WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR BASIC SYSTEMS

MEETING OF THE REGIONAL SUBPROJECT MANAGEMENT TEAM (RSMT) OF THE SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP) FOR EASTERN AFRICA

NAIROBI, KENYA, 21-24 JUNE 2011

FINAL REPORT

(Back row) John Kimori, Igantius Gichoni, Samuel Mwangi, Levi Imbuga, Anthony Twahirwa, Peter Masika, Lawrence Wilson, Samwel Marigi
(Middle row) Gissila Tesfaye, Khalid Yakub, Ruben Barakiza, Rogers Ndichu, John Mungai, Samuel Senkunda, Hamza Kabelwa, Urlich Blahak, Ali Mafimbo, Peter Njuguna, Vincent Sakwa
(First row) Ketema Tsegaye, Haleh Kootval, Robert Stefanski, Alice Soares, Joseph Mukabana, Salla Himberg, Stella Aura, Steve Palmer, James Kongoti

EXECUTIVE SUMMARY

The meeting of the Regional Subproject Management Team (RSMT) for the Severe Weather Forecasting and Demonstration Project (SWFDP) for Eastern Africa was held in Nairobi, Kenya, from 21 to 24 June 2011. Participants included representatives of:

- Global products centres: Met Office UK and DWD (Germany);
- Regional centres: RSMC Nairobi (Kenya) and TMA (Tanzania);
- National Meteorological Centres of Burundi, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda; and,

the representative from the East African Community (EAC) and the WMO Secretariat (DPFS, PWS and AgM programmes).

The meeting reviewed the outcomes of the Technical-Planning Workshop on Severe Weather Forecasting Demonstration Project (SWFDP) Development for Eastern Africa, which was held in Nairobi, Kenya, from 4 to 8 October 2010. It discussed the synergy of the SWFDP with the World Bank Development Grant Facility funded project "Weather and Climate Service Delivery in the Lake Victoria Region", the pilot project "Mobile Weather Alert", and the Early Warning System in Rwanda. It also discussed the synergy of the SWFDP with EAC's NWP Strategy and the EAC Lake Victoria Meteorological Project.

The meeting discussed the respective roles and capacities in the cascading forecasting process involving participating centres, with respect to severe weather forecasting, production and dissemination of warnings; public weather services and agrometeorological applications.

The meeting reviewed the draft Regional Subproject Implementation Plan, considering the *SWFDP Guidebook for Planning Regional Subprojects* (Rev. 2010), and discussed all components of the Implementation Plan, including the following aspects:

- Membership, chairperson and vice-chair-person of the RSMT, and the members' responsibilities*;*
- Lead RSMC responsible for SWFDP's "cascading process", being RSMC Nairobi;
- Role and responsibilities of Regional Forecasting Support Centre for the Lake Victoria Region, being TMA (Tanzania);
- Contributions by Centres for Limited Area Modelling over the Lake Victoria Region;
- Criteria for alerting severe weather in the RSMC Nairobi severe weather guidance charts, which would be *Heavy Rain (≥ 50mm in 24 hours), Strong Winds (≥ 25knots), Large Waves (≥ 2.0m)* and *Dry Spells (up to 5 days (from LAMs); up to 10 days (from global models))*;
- Developments of the *RSMC Nairobi* Website/Portal;
- Responsibilities and products provided by global, regional and national centres, including those for agricultural applications;
- Liaison with media and disaster management and civil protection at national level;
- Liaison with agriculture and fishery communities;
- Verification aspects, monitoring and evaluation, reporting of severe weather events, and progress reporting of the project;
- Training aspects and plans;
- Timetable of implementation (milestones and responsible member).

Regional Subproject Implementation Plan for the initial demonstration of the SWFDP is available at: http://www.wmo.int/pages/prog/www/CBS-Reports/documents/RSIP-SWFDP-EA.pdf.

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING

1.1 The Meeting of the Regional Subproject Management Team (RSMT) of the Severe Weather Forecasting Demonstration Project (SWFDP) for Eastern Africa started at 09.30 hours on Tuesday, 21 June 2011, at the Institute for Meteorological Training and Research of Kenya Meteorological Department (KMD), in Nairobi, Kenya. Ms Stella Aura (Deputy Director of Education, Training and Research, Kenya) welcomed participants to the meeting, and introduced Ms Alice Soares, Scientific Officer of the WMO's Data-Processing and Forecasting System Division, to address the meeting.

1.2 On behalf of the Secretary-General of WMO, Mr Michel Jarraud, as well as on behalf of her colleagues Ms Haleh Kootval, Mr Robert Stefansky and Ms Salla Himberg (also presented at this meeting), Ms Alice Soares welcomed participants to the meeting and expressed the gratitude and appreciation of WMO to the Government of Kenya, the Kenya Meteorological Department (KMD), and Dr Joseph Romanus Mukabana, Permanent Representative of Kenya with WMO, for hosting this meeting in Nairobi. Ms Soares also thanked Mr Kongoti, Mrs Stella Aura and Mr Nicholas Maingi of the Kenya Meteorological Department (KMD) for their work in organizing the local arrangements.

1.3 Ms Soares explained that the Severe Weather Forecasting Demonstration Project (SWFDP) initiative is intended, to (1) further explore and enhance the use and application of outputs of existing NWP systems, available through WMO's Global Data-Processing and Forecasting System (GDPFS), in the improvement of severe weather forecasting in countries where sophisticated NWP outputs are not currently used, or poorly used; and, (2) through the assistance of the Public Weather Services Programme of WMO, improve the delivery of warnings and forecasts to target user groups at the national level. She noted that the SWFDP had been implemented successfully in southern Africa and a second project is in progress for the South Pacific Islands. Following the request by the WMO Executive Council to further expand the SWFDP to other WMO Regions, plans had initiated to consider SWFDP regional subprojects for Southeast Asia, and this meeting would consider the launch of a SWFDP regional project for Eastern Africa, as an excellent opportunity to improve the application of science and technology that supports forecasting and severe weather warning services. This project would be rather different from the other SWFDPs, in that for the first time in addition to enhancing the capabilities of NMHSs in more effectively supporting the traditional areas of disaster management and civil protection organizations, and forging links with the media to serve the general public, it would also provide forecast and warning services to two very important socio-economic sectors, namely agriculture and fisheries in the Lake Victoria region., hence the expanded scope of this project.

1.4 Mr James Kongoti (Deputy Director of Meteorological Services, Kenya) pointed out that the implementation of a SWFDP in Eastern Africa is crucial and this meeting will have important deliberations in the formulation of the implementation plan for the demonstration phase of the project. Mr Kongoti thanked all participants for their presence at the meeting and for their contributions, in particular he expressed his appreciation to the global products centres which make available their NWP/EPS products through the project and to WMO for the continuous support to its Members in facing the challenges of improving severe weather forecasting and warning services, and their delivery to the users.

1.5 Dr Joseph R. Mukabana (Director of Meteorological Services and Permanent Representative of Kenya with WMO) welcomed all participants to the meeting of the RSMT of the SWFDP for Eastern Africa. He noted that this meeting will prepare a roadmap for the implementation of a SWFDP in Eastern Africa, taking into consideration the outcomes of the Technical-Planning Workshop on SWFDP Development for Eastern Africa, held in Nairobi (Kenya), in October 2010. He recalled that the Technical-Planning Workshop unanimously agreed in principle that the implementation of an SWFDP in Eastern Africa would be technically feasible and

would bring benefits in terms of enhancement of technical capacity in operational weather forecasting and advancement in service delivery to the general public and key application areas such as agriculture and fisheries, in the region. He noted that Eastern Africa region is vulnerable to weather and climate related disasters, such as droughts, floods, landslides, wild fires, cyclones and frosts, among others; and that the SWFDP for Eastern Africa would form the basis for the experts in the region to address some of these challenges within the region. Dr Mukabana concluded by wishing fruitful discussions and by declaring the meeting of the Regional Subproject Management Team (RSMT) of the Severe Weather Forecasting Demonstration Project (SWFDP) for Eastern Africa officially open.

