WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY

INTERDISCIPLINARY EXPERT FORUM FOR COASTAL INUNDATION FORECASTING DEMONSTRATION PROJECT FOR FIJI (CIFDP-F)

Nadi, Fiji, 7 – 10 October 2013

FINAL REPORT

JCOMM Meeting Report No. 111

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NOTES

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C O N T E N T S

GENERAL SUMMARY OF THE MEETING

The Interdisciplinary Experts Forum for Coastal Inundation Forecasting Demonstration Project for Fiji (CIFDP-F) opened at 1030 hours on Monday 7 October 2013, at the conference room of the Tanoa International Hotel, Nadi, Fiji.

Mr Malakai Tadulala, Deputy Secretary of the Ministry of Works, Transport and Public Utility, welcomed all participants in Fiji. He noted that, since the initiation of CIFDP-F, all national stakeholders have been working together to strengthen their network toward efficient coastal disaster risk reduction. Mr Tadulala reaffirmed the strong support of the Government of Fiji for CIFDP-F implementation, and expressed his hope that the Fiji Meteorological Service (FMS) would be able to issue timely warnings for coastal inundation as the result of the successful project completion. In concluding his remark, he noted that the benefit of successful CIFDP-F would be shared with the neighbour countries in the South West Pacific. Mr Tadulala wished a fruitful discussion and successful meeting to all participants.

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

Participants adopted its agenda for the meeting based on the provisional agenda that had been prepared by the WMO Secretariat and the CIFDP Steering Group. This agenda is provided in ***Annex II***.

All documents and information were provided through the meeting web site: http://www.jcomm.info/CIFDP-F-IEF.

Purpose and Objectives

The main purpose of the meeting was to:

- Review the progress in the implementation of CIFDP-F Phase 1;
- Review the National Capacity Assessment (NCA);
- Review user requirements so far identified; consult with national stakeholders for further analyses on requirement and gaps, and; update the User Requirements Plan (URP);
- Facilitate communication within the National Coordination Team (NCT) for CIFDP-F;
- Discuss on the system implementation approach and the forecasting system setup, as defined in the CIFDP Implementation Plan (JCOMM-TR-64), and agree on an outline of a System Design for CIFDP-F. Definition on the details.

Summary of Discussion and Outcomes

Review progress for CIFDP-F Phase 1

The CIFDP Steering Group (PSG) and the members of the National Coordination Team (NCT) participated in the meeting reviewed the progress of CIFDP-F Phase 1 implementation, against the framework and requirements described in the CIFDP Implementation Plan (JCOMM-TR-64). The PSG and NCT expressed their satisfaction on the near-final stage and excellent quality of the outcomes. The detailed status of each required deliverable was as following:

- Definitive National Agreement (DNA): signed in July 2013 (by Prime Ministers' Office, Ministry of Works and Transport (FMS), Ministry of Provincial Development and Disaster Management);

- National Coordination Team (NCT): formed with Terms of Reference agreed;

- Detailed Project Plan with National Capacity Assessment (NCA): completed. Final version to be issued by November 2013;

- User Requirements Plan (URP): Version 1 completed. Revision made during the meeting through consultation with national stakeholders;

- Funding in place for Phases 2 to 4: needing further arrangements after the meeting (see the following section).

The Fiji Government reaffirmed its full support and expectation for success of the CIFDP-F, through the National Coordination Meeting held on 18 July 2013. All engaged agencies and NGOs are working closely to identify gaps and available resources to complement the required systems, which are outside of CIFDP-F but closely linked for the improvement of the national system for flood early warnings.

The participants agreed on the actions to complete Phase 1, as described in ***Annex IV***, part 1.

Review report of the National Capacity Assessment (NCA)

During the Phase 1 implementation period, the PSG developed the framework for NCA, and worked with metocean & hydrological experts in the region in drafting the NCA. The final draft was presented to and reviewed by all participants (the full NCA can be found at: http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=11800).

All participants agreed that the current version is ready to be finalized with minor addition on the available datasets by FMS – to include information on available DEM, by FMS; and available post-event survey data. The final version should be released as JCOMM Technical Report Series by November 2013.

The following discussion focused on identifying activities to complete Phase 1. Those agreed actions are summarized in ***Annex IV***.

Review report of the User Requirement Plan (URP)

The first draft of CIFDP-F URP was prepared by the PSG and a social expert (Professor So-Min Cheong, University of Kansas) during the Phase 1, and distributed to the NCT / national stakeholders in advance to the workshop for review.

The Participants, particularly those NCT members, reviewed the draft NCA and respond to the additional questions to supplement the URP in advance to the meeting.

