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| WORLD METEOROLOGICAL ORGANIZATIONCOMMISSION FOR BASIC SYSTEMSOPAG on DPFSMEETING OF THE RA-IV EXPERTS GROUP ON SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP)Miami, USA, 23-26 May 2017 |  | WDS-DPFS/RAIV-SWFDP-EG/Doc.3.1.2(12.IV.2017)\_\_\_\_\_\_\_Agenda item : 3.1ENGLISH ONLY |

INTRODUCTION TO SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT

**WMO Severe Weather Forecasting Demonstration Project (SWFDP)**

**Overall Framework**

*(Submitted by the Secretariat)*

##### Summary and purpose of document

This document provides information on the development of the WMO SWFDP, its regional subprojects, and the SWFDP framework as established by the Commission for Basic Systems, in two documents: the “SWFDP Overall Project Plan”, and the “SWFDP Guidebook on Planning Regional Subprojects”.

##### Action Proposed

The meeting is invited to review and consider this information to develop the Regional Subproject Implementation Plan (RSIP) for SWFDP-Eastern Caribbean.

**Reference(s):** - SWFDP Overall Project Plan

 - draft SWFDP Guidebook on Planning Regional Subprojects (2016)

**WMO Severe Weather Forecasting Demonstration Project (SWFDP)**

**Overall Framework**

**1. Introduction**

With the ever-increasing precision, reliability and lead-time provided by numerical weather prediction (NWP) systems, for weather forecasting and the provision of meteorological services, they have also become a very relevant component of routine and severe weather forecasting processes at National Meteorological and Hydrological Services (NMHSs).

WMO’s Severe Weather Forecasting Demonstration Project (SWFDP) is an initiative to further explore and enhance the use of outputs of existing NWP systems, including ensemble prediction systems (EPS). It is a cross programmatic activity organized within the Commission for Basic Systems (CBS) at WMO and lead by the Global Data Processing and Forecasting System (GDPFS) in close collaboration with several related WMO Programmes including Public Weather Services (PWS), Agriculture Meteorology (AgM), Marine Meteorology and Oceanography (MMO), Disaster Risk Reduction (DRR), Hydrology and Water Resources (HWR) and Tropical Cyclone Programmes.

The SWFDP aims is 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 through a ‘Cascading forecasting process’, from Global Centres to Regional Centres to National Centres, 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) or an agreed Regional Forecast Support Centre (RFSC) or Regional Forecast Support Facility (RFSF), which, in turn, provides daily guidance for short-range (days 1 and 2) and medium-range (out to day-5) on specified hazardous phenomena (e.g. heavy rain, damaging waves, etc) to the National Meteorological Centres of participating countries in the region.

SWFDP has proven to be successfully improving severe weather forecasting in several developing countries including least developed countries (LDCs) and Small Island Developing States (SIDSs) through improved access to, and more effective use of outputs of numerical weather prediction systems for weather forecasters, who in turn have improved the delivery of warning services. The SWFDP represents a systematic and practical approach for building capacity, and for transferring new knowledge and skills. The first ever SWFDP regional subproject was started in South-Eastern Africa in 2006 with participation of just 5 countries. The subproject was expanded in 2009 to include all 16 countries in Southern Africa and to span all seasons and a number of meteorological and related hazards (heavy rain, strong winds, large waves, cold temperatures, etc.). After successful completion of its demonstration and evaluation, the subproject entered into sustained operational mode in 2012. The SWFDP regional subprojects for the South Pacific Island States and Eastern African countries are in the full demonstration phase with main focus on heavy rains, strong winds, and damaging waves since 2011 and 2013. The SWFDP in South-East Asia also entered its demonstration phase in January 2016. The development of SWFDP regional subprojects for the Bay of Bengal and Central Asia regions has been in progress since 2012 and 2014 respectively. Both subprojects are ready to start their demonstration phases. The formal discussions and development planning process for initiation of SWFDP regional subprojects in West Africa, the Caribbean, and South-East Europe are also underway.

