World Meteorological Organization

Weather • Climate • Water

The WMO Severe Weather Forecasting Demonstration Project (SWFDP):

its framework, implementation and future directions

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Second Meeting of WMO Flood Forecasting Initiative Advisory Group
Geneva, Switzerland, 1-3 December 2015

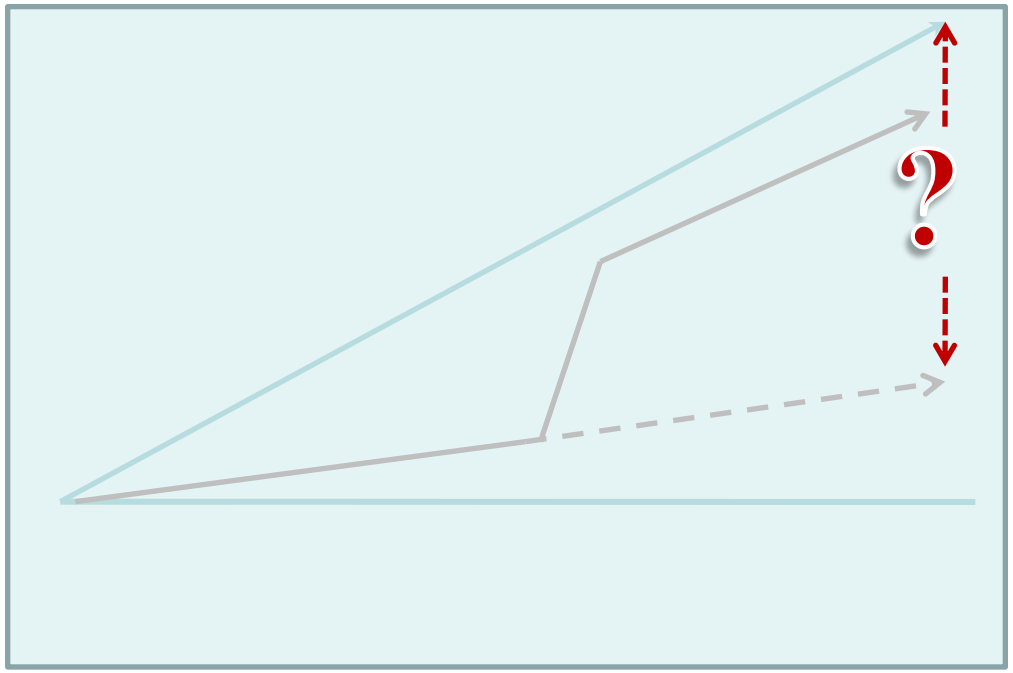
Why a project on severe weather forecasting?

Mandate of NMHSs:

To provide meteorological information for protection of life, livehoods and property, and conservation of the environment

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
- Developing countries, including LDCs and SIDSs, saw little progress
- Increasing gap in application of advanced technology in early warnings
- WMO SWFDP attempts to close this gap, by applying the *'Cascading Forecasting Process'* (regional frameworks)



Vision

WM Congress provided vision for improving 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) & Cg-16 (2011)

Realizing the Vision

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

To

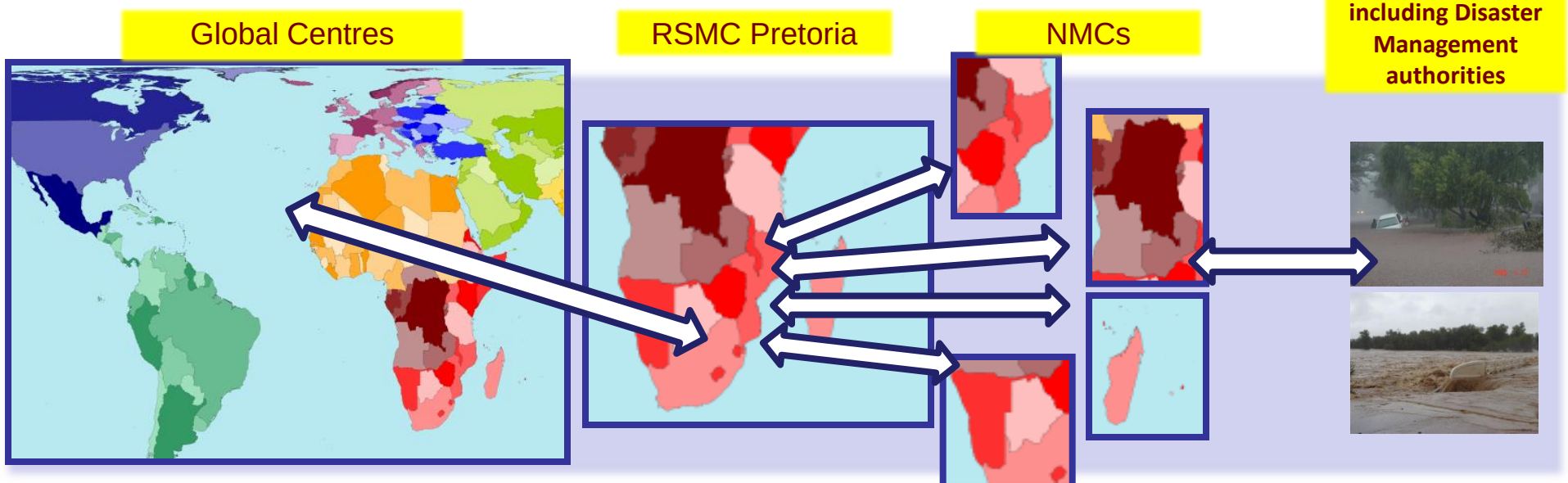
Implement 'Cascading Forecasting Process'

through SWFDP

(from Global to Regional to National)

SWFDP Cascading Forecasting Process – efficient delivery of GDPFS

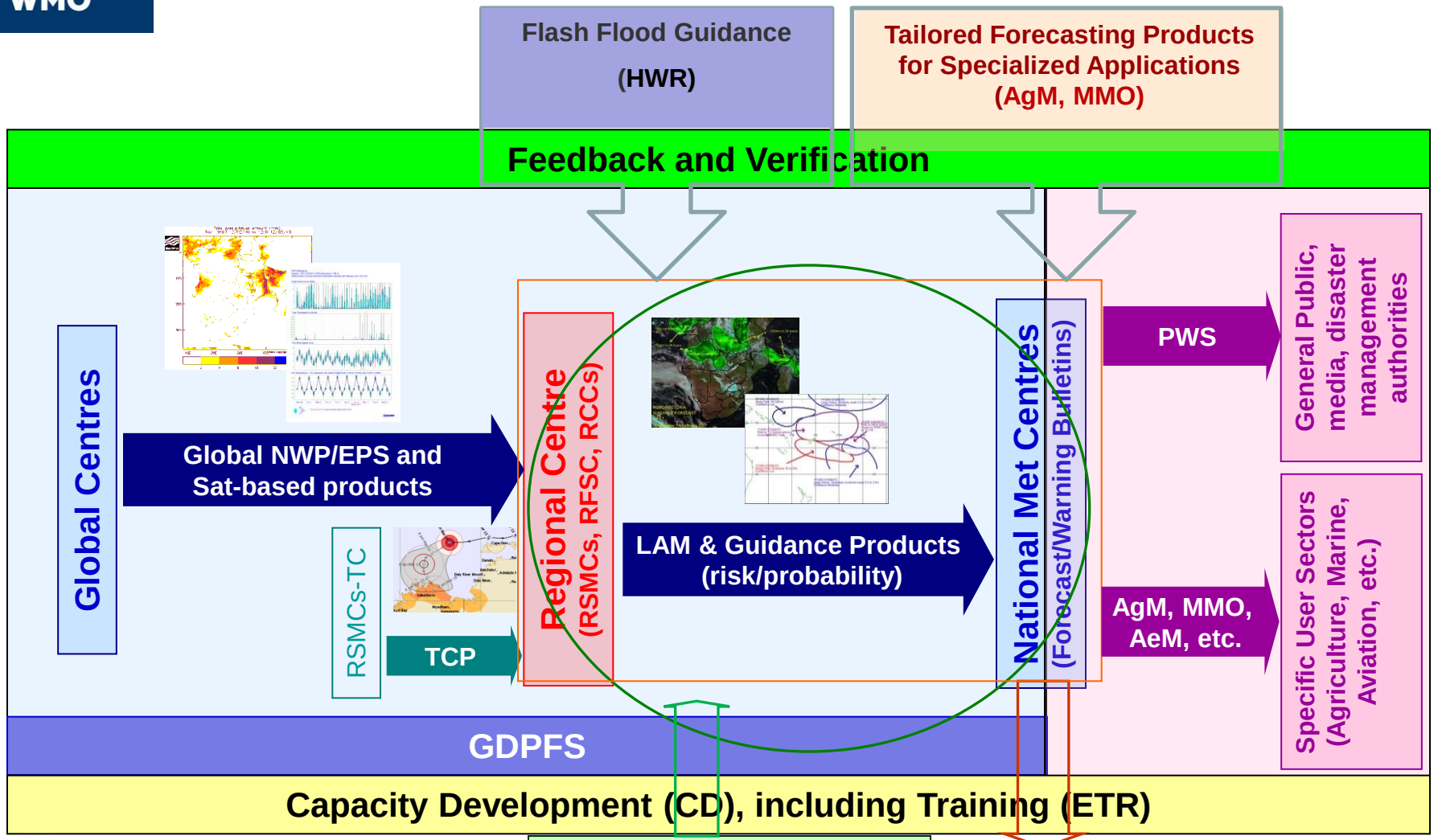
- *Global NWP* centres to provide available NWP/EPS and sat-based products, including in the form of probabilities, cut to the project window frame;
- *Regional centres* to interpret information received from global centres, prepare daily guidance products (out to day-5) for NMCs, run limited-area model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