Noting that the URP is a dynamic document, to be continuously updated through all Phases of CIFDP-F, the national stakeholders actively provided feedback to update the draft URP. The CIFDP-F URP Version 1 would be finalized by the end of October 2013.

Review national and regional technical capabilities relevant to CIFDP-F Implementation

The meeting reviewed related activities and available technologies/tools to the implementation of CIFDP-F, including;

- Systems, products and research activities of the Bureau of Meteorology and CSIRO (through the Center for Australian Weather and Climate Research; CAWCR) that are potentially relevant for CIFDP-F. The overview included current operational models, systems and products, and ongoing development for enhanced storm surge system for Australia (by Dr Mikhail Entel, Australian Bureau of Meteorology).

- EU-funded Waves and Coast (WACOP) Project, which aims to improve the technical knowledge base, information and understanding of coastal hazards particularly caused by extreme swell waves (by Dr Jens Kruger, SPC/SOPAC). It was agreed that this ongoing project would be in close collaboration with the CIFDP-F implementation, and agreed that funding proposals and the project plan for CIFDP-F would take into account the remainder of / extended parts of the WACOP project.

- Advisory and warning services provided by RSMC-Wellington, including information produced through the Severe Weather Forecasting and Disaster risk reduction Demonstration Project (SWFDDP) (by Mr Steve, Ready, New Zealand MetService)

- Integrated coastal inundation warning service in UK, provided by Flood Forecasting Center (by Dr Chares Pilling, UK MetOffice). The meeting expressed its appreciation to the service products and delivery conducted through an integrated manner within the national disaster management system, in particular, easy-to-understand products based on the sound scientific knowledge. It was generally agreed that such an example should be taken into account in the system design, in terms of long-term goals for CIF service products/delivery.

Outline for CIFDP-F System Design / Preparation for Phase 2

The PSG, invited experts and the NCT discussed on the scope, direction and prioritized activities to be carried out during Phase 2 (System Implementation), based on the NCA and URP. The agreed outline for System Design / Phase 2 implementation is reproduced in ***Annex III***.

The actual System Design and its implementation will start from Phase 2, once the funds are confirmed. In initiating Phase 2, (a) system developer(s) should be identified as the first step, through consultation and agreement by PSG and NCT.

The FMS agreed to the recommendation of PSG and invited experts, that the additional support for the institution (FMS) from the Government of Fiji should be secured as a matter of priority; to participate in the development (in Phase 2) and the following maintenance. The details are yet to be specified, but the PSG and experts estimated that minimum one additional forecaster/operator position and a dedicated PC for pre-operational test of CIF would have to be secured as soon as possible. The FMS and NCT agreed to initiate negotiation within the government, along with the proposed assessment by the Secretariat of the Pacific Regional Environment Program (SPREP) for resource requirements (See activity item under “Funding Proposal”, in ***Annex IV***).

Funding for Phases 2-4 Implementation: as a matter of principle, national sub-projects of CIFDP should be implemented through either national resources or budgetary contribution by external agencies / donors. In the meantime, it should be noted that the momentum (and the full support of Fiji government for the project implementation) would not be lost only when the associated activities continue without a break.

Bearing these points in mind, the participants agreed on the course of actions for funding; including the communication with potential donors (AusAID and World Bank, and other potential donors to be identified in the regional meeting with donors / by SPREP). It was agreed that the fund raising should be carried out in two ways: targeting a full-scale funding for entire CIFDP-F implementation, and an immediate /short-term funding to bridge the Phase 1 completion and Phase 2 launch with full funding. For the former, preparation is under way in coordination with WMO Secretariat, AusAID and regional organizations (SPC/SOPAC and SPREP), targeting to produce a complete funding proposal by May 2014. For the latter, discussion is under way within the WMO Secretariat for the WMO Volunteer Contribution Programme (VCP), in order to continue activities without a break (see detailed actions/workplans in Annex 4). It is likely that the fund-raising will be partially or fully successful before the end of 2013, depending on timely input to and contact with donors.

The meeting was closed at 1230 hours on Thursday 10 October 2013.

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Annex I

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Annex II

AGENDA

1 OPENING

2 ORGANIZATION OF THE MEETING

3 REVIEW OF NATIONAL / REGIONAL TECHNICAL CAPABILITIES AND RELATED PLANS FOR DEVELOPMENT

3.1 Ongoing effort for enhanced storm surge system in Australia
3.2 Regional project for improved wave forecasting
3.3 Advisory and warning services provided by RSMC-Wellington
3.4 Integrated coastal inundation warning service
3.5 Progress review of the National Capacity Assessment (NCA)

