Severe Weather Forecasting Demonstration Project (SWFDP)

Framework and Experience

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WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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World Meteorological Organization
Organisation météorologique mondiale

WMO's Global Data Processing and Forecasting System (GDPFS)

- **The GDPFS is the world-wide network of operational centres operated by WMO Members**
- **Its purpose is, in operational conditions, to make available among WMO Members, agreed products and services for applications related to weather, climate and water, and related environment**

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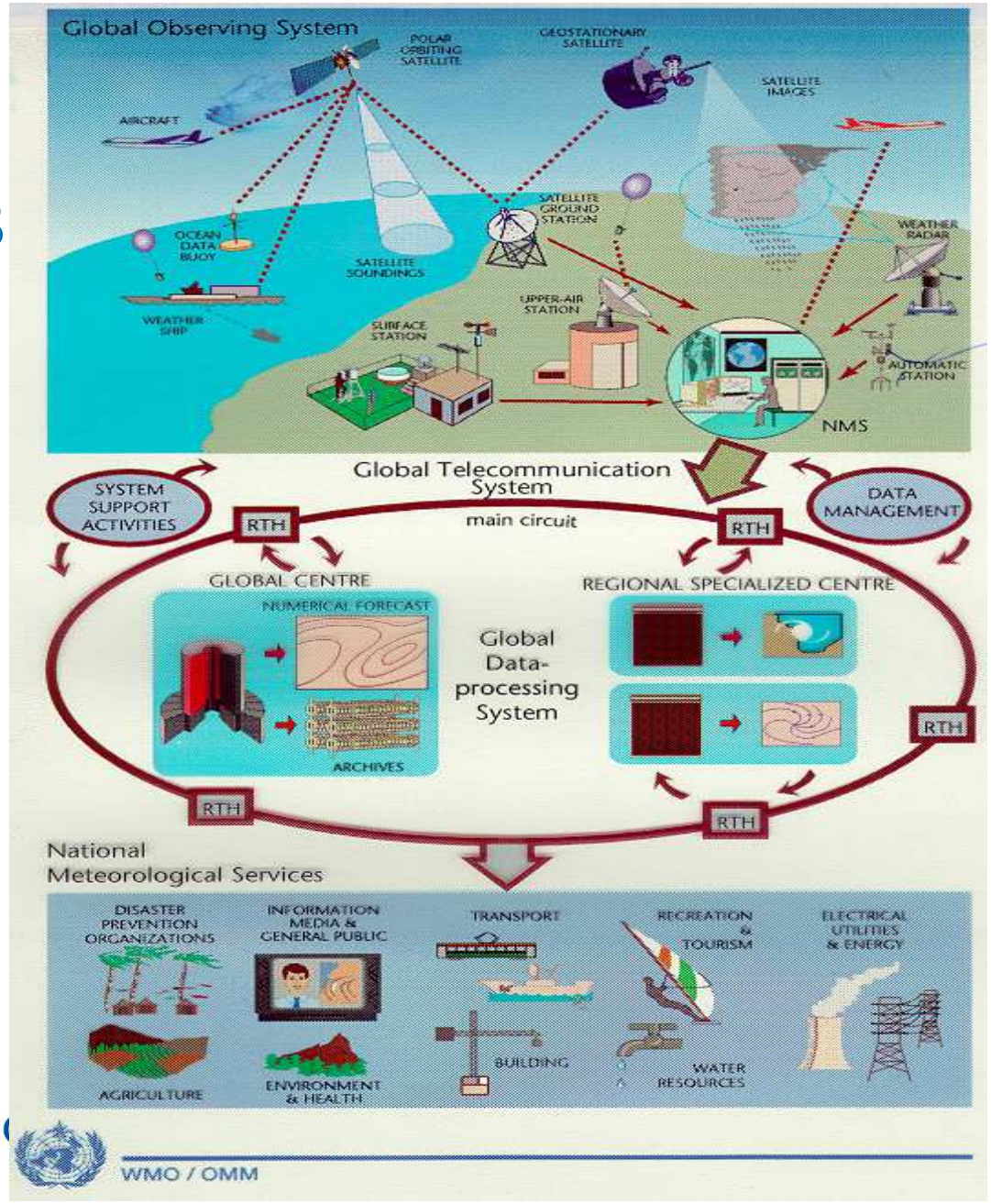
WMO operational networks

WIGOS

WIS

GDPFS

Service delivery



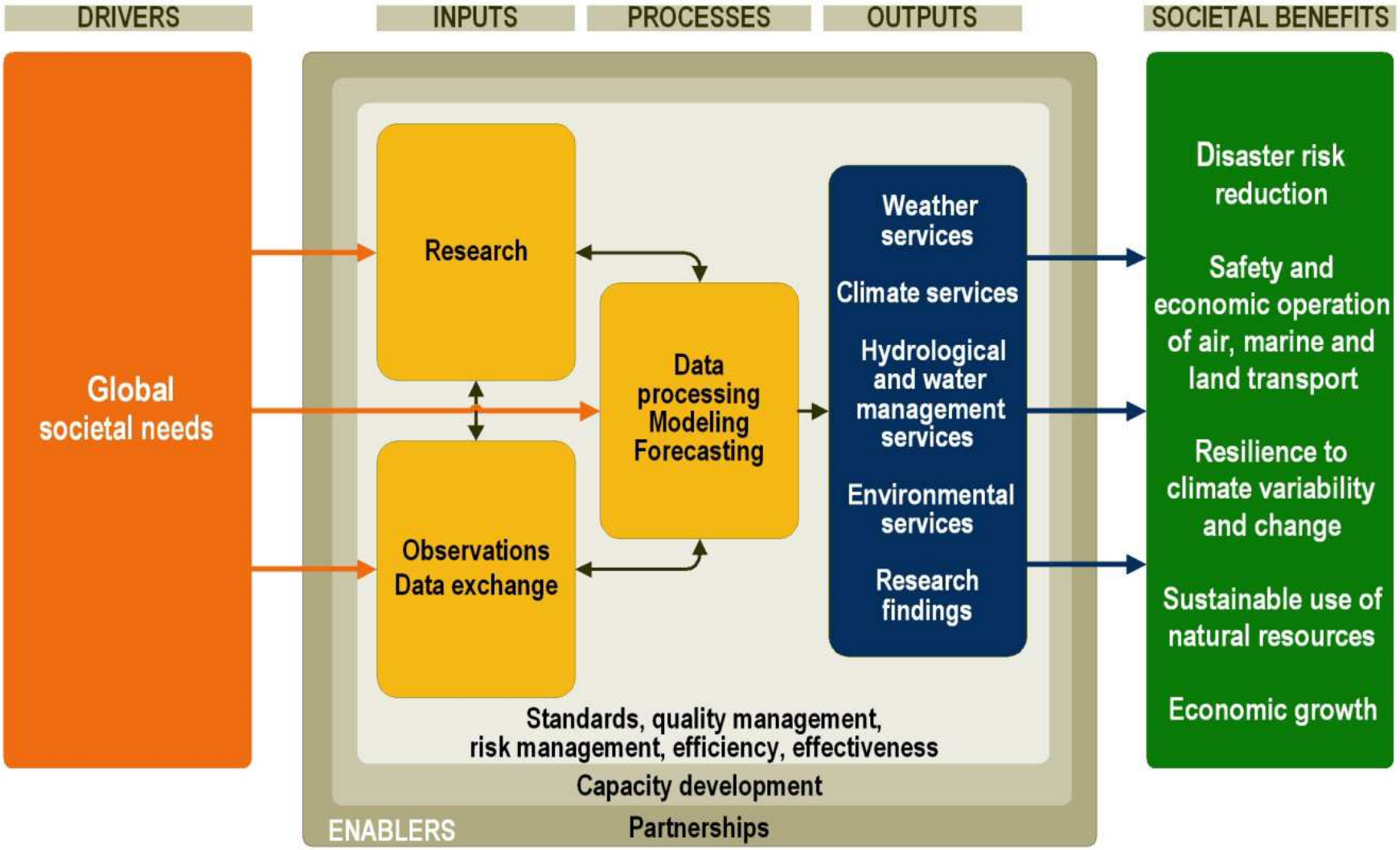
191 NMHSs: satellites, land, ships, buoys, and aircraft contribute to Global Observing every day

Global Telecom. System with Regional Hubs – becoming the WMO Information System (WIS)

The GDPFS: Global, Regional Specialized Met. Centres (RSMC, RCC), and National Centres

NMHSs deliver analyses, forecast and early warning services

GDPFS at the heart of the WMO operational system



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Source: WMO 2016-2019 Strategic Plan

Why a project on severe weather forecasting?

Basic function and Mandate of NMHSs:
To provide weather information and services for protection of life, livelihood, property, and infrastructure, and for application sectors including conservation of environment

Severe weather evets are responsible for hydrometeorological hazards and disasters

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Why a project on severe weather forecasting?

