WORLD METEOROLOGICAL ORGANIZATION

WMO SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP) MISSION TO THE UGANDA DEPARTMENT OF METEOROLOGY

ENTEBBE, UGANDA, 7-8 JUNE 2012

FINAL REPORT

1. INTRODUCTION

The World Meteorological Organization (WMO) Severe Weather Forecasting Demonstration Project (SWFDP) Mission to Entebbe, Uganda, was conducted from 7 to 8 June 2012. The aim of the mission was to gather information on the Uganda Department of Meteorology (UDoM) in order to develop a SWFDP Implementation Plan for Uganda. The programme for the two-day mission is shown in **Annex I** to this report.

The WMO delegation included Mr Peter Chen, Chief of the Data Processing and Forecasting Systems (C/DPFS), Mr Samuel Muchemi, Scientific Officer, Public Weather Services (SO/PWS), and Mr Mohamed Matitu (WMO Consultant). The delegation was received by the Deputy Commissioner of the UDoM, Mr James B. Magezi-Akiiki, who represented the Commissioner for Meteorology and Permanent Representative of Uganda with WMO, Mr Michael Nkalubo.

The delegation met with the staff at the National Meteorological Centre (NMC) forecast office located next to the Civil Aviation Authority (and Air Traffic Control (ATC) tower) on the Entebbe International Airport grounds. Mr Magezi-Akiiki officiated at the opening of the Mission while the Officer in Charge (OiC) of the NMC, Dr Ronald Wesonga, played the role of master of ceremonies. Mr Magezi-Akiiki made the welcoming remarks and Mr Chen spoke on behalf of the WMO delegation. There were about 25 UDoM staff members, including Mr John Eza, UDoM's focal point for the SWFDP-Eastern Africa Project and Ms Margaret Nankya Serwanja, the PWS Focal Point for the UDoM. The proceedings were conducted in English. The full list of participants is shown in **Annex II** to this report.

The Commissioner, Mr Michael Nkalubo, met with the delegation at the hotel in the evening of 7 June 2012, and expressed his regret for not being able to participate personally at the meeting. He warmly welcomed the WMO mission.

Entebbe is located on the northwestern shores of Lake Victoria in Uganda. The NMC and the adjacent ATC buildings are located on a small hill, next to the international airport, at an elevation of approximately 1,200 metres. Adjacent to the present-day international airport, the older runway and airport facilities are used by United Nations (UN) flight operations, serving its missions in Uganda, the Democratic Republic of Congo (DRC), and South Sudan. The UDoM's upper-air facility, including the hydrogen generation shed and housing for the observer, is located at the old airport.

2. WEATHER OBSERVING AND FORECASTING IN THE UDOM

2.1 The UDoM Observing Network

1. Uganda has 12 synoptic stations, 18 agrometeorological stations and 110 rainfall stations (of which only 60 are active);

2. Regarding staff members, the UDoM currently has 112 meteorologists and technicians on the payroll. Of these, there are 34 forecasters (both Class 1 and 2 forecasters) as follows:

    a. Class 1 forecasters are 20 in number, with 8 having experience of ten years and above, and mostly holding administrative positions. Three of these are on training; and,

b. Class 2 forecasters are 14 in number, with 7 of them having experience of over ten years. The majority of these have experience of less than six years. Two of them are currently training to become Class 1 forecasters.

3. There is a second generation Satellite Distribution System for Information Relating to Air Navigation (SADIS 2G) in place, which receives World Area Forecast Centre (WAFC) London broadcasts;

4. There is no working weather radar in Uganda. However there is a radar installation at the Entebbe airport, located next to the ATC and NMC building. It should be noted that this has not operated since 2007. There are plans to purchase one;

5. Upper-air sounding at Entebbe is not currently operational, but a new system has been donated and is likely to be installed and restored within the coming year;