WMO's cross-programmatic activity

SWFDP Cascading Forecasting Process

(Global to Regional to National)



SWFDP Main Goals

- Implement the WMO's GDPFS three-level system – the *'Cascading Forecasting Process'*
  - ✓ International collaboration among operational centres at global, regional and national levels
  - ✓ Improve the skill of products from WMO operational centres through feedback and forecast verification
  - ✓ Continuous learning and modernization
  - ✓ Address the needs of groups of "like-countries"
- Improve lead-time of Warnings
- Improve interaction of NMHSs with their users
- Identify areas for improvement and requirements for the WMO Basic Systems

WMO Strategic Priorities (2016-2019)

- ✓*Disaster Risk Reduction (DRR, PWS)*
- ✓*GFCS (climate change adaptation)*
- ✓*WIGOS/WIS (Basic Systems)*
- ✓*Aviation (AeM)*
- ✓*Polar and High Mountain regions*
- ✓*Capacity Development (NMHSs)*
- ✓*WMO Governance*

SWFDP framework and guidance

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

PSG has developed following two documents to detail overall project plan and provide guidelines for developing SWFDP Regional Subprojects

- *SWFDP Overall Project Plan*
- *SWFDP Guidebook for Planning Regional Subprojects*

(http://www.wmo.int/pages/prog/www/DPFS/Meetings/RAII-SeA-SWFDP-RSMT_HaNoi2015/DocPlan_000.html)

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
- Developing project website and web portal (to be maintained by the lead Regional Centre)

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
- Submission of Quarterly Progress Reports by the NMHSs (verification, feedback, tracking etc.)

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

Role and Responsibilities of Participating Countries

- **Identify the Country Representatives on Regional Sub-project Management Team which will develop the Implementation Plan**
    - **Agreement on warning criteria for severe weather elements (Temp, Wind, Pcpn , TSTM etc)**
    - **Agreement on when to begin the demonstration phase (phase II)**
    - **Provide Quarterly Progress Reports including some stats on their warnings and case studies**
- **Agreement on RSMC/RFSC for the provision of guidance product (including maps, risk tables etc.)**

SWFDP Regional Subprojects

- ✓ **SWFDP-Southern Africa** (Fully operational and sustained (Phase-IV))

  16 countries; RSMC Pretoria, RSMC-TC La Réunion

- ✓ **SWFDDP-South Pacific Islands** (In progress with full demonstration (Phase-III))

  9 Island States; RSMC Wellington, RSMC-TC Fiji

- ✓ **SWFDP-Eastern Africa** (In progress with full demonstration (Phase-III))

  7 countries; RSMC Nairobi, RFSC Dar

- ✓ **SWFDP-Southeast Asia** (In progress, demonstration to start in 2015 (Phase-II))

  5 countries; RFSC Hanoi, RSMC-TC Tokyo, RSMC-TC New Delhi

- ✓ **SWFDP-Bay of Bengal** (in development (Phase-II))

  6 countries; RSMC New Delhi (including for TC)

- ✓ **SWFDP-Central Asia** (in development (Phase-I))

  4 countries; RSMC Tashkent

Several WMO programmes (i.e. GDPFS, PWS, TCP, DRR, MMO, AgM, SP, ETR, CD, LDC, RP, and WWRP) and technical commissions (i.e. CBS, CAgM, CHy, JCOMM, and CAS)

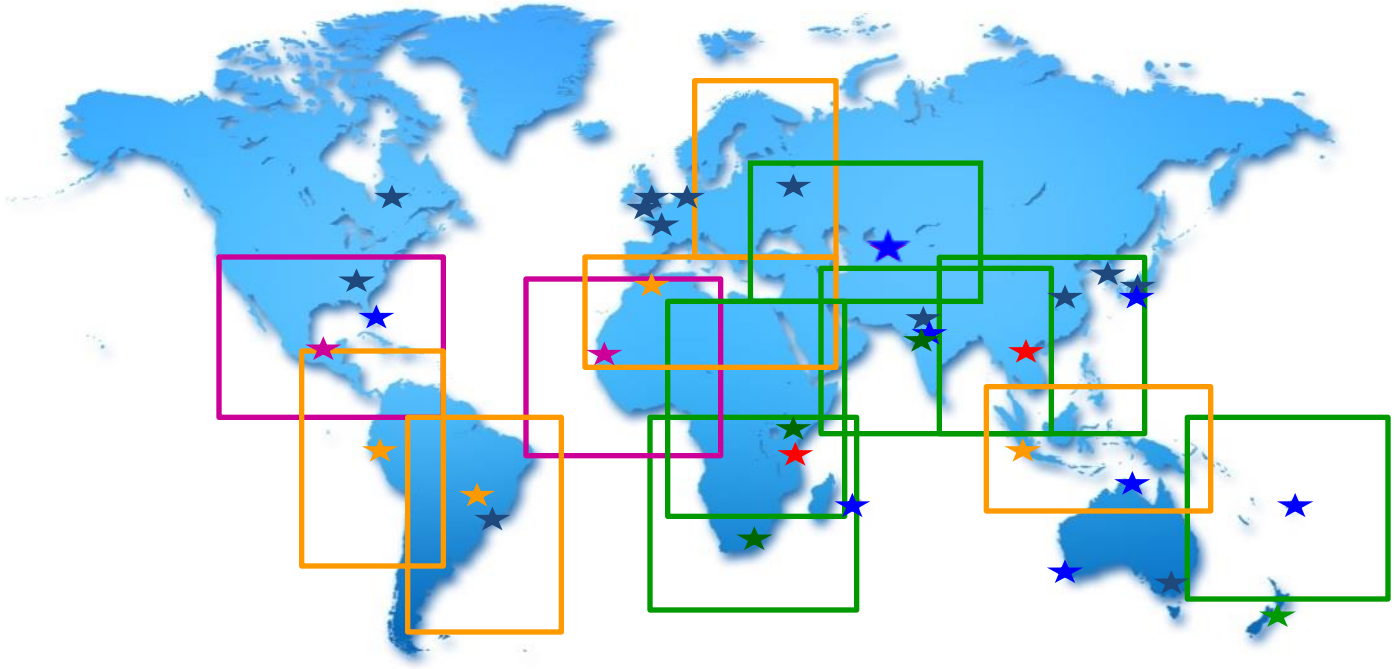
- WMO global and regional operational centres (e.g. RSMCs)
- 45 NMHSs of developing countries (29 of which are LDCs/SIDSs)