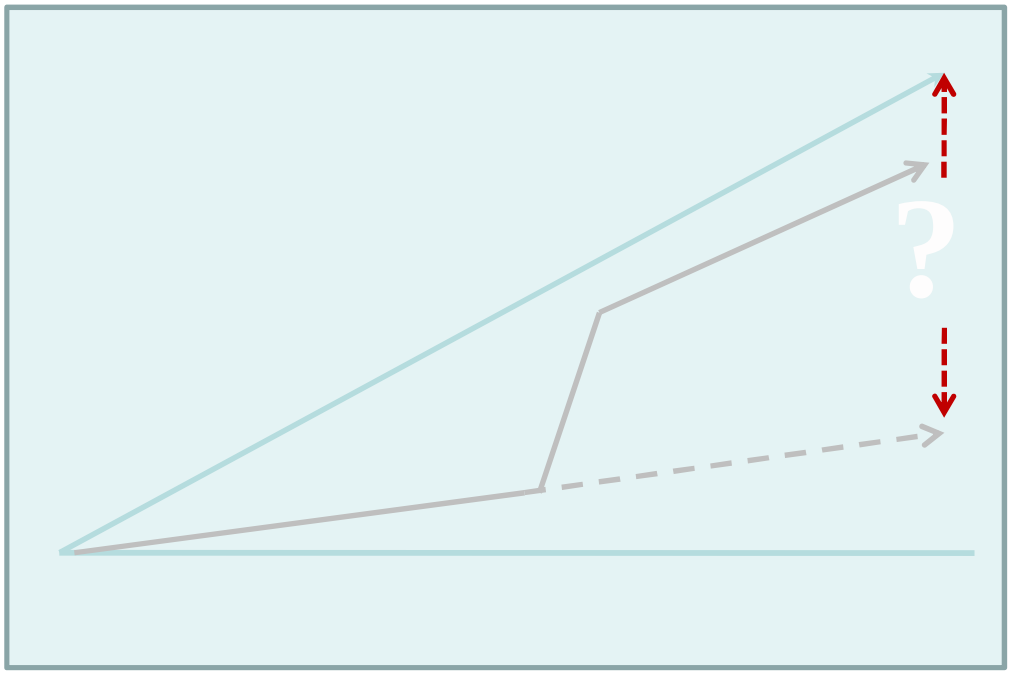
- Dramatic developments in weather and climate prediction science

- Leading to improved alerting of hydro-meteorological hazards, at ever-increased precision, reliability, and lead-times of warnings

- NMHSs in many developing countries (including LDCs and SIDSs) are generally less resourced

- Gap in application of advanced technology in early warnings (NWP and service delivery)

- WMO SWFDP attempts to close this gap, by applying the *'Cascading Forecasting Process'* (by making efficient use of the GDPFS centres)



Vision

WM Congress provided vision on NWP strategy to improve severe weather forecasting and warning services in developing countries

"NMHSs in developing countries are able to implement and maintain reliable and effective routine forecasting and severe weather warning programmes through enhanced use of NWP products and delivery of timely and authoritative forecasts and early warnings, thereby contributing to reducing the risk of disasters from natural hazards."

Cg-15 (2007)

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Realizing the Vision

Collaboration between GDPFS Centres and involvement of Public Weather Services (PWS) and other relevant Programs

To

Implement 'Cascading Forecasting Process' through SWFDP

(from Global to Regional to National)

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SWFDP framework and guidance

SWFDP started in 2006, is organized within the WMO Commission for Basic Systems (CBS) and taken care of by a Project Steering Group (PSG) established by CBS at WMO

PSG has developed SWFDP Overall Project Plan and provide guidelines for developing SWFDP Regional Subprojects

- *SWFDP Guidebook for Planning Regional Subprojects*

The SWFDP Guidebook is subject to periodic review and updating by the PSG. The last meeting of PSG was held in Geneva, Switzerland in March 2016 and the latest draft version of the Guidebook is available at the following:

http://www.wmo.int/pages/prog/www/DPFS/Meetings/RAIV-SWFDP_Martinique2016/DocPlan.html

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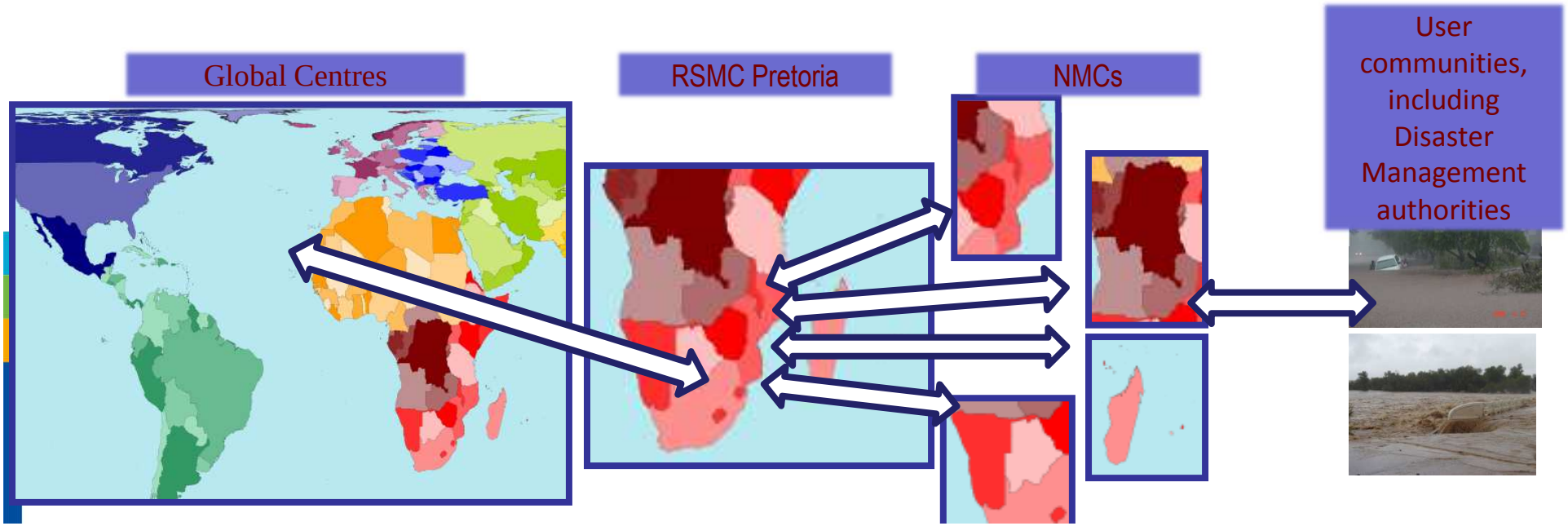
SWFDP 'Cascading Forecasting Process'

- *Global NWP* centres to provide available NWP/EPS and sat-based products, including in the form of probabilities, cut to the project window frame;
- *Regional centres* to analyses and interpret information received from global centres, prepare daily guidance products (out to day-5) for NMCs, run limited-area model to refine products, maintain RSMC Web site, liaise with the participating NMCs;
- *NMCs* have access to all products, and maintained responsibility and authority over national warnings and services; to issue alerts, advisories, severe weather warnings; to liaise with user communities, and to contribute feedback and evaluation of the project.



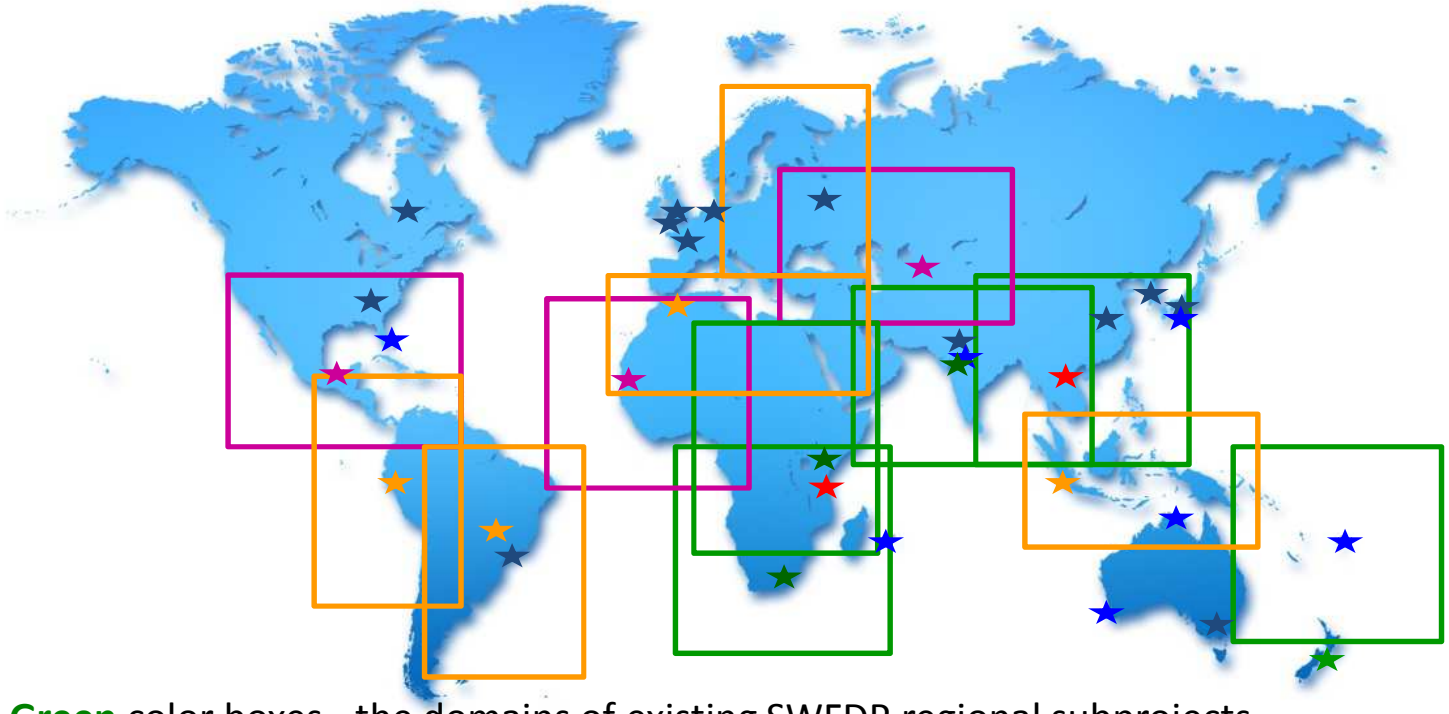
SWFDP

(ongoing regional subprojects and future directions)

SWFDP Strengths

- **Cost effective;**
- **Simplicity;**
- **NMHSs need internet only;**
- **Highly operational focus;**
- **Capacity development with improved forecasts and lead-time of warnings**

Depending upon the resources, the number of developing countries and LDCs to benefit from the SWFDP may grow to over 100 in next 5 years



Green color boxes - the domains of existing SWFDP regional subprojects.

Pink and **Orange** color boxes - the regions for future SWFDP subprojects which will be developed within next 1-2 years and 3-5 years respectively.

SWFDP
Implementation Process

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SWFDP Implementation process

Four Phases approach

Phase I: Overall Project Planning:

Establish regional partnerships including:

- Strong commitment by the participating Members (NMHSs) in a geographical area
- Identification & commitment of the possible Global and Regional Centres
- the types of severe weather to focus on (starting with a few top hazards)
- Preparation of products by global and regional centres

Phase II: Regional Subproject Implementation Planning and Execution:

- Establishing Regional Subproject Management Teams (RSMT)
- Regional & National Implementation Plans (RSIPs & IPs)
- Start prototype demonstration focusing on short to medium-range forecasting and warning services (1-2 years)
- Capacity development through specialized training programmes on forecasting and service delivery
- **Regular reporting:** Submission of Quarterly Progress Reports by the NMHSs (verification, feedback, tracking etc.)