6. Data from all the 12 synoptic stations are provided to the Global Telecommunication System (GTS), normally through a connection to the Regional Telecommunication Hub (RTH) Nairobi via a Very-Small-Aperture Terminal (VSAT) System. However, for nearly a year, transmission has been via Internet as the Kenya Meteorological Department (KMD) disconnected VSAT because it was too expensive. Uganda is also connected by fiber optic cable from the NMC to Telkom Kenya in Nairobi, and is awaiting the RTH to connect to the link any time now;

7. Data communication 'Self Monitoring' result is at 67% on average but RTH, Nairobi, puts the monitoring at 56% on average; and,

8. Below is a table showing the observing stations and their Station numbers:

STATIONS:	STATION NUMBERS:
ARUA	63602
GULU	63630
LIRA	63631
MASINDI	63654
SOROTI	63658
KASESE	63674
KAMPALA	63680
JINJA	63682
TORORO	63684
MBARARA	63702
ENTEBBE	63705
KABALE	63726

2.2 Weather Forecasting at the UDoM NMC

The UDoM NMC is located at the Entebbe International Airport and serves, nationally, both the aviation and public weather services components. There are ten weather forecasters, most of whom attended the meeting. Approximately seven are in PWS, some of whom are also forecasters. Dr Wesonga is the head of the forecasting section. Out of the ten forecasters, the majority are "Class I". In addition, there are a few who are "On-the-Job Training" (OJT). Three others are from the military.

The forecasting office operates 24/7 on continuous shift cycles. Day shifts start at 0800 and ends at 1700 hours. The other shifts, evening and night, covers 1700 to 0800 hours. There are at least two forecasters on duty at any given time. The office is equipped with a number of PC-based systems mainly and one African Monitoring of Environment for Sustainable Development (AMESD) / Preparation for Use of MeteoSat Second Generation (MSG) in Africa (PUMA) satellite receiver station (since 2010). The office has Internet connection (no wireless). They indicated no problem in accessing Regional Specialized Meteorological Centre (RSMC) Nairobi and Regional Forecasting Support Centre (RFSC) Dar Es Salaam Websites for participating in the SWFDP Project.

The NMC produces a public weather bulletin every day which includes a forecast only for the next day, and an outlook for an additional three days, and are issued at 1600 hours everyday as a document that is distributed via an e-mail list (approximately 50 addresses) of external users, media outlets (newspapers, radio, television (TV), etc.). This product includes descriptive text of the weather for the current day, and forecasts contained in a table with the following columns for each of eight geographical districts:

Forecast for the next day (day 2):

- A single pictogramme and word(s) for forecast conditions, one for the morning and one for the afternoon;
- Temperature (max. and min.); and;

A “further outlook” (day 3 to day 5): short text of anticipated conditions.

2.3 Severe Weather in Uganda

Heavy rain is likely the most important severe weather phenomenon which causes both flash and river floods, and landslides in the country. Heavy thunderstorms, some over the Lake, bring severe weather such as strong wind gusts and hail, and associated impacts.

At the time of this mission, the weather was relatively “quiet”; there were localized thunderstorms and showers over Uganda, while the main Inter-Tropical Convergence Zone (ITCZ) band remained north of the country.

3. THE PWS COMPONENT OF THE SWFDP

The role of the PWS component of the SWFDP is to improve delivery of forecast, alert and warning services to the public and other users. The main focus of the visit to Uganda, as regards the PWS component of the Project, was to assist the UDoM to develop the capacity to deliver services by taking the following actions:

a) Identifying a team to carry out PWS activities, and availing them the opportunity to train on service delivery skills including:

- Criteria for issuing warnings and alerts;
- How to formulate a warning, including the essential attributes of a warning message;
- Effective use of the different dissemination channels for warnings including mobile technology, radio, RANET, TV, etc.;

- Using the website effectively to deliver severe weather-related services;
- Working with the media;
- Working with the disaster community;
- Building a severe weather database that would include alerts issued by the UDoM, severe weather events for which no alerts were issued, and the feedback on actions taken by users; and,
- Public education and outreach.

b) Engaging users:

- Identifying users and making contacts to establish a dialogue;
- Establishing user needs; and,
- Responding to user needs in the generation of products and delivery of services.

c) Monitoring and Evaluation (M&E):

- Building feedback mechanisms to inform the UDoM how products and services are put to use, and their impacts;
- Carrying out surveys to establish the level of satisfaction of the users;
- Reviewing the service delivery process with a view to applying lessons learnt to future processes; and,
- Compiling quarterly reports using the template provided under the Project.