SWFDP Regional Subprojects

SWFDP Strengths

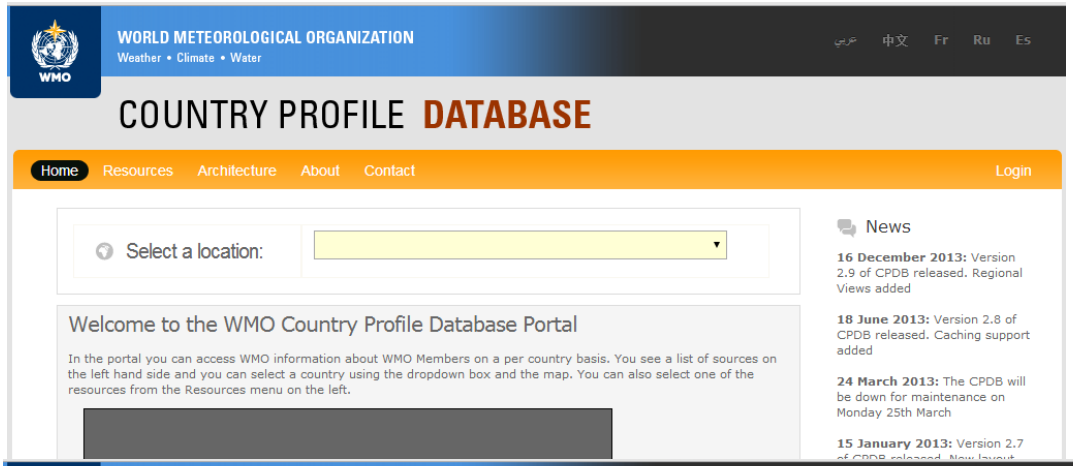
- **Cost effective;**
- **Simplicity;**
- **NMHSs need internet only;**
- **Highly operational focus;**
- **Capacity development with improved forecasts and lead-time of warnings**

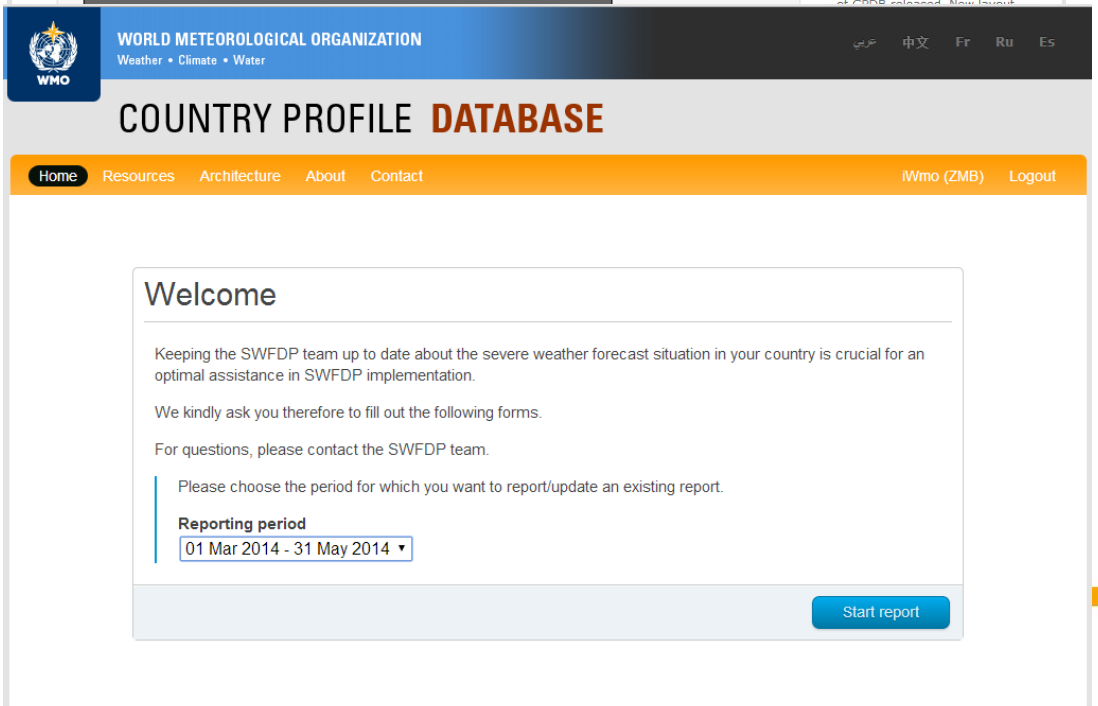
Depending upon the resources, the number of developing countries and LDCs to benefit from the SWFDP may grow to over 100 in next 5 years

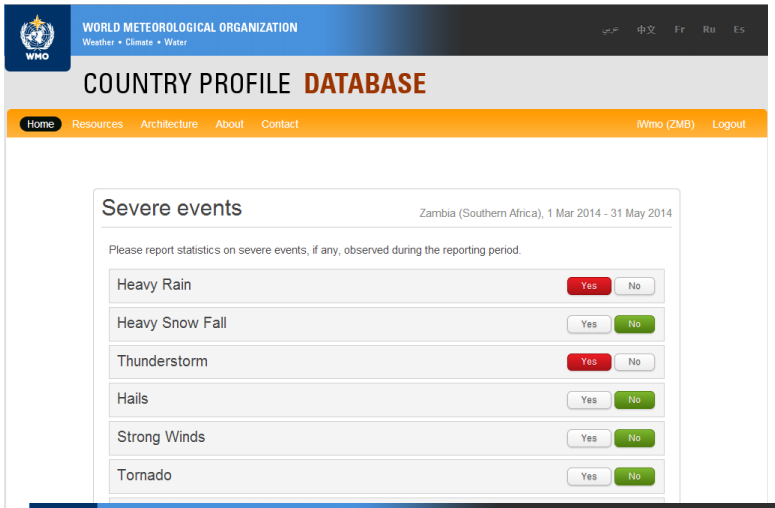


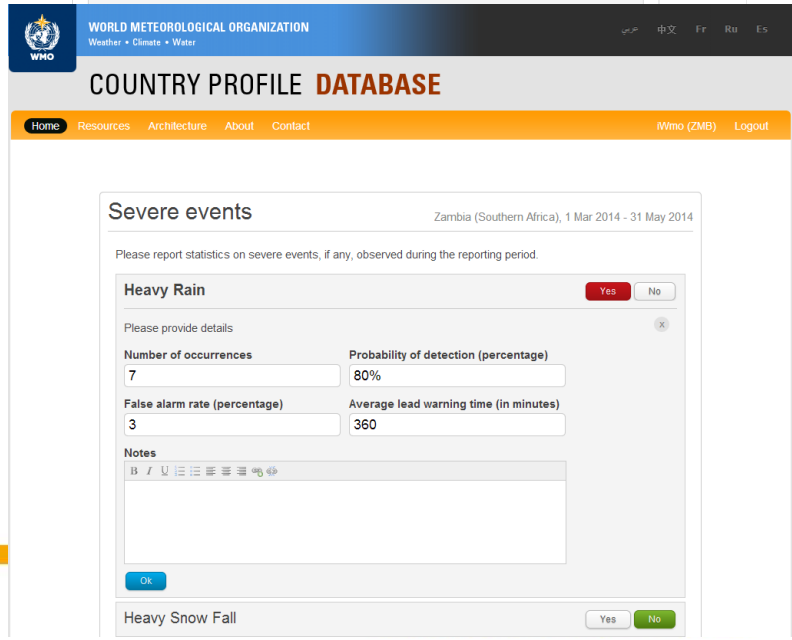
Green color boxes - the domains of existing SWFDP regional subprojects. **Pink** and **Orange** color boxes - the regions for future SWFDP subprojects which will be developed within next 1-2 years and 3-5 years respectively.