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SWFDP Implementation process

Four Phases approach

Phase III: Evaluation of the SWFDP Regional Subproject and broaden (return to I or II if necessary):

- Evaluation of the progress reports
- Tracking and analysis for further improvement
- More countries, more hazards
- Continuous evaluation, training and reporting

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

- Sustain operations and expand partnerships through continuous development, regular trainings and sharing knowledge
- Future capability and technology developments, and to foster broadening of activities in synergy with other WMO Programmes
- Responsibility of management to be taken by the concerned Regional Association

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SWFDP Implementation process

Regional Subproject Management Team (RSMT) & Regional Subproject Implementation Plan (RSIP)

- Each SWFDP regional subproject is managed by a Regional Subproject Management Team (RSMT)
- The RSMT is mainly composed of the designated representatives of participating centres (global, regional and national) and generally chaired by the representative of the lead Regional Centre
- The RSMT is responsible to review and update the Regional Subproject Implementation Plan (RSIP), review the progress of subproject, outline the training needs of the region, define timeline and evaluation of demonstration etc.
- The responsibilities of RSMT and its members as well as of participating global, regional and national centres should be described in the RSIP.
- The RSMT is expected to meet once in every two years
- Participating national centres will develop their national implementation plans

SWFDP Synergies

SWFDP linkages are developed with relevant programmes and projects wherever appropriate to continue further developments, and to include more hazards to provide operational support for MHEWS

- Tropical Cyclones Programme (TCP)
- SAT-Nowcasting
- HWR-Flash Flood Guidance Systems (FFGS)
- MMO-Coastal Inundation Forecast Demonstration Project (CIFDP)
- WWRP

SWFDP Database

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SWFDP Database

WMO's Country Profile Database (CPDB) portal for SWFDP Database (integration, cost effectiveness, sustainability)

https://www.wmo.int/cpdb/

Submission of Quarterly Regular Progress Reports by NMHSs

Assessment of Global NWP/EPS products, performance of Regional Guidance and NMHSs warning systems, forecast evaluation (POD, FAR etc.), clients feedback etc.

SWFDP Database: an efficient (and paper free) way for submission of reports and SWFDP monitoring

Evaluation of the SWFDP Regional Subprojects

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SWFDP Database and Quarterly Progress Reports

Key elements & information to be reported in the Quarterly Progress Report

(to be submitted on-line through SWFDP database)

1. **Reporting Period** (Start date to end date)
2. **Severe events** (e.g. heavy rainfall, strong winds, high waves, flooding etc.)
3. **Reporting period highlights** (e.g. duration and amount of rainfall, impact of rainfall and/or strong wind and high waves, affected areas, damages (if any), coordination with disaster management offices etc.)
4. **Clients** (e.g. Disaster Management Offices, media, humanitarian organizations etc. New clients can also be added)
5. **Client feedback** (e.g. adequacy and effectiveness of the warning and how it was used etc.)
6. **Desired products** (e.g. NMHS may propose a demand for additional product(s) from global and/or regional centres if already not available etc.)
7. **Forecast Period and Area** (to provide information about area of responsibility of an NMHS and the period for which NMHS issues forecast etc.)
8. **Dissemination channels** (e.g. TV, radio, mobile SMS etc. New channel can also added)

Continues……

SWFDP Database and Quarterly Progress Reports

Key elements & information to be reported in the Quarterly Progress Report

(to be submitted on-line through SWFDP database)

9. **Observing Systems** (e.g. basic synoptic network, AWS network, radar and satellite information receiving stations etc.)
10. **Workshop** (to provide title, duration and summary outcome of the training workshops arranged for the forecasters, emergency managers, media, school officials, general public etc. during the reporting period)
11. **Product usage** (to select various products which are available from participating global and regional centres and are used in making forecasts at national level etc.)
12. **Local forecasting tools** (to provide information about the existing forecasting tools used at the NMHS and any new forecasting tool implemented at the NMHS etc.)
13. **Resources** (to provide information about the budget of NMHS and the number of forecasters and observers working in NMHS etc.)
14. **Case Studies** (to provide title and description of case studies related to the severe event(s) observed during the reporting period, key findings of the study etc.)
15. **Related projects** (to provide information about the on-going and new related projects etc.)

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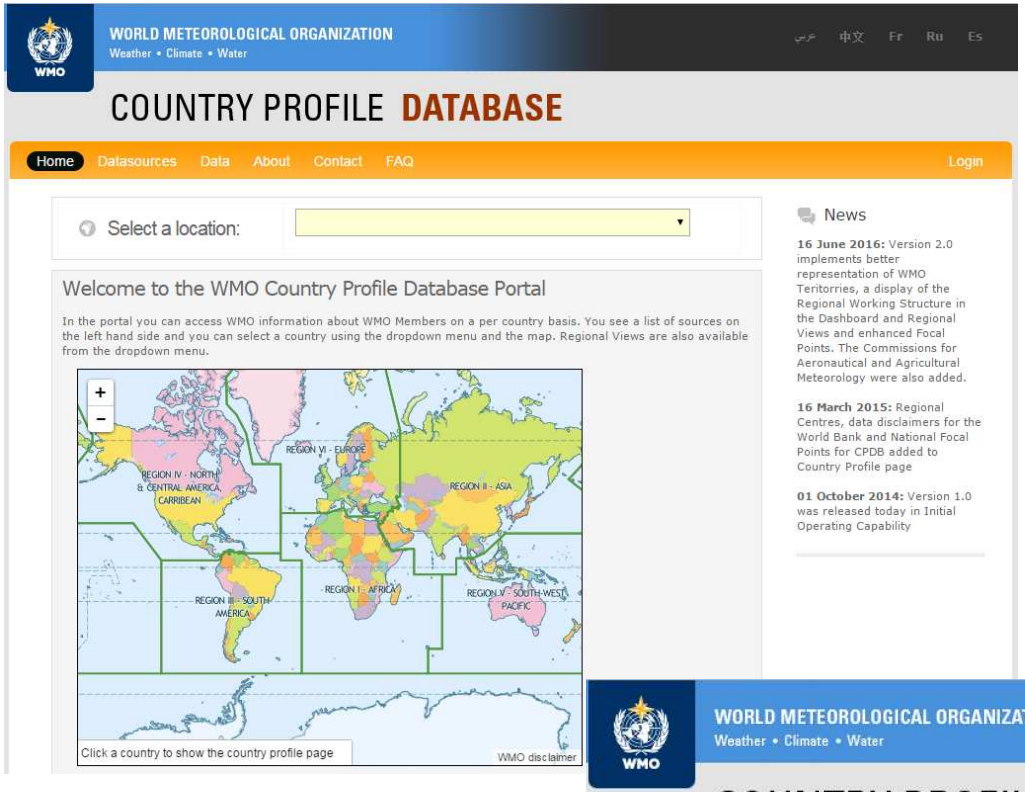
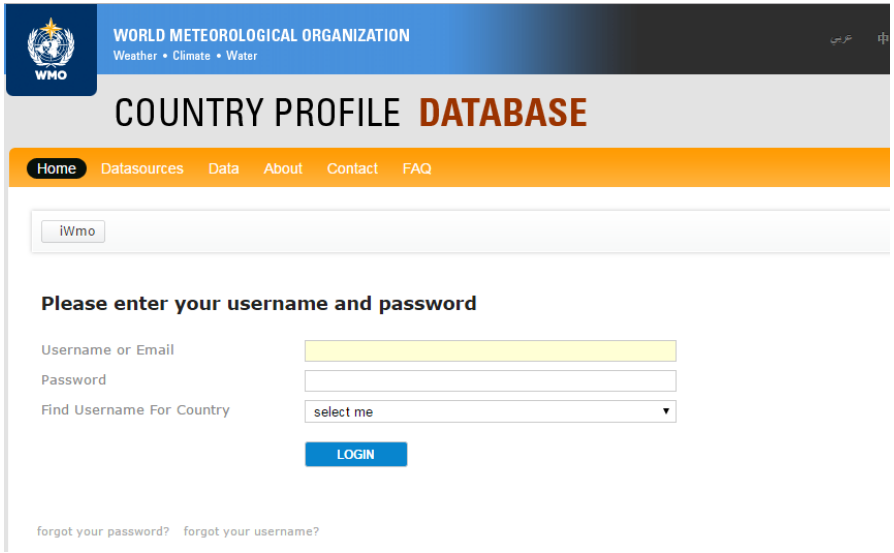
Submission of Quarterly Progress Reports through SWFDP Database