3.1 The PWS Team

The UDoM already has a PWS Team, which is coordinated by Ms Nankya Serwanja. Some of the PWS Team also carry out forecasting duties. They have had different levels of experience and training, but a need was expressed for further training in most of the PWS skills including radio and TV weather presentation, basic website design and updating, production of press releases, organizing press conferences, skills in for handling radio and TV interviews, engaging users such as the Disaster Managers and Civil Protection Agencies (DMCPAs) and drawing up Memoranda of Understanding (MoUs) and Standard Operating Procedures (SOPs).

3.2 Status PWS Service Delivery by the UDoM

3.2.1 The Use of the Internet

a) The UDoM does not have an independent operational departmental website and this was recognized as a need that should be addressed urgently. Daily forecasts are routinely sent to the Ministry Headquarters in Kampala, where they are supposed to be uploaded on the Ministry's Website. However, the forecast is not reliably updated

everyday. As a starting point, it was agreed that WMO would assist the UDoM revitalize its RANET Internet Presence Initiative (RIPI) Website that had been operational in the past. The process to get revitalization of the Website was started during the mission. In this regard, the PWS National Focal Point, Ms Nankya Serwanja was to coordinate with Mr Milton Waiswa in Kampala. They would contact the RANET Coordinator, Mr Kelly Sponberg, to make the website operational. They would then organize for the training of the PWS Team to carry out the updating duties and put in place a procedure for updating it on a daily basis.

b) The forecast office produces "city forecasts" for the World Weather Information Service (WWIS) for four locations. The participants were informed that WMO, through its PWS Programme, was in the process of enhancing the WWIS Website, and in connection with this, a request would soon be sent to all Permanent Representatives (PRs) with WMO requesting them to enhance their participation in WWIS. Enhancement of participation would include increasing the number of locations for which a country sent weather forecast for display on the WWIS.

c) The use of Social Media, including Facebook, Twitter and YouTube was discussed and considered as the way to go in the future.

3.2.2 Mobile Technology

The UDoM has established the Mobile Weather Alerts (MWA) Pilot Project for fishers on the Ssese Islands of Lake Victoria. The Project focuses on utilizing mobile phone technology to develop a sustainable warning service that reduces the vulnerability of communities in the Lake Victoria region to weather hazards. Within the Project, 1,000 fishermen and traders from the islands have registered for the mobile alert service and receive a forecast every morning around 0400 hours. Drawing upon the SWFDP and other initiatives, clearly defined processes for the delivery of pilot warnings and forecasts have been developed and implemented. These include well defined thresholds for issuing warnings, information on possible impacts of the hazardous weather, and advice on the appropriate level of response by the recipients of the warnings. The Project was made possible through a wide partnership that includes: the UDoM, WMO, Ericsson mobile technology provider, the National Lake Rescue Institute, MTN mobile phone service provider and the UK Met Office. Due to this Project, the UDoM has some experience in issuing warnings, an experience that can be built upon to upscale service to include other hazards, and in other parts of the country.

3.2.3 E-mail and Newspapers

The UDoM has an e-mail list comprised of approximately 50 addresses (individuals, institutions and the media). In addition to daily weather forecasts, it issues dekadal (10-day), monthly, and seasonal forecasts (in collaboration with the Climate Outlook Forum (COF)) process. However, these are issued from the headquarters in Kampala and not by the NMC in Entebbe. Press releases are also issued to newspapers for these forecasts and for agrometeorological forecasts.

