public Work/PUSAIR)
- Deltares Indonesia

International Experts:

Dr Linda Anderson-Berry (Social Scientist, James Cook University)

Mr Paul Davies (UK MetOffice)

Prof Kevin Horsburgh (UK National Oceanography Centre)

Mr Deepak Vatvani (Deltares, The Netherlands)

Dr Graeme Smart (NIWA, New Zealand)

Remote Participants (by video): Mr Val Swail (Co-Chair CIFDP)

WMO Secretariat:
ANNEX 2: AGENDA, CIFDP Indonesia Final Meeting, January 28-30, 2019

World Meteorological Organization

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM) CIFDP-I
ADOPTED 28 January 2018

COMMISSION FOR HYDROLOGY (CHY)
CIFDP Indonesia Wrap Up Meeting
Denpasar, Bali, Indonesia 28-30 January 2019
Nusa Dua Beach Hotel

AGENDA

1 OPENING OF THE MEETING
   1.1 Opening of the meeting (PSG, BMKG, WMO)
   1.2 Adoption of the agenda (WMO)
   1.3 Organization of the meeting (WMO, BMKG)

2 OVERVIEW OF THE CIFDP-I SUB-PROJECT
   2.1 Summary of scope, plan, decisions and actions through CIFDP-I implementation (PSG)

3 SUMMARY OF THE CIFDP-I IMPLEMENTATION
3.1 Description of forecast system development, including tide, rivers, rainfall, waves, FEWS (BMKG, PUSAIR)

3.2 Status of Bathymetry, Digital Elevation Data Bases (BMKG)

3.3 Demonstration of operational system at BMKG, PUSAIR (BMKG, PUSAIR)

3.4 Summary of training carried out (BMKG, PUSAIR, DV)

3.5 Summary of end-to-end forecast exercise (BMKG, PUSAIR, NCT)

3.6 Links with joint project with Netherlands (BMKG, DV)

4 DISCUSSION ON END USER PERSPECTIVES

4.1 End User questionnaire breakout groups (LAB)

4.2 Summary of end user survey questionnaire (LAB)

4.3 Forum for end user comments and discussion (PSG, NCT)

5 FUTURE ENHANCEMENTS FOR EARLY WARNING SYSTEMS IN INDONESIA (discussion moderated by PSG)

5.1 Discussion on possible future improvements to operational forecast system, extension to other locations

5.2 Discussion on potential enhancements to end user uptake of forecast products

5.3 Dissemination of CIFDP-I story (e.g. WMO Bulletin, news release, social media)

6 ANY OTHER BUSINESS

7 CLOSING

7.1 Closure of The Meeting (PSG, WMO, BMKG)