2. ORGANIZATION OF THE MEETING

2.0.1 The meeting was invited to nominate from among the participants a chairperson and a vice-chairperson to conduct the business of the meeting. Mr James G. Kongoti (KMD) and Dr Hamza Kabelwa (Tanzania) were unanimously elected to act, respectively, as chairperson and vice-chairperson for this meeting.

2.1 Adoption of the agenda

2.1.1 The meeting adopted the provisional agenda, as provided in Annex I.

2.2 Working arrangements

2.2.1 All documents submitted for the meeting are referenced and hyperlinked in the Documentation Plan (INF. 1), which had been posted on the WMO web site at:

http://www.wmo.int/pages/prog/www/DPFS/Meetings/RAI-EA-SWFDP-RSMT_Nairobi2011/docplan.html

2.2.3 The participants agreed its hours of work and other practical arrangements for the meeting, including the tentative work programme. Participants briefly introduced themselves, to facilitate interactions throughout the meeting. The list of participants in the meeting is provided in Annex II.

3. INTRODUCTION TO SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP)

3.1 Overall Framework

3.1.1 The Secretariat informed the meeting of the WMO SWFDP framework, including guidance from the Commission for Basic Systems (CBS), and introduced the basic documents: “SWFDP Overall Project Plan (2010)”, and “SWFDP Guidebook for Planning Regional Subprojects (2010)” that have been developed by the CBS Steering Group on the SWFDP.

3.1.2 The meeting noted that SWFDP aims to contribute to capacity-building and to help developing countries in particular to have available and implement the best possible use of existing NWP products for improving warnings of hazardous weather conditions and weather-related hazards. Global-scale products, as well as data and information provided by other regional centres, are integrated and synthesized by a designated Regional Specialized Meteorological Centre (RSMC), which, in turn, provides daily guidance for short-range (days 1 and 2) and medium-range (out to day-5) on specified hazardous meteorological phenomena (e.g. heavy rain, strong winds, etc) to participating National Meteorological and Hydrological Services (NMHSs) of the region. This is a “Cascading” concept of the forecasting process, which is further discussed under item 4.

3.1.3 The meeting noted that the “SWFDP Overall Project Plan (2010)” is a high-level document

targeting senior managers, which describes the SWFDP technical aspects related to weather forecasting (GDPFS) and public weather services (PWS) programmes; and general principles and conceptual framework for guiding project planning; while the "SWFDP Guidebook for Planning Regional Subprojects (2010)" provides a "template" and procedures for developing a Regional Subproject Implementation Plan (RSIP). The meeting noted that the development of an Implementation Plan for a SWFDP for Eastern Africa should follow the procedures as described in the Guidebook, with the required adjustments to address particular aspects of the region. The meeting further noted that the Implementation Plan would be reviewed by the Steering Group for the SWFDP prior to its implementation to ensure that the required procedures had been properly addressed. Both the "SWFDP Overall Project Plan (2010)" and the "SWFDP Guidebook for Planning Regional Subprojects (2010)" are available at: http://www.wmo.int/pages/prog/www/DPFS/Meetings/RAI-EA-SWFDP-RSMT_Nairobi2011/docplan.html. The RSIP for the SWFDP for Eastern Africa will be discussed in detail under agenda item 9.2.

3.2 Review the outcomes of the Nairobi Workshop (October 2010)

3.2.1 The meeting reviewed the outcomes of the Technical-Planning Workshop on Severe Weather Forecasting Demonstration Project (SWFDP) Development for Eastern Africa, which was held in Nairobi, Kenya, from 4 to 8 October 2010. Participants included representatives (forecasters and Agmet) of Burundi, Ethiopia, Kenya, Rwanda, Uganda and Tanzania. The meeting noted that the participants in this workshop unanimously agreed in principle that the implementation of an SWFDP in Eastern Africa would be technically feasible and would bring benefits in terms of enhancement of technical capacity in operational weather forecasting and advancement in service delivery to the general public and key application areas such as agriculture and fisheries, in countries of the region. The meeting further noted that the workshop recommended that proposed regional subproject should focus on the following severe weather events in order of decreasing priority (and associated hazards such as flooding, droughts, etc):

(a) Heavy rain/flooding and deficit of precipitation/dry spells;
(b) Strong winds in relation to thunderstorms and any other phenomena over the Indian Ocean and major lakes;
(c) Hazardous Indian Ocean and major lake waves.

3.2.2 The meeting was informed that the workshop discussed various aspects of the planning of a SWFDP, following guidelines as laid out in the "SWFDP Guidebook for Planning Regional Subprojects (2010)", including the domain to be covered for monitoring, analyzing and predicting the various severe weather events (proposed to be bounded by 5E – 55E; 30N – 25S), and a specific domain for the Lake Victoria (proposed to be bounded by 26E – 36E; 3N – 4S). The meeting agreed that these domains should be reviewed under agenda item 9.2, during the discussion of the Regional Subproject Implementation Plan (RSIP). The full workshop report is available on the WMO Web site at http://www.wmo.int/pages/prog/www/CBS-Reports/documents/Final_report_SWFDP-Eastern_Africa-Nairobi_workshop.pdf.

3.2.3 The meeting noted that a preparatory training on severe weather forecasting and warning services in support of disaster risk reduction, and fishing and farming communities, was conducted in Dar-Es-Salaam, Tanzania, from 18 to 29 October 2010, to ensure that NMHSs in the region start familiarizing with the various NWP/EPS, satellite-based and guidance products that will be made available through this project, from the major NWP and satellite centres, and to prepare user-focused information. To this end, the training included one week training on the use of NWP/EPS and nowcasting guidance products for severe weather forecasting; the second week was focused on the delivery of forecast and warning services to key users (including general public, agriculture and fisheries) in the context of emergency preparedness and response. The training involved end-user communities. The meeting was informed that within the framework of the SWFDP, such training workshops will be carried out annually.

3.3 World Bank Development Grant Facility (DGF) Project: "Support for the Weather and Climate Service delivery in the Lake Victoria Region"

3.3.1 The meeting noted that a World Bank Development Grant Facility funded project "Weather and Climate Service Delivery in the Lake Victoria Region" has been established with the aim of enhancing the security of the livelihoods of farmers and fishermen in and around Lake Victoria. The project involves three countries (Kenya, Tanzania and Uganda), and has two main components:

a) improving agricultural productivity through increased access to weather information for agricultural decision making; and
b) Reducing loss of life due to severe weather and climate by improving the reach of tailored forecast products from NMHSs to fishing communities and farmers in case of severe weather and climate-related events (drought, etc.).

3.3.2 The meeting further noted that through this World Bank funded project, funds have been made available to support certain components of the SWFDP for Eastern Africa. The project will run until the end of the year 2012.

3.4 Other relevant project initiatives in the region

3.4.1 The meeting was informed about two projects in the region which have synergy with the development and delivery of the SWFDP.

Mobile Weather Alert

3.4.2 The meeting was informed about the continued collaborative pilot project "Mobile Weather Alert" between Uganda Department of Meteorology, WMO, Ericsson, MTN and the National Lake Rescue Institute. This builds upon the work started through the WIFA initiative and is mainly focused on piloting the use of mobile phone technologies to communicate forecasts and warnings to farmers and fishermen in the Lake Victoria region. The meeting agreed that the completion of the SWFDP is essential to help develop the capacity within NMHSs to deliver reliable and accurate forecasts and warnings to be disseminated in this manner.

