DELIVERY OF WARNINGS OF HYDROMETEOROLOGICAL HAZARDS – SOUTHERN AFRICAN REGION

Implementation Plan Workshop

Mbabane, Swaziland 16-20 January 2017

FINAL REPORT

2017

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1. Introduction and Welcome

In 2009, the Memorandum of Understanding among the World Meteorological Organization (WMO), the US National Oceanic and Atmospheric Administration/National Weather Service (NWS), the US Agency for International Development/Office of Foreign Disaster Assistance (USAID/OFDA), and the Hydrologic Research Center (HRC) was signed with the purpose of facilitating the implementation of the Flash Flood Guidance System (FFGS) project with global coverage. Under this instrument, the Southern African Region Flash Flood Guidance System (SARFFGS) was implemented, with the Regional Specialized Meteorological Centre (RSMC) Pretoria acting as its Regional Centre. Coincident with these efforts, the Southern Africa Severe Weather Forecasting Development Project (SWFDP-SA) was also developed and implemented. In early 2015, the partners agreed to undertake an additional project that would enhance inter-system linkages to improve accuracy, lead time, communication and dissemination of early warnings of extreme hydrometeorological hazards with appropriate lead times to reduce loss of lives and protect livelihoods and property and the environment in Southern African Region. A Project Brief was developed outlining the various project objectives and outlining in detail important aspects of the project including activities. The overall plan called for a Regional Technical Meeting to initiative the development of the system integration implementation plan, also referred to as a Roadmap, and the User/CONOPS Workshop. This second event was designed to obtain Disaster Risk Reduction user community input on warning requirements that are needed to promote and allow effective responses to be taken.

The Regional Technical Meeting was held on October 26-27 and back-to-back with the User/Concept of Operations (CONOPS) Workshop, which was held 28-30 October 2015 in Pretoria, South Africa. Both events were hosted by the South African Weather Service and were attended by experts from the National Meteorological and Hydrological Services (NMHSs) of the countries participating in the South African Region Flash Flood Guidance (SARFFG) project. One expert from each participating country's disaster management agency was also invited to participate on 28 October 2015.

From discussion at these meetings, it was felt that future efforts should be focused building upon what had been attained to date. These additional efforts would be directed to the development of national "Implementation Plans", based on a situational analysis. It would include an understanding of existing capabilities, service provide, etc. as a "current state description". It would also articulate what would be constituted as a future realistic state, allowing identification of gaps between these two states. In turn, large blocks or major steps would be identified in order to help fill the gaps. As much as possible, these major gaps would be prioritized and rough resources would also be subjectively identified to fill the gaps. An additional workshop was planned to achieve the above, and this report documents its outcomes.

The workshop on "Development of National Implementation Plans (IPs)" was held in Mbabane, Swaziland from 16-20 January 2017 at the kind invitation of the government of Swaziland. Annex I provides a list of workshop participants, while Annex II provides its agenda.

Ms Nhlengethwa-Masina, the Permanent Representative for WMO to Swaziland and the Director of Meteorology of the Swaziland Meteorological Service, opened the event, welcoming everyone to her country. Mr Abdoulaye Harou, Chief, Data Processing and Forecasting System, WMO, welcomed participants on behalf of the Secretary-General, Mr Petteri Taalas, and highlighted that the synergy between the SWFDP-SA and the SARFFGS represents significant advances in increasing the Members capacity to provide early warnings of hydrometeorological hazards. Mr Emmanuel Dlamini, Principal Secretary of State, Ministry of Tourism and Environmental Affairs, also welcomed participants and noted that he was indeed pleased to address the audience and introduced

Mr Christopher Gamedze, the Honourable Minister of Tourism and Environmental Affairs. The Honourable Minister also welcomed participants to Swaziland and stressed the importance of efforts that strengthen early warning systems such as achieved through the twinning of the SWFDP-SA and SARFFG. He noted that such strengthened early warning systems help to increase resilience to climate variability and change in the region, are important to helping reduce losses from disasters, and are of underlying importance for economic prosperity.