**2 Brief history, to now**

A Workshop on Severe and Extreme Events Forecasting was held in Toulouse, France in October, 2004 to discuss development of a demonstration project at WMO to improve severe weather forecasting and warning services of NMHSs in developing and least developed countries by making use of the NWP/EPS products to be made available to the NMHSs through a ‘Cascading forecasting process’, from Global Centres to Regional Centres to National Centres. The CBS-XIII (St. Petersburg, Russian Federation, 23 February – 3 March 2005) while noting the outcomes of the workshop, including general terms for the demonstration project (its goals, the roles of the participating centres, and the criteria), agreed that the DPFS programme should coordinate the implementation of SWFDP.

The CBS-XIII also agreed with the following goals of the demonstration project(s):

* to improve the ability of NMCs to forecast severe weather events;
* to improve the lead time of alerting of theses events;
* to improve interaction of NMCs with Disaster Management and Civil Protection Authorities (DMCPA) before and during events;
* to identify gaps and areas for improvements;
* to improve the skill of products from GDPFS Centres through feedback from NMCs.

A project Steering Group on SWFDP (PSG) was established which formulated a SWFDP Overall Project Plan and provided guidance in the form of a SWFDP Guidebook for the planning of SWFDP regional subprojects during its first meeting in Geneva, Switzerland in December, 2005.

The Executive Council in its fifty eighth session (Geneva, June, 2006) agreed that the SWFDP should be implemented, beginning with one regional subproject, as soon as possible relative to the season of the relevant severe weather phenomena. Subsequently, planning of the first SWFDP Regional Subproject in South-Eastern Africa (RA I) was initiated in July 2006 and the first realization of the SWFDP was implemented at the beginning of the rainy season in November 2006 with participation of five countries namely: Botswana, Madagascar, Mozambique, Tanzania and Zimbabwe. RSMC Pretoria (South Africa) is the integrating regional centre for the global-scale numerical weather prediction (NWP) products provided by the European Centre for Medium-Range Weather Forecasts (ECMWF), the Met Office, UK (UKMO), the National Centres for Environmental Prediction (NCEP, USA), as well as other information from RSMC La Réunion (France) specializing in tropical cyclones in the Indian Ocean, and RSMC Pretoria’s own NWP production system, such as a LAM NWP system (UM SA12), and satellite data products (e.g. METEOSat MSG). A regional subproject management team was established to manage the project implementation.

Training workshops were conducted in 2006 and 2007, targeting weather forecasters of the region who were carrying out the project’s implementation. While the first demonstration phase involving five participating countries ended in November 2007, and was fully evaluated, the subproject’s framework was maintained and the SWFDP continued to reap benefit for the participating NMHSs. Regular reports of the experiences of the participating countries in the SWFDP were extremely positive. The goals of the project of improved weather forecasting and warning service programmes were significantly realized, including for example, longer lead-times for alerting the public and national and regional civil protection agencies, and improved cooperation between NMHSs with their civil protection agencies. Some deficiencies were also identified, such as tools for forecasting the rapid onset of localized severe thunderstorms.

The Cg-XV (Geneva, Switzerland, 7-25 May, 2007) noted with satisfaction the significant development and progress of the SWFDP, from concepts to the first SWFDP regional subproject, implemented in the south-eastern region of Africa in 2006. The participating NMHSs recognized and appreciated the support from the global and regional centres. The Cg-XV noting the importance of accurate and timely severe weather warnings for Members and that if the SWFDP in South-Eastern Africa was successful, decided that its concept should be expanded and implemented throughout RA I and to other WMO Regions especially in developing countries.