3.4.3 The pilot to the fishermen in Uganda has been running since May 2011. The meeting agreed that an important component of the Uganda pilot will be a full evaluation of the benefits of the warning and forecast service and the development of business case, for the wider rollout of the initiative. The pilot will also include a trial of the quality of data from Automatic Weather stations installed at mobile phone mast sites and address issues of data integration and lake observations. The project will be looking for options to extend the pilot to Tanzania in the near future and to start developing mobile phone applications for the farmers.

3.4.4 The benefits of the proposed project over the next 12 months are as follows:

- Reduction in the frequency of deaths on Lake Victoria
- Improved capacity amongst pilot communities to respond to warnings of severe weather
- Increased capacity to deliver effective warnings
- Sustainable increase in observations

3.4.5 The meeting recognized that the synergy between SWFDP and other initiatives in the region would optimize the benefit to NMHSs, disaster management, the agricultural and fishery sectors and ultimately the end users.

Early Warning System in Rwanda

3.4.6 The meeting was informed that Rwanda Environmental Management Authority (REMA) has allocated funds for a project with a component on meteorology, which will be used to enhance the

capacity of Rwanda Meteorological Service (RMS). In this context, a project proposal was developed for establishing an Early Warning System in Rwanda for flood-prone areas. The meeting agreed that the implementation of the SWFDP will help develop the capacity of RMS to produce better forecasts and warnings.

3.5 Synergy with and contributions to the EAC's NWP Strategy

EAC's NWP Strategy

3.5.1 Mr John Mungai (Eastern African Community - EAC) presented a strategic framework for the development of NWP in the East African Community region. There are five countries in the EAC (Burundi, Ethiopia, Kenya, Rwanda, and Uganda). The meeting noted that from the perspective of the EAC there was limited NWP capability in the region with only Tanzania and Kenya running NWP models. One of the objectives of this framework is to advance the science of NWP and its application in the region. The main goal is to work towards the proposed establishment of East African Centre of excellence in Medium-Range Weather Forecasting.

3.5.2 The meeting noted the strengths, weakness, opportunities, and threats analysis from the framework. The meeting agreed that this proposed East African Forecasting Centre provides opportunities for cooperation and investments, and that linkages should be made with SWFDP. The meeting noted that the EAC is ready to cooperate with partner states and international centres. In the short term, the framework recognizes that the regional states will continue to rely on international centres for NWP products but that in the long term, the goal should be the establishment of the centre.

3.5.3 The meeting commented that such a regional centre needs global NWP models to run regional models and that the funding for the establishment will cost several million US dollars. The meeting agreed that there is a need to do operational research on NWP in the East African region.

EAC Lake Victoria Meteorological Project

3.5.4 Mr Mungai then presented the EAC's proposed Lake Victoria Meteorological project. The goal of this project is to strengthen the Meteorological Services over Lake Victoria with a view to enhancing navigation activities and promoting sustainable utilization of resources in the lake and its basin. The project objectives include enhancing weather observations and dissemination networks on the lake, enhancing weather forecasting capabilities over the lake, and the development of human capacity for meteorological services over Lake Victoria.

3.5.5 The meeting noted that weather observations in and around the lake do need to be improved to provide better data for high-resolution models and for verification. Kenya is already working on establishing two fixed buoys in the Lake and a radar system that will cover most of the Lake. TMA also plan to install a radar at Mwanza. These and other future radars should be incorporated in a mosaic. The meeting noted that the EAC has hired a consultant which started working in May 2011 on the project proposal and that the proposal should be completed by September 2011. The meeting noted the possibility of linking this project proposal with other existing projects such as the OSTIA project. Lake surface temperature may be measured by fixed buoys or instruments on ships. The UK Met Office expressed interest in cooperating with EAC to kit MV JUMUIYA with met instruments.

4. CASCADING FORECASTING PROCESS: ROLES OF PARTICIPATING COUNTRIES

4.1 Global Products Centres

4.1.1 Representatives of Global Products Centres informed the meeting of the general features of their global and regional NWP production systems, including the kinds of NWP/EPS products that were and/or could be provided to the SWFDP for Eastern Africa, with focus on severe weather

monitoring and forecasting. In the absence of the representatives of NCEP and African Desk, and the ECMWF to the SWFDP, the Secretariat presented their reports.

DWD (Germany)

4.1.2 Dr Urlich Blahak outlined that the DWD has a longstanding tradition in supporting several (including African) countries (e.g., Kenya since 2001) with its regional model HRM (High resolution Regional Model), at the same time enabling KMD to continuously run the model through provision of initial and boundary data from the global model GME and staff training concerning the HRM. This should basically be the role of the DWD in the project. The necessary resources for support and custom-tailored data provision are already available at DWD, as such tasks have been and will be continuously fulfilled in the future also for several other countries.

4.1.3 Taking into account that very soon the resolution of GME will be increased from 30 to 20 km globally, Mr Blahak however emphasized that the LAM-component for SWFDP should plan for a considerably smaller grid spacing in the range of ~7 km ("large" domain over Eastern Africa) and (maybe) a very high resolution domain (< 3 km) over the Lake Victoria region. The meeting noted that HRM, due to its hydrostatic nature, is not designed for such a high resolution. Here, DWD offers to provide its currently operational non-hydrostatic COSMO-model (Consortium for Small Scale Modeling) in replacement for the HRM for free (in a ~1 year old version).

4.1.4 The meeting noted that a first case study was conducted at DWD with the proposed nested configuration GME – COSMO 7 km ("large" East Africa domain) – COSMO – 2.8 km (Lake Victoria domain), a setup which is similar to DWD's operational application for Germany. This was done mainly to test technical things like the newly generated external data sets (orography, land use, soil parameters) for Eastern Africa for these resolutions and the models general stability for tropical cases, with their much higher tropopause and model domain compared to mid-latitudinal applications. Results of this first case study were shown, which demonstrate that the COSMO model is generally able to run tropical cases. However, there was no attempt to conduct a proper verification of this experiment in comparison to data, except a qualitative comparison with satellite data. The latter showed that during daytime, convective precipitation was simulated qualitatively correct around the lake, and that precipitation amounts were considerably higher and spatially more confined in the 2.8 km model. Over Lake Victoria, a distinct see-breeze circulation was simulated in the 2.8 km model, which is an important precursor of convection over and around the lake. However, the meeting recommended that more systematic assessments of the forecast quality should be made in the future.

4.1.5 The meeting noted that the COSMO model for this simple test initialize the Lake Victoria surface temperature with simple climatological values representatives of the dates of the simulation. Noting that this may impact on the model performance, the meeting recommended the use of in-situ or satellite-based surface temperature data.

4.1.6 The meeting discussed the possibility of installing ocean/lake wave models (e.g. WAM-4, WaveWatch-3, SWAN) at a regional centre(s) using the input data (i.e. wind data) from a LAM (e.g. HRM, WRF). The meeting requested the Secretariat to explore its feasibility in coordination with relevant experts from global and regional centres.

Met Office (UK)

4.1.7 Mr Steve Palmer informed the meeting that the Unified Model is the product of cooperation between a number of National Meteorological Services. In particular the UM is used by the Met Office and South African Weather Services (SAWS). The Met Office makes model products available to African NMHSs as part of the Met Office contribution to WMO VCP, and through the SWFDP, and expects to continue with this active support. The meeting noted that SAWS are currently connecting to the RA-VI RMDCN communications cloud. This will enable SAWS to provide GRIB files from their operational UM to Eumetsat for transmission on EuMetCast.