2. Meeting and Workshop Objectives

Mr Paul Pilon (WMO) provided a presentation outlining the workshop's objectives, as well as its expected outcomes. The workshop's objectives were given as:

- Preparing National Implementation Plans for each participating country
- Articulating a clear understanding of:
  - current national and regional capabilities
  - a clear vision of a future, realistic state of capabilities
  - gaps in the End-to-End Early Warning System (E2E EWS)
- Estimating subjectively the resources to fill the gaps
- Documenting a plan on moving forward.

Mr Pilon also noted that participants would also achieve:

- An increased understanding of the new functionality of the system(s)
  - SWFDP-SA data flow and nowcasting
  - Global FFGS
  - SWFDP-SA and SARFFG system interfaces
- An increased understanding of the capabilities and capacities of NMHSs and their users' needs and requirements for early warnings for extreme hydrometeorological hazards
- Completion of draft National Implementation Plans (IPs)
- Basic agreement on a path forward for NMHSs and further implementation.

Mr Pilon stressed that the purpose of the workshop was to have:

- Clear articulation of national strengths, weaknesses, gaps, needs…
- Undertake an exercise of priorities versus resources
  - Identification of higher priority low cost items to higher cost items
- Input for potential funding through
  - Integration of needs into National Development Plans
  - Potential modest USAID funding
  - Donor proposals (to be prepared)
- Immediate next steps, including completing the national Implementation Plans.

3. Presentations of Monday 16 January 2017

Mr Eugene Poolman, RSMC Pretoria, provided a presentation on recent advances achieved for the SWFDP-SA, a brief history of the project, and possible next steps within the projects current phase. Most notably, he mentioned that the goal is to provide forecast information to national centres for the next 5 days using existing technology, with no need for complex technology at the national level other than regular PCs and connectivity to the Internet. He noted that some recent developments included:

- Moving from the Unified Model 12km to a 4km version covering SADC in April 2014;
- Nowcasting
  - Adding RDT (Rapidly Developing Thunderstorms) on a Google Earth background – allowing zooming and id of more detail
  - Forecasts of Lightning Threat Index,
  - Hail forecasts
  - Convective Rain Rate (CRR)

Mr Ezekiel Sebego, RSMS Pretoria, provided a presentation also outlining some of the advances that will be coming forward with the twinning project and some efforts that remain. He indicated that SWFDP-SA QPF will be ingested directly into the SARFFG, and this will include 6-hourly QPF for the first 36 hours. He indicated that additional effort is needed for:

- forecaster tool implementation,
- upgrading the current RSMC website to accommodate new products coming on-line,
- developing and/or improving the archiving of products.

He noted that the twinning project can definitely succeed and will greatly extend the systems as well as forecaster capabilities. He also noted that advances attained in the system could also be extended to benefit the two SADC countries not yet officially part of the SARFFG, which have shown interest and are using the SARFFG to issue flash flood warnings.

Ms Rochelle Graham, HRC, provide two presentations. The first provided an overview of new functionality of the FFGS, being:

- urban flash flood warning,
- multi-model ensemble products,
- riverine forecasting (channel routing),
- landslide susceptibility.

Her second presentation on SWFDP-SARFFG system development also mentioned some advances being made in the on-line training, with 5 new courses under development:

- advanced hydrology,
- snow and ice hydrology,
- mesoscale modelling basics and uncertainties in FFGS,
- fluvial geomorphology/landslides,
- Early warning and Disaster Management.

She also described various features of the prototype of the Mapserver Interface.

4. NMHS Presentations

Each participating country provided a presentation outlining:

- Where each currently is (capabilities in each link of the End-to-End Early Warning System (E2E EWS) chain, service being provided, etc.,) as a "current state description";
- Future realistic state;
- Gaps (weak or broken links in an E2E EWS);
- Major steps (large blocks) needed to fill the gaps; and
- Rough estimate of resources (financial and human) need to fill the gaps, including maintenance.