Submission of Quarterly Progress Reports through SWFDP Database









SWFDP Synergies

SWFDP synergies with various programmes and projects as appropriate

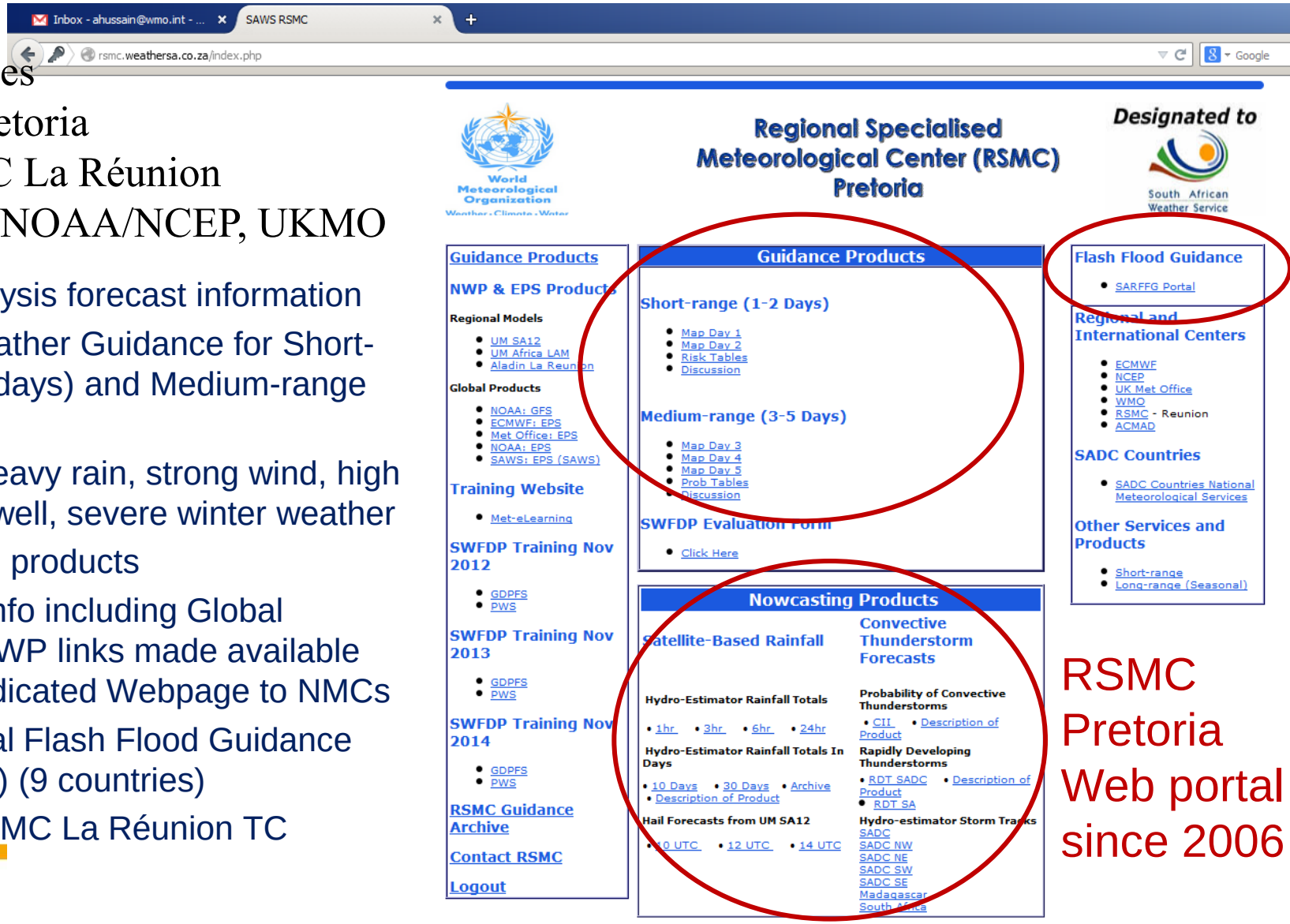
- Tropical Cyclones Programme (for TC/Typhoon/Hurricane forecast support in different Ocean basins)
- SAT-Nowcasting (e.g. SCOPE Nowcasting products)
- HWR-Regional Flash Flood Guidance Systems (e.g. SARFFGS, CARFFGS)
- MMO-Coastal Inundation Forecast Demonstration Project (CIFDP)
- *WWRP (for application of research into operations)*

SWFDP in RA I (Southern Africa)

(in operational phase, now SWFDP and SARFFGS Integration)

- ✓ 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
- Nowcasting products
- Guidance info including Global Regional NWP links made available through dedicated Webpage to NMCs
- SA Regional Flash Flood Guidance (SARFFGS) (9 countries)
- Links to RSMC La Réunion TC forecasting

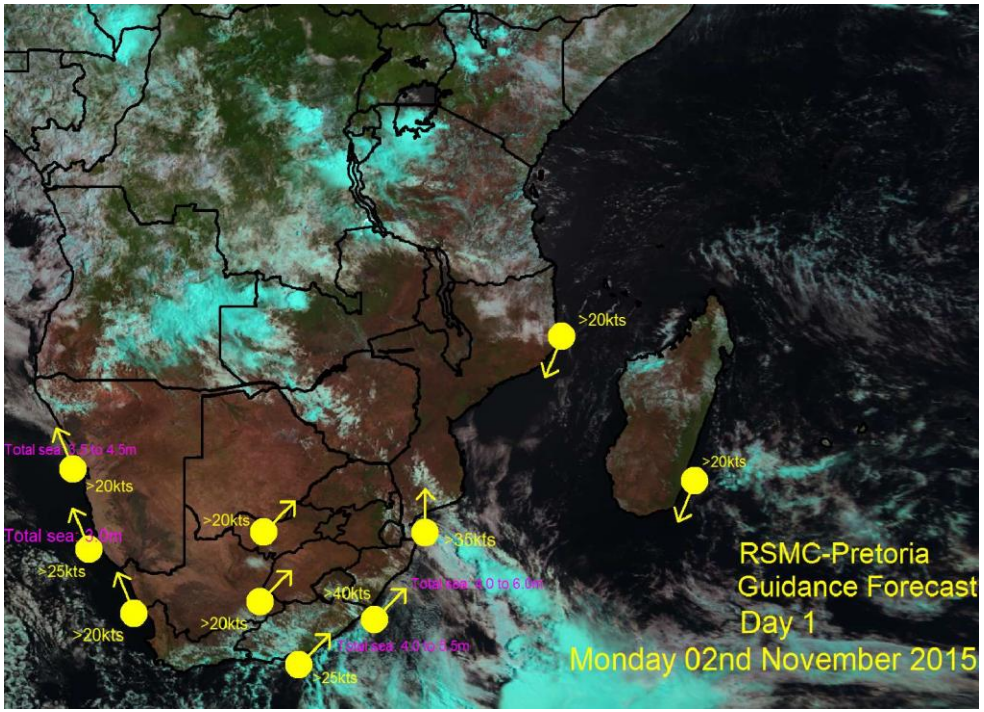


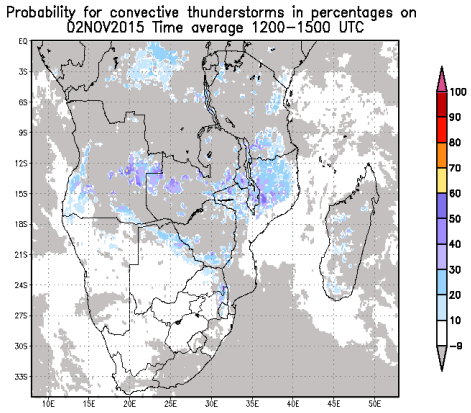
RSMC Pretoria Web portal since 2006

SWFDP in RA I (Southern Africa)

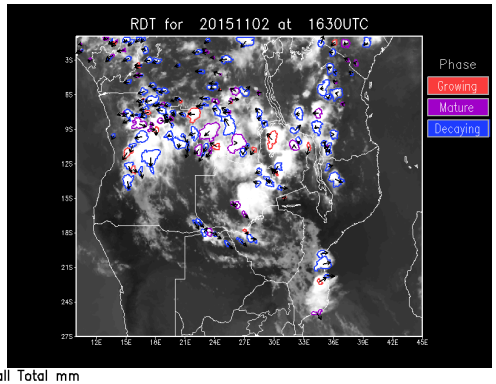
(in operational phase, now SWFDP and SARFFGS Integration)