4.1.8 The meeting noted that currently, the Met Office runs the UM globally with a resolution of 25 Km, with embedded Limited Area Models running at 12 KM resolution, including the latest implementation of the Met Office Africa LAM. Further models running at 4 Km resolution can be embedded either within the global model or a 12 Km model. A relocatable 1.5 Km model can be run on demand anywhere within a 4 Km model. The Met Office Africa LAM currently covers the region over Northern Africa to 8 deg S. Fields from this model are available as graphics on the website www.metoffice.gov.uk/weather/africa/lam. The meeting noted that if there is a requirement, GRIB files can be made available, but are not currently routed to EuMetCast or to any other NMHS. This model includes Dust, and a dust graphic will be added to the website soon.

4.1.9 The meeting noted that the UM Lake Victoria model is due to become operational in July 2011. This is running at 4 Km resolution on a 240 x 216 grid between 4.1 deg S to 4.5 deg N and 28.1 deg E to 35.9 deg E, with a timestep of 100 secs and running to T+48. Dissemination will be by graphics on the same website as the Africa LAM. If there is a requirement, GRIB files could be produced. Post-processing products may also be derived, including a potential diagnostic for strong convection.

4.1.10 The meeting noted that display of GRIB files on the forecaster workstation component of the PUMA2010 systems is currently limited to those GRIB files being transmitted when the contract was set up. The Met Office Africa LAM was unavailable on the forecaster workstations since the model was changed from 20 Km to 12 Km and the area changed. The Met Office (late June 2011) was changed these bulletins to mimic the old GRIB bulletins, but derived from the Global UM as a whole-Africa cut-out. It is expected that this set of products will continue for the long term, though resolution could be increased with future changes to the Global UM, if this can be arranged with Eumetsat and the PUMA2010 support. A meeting is being arranged by Eumetsat for late June 2011 to decide on a strategy for future additions and upgrades to the products transmitted over EuMetCast.

4.1.11 Mr Palmer informed the meeting of the future plans for the Met Office UM, which expected to change in the first half of 2012 from the current 25 Km resolution to either 20 Km with enhanced physics or 16 Km. Once this change happens, the current 12 Km models will be obsolete, including the Africa LAM and the SAWS SA12. These will be replaced by 4Km models working over a larger area than at present. Limited domains running at 1.5 Km over major populations centres and other sensitive areas will probably become a routine feature, supplemented by the relocatable 1.5 Km which can be run on demand in areas where particular problems are identified, such as rapid cyclogenesis.

4.1.12 The meeting was informed that Met Office's support to African NMHSs will continue, but apart from the whole-Africa cut-out from the Global UM and the Lake Victoria 4 Km, models and products over other areas and resolutions have yet to be defined. There may be potential to increase the area of the Lake Victoria model, and/or add other domains.

NCEP and African Desk (USA)

4.1.13 On behalf of Mr Wassila Thiaw, the Secretariat informed the meeting that through the SWFDP – Eastern Africa, a wide range of forecast products, are available from NCEP via the African Desk website (http://www.cpc.ncep.noaa.gov/products/african_desk/cpc_intl/), including regional and sub-regional charts. In particular, this web site provides access to:

(a) Forecast soundings – using weather model data to create a forecast sonde output. Two locations per country participating in SWFDP have been set up. Noting the relevance of such product for tropical areas, the meeting requested NCEP to consider providing forecast soundings for more locations.
(b) Satellite rainfall estimates;
(c) Real time monitoring of Monsoons rainfall maps: 7-days, 30-days, 90-days and 180 days.

4.1.14 The meeting noted that NCEP and NWS provided workstations and Weather Research Forecast (WRF) model codes to be run at 8 NMHSs within southern Africa and Eastern Africa. The meeting further noted that NMHSs in Ethiopia, Kenya and Tanzania run WRF. The model has been running with initial and boundary conditions provided by the GFS. Recognizing the challenges related to limited area NWP modeling at NMHSs, NCEP invited countries that were provided with the capacity to run the WRF model to continue to send feedback on model runs and access to boundary conditions to enable efficient use of the model. In this context, the meeting requested NCEP's assistance to implement the data assimilation component of WRF at NMHSs in Ethiopia, Kenya and Tanzania.

ECMWF

4.1.15 On behalf of Dr David Richardson, the Secretariat informed the meeting that ECMWF has a cooperation agreement with WMO and actively supports its work. The meeting was pleased to note that ECMWF has indicated its support to the SWFDP. For the SWFDP – Southern Africa and SWFDDP – South Pacific Islands, ECMWF has been providing a range of products from both the deterministic forecasts and the Ensemble Prediction System (EPS), focusing on early warning for severe weather. These are provided as graphical products, mainly as charts focused on the region of interest for the SWFDP. The products are accessible via the ECMWF web site (see http://www.ecmwf.int/about/wmo_nmhs_access/index.html), on a password-protected page. For the SWFDP – Eastern Africa, ECMWF will also be able to provide a range of products from its high-resolution deterministic forecast and its ensemble prediction system (EPS). These products will be aimed at providing indication about the risk of severe weather. Initially these would be based on the existing product range, plotted on the geographical area of interest for the SWFDP, and would include:

- probabilities of precipitation and winds exceeding given thresholds;
- extreme forecast index (EFI); identifies locations where the ensemble is substantially far from the model climate, indicating potential severe event;
- tropical cyclone tracks and strike probability maps;
- site-specific forecasts for surface weather parameters (EPSgrams) for specified locations (up to 10 stations for each participating country);
- Ocean waves exceeding given thresholds (2m; 4m; 6m; and 8m).

4.1.16 The meeting noted that all products would be updated twice a day with forecasts from 00 and 12 UTC; and an archive of the previous 7 days would also be provided to assist in evaluation. All products will be provided in graphical format on the ECMWF web site (password-protected). ECMWF will consider requests for additional products to support the SWFDP, but the resources required to undertake the work will need to be taken into account.

4.1.17 The meeting noted that ECMWF encouraged and supported evaluation of the SWFDP, and requested participants to provide feedback on the application and usefulness of ECMWF products during the project. The meeting also noted that ECMWF had prepared a guide to the use of its EPS products for WMO Members. The guide also includes the additional products that are available to the participants in SWFDPs.

4.2 Regional Centres

4.2.1 Representatives of Regional Centres informed the meeting of their roles and contributions to the project.

RSMC Nairobi (Kenya)

4.2.2 The meeting noted that the RSMC Nairobi (Kenya) will act as the lead regional centre for the SWFDP – Eastern Africa, including (among other activities) the responsibility for the development and management of a dedicated project Web Portal. KMD will make available outputs from the High Resolution Regional Model (HRM) and the Weather Research and

Forecasting (WRF) model, and will be responsible for synthesizing all available and relevant products and information, and making the best use of all these products for diagnosing the convective systems, in order to provide daily severe weather forecasting guidance for the entire project footprint to NMHSs in Eastern Africa region (day-1 to day-5, and an outlook for days-6 to 10).

TMA (Tanzania)

4.2.3 The meeting noted that TMA (Tanzania) has been benefiting from participating in the SWFDP – Southern Africa and will be able to share its experience with participating countries in the proposed SWFDP – Eastern Africa. Therefore, TMA will assist RSMC Nairobi, as appropriate. The meeting also noted that TMA's major role and contribution to the project relates to the Lake Victoria component. Details under agenda item 4.4.

4.3 National Meteorological Centres

4.3.1 The representatives of Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda presented the status of weather forecasting especially for severe weather, and the means of disseminating and communicating such information for the benefit of the general public and socio-economic sectors, in particular agriculture and fisheries. The relationship with disaster management and civil protection authorities and the media, as well as with agricultural and fishery agencies, was also addressed.