Presentations [1] were given providing an overview of the above. There was much commonality among presentations, with additional weakness mentioned during discussions, with some gaps varying from country to country. Many identified gaps included:

- Inadequate station network density including real-time capability of stations
- Inadequate number and training of staff
- Weak institutional collaboration (meteorology, hydrology, disaster management, river basin authorities)
- Inadequate financial support from Governments
- High resolution model capabilities and products
- Slow internet connectivity
- Lack of coverage 24/7 of forecast and warning function
- Calibration of monitoring equipment (e.g., AWSs)
- Awareness of general populace and inability to deliver warnings to remote communities
- Sharing of data with RSMC Pretoria to improve forecasted products and warnings

Discussions also raised additional gaps or weaknesses. The ability for countries to update FFGS parameters such as basin delineations, soil types, land uses, etc) was seen as a FFGS weakness. As well, three countries are not issuing warnings based on the FFGS. These include Botswana (poor system performance, too many false alarms), Lesotho and Zimbabwe (lead time too short, difficult to deliver warnings to grass root communities). As well, the step 3 trained expert in Lesotho is no longer accessible to the forecast programme. In addition, some countries have not provided cross-sectional or geomorphological data to calibrate the unit hydrograph equations.

[1] All presentations made during the two events can be downloaded from the WMO website, under water and its Hydrology and Water Resources Programme under Hydrological Forecasting and Prediction: see http://www.wmo.int/pages/prog/hwrp/flood/ffgs/meetings/swaziland2017.php

From the discussions that followed the initial country presentations, 17 priority areas were identified as needing attention. These were listed as:

1. Provision of 24/7 service

    a. Proposals should be prepared in advance of disasters that can be put forward for provision of 24/7 service particularly when losses increased due to lack of staff and closure of office
    b. While the office is closed, no short term (flash flood) forecasts are available, missing events, and no provision of warnings is possible when the office is closed

2. Getting messages to grass root level/getting warnings to remote areas and citizens

    a. Technology involved
    b. What is needed from you to reach the people to make decisions
    c. Wx radio (1000 – Zimbabwe) distributed to communities – equipment to transmit information (high cost).
    d. Building trust, ability to share cost and use social media (WhatsApp), networking and NGOs.
    e. Language, wording, educating users
    f. SMS

3. Cooperative MOUs with Water and DMA
4. Improve data information and Local Area Models (LAM) field improvement (<4km resolution)
5. More staff – research, targeted product development
6. In-situ Stations and maintenance (telecom costs)

    a. $30K for traditional stations
    b. 3D-PAWS could be used to reduce costs

7. Radars and maintenance (ongoing)
8. Disaster management portal
9. Making station data available (data sharing)

    a. stream gauge data,
    b. weather station data from other agencies (precipitation, temperature),
    c. disaster management data,
    d. putting data online,
    e. making data available to SARFFG,
    f. data kept all in the family

10. Need for validation and evaluation of Products (and their use)
11. Training meteorological and hydrological forecasters and DMA staff and other users at relevant levels

    a. Local training of forecasters and other users (lower cost)
    b. Forecasters get trained at RSMC and global (higher cost)

12. Channel cross-section and related data
13. Role of water affairs to enhance multiple hazard early warning systems (MHEWS)

a. sharing data and files between agencies (verify ASM within the FFGS)
b. sharing parameter files with countries

14. Adopting common alert protocol (CAP) or other protocol (SMS) for warning dissemination

    a. WMO is investigating alerting protocols appropriate for hydrology
    b. Need training and software

15. Need forecaster work stations

    a. Forecaster work station with ability to access and use all forecaster tools ^(South Africa – no donor funding) *(Zimbabwe, Malawi, Swaziland, Lesotho – donor funding) (Synergie – Meteofactory)

16. Awareness campaigns for citizenry

    a. Travel to different areas of country to engage citizenry based on Lesotho, Malawi and Swaziland experience

17. Inviting Swaziland and Lesotho to officially join SARFFGS

    a. Identifying focal and alternate contact points for each country
    b. Country commitment (reestablish commitment for other participating countries)

These were then categorized by cost versus priority, resulting in the table below, where the number in the table refers to the priority listed above.