3.2.4 Television

At the time of the Mission, the UDoM had not had a weather presentation studio for television for four years. The delegation was informed that the UDoM used to have a studio where they prepared bulletins in English and Luganda on video tapes. The tapes would then be sent to national TV stations for airing. However, for various reasons, it was not possible to sustain the service. They expressed a great need for a new studio, as it would enhance weather information dissemination to the public. They also expressed the need to convert some space in Kampala into a studio and not in Entebbe, which they thought would be more suitable due to proximity to the media houses.

The Secretariat was requested to assist the UDoM acquire the necessary equipment and training for the planned studio.

3.2.5 Dissemination of Forecasts through Radio and the RANET Network

The RANET Project provides communication solutions to rural and other isolated communities. Uganda has had a long experience within the RANET Project and has conducted RANET activities successfully for many years. Mr Waiswa is the RANET Coordinator for the UDoM. Within RANET, the UDoM has collaborated with the Ministry of Agriculture in the training of farmers and disseminating agrometeorological information to them. The RANET network was affected when the WorldSpace satellite ceased to be operational. However, RANET-Uganda also collaborated with rural community radios. There is now a need to use the existing RANET network to communicate warnings, and to also establish new RANET community radios in Uganda.

Apart from RANET, it was reported that the UDoM was collaborating with several radios including Dembe FM, Sanyu FM, Voice of Toro and Voice of Kigezi to disseminate weather information.

3.3 Communicating Warnings

At present, the area on Lake Victoria covered by the MWA Project is the only area where warnings are issued regularly. There is a need to establish a warnings programme covering the whole country. A session on how to develop and communicate warnings was held, and it was noted that forecasters were not very confident to issue warnings due to lack of certainty in the accuracy of warnings. Within the SWFDP, they planned on evaluating the accuracy of forecasts so as to raise their level of confidence. The following points came out of the discussion:

a) Emphasis was laid on the need for forecasters and the PWS staff to appreciate the importance of issuing alerts and warnings, since saving lives and property is the primary role of a National Meteorological or Hydrometeorological Service (NMS);

b) Participants were informed of how they could develop criteria for issuing warnings, based on intensity thresholds of weather and on probable impacts; and,

c) The attributes of a good warning message in terms of its title, content, attribution of origin, the period of validity, expected intensity, location and advice to users on the actions they could take were emphasized upon.

During the mission, awareness was raised on the importance of establishing permanent contact between the UDoM and the DMCPAs for rapid intervention in case of extreme weather event. In this regard, a need was established to develop the necessary capacities and skills to identify, approach, and engage users, especially for the delivery of services associated with extreme weather. This includes skills to develop Memoranda of Understanding (MoUs) and Standard Operating Procedures (SOPs) between the UDoM and users such as the media and the DMCPAs.

3.4 Public Education and Outreach

During the two days of the mission, the delegation witnessed many organized tours of the UDoM NMC by school groups. The delegation took the opportunity to speak to some of them, and made remarks about weather forecasting. It was quite clear that the UDoM carried out effective public education activities that are very popular with schools (see Figure 1 below).

Figure 1: A UDoM meteorologist talks to students about meteorological instruments inside an observatory enclosure at the UDoM in Entebbe

3.5 Functions of the PWS Team

Discussions were held on the duties of the PWS Team of the SWFDP. It was understood that they were expected to carry out the following functions:

a) Ensure issuance of warnings to specific users (emergency responders, media, etc.);

b) Develop a severe weather database, including a record of:

- severe weather events and the warnings issued (intensity, location, severity);
- severe weather events that occur, even if no warnings had been issued; and,
- outcomes of warnings (did the severe weather occur (yes/no)), intensity, etc.;

c) Initiate and participate in the development of MoUs between the UDoM and users;

d) Initiate and participate in the development of internal SOPs streamlining the warning procedures within the UDoM;

e) Initiate and participate in the development of SOPs, linking the UDOM to users;

f) Carry out user satisfaction surveys;

g) Respond to user needs in terms of new products and changes in service delivery;

h) Complete all the parts relevant to PWS of the "Quarterly Report of the SWFDP Subproject" template, which is provided on the SWFDP Website managed from Nairobi, Kenya. This information may be accessed at the following web-link: http://www.meteo.go.ke/rsmc/index.php .