https://www.wmo.int/cpdb/





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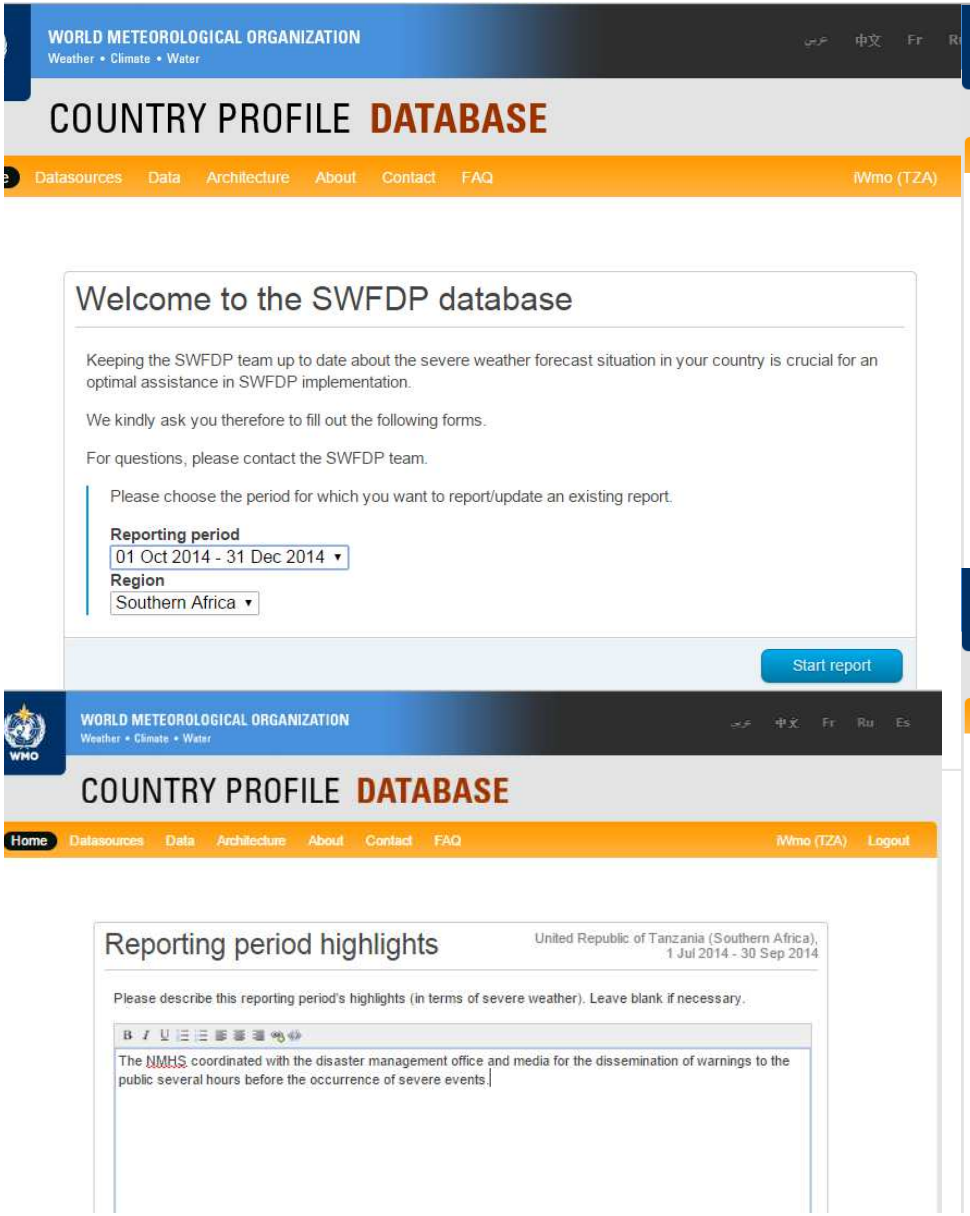
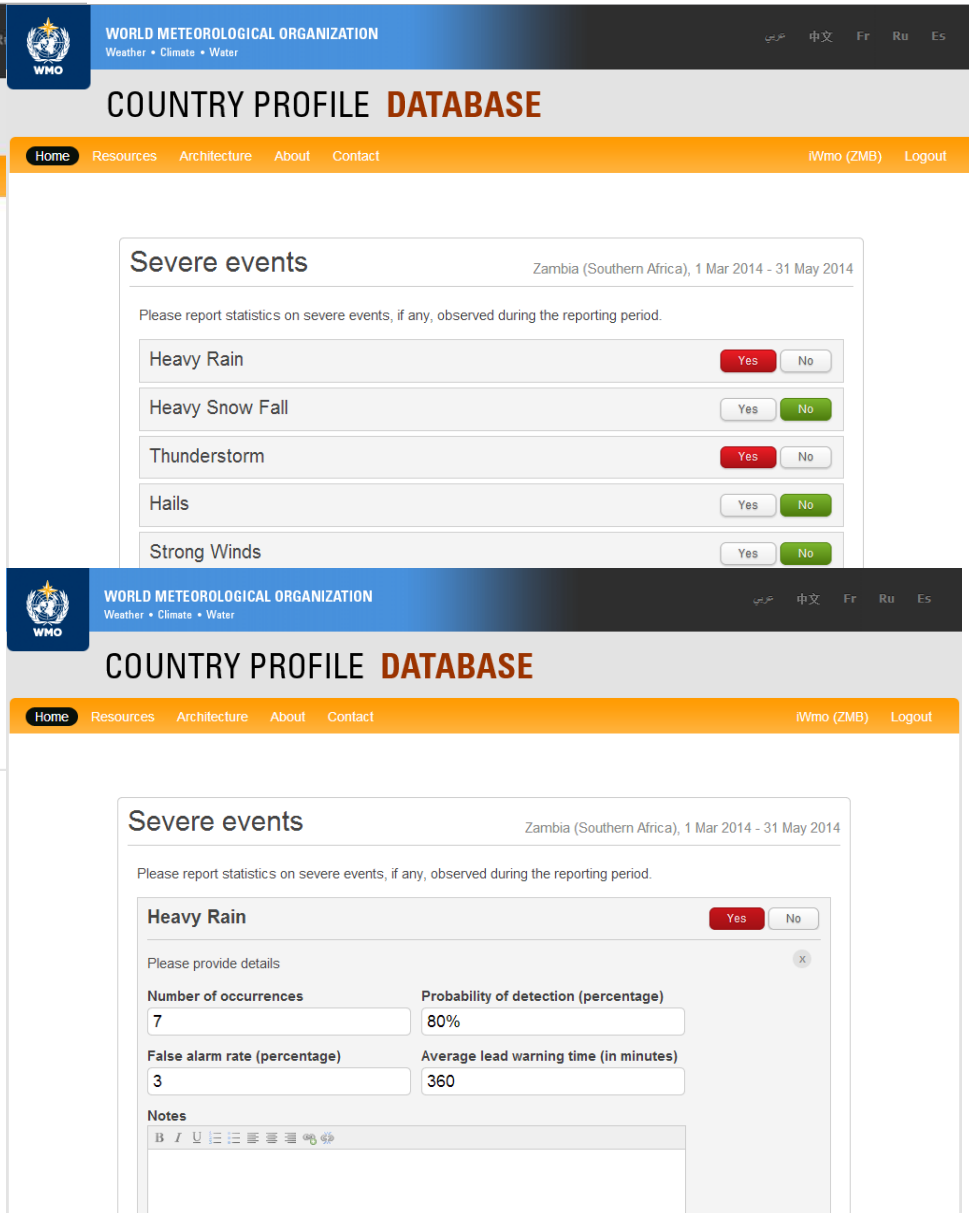
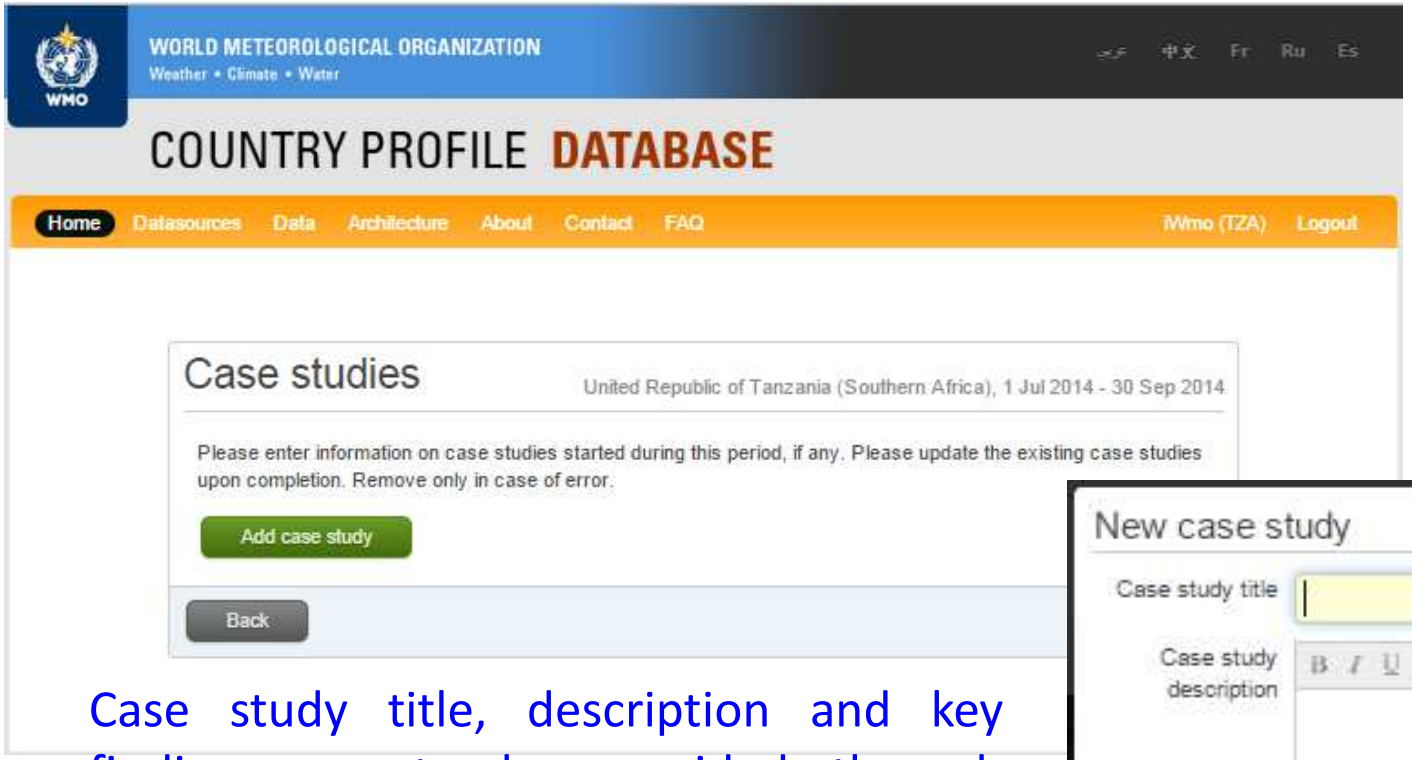
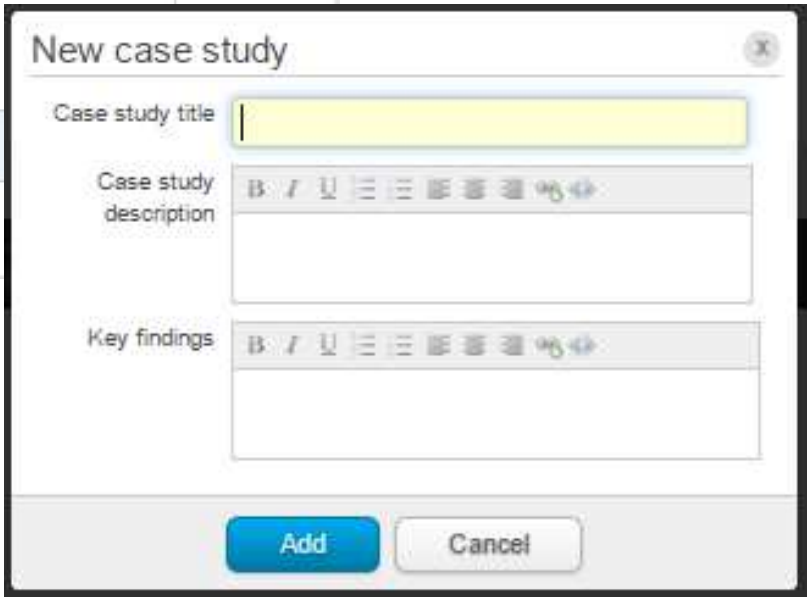
Submission of Quarterly Progress Reports through SWFDP Database