	Priority		
	Low	Medium	High
Cost			
Low affordable w/in Wx budget		12	2,3,8,9,10,11a,13,17
Medium w/in National budget			1,2,5,6,15^
High – Donor funding	4	4	6,11b,14,15*,16
Very High			7

^ South Africa fund own work station
* Zimbabwe, Malawi, Swaziland – donor funding

5. Round Table on End-to-End Early Warning System Weaknesses

Participants brought forward specific points of concern and interest:

- Countries should have the ability to update FFGS parameters themselves, such as delineations, soil types, land-use, etc.,
- Participating countries' WMO certified trainers could assist those countries that have lost their trainers in the provision of local forecaster training,
- All local trainees should do the Step 2 e-training courses,
- Some (e.g., RSA and Malawi) but not all countries have provided cross-sectional and related data, hence some additional effort is needed to provide data to improve performance,

- More information is needed on Synergie and Meteofactory licensing (Mr Abdoudlaye Harou (WMO) agreed to provide participants with more information).

6. Next Steps and Workshop Wrap-Up

Participants discussed the need to brief Permanent Representatives of participating countries on the twinning project including SWFDP-SA and SARFFG: As well, participants indicated that they would also raise the need to share data with RSMC Pretoria for product generation, with RSMC Pretoria agreeing to provide the template to participants for sharing data.

Participants agreed that significant advances had been made through the workshop in the development of national Implementation Plans, with an increased understanding of strengths and gaps, and in particular, what low cost efforts could be undertaken to strengthen their End-to-End Early Warning System.

Participants agreed to provide Rochelle Graham (HRC) their final draft of their national Implementation Plans as they currently stand, so that she could implement common changes to them. She had agreed to provide the revised plans to participants for their review and approval. Once the documents have been completed, participants were requested to send them to Mr Ayhan Sayin (Asayin@wmo.int), copying Ms Mireille Hérin (Mherin@wmo.int). It was noted that participants should take their final Implementation Plans to their Permanent Representative and devise plans on how they can implement the low cost – high priority quadrant of the table and to seek national support for medium to high cost high priority items.

It was raised that it would be beneficial if an annual report were prepared to track implementation on national plans, possibly with end of June being the reporting period.

The participants thanked the hosts of the meeting and commented on the lovely facilities and efforts undertaken by the hosts that contributed to the positive atmosphere of the meeting. Participants also thanked WMO, USAID/OFDA, HRC, Swaziland Meteorological Service and their fellow participants for their efforts in making the meeting a success and in sharing their views. Participants expressed that they were looking forward to taking steps to implement their National Implementation Plans.

It was agreed that the report of the meeting and workshop would be circulated for comment prior to its finalization likely to be completed within one month of the meeting. The workshop closed at 17:00 Friday 20 January 2017.

Annex I

LIST OF PARTICIPANTS

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Annex II

South Africa Severe Weather Forecasting Demonstration Project (SWFDP-SA) and Southern Africa Region Flash Flood Guidance (SARFFG)

Development of National Implementation Plans (IPs)