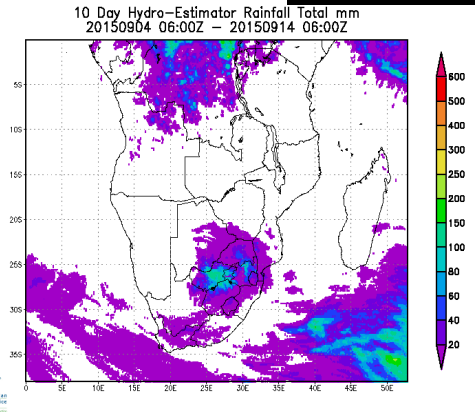
(Guidance Map for Day 1





Nowcasting products





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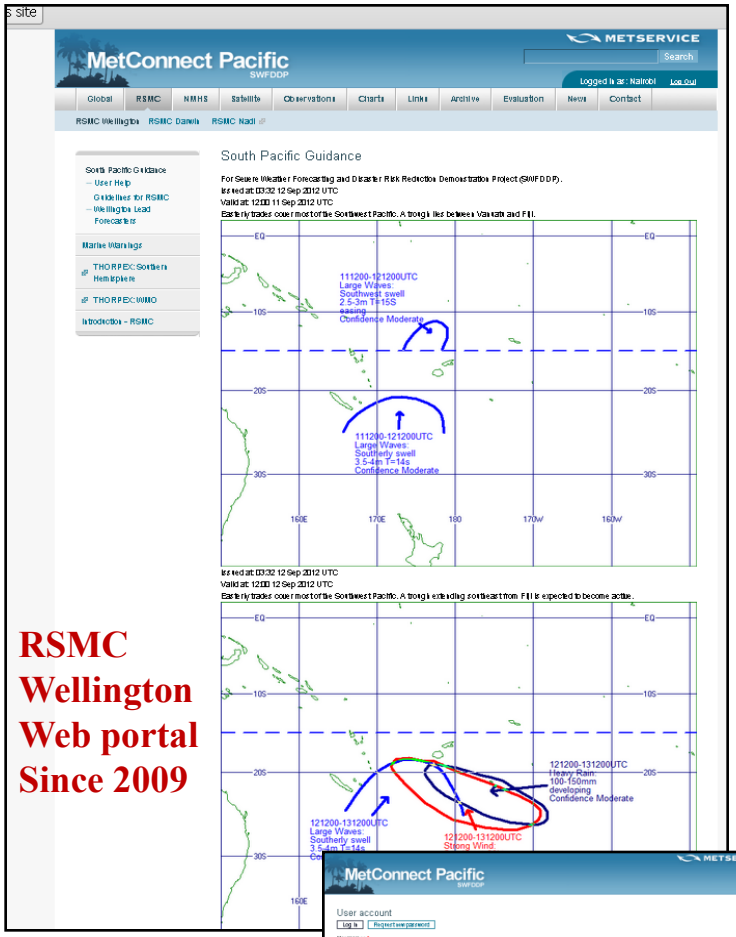
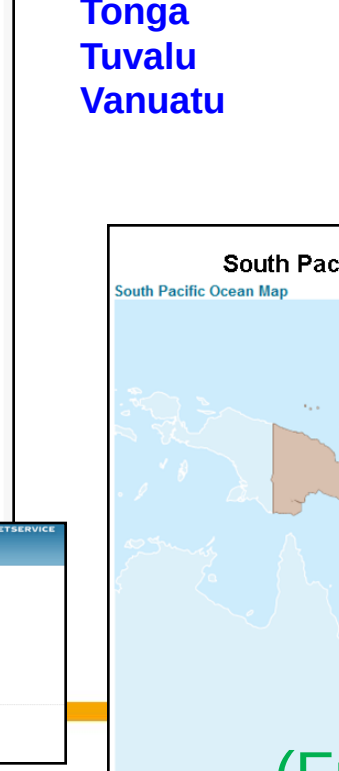
SWFDP in RA V (Southwest Pacific)

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

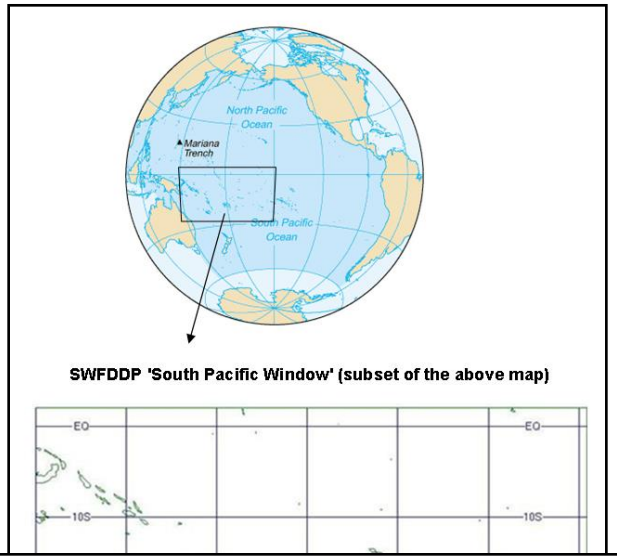


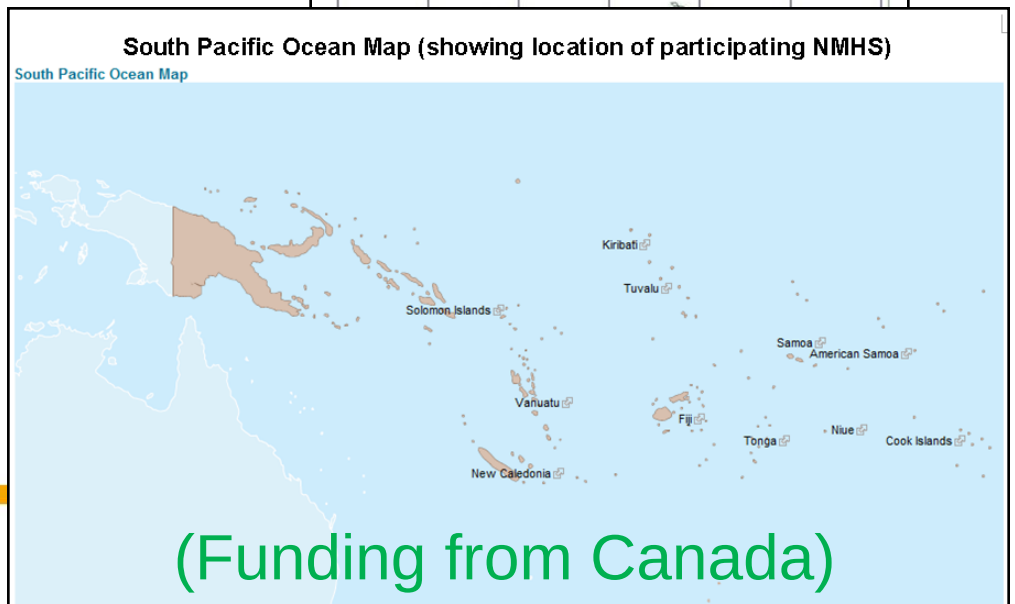
RSMC Wellington Web portal Since 2009



9 Island States:

- Cook Islands
- Fiji
- Kiribati
- Niue
- Samoa
- Solomon Islands
- Tonga
- Tuvalu
- Vanuatu