Submission of Quarterly Progress Reports through SWFDP Database





Case study title, description and key findings are to be provided through SWFDP database by NMHSs, but full versions of case studies can be sent to the lead Regional Centre with cc to WMO Secretariat through eMail for analyses

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SWFDP
Regional Subprojects

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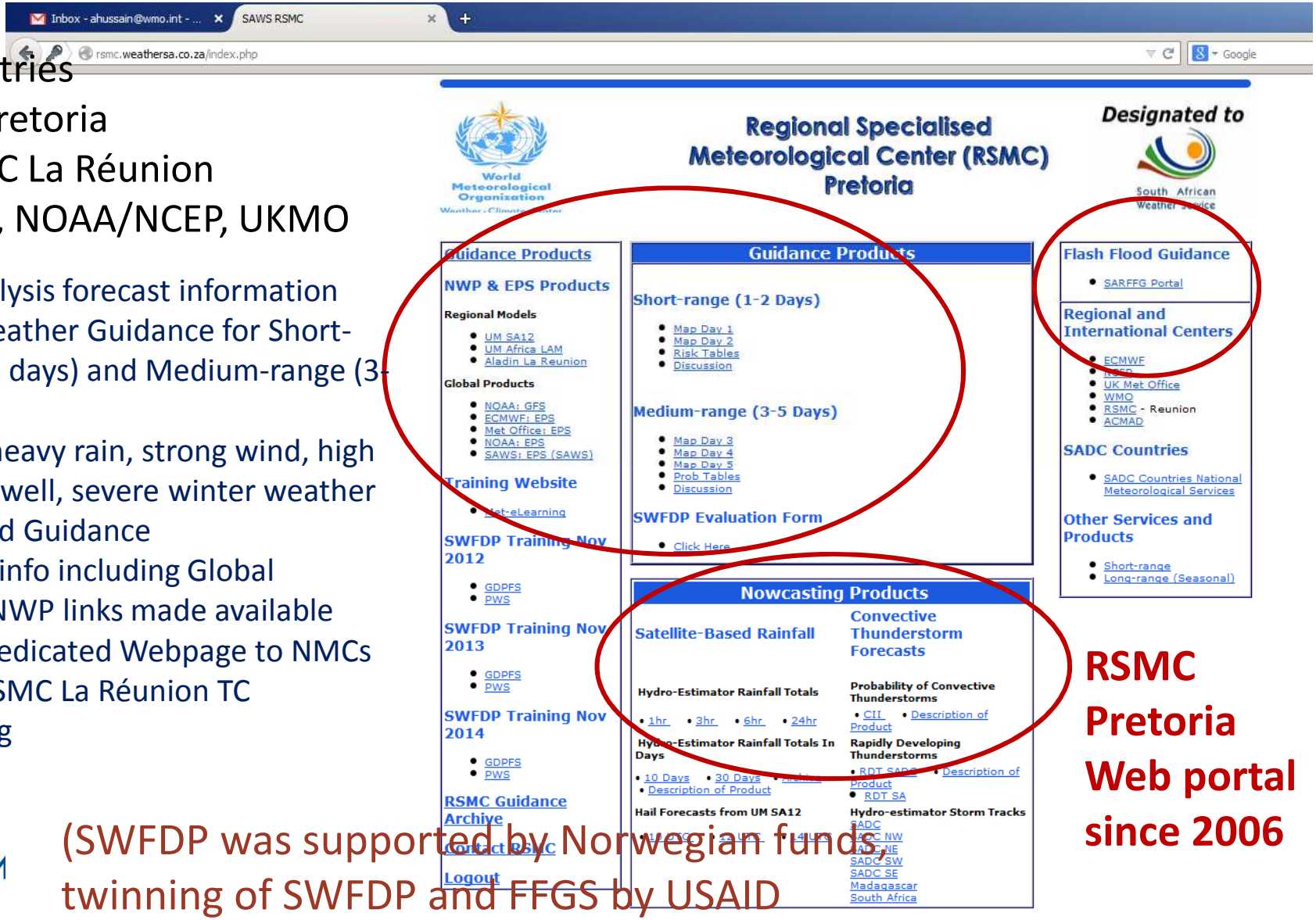
SWFDP in RA I (Southern Africa)

(in operational phase, SWFDP and SARFFGS Integration since 2014

- ✓ 16 countries
- ✓ RSMC Pretoria
- ✓ RSMC-TC La Réunion
- ✓ ECMWF, NOAA/NCEP, UKMO

- RSMC analysis forecast information
- Severe Weather Guidance for Short-range (1-2 days) and Medium-range (3-5 days)
- Hazards: heavy rain, strong wind, high seas and swell, severe winter weather
- Flash Flood Guidance
- Guidance info including Global Regional NWP links made available through dedicated Webpage to NMCs Links to RSMC La Réunion TC forecasting

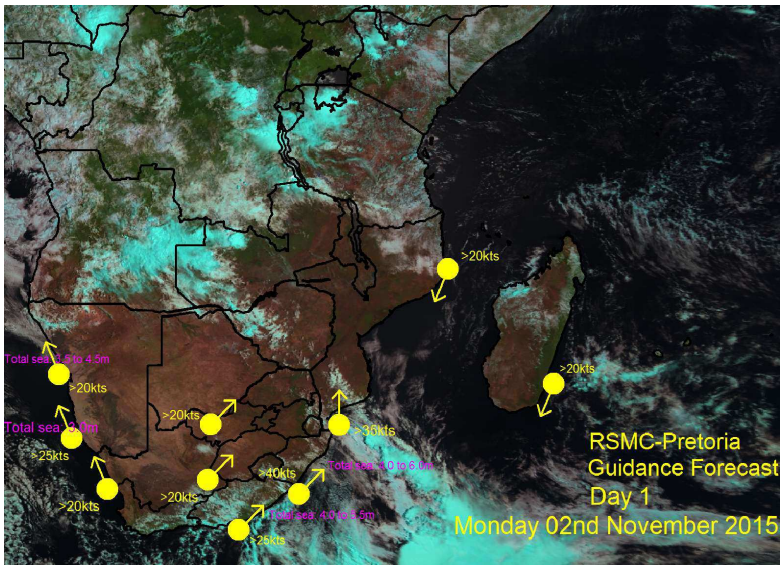


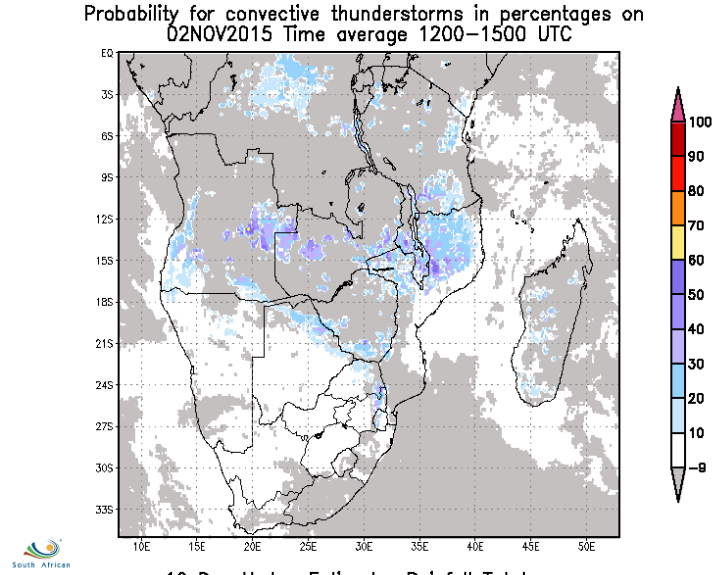
RSMC Pretoria Web portal since 2006

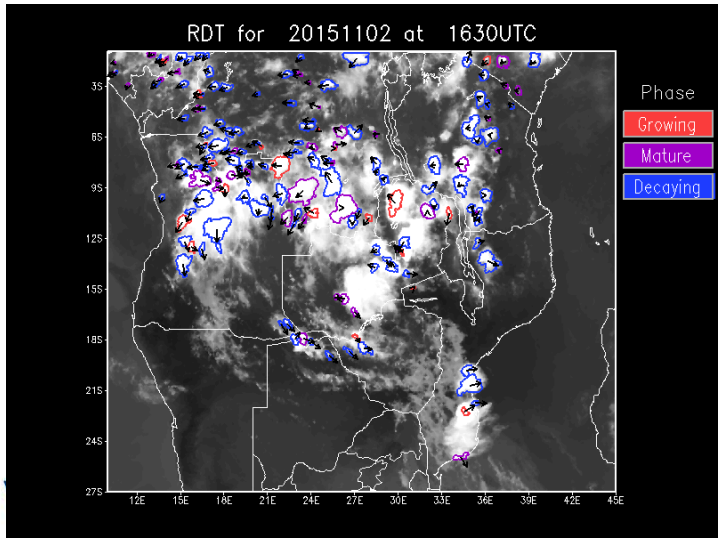
(SWFDP was supported by Norwegian funds, twinning of SWFDP and FFGS by USAID