Burundi

4.3.2 The meeting noted that Burundi NMHS does not run any numerical model. However, the Burundi NMHS has established a high speed internet connectivity, which enables the access to NWP products from global centres, including NOAA/NCEP, ECMWF, etc. that are used for improving forecasts and warnings of severe weather warning in the country. Burundi NMHS also has access to satellite-based products.

4.3.3 The meeting noted that Burundi is impacted by a number of severe weather and extreme events, including: (i) rainstorms; (ii) hailstorms, particularly over the high ground region called Nile/Congo Crest region, which is a high ground crest dividing the two river basins in the country; (iii) strong and devastating winds; (iv) floods (flash foods and river bank flooding); (v) drought , particularly over the Northeastern part of the country (Bugesera ecological region); and (vi) landslides over mountainous parts of the country.

4.3.4 The meeting noted that Burundi NMHS is issuing (on a daily basis) weather forecast bulletins to the general public and other socio-economic sectors through various media (i.e. national broadcasting radio, emails and newspapers). It also noted that Burundi NMHS does not have yet a studio for Television presentation, which would enhance weather information dissemination to users. The users are, among others, the general public, farmers, various governmental institutions (including the Ministry of Agriculture and Livestock, the Ministry of Water and Environmental Management, and the Disaster Management and Civil Protection Authority), and international agencies such as FAO and World Food Programme (WFP).

Ethiopia

4.3.5 The meeting noted that the National Meteorology Agency of Ethiopia (NMAE) uses NWP products from different Global Centres, including the ECMWF and the Met Office UK. For seasonal forecasting, the NMAE uses products from NOAA CPC and IRI. The NMAE also runs two models: WRF and MM5 experimentally and has good Internet facilities.

4.3.6 The meeting noted that floods and droughts are the major hazards affecting Ethiopia. The National Meteorology Agency of Ethiopia issues warnings of heavy rain when rainfall amount may exceed 30mm and of droughts if the amount of rainfall expected to occur is much below normal for

an extended period. Forecasts and warnings are disseminated to Prime Minister; D/Prime Minister; Ministry of Rural Development; Ministry of Agriculture; Ministry of Water Resources; Disaster Risk Management and Food security Sector (DRMFSS) and EPPC; Regional States; Dam Administrators; Mass Media; Universities, colleges; Research Centres; etc. The National Meteorological Agency of Ethiopia (NMAE) has a TV broadcasting system, by which it disseminates the forecasts in four languages: 1 international language, 1 national language, and 2 local languages.

Kenya

4.3.7 The meeting noted that the operational HRM-Kenya is based on GME data at 30 km horizontal resolution and 60 vertical levels. HRF-Kenya Model domain (Mesh size: 0.125° ~ 14 km) extends from latitudes (12^0 S, 12^0N) and longitudes (26^0E, 51^0E). WRF Environmental Modelling System (EMS) is a complete, full-physics NWP package that incorporates dynamical cores from both NCAR/ARW and NCEP Non-hydrostatic Mesoscale Model (NMM-WRF) releases into a single end-to-end forecasting system. WRF has a similar domain as HRF-Kenya and 15.5km horizontal resolution. Verification of the two models is ongoing. The meeting noted that KMD does not run a wave model but gets access to wave model outputs at 50km resolution.

4.3.8 The meeting noted that KMD is increasing its observational network, including 36 synoptic and agrometeorological stations, 3 upper air observing stations (radiosondes), 17 hydro-meteorological AWSs, and 3 tide gauges along the Kenyan coast. Procurement process for the acquisition of three radar systems has started. Plans have been initiated to acquire and deploy Acoustic Doppler Current Profilers (ADCPs) in the Kenyan coastal areas of the western Indian Ocean, and 2 fixed buoys (with water and atmospheric sensors) in the Lake Victoria. The meeting encouraged KMD to share its observational data within the framework of the SWFDP, in particular considering its role as the lead regional centre for the project.

4.3.9 KMD has initiated measures to communicate and educate the communities on the impacts and mitigation required to avoid socio-economic losses emanating from weather-related disasters. In this context, KMD has been liaising with many stakeholders in disaster risk management, training and awareness programmes on hydro-climatic disasters, advocacy and outreach programmes to reach the communities and other users. These include school visits to KMD, interviews on TV and public call-in live, using local languages. All forecasts are communicated to the users through the Regional Directors of Meteorology (RDMs), RANET, Line ministries, FM Radio Station; including Electronic and Print Media.

Rwanda

4.3.10 The meeting noted that Rwanda Meteorological Service (RMS) prepares forecasts based on observations and products from global centres, including ECMWF (password protected), GFS (NOAA), etc. The meeting noted that the following severe weather events affect Rwanda: droughts, floods, landslides, strong winds, frost, hail storm and lightening.

4.3.11 The meeting noted that forecasts are disseminated through the Rwanda Television, radios, newspapers and Web site. Rwanda Meteorological Service issues 24-hours, 3-days, 10-days, monthly (30-days) and Seasonal (90-days) forecasts through media (i.e. radio, newspapers and TV). The RMS also provides specialized services to other sectors of the economy including: aviation, health, infrastructures, agricultures, water resources, energy, tourism, etc.

Tanzania

4.3.12 The meeting noted that TMA is putting more efforts in enhancing severe weather forecasting and warnings for disaster risk reduction in Tanzania by improving the observing system and modernization of computing system, from lower-speed category to a higher one computer system in order to improve the assimilation of synoptic data and remote-sensing. TMA uses global and regional NWP, and EPS products from ECMWF, RSMC UM-SA12, NCEP and its own NWP

products for severe weather forecasting. TMA runs the following limited-area models (LAM): the Weather Research and Forecasting (WRF; horizontal resolution 5-15km; forecasting length: 48-54h); the WRF-BOGUS for TC track during the TC season (horizontal resolution 10km; forecasting length: 48-72h) for experimental purposes; and the High Resolution Regional Model (HRM; horizontal resolution 14km; forecasting length: 78h), which are also used for severe weather forecasting.

4.3.13 The meeting noted that the primary severe weather phenomena that affects Tanzania are: (a) thunderstorms over the southern part Lake Victoria basin (Kagera, Mwanza and Mara regions); (b) hailstorms in north-west part of the country near Lake Victoria basin (Northern Kigoma and Kagera regions); (c) strong gusty winds during the hot season; (d) floods over some parts of the country (Kilosa part of Morogoro region); (e) drought particularly over the North-eastern part of the country (Kilimanjaro, Arusha and Mara regions); (f) large waves over south-western Indian Ocean and Lake Victoria, and (g) landslide over some parts of the country (Kilimanjaro regions).

4.3.14 The meeting noted that TMA regularly exchanges views with Disaster Management and Civil Protection Agency (DMCPA) regarding areas for required improvement, and regular meetings are conducted with participation of TMA, Prime Minister's Office, Disaster Management Department (PMO-DMD) and other Stakeholders for improved understanding of terminology used in forecasts and warning issued by TMA. In addition, TMA invites DMCPA and other stakeholders (Food security, Water resources, Health, Media, energy sector, etc) for one day discussion before issuing the press release for the seasonal outlooks (two times a year).

4.3.15 The meeting noted that TMA has a plan to increase the number of surface observation stations and developing a radar network. TMA has installed one Doppler weather RADAR with a range of 480 KM (with effective range of 200km) in the coastal zone (Dar-es-Salaam). The procurement process for the second radar is in place and a site for installation has already be identified in Mwanza, southern part of the Lake zone, with the coverage of the entire Lake Basin and countries within the Lake Victoria Basin. Tanzania is planning to install in total seven weather RADAR stations in the country in order to enhance the capability to monitor severe weather events not only in Tanzania but also the near bordering countries in project footprint. All these observational information are expected to be assimilated during the model run initialization and radar data imagery will likely be shared with the participating countries through the project.