4 UPDATE OF END USER PERSPECTIVES/REQUIREMENTS

5 REVIEW STATUS OF PROJECT IMPLEMENTATION

5.1 NCT report
5.2 PSG Decisions regarding CIFDP-F, and planned activities

6 DIRECTION AND OUTLINE FOR CIFDP-B PHASE 2

7 OUTLINE OF SYSTEM DESIGN FOR FIJI COASTAL INUNDATION FORECAST (CIF) SYSTEM

7.1 Overview of proposed System Design and usable national/regional resources
7.2 Options for Storm Surge Forecasting
7.3 Options for Wave Forecasting
7.4 Options for Hydrological Forecasting
7.5 Consideration on interconnectivity of tools
7.6 Discussion of inundation forecasting service products

8 DEVELOPMENT AND TESTING OF OPERATIONAL COASTAL INUNDATION FORECAST (CIF) SYSTEM FOR FIJI

8.1 Model and System Development
8.2 User Products
8.3 Capacity Development and Training
8.4 Sub-Project Implementation Progress and Plan Update

9 UPDATE SUB-PROJECT PLAN FOR CIFDP-F

9.1 CIFDP-F sub-project plan updated
9.2 Revised timeline for CIFDP-F Phases 2 and beyond

10 ANY OTHER BUSINESS

11 CLOSING

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Annex III

System Design Outline & Actions during Phase 2
as agreed at the CIFDP-F Interdisciplinary Exerts Forum (7-10 October 2013, Nadi, Fiji Islands)

Scope of CIFDP-F

- Limit initial implementation/demonstration to Viti Levu

Direction for CIFDP-F System Development/Implementation

- Models to be implemented in Fiji, on dedicated computers at FMS, with some data resources being transmitted from external sources

CIFDP-F System Design: modelling components

- Focus on the two primary sources of coastal inundation:
  - wind driven storm surge from tropical cyclones
  - wave driven inundation from long period waves from distant storms
- Include riverine flooding from rainfall-runoff model
- Tides and sea surface height anomaly information to be considered as a contribution to the Total Water Level Envelope, not as sole source

Upon agreement on the final model selection, system developer(s) to identify suitable models and set up for:

- storm surge model (N.B. SPC acquiring Delft-3D FM)
- wave model (N.B. SPC implementing SWAN/XBeach)
- river flood / rainfall-runoff model (initial implementation may be based only on real-time or non real time river flow data⇨Identify relevant streamflow/discharge data for input to the inundation model)

System developer(s) to

- Develop techniques, as required, to estimate parametric values for input to a storm surge model from existing model and other guidance available at FMS
- Determine suitable fixed value to Include waves in total water level estimates
- Identify input requirements for river flood model
- Establish FMS access to externally produced tidal predictions
- Validate tidal prediction models against Suva and Lautoka tide gauges.
- Establish FMS access to relevant (digital) operational SSHA forecast products

CIFDP-F System Design: Integration of model output & Service products

- Implement a forecast integrating system to take input from storm surge, wave, and river flood models, and imported external tidal and SSHA forecast fields
- Consider range of products, including graphical, text

System developer(s) to:

- Implement a forecast integrating system to take input from storm surge, wave, and river flood models, and imported external tidal and SSHA forecast fields
- test feasibility of running ensemble storm surge runs and determine optimum number of ensemble members considering utility and run time
- investigate suitability of Delft FEWS system for application in Fiji, and if positive, develop adapters to FEWS for selected models

NCT to:

- discuss & determine on the products requirements – range of products (including graphical, text), based on the identified examples (see activity plan)

PSG & invited experts to:

- discuss & decide on the propriety and feasibility to reflect uncertainty estimates in Fiji's coastal inundation forecast

CIFDP-F System Design: Bathymetry & DEM

- Develop and implement the CIF system using the best available bathymetry data (around Viti Levu), allowing the developed system to be able to update bathymetric dataset when available.
- Develop and implement the CIF system using the best available DEM (including the recent LIDAR survey of the Nadi basin)

System developer(s) to

- Assemble the relevant bathymetric data sets in a gridded format compatible with the models selected (to consider gaps in coral reef in the lagoon)
- Assemble the relevant DEM data sets in a gridded format compatible with the models selected

CIFDP-F System Design: Validation

- Post-event survey data is critical for the validation of the various models.
- Require water level, wave measurements, extent and depth of inundation, damage surveys, etc.

FMS and System developer(s) to identify and assemble any sources of post-event survey data information, particularly for significant inundation cases (see activity plan)

FMS to identify available observing data archive for water level and wave measurements

System Developer(s) to:

- Compile adequate relevant historical meteorological data for testing the system in hindcast mode, including post-event survey data
- Hindcast and validation of historical cases
- develop process for validation
- develop plans for pre-operational test/exercise during the project period

CIFDP-F System Design: Operational environment for coastal inundation forecasting (of FMS)

- Dependent on the models selected for storm surge, waves and river flooding, and decision on the mode of operation (e.g ensemble runs).
- The introduction of a storm surge, wave and river flood modelling activity into the current operational practice of FMS will be a challenge for the existing resource levels.
- Dynamic reallocation of resources from the duty forecaster, TC forecast and hydrology to fit the prevailing forecast issue may be investigated for feasibility.