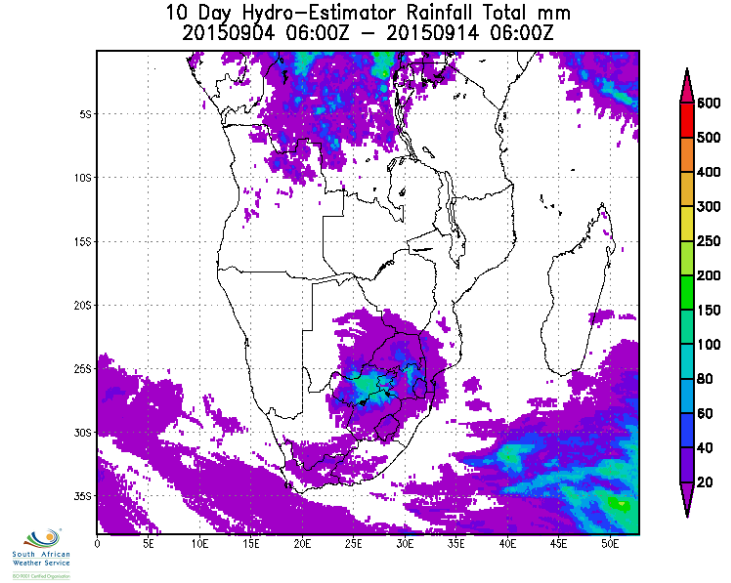
SWFDP in RA I (Southern Africa)

(in operational phase, SWFDP and SARFFGS Integration since 2014



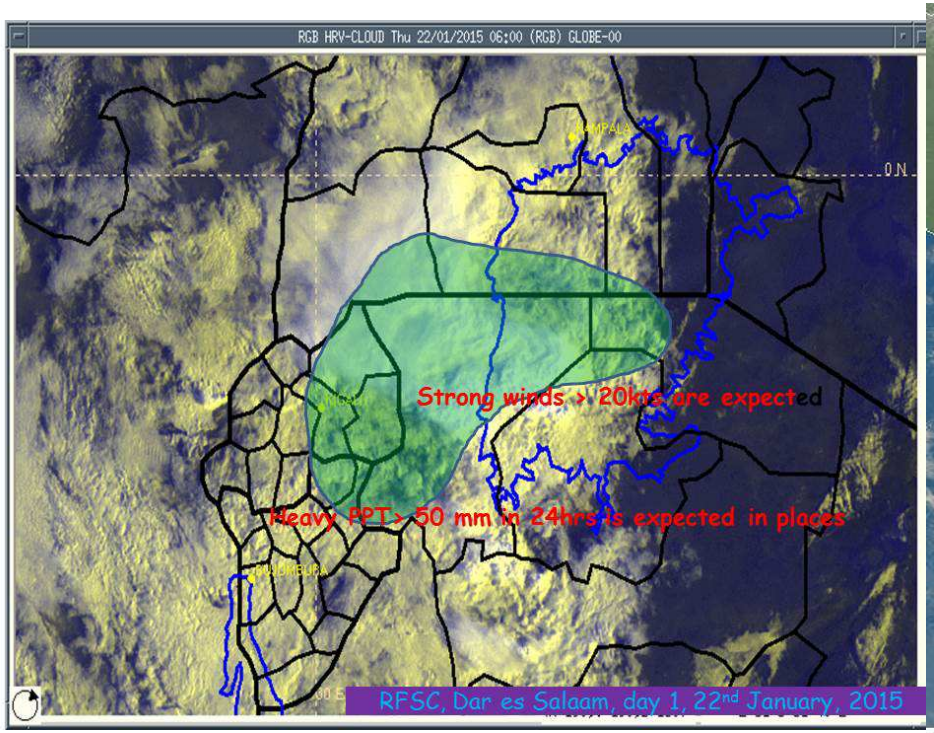


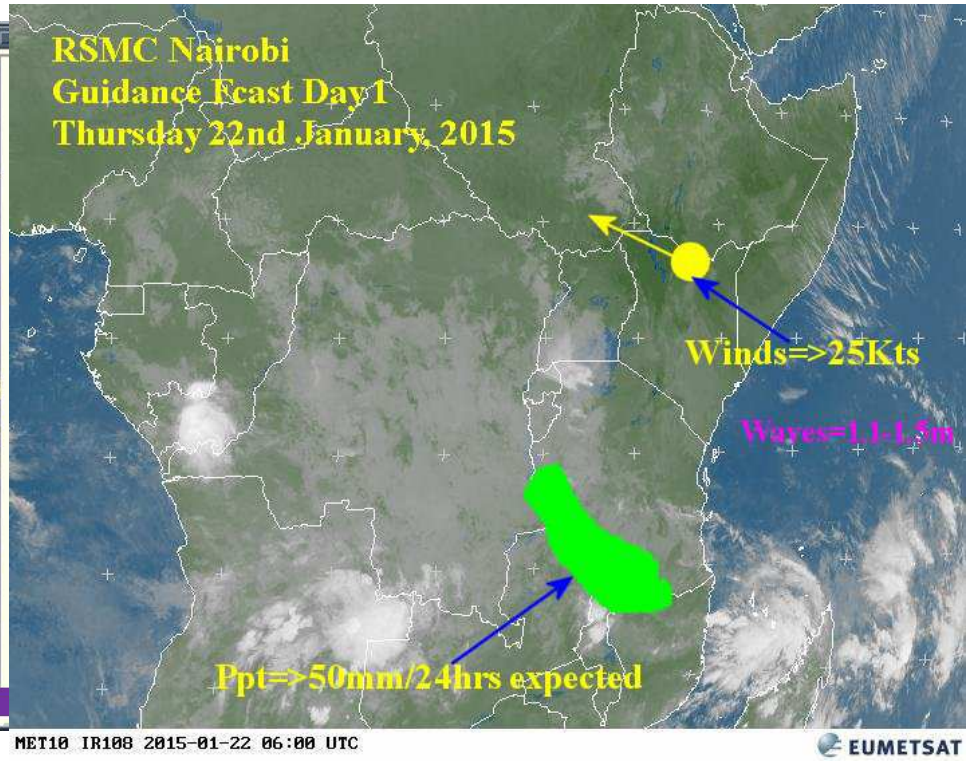




SWFDP RA-I-Eastern Africa

(Development started in 2010, and RSMC web portal since 2011)





Benefitting Countries (7):

Burundi, Ethiopia, Kenya, Rwanda, South Sudan, Tanzania and Uganda

Global Centres: ECMWF, UKMO, NOAA/NCEP, DWD

Regional Centre: RSMC Nairobi (for whole domain)

RFSC Dar Es Salaam (Lake Victoria basin)

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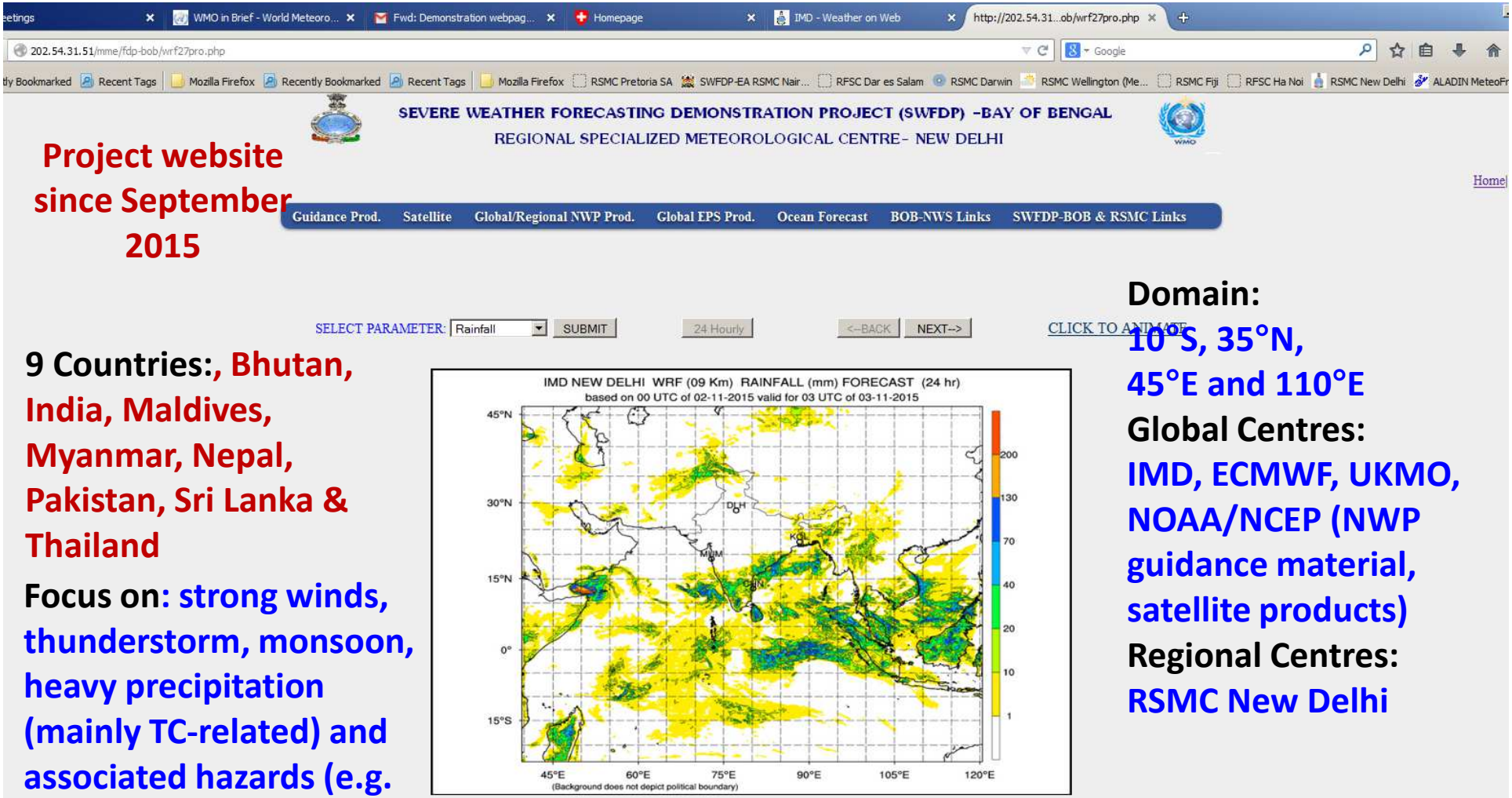
(Supported by Norwegian funds)