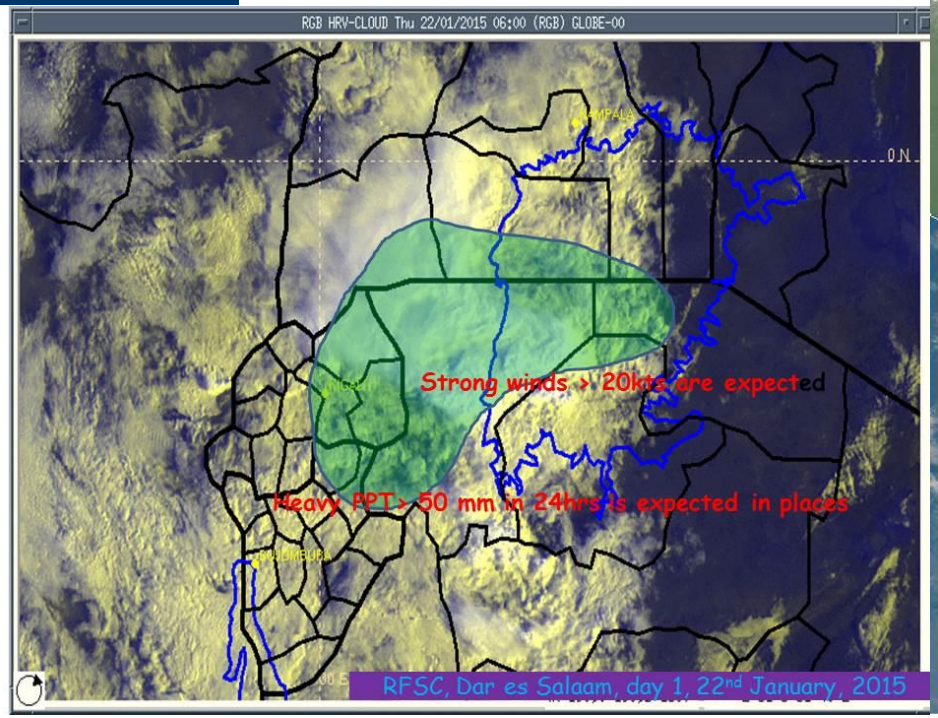


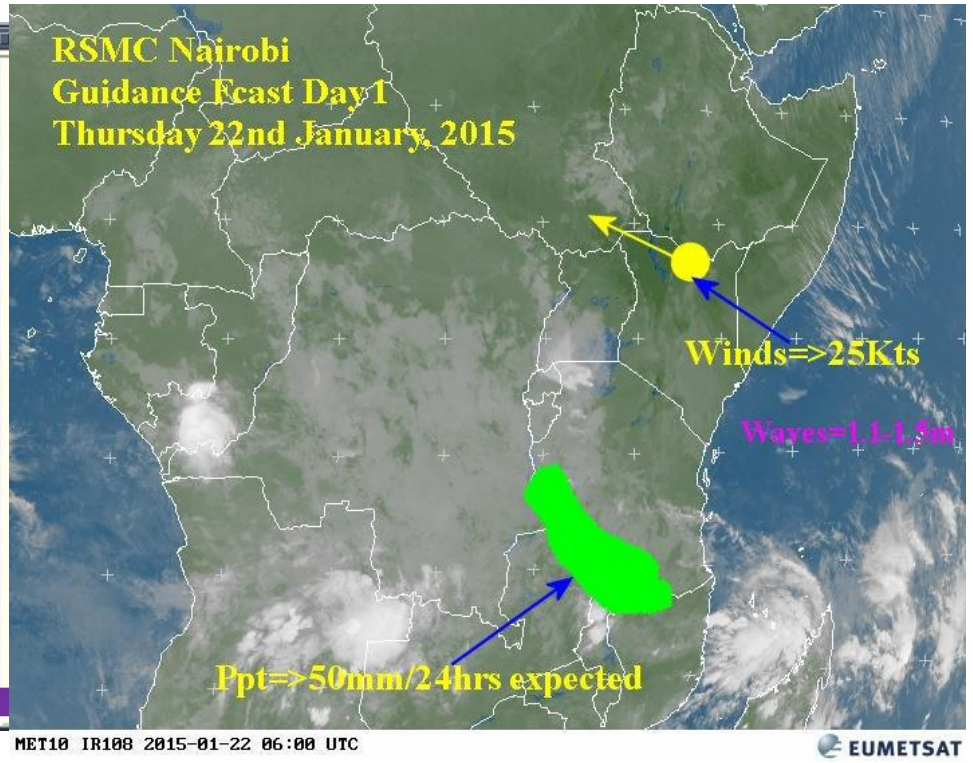


(Funding from Canada)

SWFDP RA-I-Eastern Africa

(Since 2010)





Benefitting Countries (7):

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

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

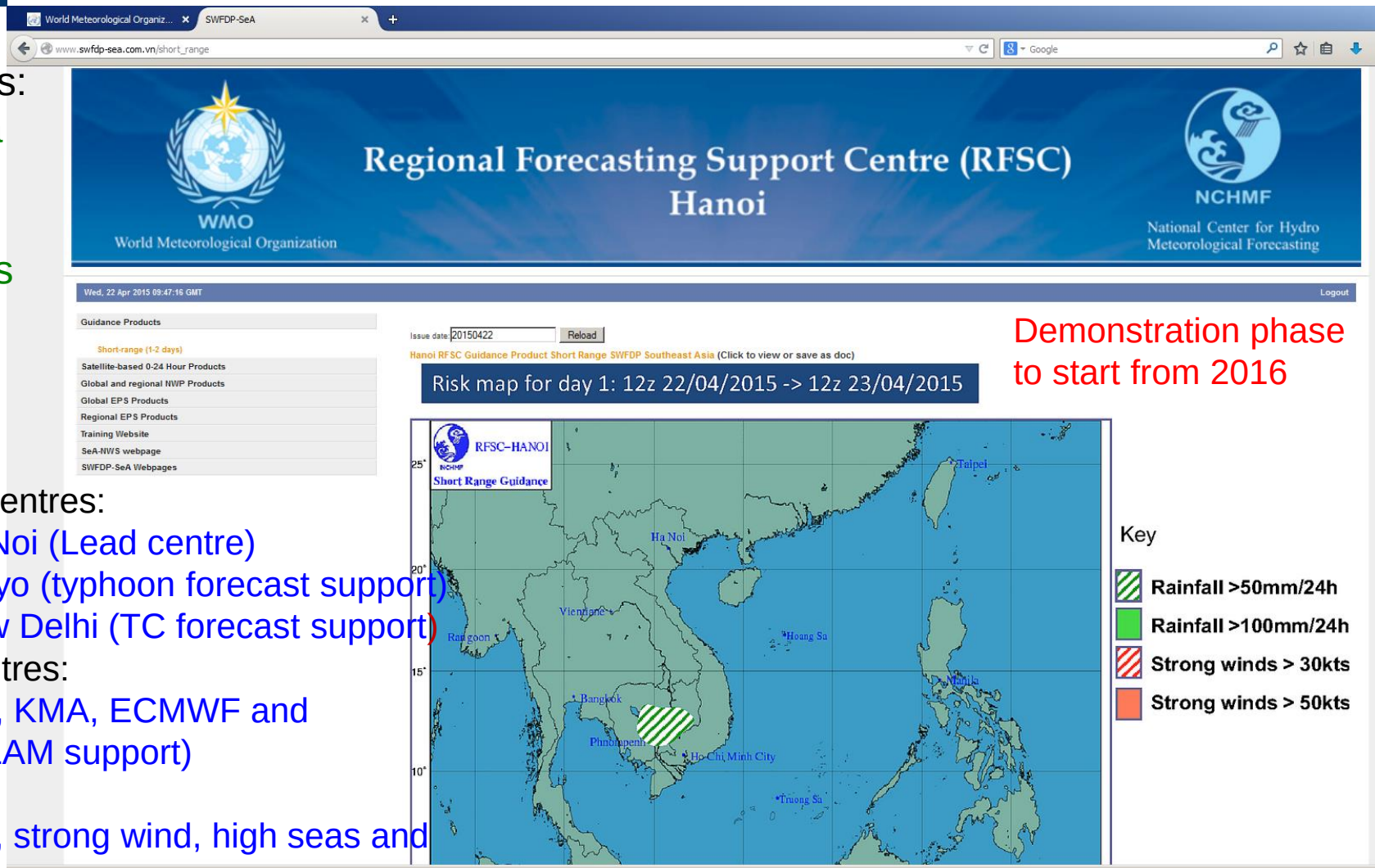
Regional Centre: RSMC Nairobi, RFSC Dar Es Salaam (Lake Victoria basin)

(Supported by Norwegian funds)

SWFDP – Southeast Asia

(RFSC Ha Noi web portal since 2011)