Uganda

4.3.16 The meeting noted that the Uganda Department of Meteorology has been implementing the pilot project "Mobile Weather Alert", with the partnership of WMO, Ericsson, MTN and the National Lake Rescue Institute. Detailed information was presented under agenda item 3.4.

4.3.17 The meeting noted that the primary severe weather phenomena that affects Uganda are: floods, droughts, heavy thunderstorms, embedded CBs and squall lines, heavy dust storms (Karamoja and some parts of northern districts), severe haze (during June-July for southern part and December- January for northern), thick fog (south-western, and Entebbe airport), and mist (during rainy season in south-western). Forecasts are prepared based on observations (in situ and satellite-based) and on NWP products available from global centres.

4.1.18 The meeting noted that Uganda Meteorological Service issues daily, city, 3-day, 10-day, 3-months and 6-months forecasts. Daily forecasts are disseminated through e-mail and mobile telephones to identified users; and 10-day forecasts are provided to agricultural officers on districts (to help them in giving good advice and advisory to farmers on the onset and cessation of the wet season). Communications through the media is still a challenge. Regular workshops with stakeholders, including disaster managers, are held to address seasonal forecasting (e.g. droughts and floods).

4.4 Roles of and contributions by Centres for Limited Area Modelling over the Lake Victoria Region

4.4.1 The meeting noted that in addition to severe weather forecasting and warning services for the benefit of the general public and socio-economic sectors, in particular agriculture, for the entire project footprint, the SWFDP – Eastern Africa includes a specific component addressing severe weather forecasting and warning services over the Lake Victoria, addressing marine meteorological aspects for the safety and protection of fishers. The intention is to engage the search and rescue (SAR) community to ensure improved warning services would improve safe operations over the lake(s) of the region. A forecast and warning verification module is also part of this component of the project.

4.4.2 The meeting noted that both the Met Office UK and TMA will run high-resolution LAM over the Lake Victoria, and TMA will be responsible for synthesizing all available information and produce a daily severe weather guidance map for the Lake Victoria domain (day-1 and day-2).

4.4.3 The meeting noted that Kenya, Tanzania, Uganda and Rwanda have initiated the process for acquiring and installing radars covering entirely or partially the Lake Victoria region. Noting the importance of the radar data for severe weather forecasting and warning services for this region, the meeting encouraged that these data be shared among the participating countries in the project and a composite/mosaic be produced. Noting that there are data policy issues associated with such proposal, the meeting requested Mr John Mungai (EAC) to pursue this proposal with the Directors of the NMHSs in the region, within the EAC framework.

5. PROVIDING SERVICES TO TARGET USER GROUPS

5.1 The meeting agreed that the term Target User Groups in the SWFDP East Africa refers to 5 groups who need the services of the participating NMSs. These user groups may fall into a category with specific needs such as disaster managers, farmers and fishers, or be defined as the general public which forms a much broader group and whose information needs are broader and not so clearly defined. Media is a special user group since it functions both as a client and as a partner of NMSs and serves the role of intermediary in the provision of services and information to all other user groups. For the most part, national PWS programmes and activities provide public forecasts and warnings which meet most of the needs of these user groups, although in some cases, special products and services may be required which fall outside of the NMSs' PWS mandate.

5.2 Delivering PWS and other services to all user sectors mentioned above, needs to follow a number of stages which are similar in principle and which need to be applied to ensure the maximum benefit derived from those services by the intended users. These stages as contained in the WMO Strategy for Service Delivery are outlined below.

- Stage 1: User Engagement - identifying users and understanding their needs, as well as understanding the role of weather, climate, and water-related information in different sectors;
- Stage 2: Service Design and Development - process between users, providers, suppliers, and partners of creating, designing, and developing services, ensuring user needs are met;
- Stage 3: Delivery - producing, disseminating, and communicating data, products and information (i.e., services) that are fit for purpose and relevant to user needs; and,
- Stage 4: Evaluation and Improvement - process to collect user feedback and performance metrics to continuously evaluate and improve upon products and services.

5.3 To receive the information the public must be aware of the services available, and the means by which they can be received. Because of the breadth and diversity of this audience, the most effective means of reaching it are the mass media. For the public to believe the information, the NMS must have a public image of credibility, reliability, accuracy and timeliness. A forecast or warning is simply irrelevant if it is not communicated to those who might act on the information

contained therein, so NMSs need the media in order to provide a service to the ultimate end-users of public weather services. Therefore, a dialogue, or two-way communication, needs to be established with media representatives through which NMS personnel can gain a full understanding of the media concerns while the media representatives can gain an appreciation of the information which can flow from the meteorological side. The development of solid working relationships with public safety and emergency management agencies, is vital to the success of the delivery of weather and warning services. NMSs should have a Disaster or Emergency Response Plan, also called a Standard Operating Plan (SOP), which clearly spells out individual and collective responsibilities in the face of catastrophic events, as well as identifying responsible managers and other key contacts, focal points and spokespersons, backup responsibilities of individual offices, and procedures for emergency communication. Overall, the Plan should describe in considerable detail how the Service will meet its mandated responsibilities in the face of a catastrophe. Experience in many countries has shown that time and effort invested in the development, maintenance and exercise of a good Emergency Plan or SOP will invariably yield substantial dividends when a real emergency occurs. Public forecasts can provide much useful guidance to agricultural communities by informing them of expected weather conditions in time to schedule farming operations. Similarly, upon receiving public forecasts or warnings, fishers can make decisions whether or not to put to sea (or the lake). Agriculture is a dominant activity in many developing countries and in some developed ones. Consequently, the provision of services to agriculture is a very high priority for many NMSs. Though much of the information of value to the agricultural community is somewhat specialized, NMSs in highly agriculture-dependant countries commonly treat applications of meteorology to this sector as part of their public weather services programmes and often supply very detailed and specialized products freely to the agricultural or rural community.

5.4 The meeting agreed that the public and other target user sectors expect to be warned of any natural hazardous phenomenon, and that the goal of any warning system is to maximize the number of people who take appropriate and timely actions for the safety of life and protection of property. To be successful, a warning programme strives to ensure that everyone at risk must receive the warning; understand the information presented; believe the information; personalize the information; make correct decisions; and, respond in a timely manner. The meeting highlighted all the important elements in a successful warning system, namely *Detection and warning, Communication, Response, Recommended action, Language, Dissemination and Communication*.

5.5 The meeting stressed that determination of forecast skill, timeliness and product accuracy, while an essential step, is not in itself sufficient for a meaningful programme evaluation of public weather services, which involves the usefulness of the products as decision support systems. This should be built within the forecasting process as an essential element of the SWFDP.

5.6 The meeting discussed the importance of providing education and raising awareness for all the Target User Groups and considered the different ways of providing such education for each group according to its requirements. The meeting agreed that provision of knowledge to the users constituted an essential element in the success of the SWFDP in the Eastern Africa region.

6. AGRICULTURAL APPLICATIONS

6.1 Mr Robert Stefanski (WMO Agricultural Meteorology Division) presented an overview of the agricultural applications for the SWFDP. The meeting noted that weather plays an important role in agricultural production. Weather forecasts from 1 to 14 days can provide useful information to agricultural decision-makers which include government officials, agricultural extension agents, farmers, ranchers, foresters, and fishers. These forecasts can be applied to tactical applications for agricultural which can provide assistance to operational decisions (cultivating, irrigating, spraying, and harvesting) based on current state and condition of crops. The meeting noted that on of the key issues in agrometeorology is to answer the following question: What are the weather / climate events that impact agricultural decision-making?