3.6 Agricultural Meteorology

Uganda has about 85% of its population living in rural areas, and around 70% of the workforce occupied in agricultural activities that provide 22% of the Gross Domestic Product (GDP).

3.6.1 WMO Ongoing Activities in the Country

As mentioned under item 3.2.2 above (Mobile Technology), a Pilot Project was developed with the Grameen Foundation (GF) to provide weather alerts to fishermen. But, another activity where mobile phones and GF are also involved in is to provide weather and climate information to the farmers in Kasese Region (Western Uganda, near the DRC border). Here, the Project entitled "Mobile Weather Alert: Communicating Weather Warnings and Advisories to Agricultural Communities via Mobile Communications" was organized by the UDoM and GF Uganda Office to provide opportunities to enhance the interactions between the service provider and end users.

The farmer's representatives called Community Knowledge Workers (CKWs) are given mobile phone with application called AppLab by GF, which provides farmers with a powerful tool to receive useful information regarding weather and climate, agricultural advice and other relevant information for the agricultural activities including market information. It also allows farmers to send local information including daily precipitation record and vegetation status to such partners as agricultural associations and the UDoM.

3.6.2 SWFDP Support to Agricultural Meteorology

As the main forecast source is the SWFDP models and products, there is an evident link between the provision of agricultural warnings and products based on short- or medium-range weather forecasts and the SWFDP activities. The following activities are proposed:

1. A specific training seminar on agricultural meteorology to the forecasters to understand better the user problems (1-day activity by lecturers from the UDoM and one invited expert);

2. Discussion between agricultural meteorology staff and forecasters to define agromet products based on numerical weather forecasts and added value from the forecasters (1-day activity, one WMO Secretariat staff to be present);

3. To define an action plan for elaboration of new agrometeorological products and services at Kasese (regional) and national level. The UDoM to propose support actions to the Secretariat (AgM) such as specific training, models, observation networks, etc.; and,

4. Agriculture User Survey: Links with GF Project. Use of mobile phone tools and selected Roving Seminars as base for an evaluation.

4. PLAN OF ACTION

Toward the end of the Mission, there was a discussion on the actions that would be taken against strategies that were agreed upon to meet the objectives of developing a Warning Service in UDoM. The outcome of the discussion is summarized on the table below:

Action Plan for Development of a Warning Service in the UDoM			
Objective:	**Strategy:**	**Action taken or to be taken:**	**Timeline:**
Strengthen capacity within NMS in forecasting	Organized training	ECMWF training	October 2012
		SWFDP training (Probably in Entebbe)	November 2012
	Transfer new knowledge to forecasting team	UDoM organizes training	October 2012
	In-country training by experts in forecasting methods at the forecast office	WMO to explore the possibility	TBD
	Increasing lead-time of forecasts	Start issuing 3-day warnings internally for heavy rain (> or = 30mm/24hrs), strong winds ((> or = 25 Kts) and extreme temperatures ((> or = 35 degrees C)	Immediately for internally issued warnings; Evaluation September 2012
Establish or strengthen capacity within the UDoM to deliver services	Identify Core PWS Team	Done	Done
	Train PWS Team	UDoM organizes internal training for PWS Team	August / September 2012
	Establish a NMS website and provide a "warnings" link on the home page	1. To coordinate with Webmaster for revival of the website; 2. Training of PWS staff to be updating website on a daily routine basis; 3. To draw a duty roster for PWS team for updating of Website; and, 4. Include a link on alerts warnings on the main page	1. Immediately 2. June 2012 3. June 2012 4. June 2012
	Reinforce links between the forecast team and agricultural meteorology	Joint 2-3 days workshop; Forecasters-agromet to improve mutual knowledge and to define new products and services for agricultural sector	First quarter 2013 after forecaster training in SWFDP products and models
	Establish TV Weather studio	Look for funding	As soon as possible