SWFDP- RA II Bay of Bengal

(development planning started in 2012, now ready to start demonstration)

Project website since September 2015



9 Countries:, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan, Sri Lanka & Thailand

Focus on: strong winds, thunderstorm, monsoon, heavy precipitation (mainly TC-related) and associated hazards (e.g. flooding, landslides, storm surges, swell)

Domain: 10°S, 35°N, 45°E and 110°E

Global Centres: IMD, ECMWF, UKMO, NOAA/NCEP (NWP guidance material, satellite products)

Regional Centres: RSMC New Delhi

First meeting of RSMT likely in 2017 subject to availability of funds

(Funding from UN ESCAP through RIMES during 2012-2015)

SWFDP- RA II Central Asia

Technical Planning Workshop in Almaty, Kazakhstan , 25-27 April 2015

SWFDP Workshop on analysis and interpretation of NWP products, Moscow, Russia, 6-10 July 2015

Workshop on Forecasting and Public Weather Services (PWS) for Forecasters and Users, Almaty, Kazakhstan, 22 Feb. to 4 March 2016

Focus

Heavy Rain and associated hazards (e.g. flooding)
Heavy Snow
Strong winds
Snow storms/blizzards
Extreme temperatures
Dry spells

Domain

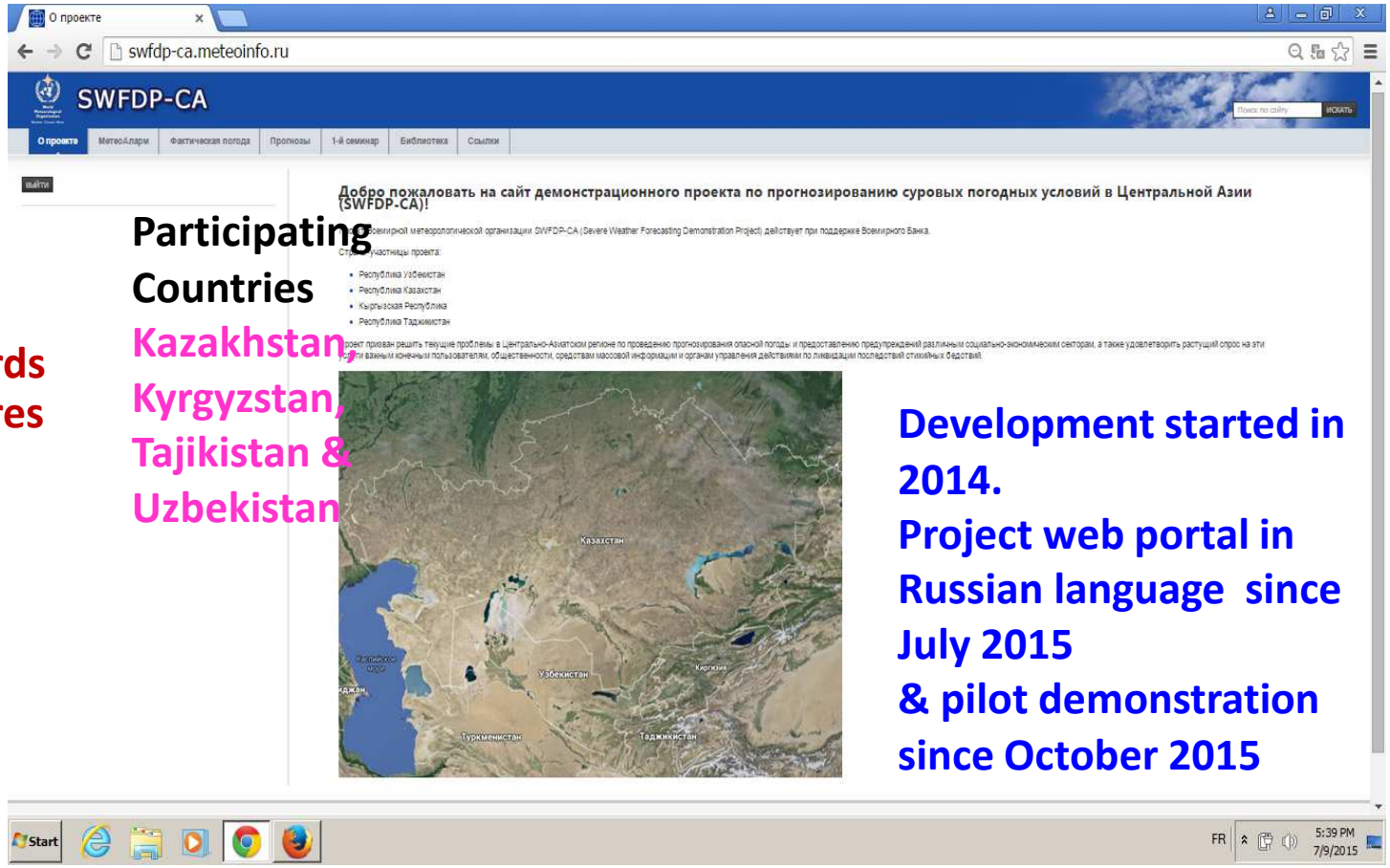
29° N - 60° N
25° E - 90° E

For Mountainous Region

36° N - 45° N
63° E - 82° E

Regional Centre

RSMC Tashkent



Participating Countries

Kazakhstan, Kyrgyzstan, Tajikistan & Uzbekistan

Development started in 2014.
Project web portal in Russian language since July 2015
& pilot demonstration since October 2015

Global Centres

RosHydromet, ECMWF, CMA, JMA, KMA

Funding: World Bank

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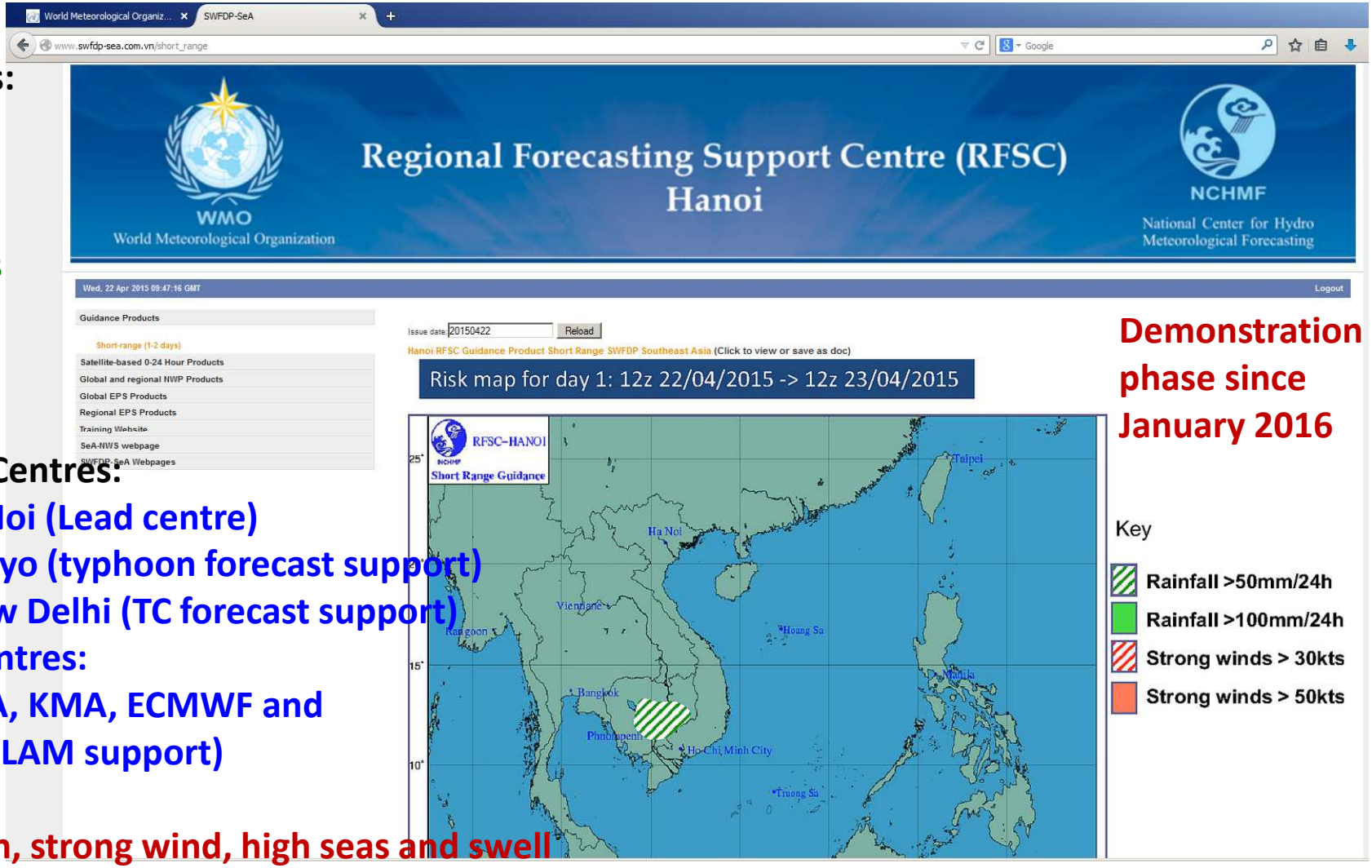
SWFDP V– Southeast Asia

(RFSC Ha Noi web portal since 2011)

7 countries:

Cambodia
Lao PDR
Viet Nam
Philippines
Thailand



Demonstration phase since January 2016

Regional Centres:

RFSC Ha Noi (Lead centre)
RSMC Tokyo (typhoon forecast support)
RSMC New Delhi (TC forecast support)
Global Centres:
CMA, JMA, KMA, ECMWF and DWD (for LAM support)

Hazards:

Heavy rain, strong wind, high seas and swell

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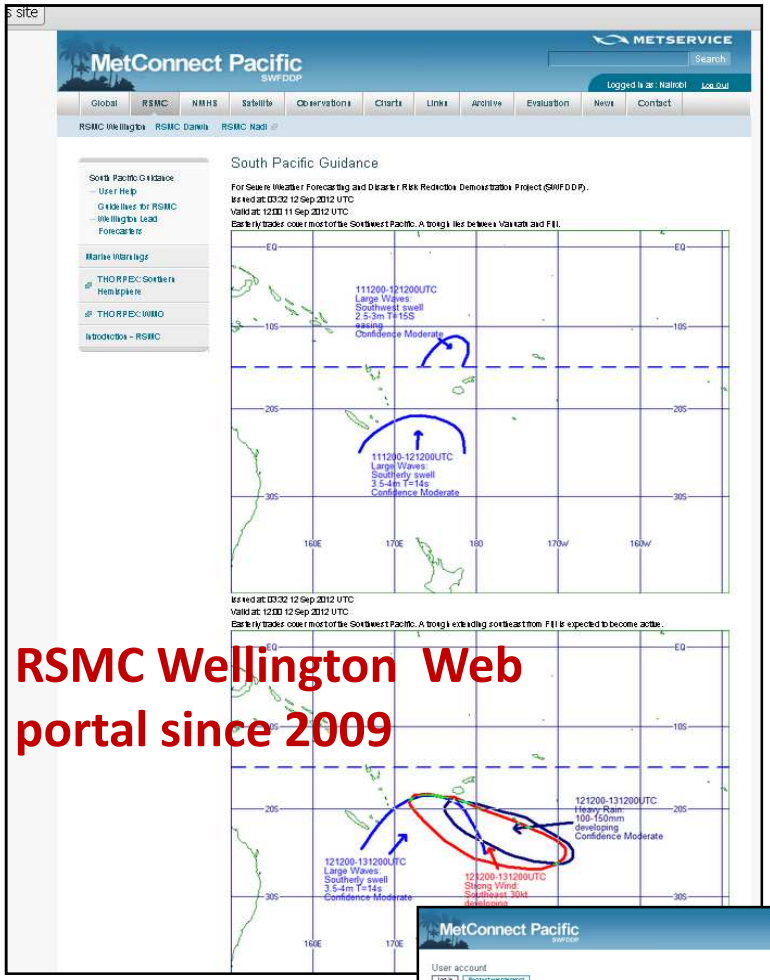
(Funding from UN ESCAP through RIMES in 2015)

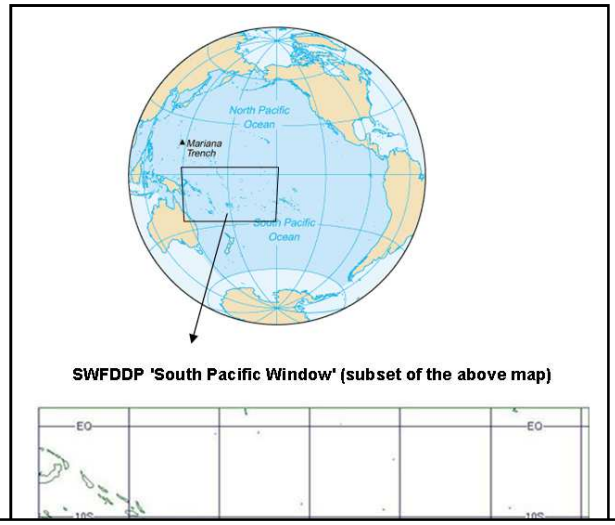
SWFDP in RA V (South Pacific)

- 9 Island States, RSMC Wellington, RSMC-TC Nadi, RSMC Darwin
- ECMWF, Met Office UK, NWS/USA, ABoM, JMA



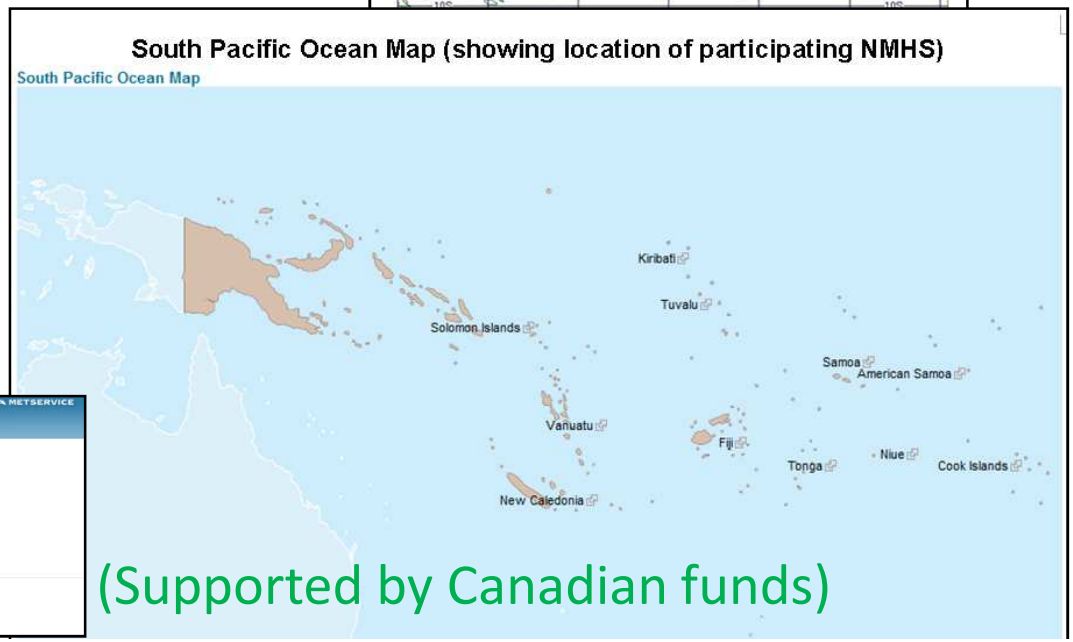
9 Island States:

Cook Islands
Fiji
Kiribati
Niue
Samoa
Solomon Islands
Tonga
Tuvalu
Vanuatu



SWFDDP 'South Pacific Window' (subset of the above map)

RSMC Wellington Web portal since 2009



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(Supported by Canadian funds)

Future Directions

(within next 2 years subject to availability of funds)

- ✓ **SWFDP-West Africa** (Seed Funding: KMA)
  RSMC Dakar (Senegal)
  (A Technical Training Workshop was held in Dakar, Senegal during 2-6 November 2015)

- ✓ **SWFDP-Caribbean** (Seed Funding: Canada)
  RFSF Martinique; RSMC Miami (for hurricane forecast support)
  (Meeting of RA IV Expert Group on SWFDP, Martinique, 13-15 December 2017)

- ✓ **SWFDP-Southeast Europe** (Expected funding: USAID)

- ✓ **SWFDP- Southeastern Asia-Oceania** (Expected funding: USAID)

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SWFDP:
Capacity Development

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Capacity Development through SWFDP Training Programmes

Based on the regional and national needs, the following approach is followed for designing the SWFDP training programmes

- *Two-week SWFDP training workshops for each region (such training workshops are to be held regularly and preferably rotated among the participating countries in a region)*
- *RSMC Training Desk (e.g. at RSMC Pretoria Training Desk for countries in Southern Africa)*
- *In-country training (e.g. for countries in Southwest Pacific)*

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Capacity Development through SWFDP Training Programmes

In addition

- ECMWF annual training for WMO Members
- DWD annual training on COSMO (aligned with SWFDP)
- Regional Training Centres (training programmes on forecasting aligned with the SWFDP)
- NOAA/NCEP Desks

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Capacity Development through SWFDP Training Programmes

- In 2014, 103 personnel (including forecasters, hydrologists, representatives of disaster management agencies and media) were trained in Southern Africa, Eastern Africa and Southeast Asia.

- In 2015, around 200 personnel (including forecasters, hydrologists, representatives of disaster management agencies and media) were trained in Southern Africa, South Pacific, Eastern Africa, Southeast Asia and Bay of Bengal.

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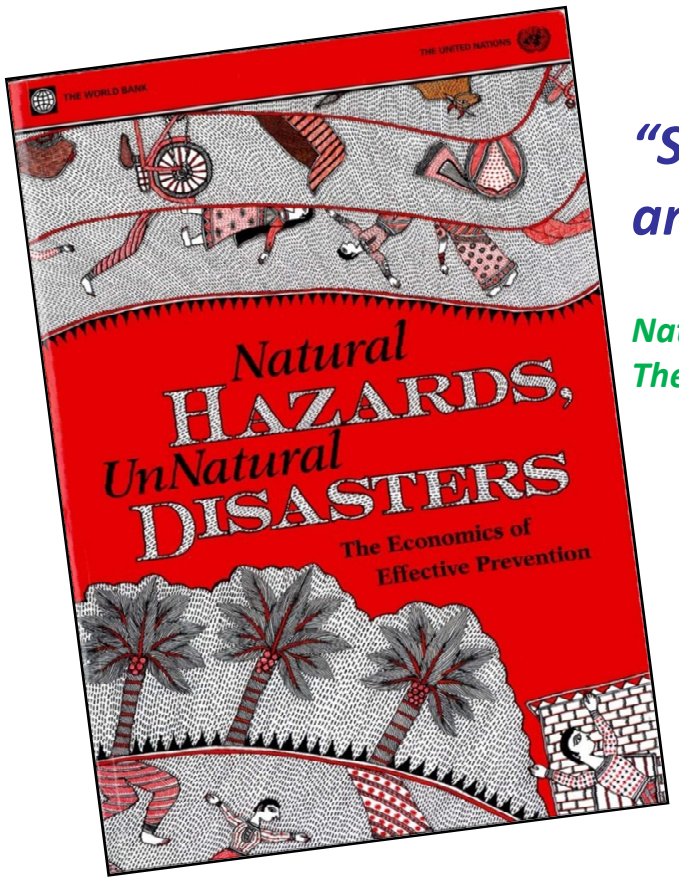

"Spending on improving weather forecasting and sharing data have high returns."

Natural Hazards UnNatural Disasters –
The Economics of Effective Preveniton, WB, UN (2011)

Thank you
Merci

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