6.2 The meeting noted the successful example of the India Meteorological Department (IMD) in providing Agromet Advisory Services (AAS) to the country's farming community in the form of bulletins. These advisories are based on the IMD medium-range weather forecasts and are jointly prepared with IMD experts and agricultural specialists at respective state departments of agriculture and are tailored to the requirements of farmers in the given state. It was noted that a study concluded that the use of these advisories can increase crop yields by 9 to 21 percent and increase farmers profits by 10 to 29 percent.

6.3 The meeting was then presented with several issues related to agrometeorology that will need to be discussed for the implementation plan. The meeting agreed that he agricultural applications of this project will only be realized once the regional forecasting support functions of RSMC Nairobi and Tanzania have become operational. It was proposed that SWFDP Guidance could be used to improve 10-day agrometeorological forecasts that in existing agrometeorological bulletins.

6.4 The meeting noted that for this subproject, agrometeorological forecasts focus on two main agricultural activities: 1) crop and livestock production; and 2) fishing in Lake Victoria. Since agrometeorological information is dependent on specific agricultural activity and is very specific to a sub-region of each country, it will be difficult for Regional Support Centre on Agrometeorology to provide assistance for all sub-regions and all countries in the regional project. The meeting noted that this centre does not need to be established immediately and that it could develop dry spell or 10-day drought products linked with a seasonal climate forecast. The meeting further discussed this issue during the implementation plan section of the meeting (Document 9.2).

6.5 Mr Stefanski then presented the responsibilities of the Regional AGM Representative. The meeting discussed this issue in detail during the implementation plan section of the meeting (Document 9.2).

6.6 The meeting noted that various steps in providing agrometeorogical advice. The advice is developed by using local agrometeorological and farming information along with weather forecasts which then experts consider the options and consequent effects and then decide on the appropriate advices to be given to the farmers. The meeting noted that each country will need to start preparing to make agrometeorological forecasts crops. This means that the areas of main crop production and crop calendars should be developed or updated by liaising with the respective Ministries of Agriculture. In addition, a preliminary list of major weather impacts on crops for each region of the country should be identified.

6.7 The meeting then considered the issues of forecasting products for the fisheries sector. It noted that wind and wave forecasts for warnings will be needed for the fisheries communities so that they can make better decisions on when and where they can safely start their operations. The meeting agreed that this wind and wave warning is one of main application focus of this subproject. In addition, weather forecasting products for the lake can assist fishers in locating fish. Several parameters from an Expert Group from the WMO Commission for Agricultural Meteorology Expert Group was presented.

7. VERIFICATION OF FORECASTS AND WARNINGS; AND THEIR EVALUATION, INCLUDING USEFULNESS AND USER RESPONSE

Verification of forecasts and warnings

7.1 Mr Laurence Wilson informed the meeting about forecast verification activities that had been carried out as part of the Southern Africa SWFDP. The contingency-table methods were outlined, with emphasis on the data processing activities required to prepare the tables, and examples were shown of verification results prepared by NMSs in the Southern Africa SWFDP.

7.2 The planned verification method for the RSMC severe weather risk guidance chart was also shown. It was noted that the comparison of this chart with the hydroestimator product would provide valuable information on both the quality of the RSMC product and also the quality of the hydroestimator product. Since the hydroestimator product will be available also in the Eastern Africa SWFDP, the meeting recommended that this planned verification be carried out as soon as possible.

7.3 With respect to the verification of global model products, it was noted that no verification of any of these products has yet been completed for any part of Africa for surface variables. Current activities to rectify this situation were outlined: ECMWF has kindly provided a timeseries of their model and ensemble forecasts for all the Eastern Africa stations for which GTS data was received, for the 2010-2011 wet season. The UK Met Office is exploring possibilities to find the resources to provide data from its models and NCEP is looking into providing data also. This data will be used to set up verification exercises for the Training Workshop in the fall 2011.

7.4 The meeting recommended that the ECMWF internal diagnostic precipitation chart which compares forecast and observed precipitation amounts for Africa be released to the participants in the Eastern Africa SWFDP as further guidance on the performance of the ECMWF model.

7.5 The meeting noted that effective verification depends on the availability and free exchange of station data among the participating countries and between the participating countries and the global centres. It was further noted that relatively little data from African stations makes it onto the GTS in real time, and that much more data is routinely collected. The meeting strongly recommended that:

a) Attention be given to increasing the amount of data that is submitted to the GTS in real time, and to their respective metadata;

b) Participating countries make available historical time series of observations to the regional and global centres for use in verification.

7.6 The meeting nominated Dr Hamza Kabelwa (Tanzania) and Mr Vincent Sakwa (Kenya) to act as regional focal points on verification activities. It recommended that the observational data should be shared among the participating centres at least for the duration of the demonstration phase of the project, and therefore requested the NMSs representatives to address this issue within their Services. The meeting agreed that verification should also be carried out for the regional LAMs by the regional centres.

Evaluation: Usefulness and User Response

7.7 The meeting fully supported that the assessment of the utility or value of the services to users must be built within the forecast and warning system. Service evaluation determines whether PWS and other services are meeting user requirements and ascertains whether users understand the products and services provided and are making optimum use of them. To be effective, the service has to contribute significant social or economic benefits to its users. Consequently, evaluation must include an assessment of the value added to users by the products and services. Surveys are the common means of obtaining user feedback. The evaluation process should be kept simple with the aim of producing results which can be used when speaking with decision-makers and in response to media enquiries. The meeting was presented with some techniques on designing and conducting surveys. A summary guide on the preparation of surveys and examples of surveys from a number of NMSs are given on the PWS Programme Website: http://www.wmo.int/pages/prog/amp/pwsp/surveys.htm

8. DEMONSTRATION FRAMEWORK, FEEDBACK AND REPORTING

8.1 The meeting reviewed the template for a quarterly report, including the progress evaluation table to report on severe weather events (observed and forecast), which is provided in Annex III.

The meeting was informed of the national warning criteria (in-country thresholds for creating warnings are provided in Annex IV) and agreed on the criteria for alerting severe weather in the RSMC Daily Guidance charts, which would be:

- Heavy rain: ≥ 50 mm/24hr;
- Strong winds: ≥ 25 Kts;
- Ocean/lake large waves: ≥ 2m;
- Dry spells: up to 5 days (from LAMs); up to 10 days (from global models).

8.2 The meeting reviewed the progress in developing the project website/portal (snapshot of the current version of the project website/portal homepage provided in Annex V), and agreed that this should also include:

- A specific section for the Lake Victoria region (NWP and guidance products, including marine products);
- A specific section for verification products;
- A specific section to share observations (starting by those available on the GTS);
- A link to marine products for the coastal areas of the western Indian Ocean;
- An outlook for 6-10 days (guidance product for the project footprint);
- A link to the WMO project website (in development), which includes background and training materials;
- A link to relevant documentation about the LAMs used in the region.

8.3 The meeting agreed that the website should only include products that are currently available and additional products such as diagnostic products based on satellite imagery should be made available in future phases, pending their development and availability.

9. IMPLEMENTATION OF THE SWFDP IN EASTERN AFRICA

9.1 Regional Subproject Management Team

9.1.1 The meeting decided on its regional subproject management system and in particular the responsibilities of the members who were appointed to the Regional Subproject Management Team (RSMT). Membership was confirmed (list available in the Regional Subproject Implementation Plan), and Mr James Kongoti and Dr Hamza Kabelwa were unanimously elected chairperson and vice-chairperson, respectively.