Engage users	Identify users and the products and services each user would require	Contact national radio and TV, office of prime minister, OP. etc. Invite users to the PWS training	July 2012 July 2012
Monitoring and Evaluation (M&E)	Monitoring on: a.) The actual occurrence of severe weather b.) Impacts of the event	1. Complete the Project's events evaluation form whether or not a warning is issued and whenever a warning was issued whether or not the event occurs 2. Create a database of extreme weather events and their impacts, including photographs, video clips, etc.	1. Continuous 2. Continuous
	Monitoring implementation of the project	Complete PWS part of the project quarterly report	Scheduled times
	Build Feedback Mechanism	1. Provide a comments page on the website 2. Every time an event occurs, users should send reports commenting on the usefulness of the warning message (was it received on time, accurate, understandable etc) 3. Questionnaire to users	June 2012
	Conduct self assessment surveys	Questionnaire to users and public	July 2013
	Review service delivery process with a view to factor in lessons learnt in future processes	Analyze the questionnaire	July / August 2013

ANNEX I

SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP) WMO MISSION TO UGANDA (ENTEBBE, UGANDA, 7-8 JUNE 2012)

PROGRAMME

7 June 2012: Morning (0900 - 1230 hours)

1. Meet the Permanent Representative (PR) of Uganda with WMO

    a. Discussion on purpose of visit and expected results
    b. General introduction of SWFDP with staff of Uganda Met Service responsible for forecasting, PWS duties and Agrometeorology
    c. Country specific implementation plan for Uganda

2. Introduction to Uganda Met operations

    a. Observing and telecommunications system
    b. Forecasting systems (demonstration of the forecasting process)
    c. Agricultural meteorology
    d. Service delivery
    e. Identification of gaps

3. Practical session on forecasting and weather dissemination: Discussion on status of forecasting and improvements needed in the operations, forecast lead times and developing warnings, etc.

7 June 2012: Afternoon (1400 - 1730 hours)

1. (Continued) Practical session on forecasting and weather dissemination: Discussion on status of forecasting and improvements needed in the operations, forecast lead-time and developing warnings, etc.

2. Establishing service delivery baseline: Current status of disseminating of forecasts, alerts and warnings and verification.

3. Developing and communicating warnings

    a. Meteorological hazards
    b. Criteria for issuing a warning (thresholds)
    c. The structure of a warning message including essential elements of an effective warning including issuing advice
    d. Communicating warnings for specific sectors (agricultural, fisheries and herders)

4. Communication channels

    a. Website
    b. Radio and TV
    c. Mobile phone
    d. RANET Network

8 June 2012: Morning (0900 - 1230 hours)

1. Session on user engagement (interactive). To enact a step by step implementation of procedures for working with the media, the disaster community and the general public. Participants to include:

   a. Senior Met management
   b. Forecasters
   c. PWS staff
   d. Agriculture Extension Service Officers from Ministry of Agriculture
   e. Disaster Managers
   f. Media

8 June 2012: Afternoon (1400 - 1730 hours)

1. Development of a strategy to develop Warnings Service for Uganda Met Service

2. Duties and expectations, in particular, the role of:

   a. Forecasters in the SWFDP
   b. PWS staff

      i. Communicating forecasts
      ii. Keeping the extreme events database
      iii. Public education
      iv. Carrying out surveys

   c. Agromet staff

Closure of the Meeting / Mission

ANNEX II

SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP) WMO MISSION TO UGANDA (ENTEBBE, UGANDA, 7-8 JUNE 2012)

LIST OF PARTICIPANTS

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