**3. Congress Vision for SWFDP**

The Cg-16 (2011) approved a vision for the SWFDP as an end-to-end, cross-programme collaborative activity led by the GDPFS, in which the participants in the Projects:

(a) Make best possible use of all existing and newly developed products and facilities at the global, regional and national levels, including high-resolution NWP and ensemble prediction products, and very-short-range forecasting, including nowcasting, tools;

(b) Establish sustainable services of reliable and effective early warnings tailored to the needs of the general public and a wide range of socio-economic sectors in LDCs, SIDSs and developing countries;

(c) Ensure a continuous improvement cycle and quality assurance of services, including efficient and responsive feedback loops between the NMHSs and the end users at the national level

**4. SWFDP framework and Steering Group**

The general principles which guide the planning and implementation of SWFDP regional projects have been established by WMO’s Commission for Basic Systems (CBS), within the work programme of the OPAG on Data-Processing and Forecasting, in collaboration with the Public Weather Services (Programme). CBS has established a project Steering Group for the SWFDP, which has developed two documents: “SWFDP Overall Project Plan” and the “SWFDP Guidebook on Planning Regional Subprojects”. These two documents are subject to periodic review and updating by the Steering Group of SWFDP as experience has been gained though the regional projects. The last meeting of Steering Group of SWFDP was held in Geneva, Switzerland in March 2016.

The “SWFDP Guidebook on Planning Regional Subprojects” is a kind of recipe for developing a regional project, or, otherwise could be thought of as a template for developing an implementation plan for a subproject (called a “Regional Subproject Implementation Plan”, “RSIP”) that is to address identified severe weather forecasting and warning services issues of a particular geographical region. The conceptual framework for the SWFDP is the “Cascading Forecasting Process”, and training and capacity development are both supported through specific activities and the project’s organization. The Guidebook describes the planning process and the wide range of considerations for developing a subproject. The subproject implementation requires a management and accountability framework including a Regional Subproject Management Team, which sustains the implementation and review, through accountability at the level of the Permanent Representatives of participating countries. The participating countries and centres have important responsibilities and respective roles to play.

**5. The Four Phases of the SWFDP Regional Subprojects**

The development and implementation of SWFDP regional subprojects involves following four phases:

1. *Phase I: Overall Project Planning*

This phase includes: identification of the needs for support for NMHSs in consultation with concerned Regional Association; the preparatory work necessary to prepare the project specifications; to identify the possible participating centres; to select suitable regional subproject according to the geographical area, the type of severe weather and the chosen period for the demonstration; engagement of funding organizations; and the list of types of products to be exchanged.

1. *Phase II: Regional Subproject Implementation Planning and Execution*

This phase involves: preparation of the detailed specifications, for example: data and products to be exchanged, performance measurements, reviewing and reporting etc.; allowing the participants (representatives of the participating GDPFS centres) forming a regional subproject management team to develop the specific regional subproject implementation plan, including a training programme, and to manage its implementation; starting demonstration of the subproject which is likely to continue for 1-2 years; start submission of progress reports; identification of regional entity to take responsibility; and engagement with other projects providing similar support for related hazards (e.g. FFGS).

1. *Phase III: Regional Subproject Evaluation*

This phase includes: the analysis and the evaluation of the entire subproject as well as its contributions to the evaluation of the overall SWFDP with respect to the goals proposed initially; to identify gaps and deficiencies, and areas for improvement in order to ensure a sustainability of the organization tested during the demonstration; and to provide improved specifications including for other similar regional subprojects.

1. *Phase IV: Regional Subproject Long-term Sustainability and Future Developments*

This phase includes: long-term sustainability of the benefits gained and a process of continual improvement; to continuously take advantage of future capability and technology developments, and to foster broadening of activities in synergy with other WMO projects and programmes; and the responsibility for management, including seeking funding, lies with the relevant regional association or a regional entity identified by the regional association , while the PSG continues to be informed of developments and to provide advice as appropriate.