Mbabane, Swaziland, 16 – 20 January 2017

Agenda

Day 1 (16 January 2017)- Implementation Plan[2] Session

08:30 – 09:00	Registration	All
09:00 – 09:30	Welcome and Introductions	All
09:30 – 10:00	Objectives of the workshop and expected outcomes: Introduction to Implementation Plans	WMO
10:00 - 10:30	Overview of new functionalities and capabilities of the SWFDP-SA: Data flow, Nowcasting	WMO
10:30 – 11:00	***Tea Break***	
11:00 – 11:30	Overview of new functionalities and capabilities of the global FFG System	HRC
11:30 – 12:30	SWFDP-SA and SARFFG System interfaces and new product considerations for the linked Systems	SAWS, HRC
12:30 – 14:00	***Lunch***	
14:00 – 15:00	SWFDP-SA and SARFFG System interfaces and new product considerations for the linked Systems (Continued)	SAWS, HRC
15:00 – 15:30	NMHS presentations (10 minutes each)[3]	

[2] Implementation Plan refers to assessment of E2E EWS chain process of the NMHSs for delivering data and products.

[3] NMHS participants are asked to present up to five power point slides and limit presentations to 10 minutes that shall contain the following topics:

Slide 1: Where you currently are (capabilities in each like of the chain, service being provided, etc.,) as a "current state description";
Slide2: Future realistic state;
Slide 3: Gaps (weak or broken links in an E2E EWS);
Slide 4: Major steps (large blocks) needed to fill the gaps; and
Slide 5: Rough estimate of resources (financial and human) need to fill the gaps, including maintenance.

15:30 – 16:00	***Tea Break***	
16:00 – 17:00	NMHS presentations (10 minutes each) (Continued)	NMHSs

Day 2 (17 January 2017) - Implementation Plan Session (continued)

09:00 – 09:30	Review of Day 1	WMO
09:30 – 10:00	Review of IP Template for the NMHSs	guided by HRC and SAWS
10:00 – 10:30	Approach for drafting IPs	guided by HRC and SAWS
10:30 – 11:00	***Tea Break***	HRC
11:00 – 11:30	Status of the Implementation Plan Preparations and path Forward	
11:30 – 12:30	Facilitated discussion on capabilities, gaps, and major steps	All
12:30 – 14:00	**Lunch**	
14:00 – 15:30	Drafting IPs for the NMHSs	
15:30 – 16:00	***Tea Break***	
16:00 - 17:00	Drafting IPs for the NMHSs (Continued)	All

Day 3 (18 January 2017) - Implementation Plan Session (continued)

09:00 – 09:30	Review of Day 2	All
09:30 – 10:30	Drafting IPs for the NMHSs (Continued)	All
10:30 – 11:00	***Tea Break***	
11:00 – 12:30	Drafting IPs for the NMHSs (Continued)	All
12:30 – 14:00	***Lunch***	
14:00 – 15:30	Drafting IPs for the NMHSs (Continued)	All
15:30 – 16:00	***Tea Break***	
16:00 – 17:00	Drafting IPs for the NMHSs (Continued)	All

Day 4 (19 January 2017) - Implementation Plan Session (continued)

09:00 – 09:30	Review of Day 3	All
09:30 – 10:30	Drafting IPs for the NMHSs (Continued)	All
10:30 – 11:00	***Tea Break***	
11:00 – 12:30	Drafting IPs for the NMHSs (Continued)	All
12:30 – 14:00	***Lunch***	
14:00 – 15:30	Drafting IPs for the NMHSs (Continued)	All
15:30 – 16:00	***Tea Break***	
16:00 – 17:00	Drafting IPs for the NMHSs (Continued)	All

Day 5 (20 January 2017) - Implementation Plan Session (continued)

09:00 – 10:30	Review of drafted IPs	All
10:30 – 11:00	***Tea Break***	
11:00 – 12:30	Discussion of drafted IPs and needed revisions	ALL
12:30 – 14:00	***Lunch***	
14:00 – 15:30	E2E EWS revisited for each NMHS: weaknesses in the chain (National and Regional)	ALL
15:30 – 16:00	***Tea Break***	
16:00 – 17:00	Next Step: How to strengthen E2E EWS: priority gaps identified	ALL
17:00 – 17:30	Recommendations and Next Steps	ALL