9.1.2 The meeting nominated Ms Serwanja Nankya (Uganda) as the regional PWS/DRR representative. The meeting agreed that each country will nominate an AgM focal point to the Subproject Working Group on AgM. It also agreed that the regional AgM representative will lead the working group and will be a member of the RSMT. The meeting nominated Mr Isack Yonah (Tanzania) as the regional AgM representative.

9.2 Regional Subproject Implementation Plan

9.2.1 The meeting reviewed the draft Regional Subproject Implementation Plan, taking into consideration the *SWFDP Guidebook for Planning Regional Subprojects* (Rev. 2010), and discussed all components of the Implementation Plan, including the following aspects:

- Membership, chairperson of the RSMT, and the members' responsibilities*;*
- Lead RSMC responsible for SWFDP's "cascading process", being RSMC Nairobi;
- Responsibilities and products provided by global, regional and national centres, including those for agricultural applications;
- Role and responsibilities of Regional Forecasting Support Centre for the Lake Victoria Region, being TMA (Tanzania)

- Contributions by Centres for Limited Area Modelling over the Lake Victoria Region;
- Liaison with media and disaster management and civil protection at national level;
- Liaison with agriculture and fishery communities;
- Verification aspects, monitoring and evaluation, and reporting (severe weather events, and progress reporting of the project);
- Training aspects and plans;
- Timetable of implementation (milestones and responsible member).

9.2.2 The Regional Subproject Implementation Plan for the initial demonstration of the SWFDP is available at: http://www.wmo.int/pages/prog/www/CBS-Reports/documents/RSIP-SWFDP-EA.pdf.

10. ANY OTHER BUSINESS (AOB)

10.1 There were no other issues raised during the workshop.

11. CLOSING

11.1 The Meeting of the Regional Subproject Management Team (RSMT) of the Severe Weather Forecasting Demonstration Project (SWFDP) for Eastern Africa closed at 15:20 on Friday, 24 June 2011.

Annex I

AGENDA

1. OPENING

2. ORGANIZATION OF THE MEETING
- 2.1 Adoption of the agenda
- 2.2 Working arrangements

3. INTRODUCTION TO SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP)
- 3.1 Overall Framework
- 3.2 Review the outcomes of the Nairobi Workshop (October 2010)
- 3.3 World Bank Development Grant Facility (DGF) Project: "Support for the Weather and Climate Service delivery in the Lake Victoria Region"
- 3.4 Other relevant project initiatives in the region
- 3.5 Synergy with and contributions to the EAC's NWP Strategy

4. CASCADING FORECASTING PROCESS: ROLES OF PARTICIPATING COUNTRIES
- 4.1 Global: DWD (Germany), Met Office (UK), NCEP and African Desk (USA), ECMWF
- 4.2 Regional: RSMC Nairobi (Kenya), TMA (Tanzania)
- 4.3 National Meteorological Centres
- 4.4 Roles of and contributions by Centres for Limited Area Modelling over the Lake Victoria Region

5. PROVIDING SERVICES TO TARGET USER GROUPS
- 5.1 General Public
- 5.2 Media
- 5.3 Disaster Management
- 5.4 Farmers and Fishers

6. AGRICULTURAL APPLICATIONS
- 6.1 Potential need for a regional forecasting support centre on agrometeorology
- 6.2 Materials needed for preparing agrometeorological forecasts
- 6.3 Forecast products for fisheries

7. VERIFICATION OF FORECASTS AND WARNINGS; AND THEIR EVALUATION, INCLUDING USEFULNESS AND USER RESPONSE

8. DEMONSTRATION FRAMEWORK, FEEDBACK AND REPORTING

9. IMPLEMENTATION OF THE SWFDP IN EASTERN AFRICA
- 9.1 Regional Subproject Management Team
- 9.2 Regional Subproject Implementation Plan

10. ANY OTHER BUSINESS (AOB)

11. CLOSING

Annex II

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Annex III

QUATERLY REPORT OF THE SEVERE WEATHER REGIONAL SUBPROJECT (Template)

NMC : - - - - - - - -
PERIOD: (Start date to end date)

1. HIGHLIGHTS OVER THE PERIOD

2. OVERVIEW OF PRODUCTS

a. Usefulness of RSMC-Severe Weather Daily Guidance
b. Usefulness of SWFDP NWP/EPS Products received from each global centre and RSMC Limited Area Model (if available)

3. PROJECT EVALUATION AGAINST SWFDP GOALS

SWFDP GOAL	COMMENTS ON PROGRESS TOWARDS EACH GOAL	Questions to help you with an answer for each box
To improve the ability of NMHSs to forecast severe weather events		How did the products on the RSMC…….help you make better severe weather forecasts and warnings?
To improve the lead time of alerting these events		How much earlier do you issue severe weather forecasts & warnings now compared to before?
To improve the interaction of NMHSs with Disaster Management and Civil Protection authorities (DMCPAs), the media, each identified user sector, before, during and after severe weather events		Comment on any interactions with your disaster agency, media agencies and identified user sectors. If there hasn't been any since the last report, just say so.
To identify gaps and areas for improvements		What are the weaknesses in your forecast and dissemination systems?
To improve the skill of products from Global Centres through feedback from NMHSs		What weaknesses have you found in the products from RSMC …, UKMO, ECMWF, etc?

4. EVALUATION OF SEVERE WEATHER FORECASTS AND WARNINGS

A) Have you received any feedback from the general public?
B) Have you taken any actions to obtain feedback from the general public? Please elaborate on these actions.

Have you received any comments from the public on how they reacted when they heard or received the warnings?

C) Have you received any feedback from the particular user sectors identified in this project, in particular farmers and fishers?
D) Have you taken any actions to obtain feedback from these user sectors? Please elaborate on these actions.

What have been specific difficulties in getting these feedbacks? Please elaborate on these.
How have improved forecasts and warnings impacted the areas of activities of these sectors?

E) Have you had any feedback from the disaster management authorities about the timeliness and usefulness of the warnings?
F) Have you taken any actions to obtain such feedback? Please elaborate on these actions.

Have you had any comments from your emergency management organisations on how they worked with other organisations?

Did messages issued from your emergency management organisation were in agreement with the forecasts/warnings?

G) Have you received any feedback from the media?
H) Have you taken any actions to obtain feedback from the media?

How did the relationship with the media work in getting forecasts/warnings out as quickly as possible?

What particular issues or difficulties emerged in working with media during the period under consideration?

I) Complete the Progress Evaluation Table if you experienced a severe weather event

5. SUMMARY (general comments, challenges, etc)

6. CASE STUDY (PowerPoint presentation to include guidance products (RSMC and NWP), satellite imagery, warnings issued, impact evidence etc)

Case studies for each severe weather event ***DON'T*** need to be completed at the same time as the rest of this report.

Comment: Case studies don't need to be long. What's important is the learning experience that you gain from actually doing the case study.

Progress Evaluation Table (Use the information from the Severe Weather Event Evaluation Form)

Annex IV

NATIONAL WARNING CRITERIA

	Rwanda	Ethiopia	Kenya	Burundi	Tanzania	Uganda
Heavy PPT	>30mm/24hr	>30mm/24hr	>35mm/24hr	>30mm/24hr	>50mm/24hr	>50mm/24hr
Strong Winds	>20kts	X	>25kts	>25kts	>25kts	>20kts
Large Waves	X	X	>2.5m	X	>2m	>2m
Dry Spells	>15days	>10days	>9days	>7days	X	>10days

Annex V

SNAPSHOT OF THE CURRENT VERSION OF THE PROJECT WEBSITE/PORTAL HOMEPAGE