**6. Ongoing SWFDP Regional Subprojects**

1. **SWFDP-Southern Africa (Since 2006)**

Present Status:In Phase IV (fully operational including further developments)

16 countries\*:Angola, Botswana, Democratic Republic of the Congo, Malawi, Mauritius, Madagascar, Mozambique, Namibia, Lesotho, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe and Comoros

Contributing Regional Centres: RSMC Pretoria, RSMC-TC La Réunion (for tropical cycloe forecast support)

Contributing Global Centres: UKMO; ECMWF; NCEP/NOAA,

\*\* initially in 2006, the subproject was started with participation of just 5 countries in Southeast Africa and later in 2008 based on request by Members in Southern Africa it was decided to expand the subproject to include all 16 countries in Southern Africa.

1. **SWFDDP-South Pacific Islands (Since 2009)**

Present Status: In Phase-III (demonstration and evaluation)

9 Island States: Cook Islands, Fiji, Kiribati, Niue, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu

Contributing Global Centres: UKMO, ECMWF, NCEP/NOAA, JMA

Contributing Regional Centres: RSMC Wellington; RSMC Nadi; RSMC Darwin

1. **SWFDP-Eastern Africa (Since 2010)**

Present Status: In Phase-III (demonstration and evaluation)

7 countries: Burundi, Ethiopia, Kenya, Rwanda, South Sudan, Tanzania and Uganda

Contributing Global Centres: ECMWF; NCEP/NOAA; UKMO; DWD

Contributing Regional Centres: RSMC Nairobi; RFSC Dar Es Salam

1. **SWFDP-Southeast Asia (Since 2010)**

Present Status: In Phase-II (demonstration phase since January 2016

5 countries: Cambodia, Lao PDR, Philippines, Viet Nam and Thailand

Contributing Global Centres: CMA; JMA; KMA; ECMWF

Contributing Regional Centres: RFSC Ha Noi; RSMC Tokyo (for typhoon forecast support); RSMC New Delhi (for tropical cyclone forecast support)

1. **SWFDP-Bay of Bengal (Since 2012)**

Present Status: In Phase II (ready to start full demonstration)

9 countries\*\*: Bhutan, Bangladesh, India, Maldives, Myanmar, Nepal, Pakistan, Sri Lanka and Thailand

Contributing Global Centres: IMD\*\*\*; ECMWF; NCEP/NOAA; JMA

Contributing Regional Centres: RSMC New Delhi

\*\* initially the subproject was started with 6 countries and later in 2016 it was expanded to add 3 more countries

\*\*\* IMD is supported by National Centre for Medium Range Weather Forecasting (NCMRWF) and Indian Centre for Ocean Information Services (INCOIS)

1. **SWFDP-Central Asia (Since 2014)**

Present Status: In Phase II (in development, pilot demonstration since January 2016)

4 countries (4): Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan

Contributing Global Centres: RosHydromet; ECMWF; CMA; JMA; KMA

Contributing Regional Centres: RSMC Tashkent\*\*\*\*

\*\*\*\*While RSMC Tashkent is preparing to shoulder the responsibilities as a lead Regional Centre within the context of this subproject, RosHydromet (Russian Federation) is maintaining the project website

**7. Future directions**

SWFDP regional subprojects are funded through extra-budgetary resources. The development planning of SWFDP regional subprojects in West Africa, the Caribbean and Southeast Europe has already been initiated. Subject to availability of resources, the SWFDP will be expanded into other regions as well including Southeast Asia-Oceania, Central Africa, Middle East, South America, and North Africa.

**8. Conclusion**

The support and guidance, and the basic tools for developing and implementing SWFDP regional projects have been provided though CBS. Since its inception in 2006, SWFDP has made a steady progress. Started with just 5 countries in southeast Africa, now the project is benefitting to 48 developing countries including 31 LDCs and SIDS in various regions of the world. SWFDP has been admired in developing countries and has gained momentum due to its operational focus, simplicity and cost effectiveness for participating NMHSs.