NCT/FMS to:

- meet requirements for computing power/infrastructure, once system design is agreed
- (based on the results of SPREP-FMS investigation – see activity plan), carry out governmental allocation for human and infrastructure resources for CIF operation
- ensure bandwidth availability within new fiber communication for the proposed system design

CIFDP-F System Design: Training

- Continuous training will be provided as an essential part in all Phases of the project
- During the Demonstration period, training will focus on those for understanding the new system/models, forecasting and service delivery skills, and understanding/application of/responses to coastal inundation forecasting/warning (for disaster managers)
- The actual training needs should be specified, for all participants in the end-to-end forecasting and warning system in Fiji, and be linked to the User Requirements Plan for CIFDP-F

System Developer(s) to:

- develop operators manual (preferred online manual, for continuous update)
- develop training material for new/developed CIF system

System Developer(s), PSG and Sec to:

- plan and conduct regular hands-on training for forecasters/operators for all project Phases
- plan and conduct a training workshop for national stakeholders on the CIF products and responses

Annex IV

Activity plan for CIFDP-F Phase 1 completion and Phase 2 Initiation
as agreed at the CIFDP-F Interdisciplinary Exerts Forum (7-10 October 2013, Nadi, Fiji Islands)

Activities	By	Due Date
Phase 1 wrap-up		
Finalize and publish CIFDP-F-IEF summary report	Sec.	31 Oct'13
Finalize and publish User Requirements Plan	S.Chung, with input from NCT	31 Oct'13
Finalize and publish National Capacity Assessment - FMS/NCT to collect complementary information on data availability - PSG to amend context based on the discussion (see section 2)	PSG, with input from FMS/NCT	30 Nov'13
Funding Proposal for Phases 2-4		
Develop funding proposals to potential donors - Proposal for short-term / Phase 2 system design - Proposal for full system implementation	Sec. & PSG & NCT, with input from invited experts	Immediate & continuous until May'14
Collect templates / information on specific requirements and timeline for potential donors	P.Dexter (AusAID), J.Kruger (WB), B.Lee (WMO/VCP), N.Koop (other funding agencies / from Donors meeting)	Nov'13
Identify resources, including human and infrastructure resources, required by FMS to sustain CIF operations beyond the Demonstration Project period	N.Koop to facilitate process upon request from FMS	20 Dec'13
Develop context for CIFDP-F addressing priorities of relevant reference documents - Pacific Islands Meteorological Strategy 2012-2021 - Disaster Risk Reduction and Disaster Management Framework for Action 2005-2015 - Pacific Island Framework for Action on Climate Change 2006-2015	PSG & Sec., with input from SPREP & SPC	20 Dec'13
Phase 2 preparation – initiation for system design		
Establish access to information for wave forecasting - BoM boundary wave spectra - Regional wind field information for wave model	J.Kruger, M.Entel, P.Dexter	ASAP

Investigate suitability of FEWS for application in Fiji	PSG (D.Vatvani)	ASAP
Identify any post-event survey data information, particularly for significant inundation cases.	NCT(FMS)	ASAP
Identify and compile examples of possible graphical and other inundation forecast products	PSG & invited experts	ASAP & before May'14
Plan for system design preparation (Phase 2 initiation)	PSG & Sec. & FMS	ASAP & before Feb'14
Plan for Phase 2 kickoff meeting (taking into account the funding cycle from short-term proposal; if possible, before May'14)	PSG & Sec. & FMS	ASAP

Annex V

ACRONYMS AND OTHER ABBREVIATIONS

CAWCR	Center for Australian Weather and Climate Research
CIF	Coastal Inundation Forecasting
CIFDP	WMO Coastal Inundation Forecasting Demonstration Project
CSIRO	(Australia) Commonwealth Scientific and Industrial Research Organization
DNA	(CIFDP) Definitive National Agreement
FMS	Fiji Meteorological Service
NCA	(CIFDP) National Capacity Assessment
NCT	(CIFDP) National Coordination Team
PSG	(CIFDP) Project Steering Group
SOPAC	(SPC) Applied Geoscience and Technology Division
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Program
SWFDDP	(WMO) Severe Weather Forecasting and Disaster risk reduction Demonstration Project
URP	(CIFDP) User Requirements Plan
VCP	(WMO) Volunteer Contribution Programme
WACOP	(EU-funded) Waves and Coast Project
WMO	World Meteorological Organization

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