7 countries:
Cambodia
Lao PDR
Viet Nam
Philippines
Thailand

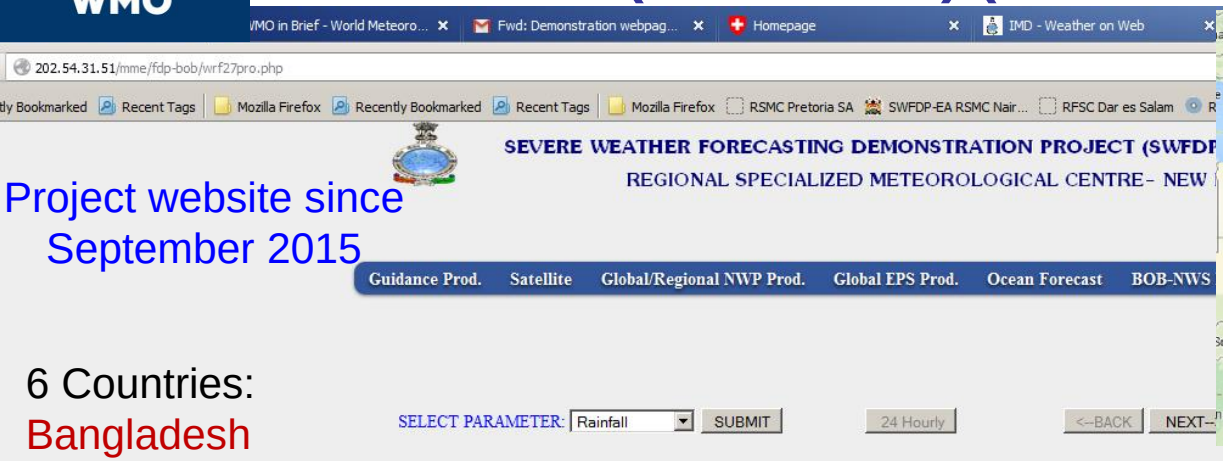


Demonstration phase to start from 2016

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

SWFDP- RA II Bay of Bengal

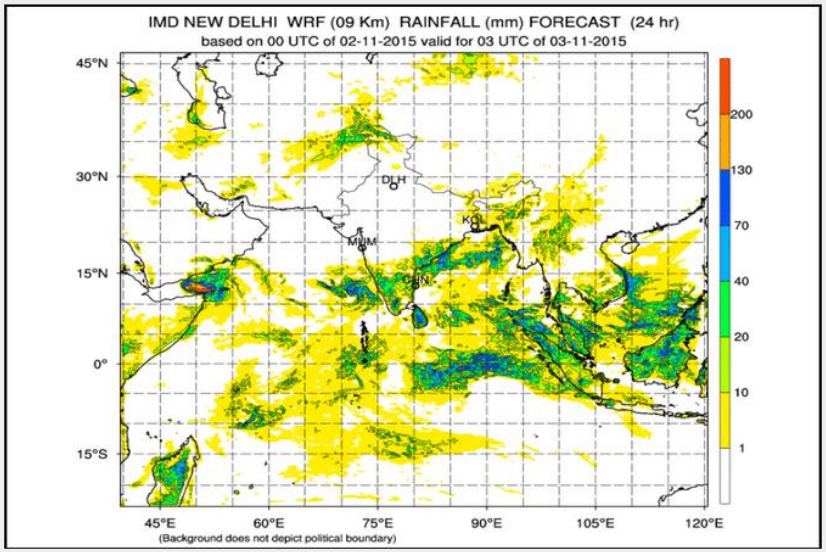
(since 2012) (in development)



Project website since September 2015

6 Countries:
Bangladesh
India
Maldives
Myanmar
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

Disclaimer : The country boundaries shown here do not necessarily correspond to the political boundary.

First Meeting of RSMT likely in 2016

Demonstration phase likely to start in 2016

SWFDP- RA II Central Asia

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

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

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

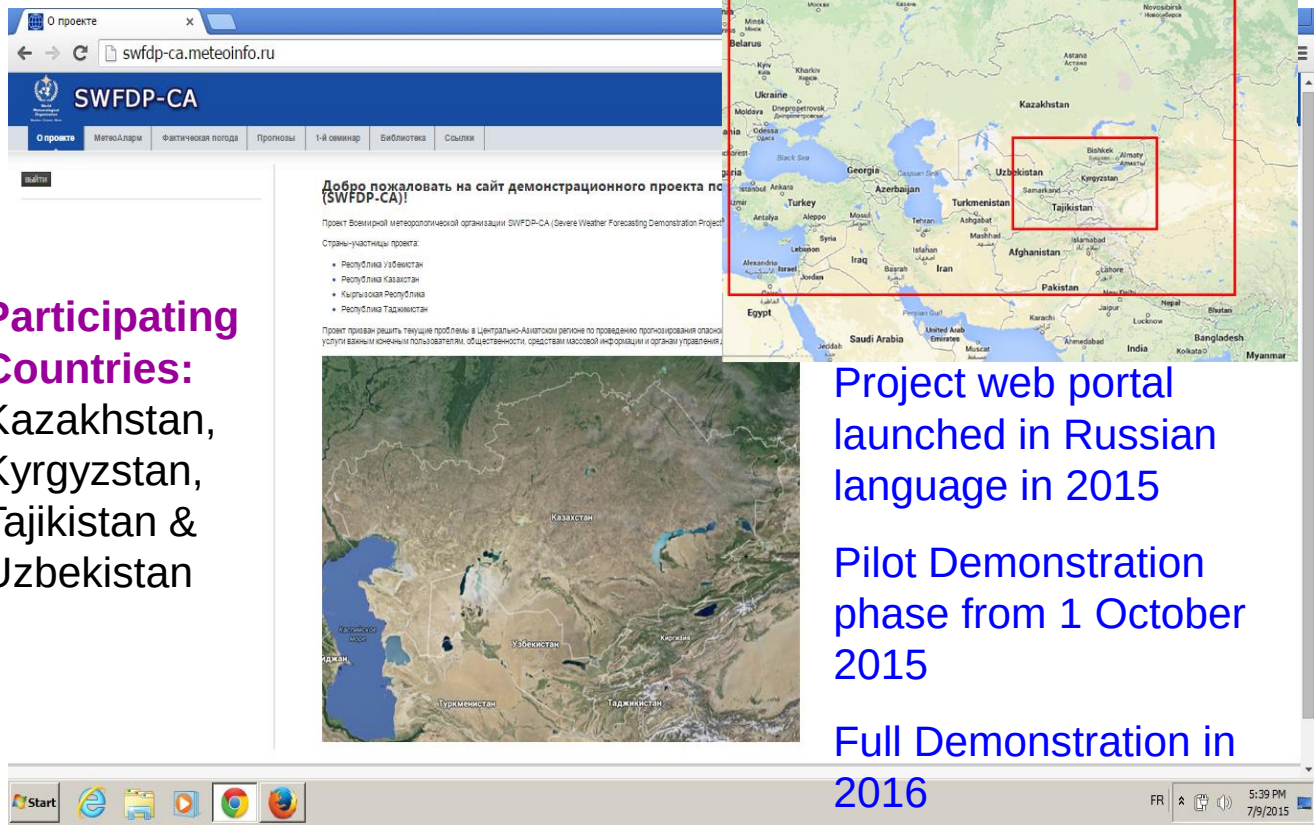
RSMC Tashkent

Global Centres

RosHydromet, ECMWF
CMA, JMA, KMA

Participating Countries:

Kazakhstan, Kyrgyzstan, Tajikistan & Uzbekistan



Project web portal launched in Russian language in 2015

Pilot Demonstration phase from 1 October 2015

Full Demonstration in 2016

Synergy with CARFFGS

Funding: World Bank

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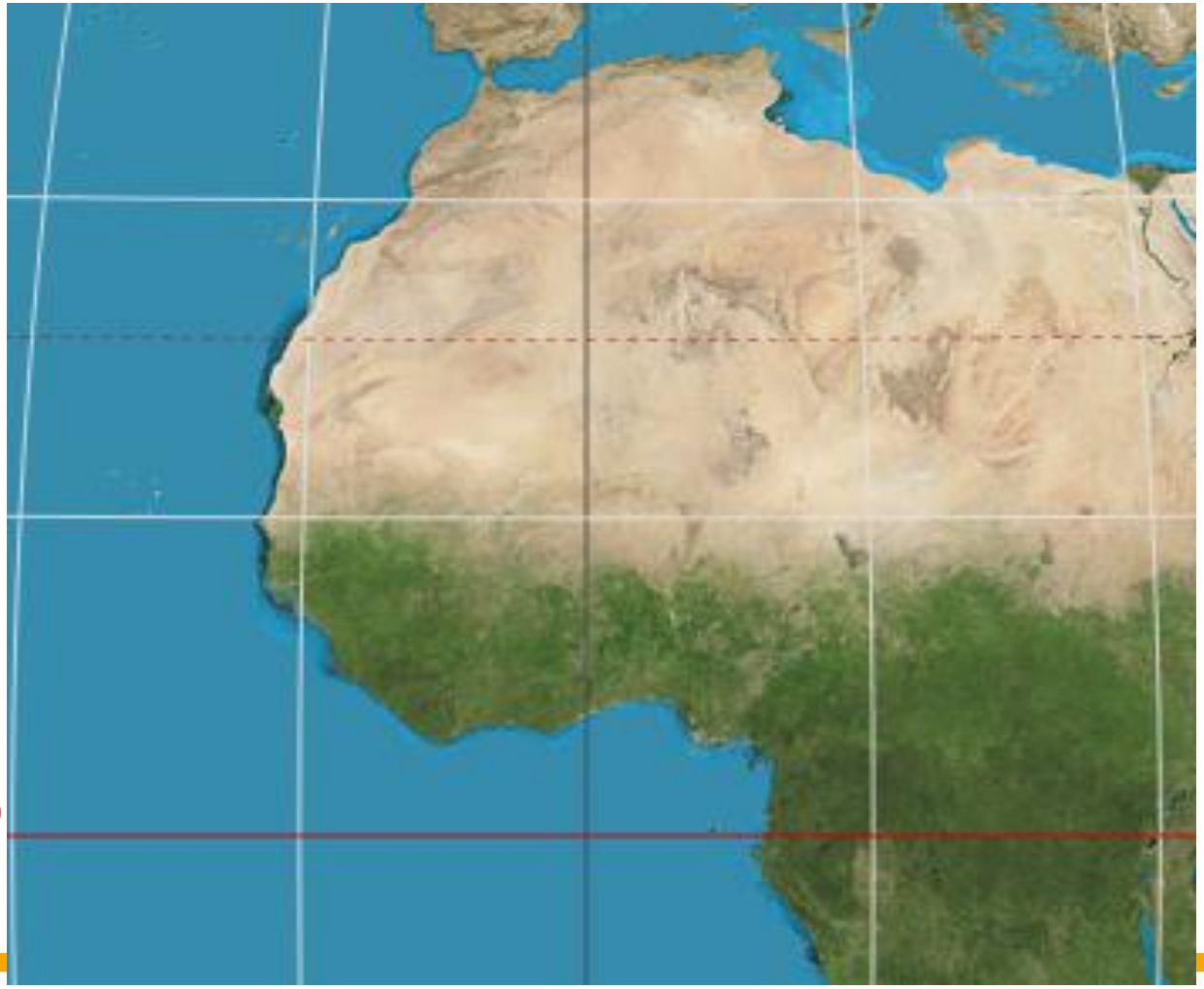
SWFDP RA-I-West Africa

(Training Workshop, Dakar, Senegal 2-6 November 2015 to gather information from the countries in Western and Central Africa on NMHSs infrastructure and capacities)

Strong request from RA I (Africa) during its 16th Session in February 2015 for expansion of SWFDP in whole Africa including Western Africa



(Seed funding from KMA)

SWFDP- RA IV Caribbean

(consider planning ?)

Countries in the region ? (strating with a smaller group of countries ?)

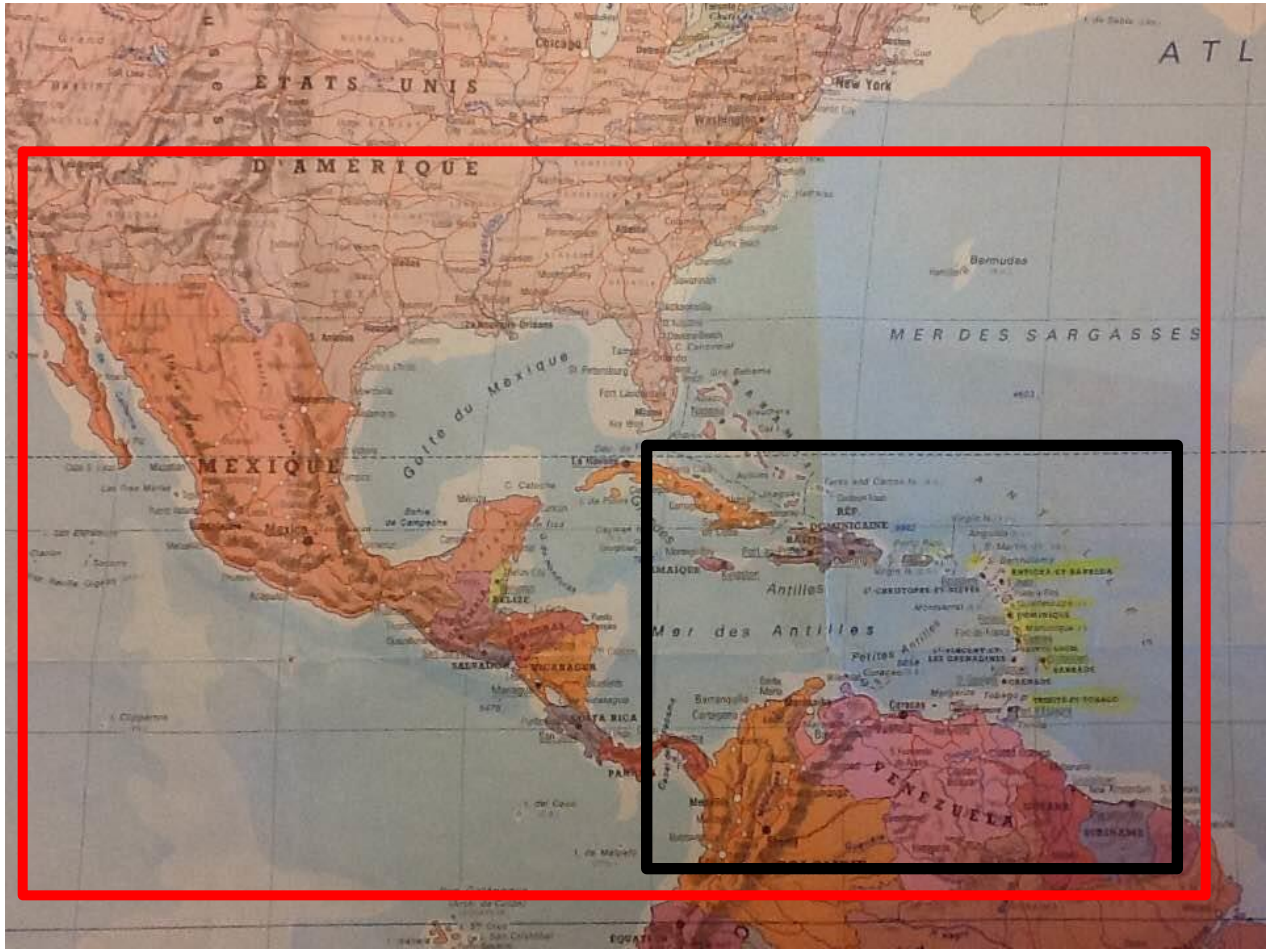
Contributing Global NWP Centres ? (NCEP/NOAA, ECMWF…?)

Contributing Regional Centres ?

- one Regional Centre to lead ?
- RSMC-Miami for hurricane fcst support ?

Project domain and Potential Focus ?

- Strong winds ?
- Heavy rains ?
- Hazardous waves ?



(Seed funding from Canada with potential additional resources from USAID)

SWFDP- RA VI South East Europe

(Consider planning ?)

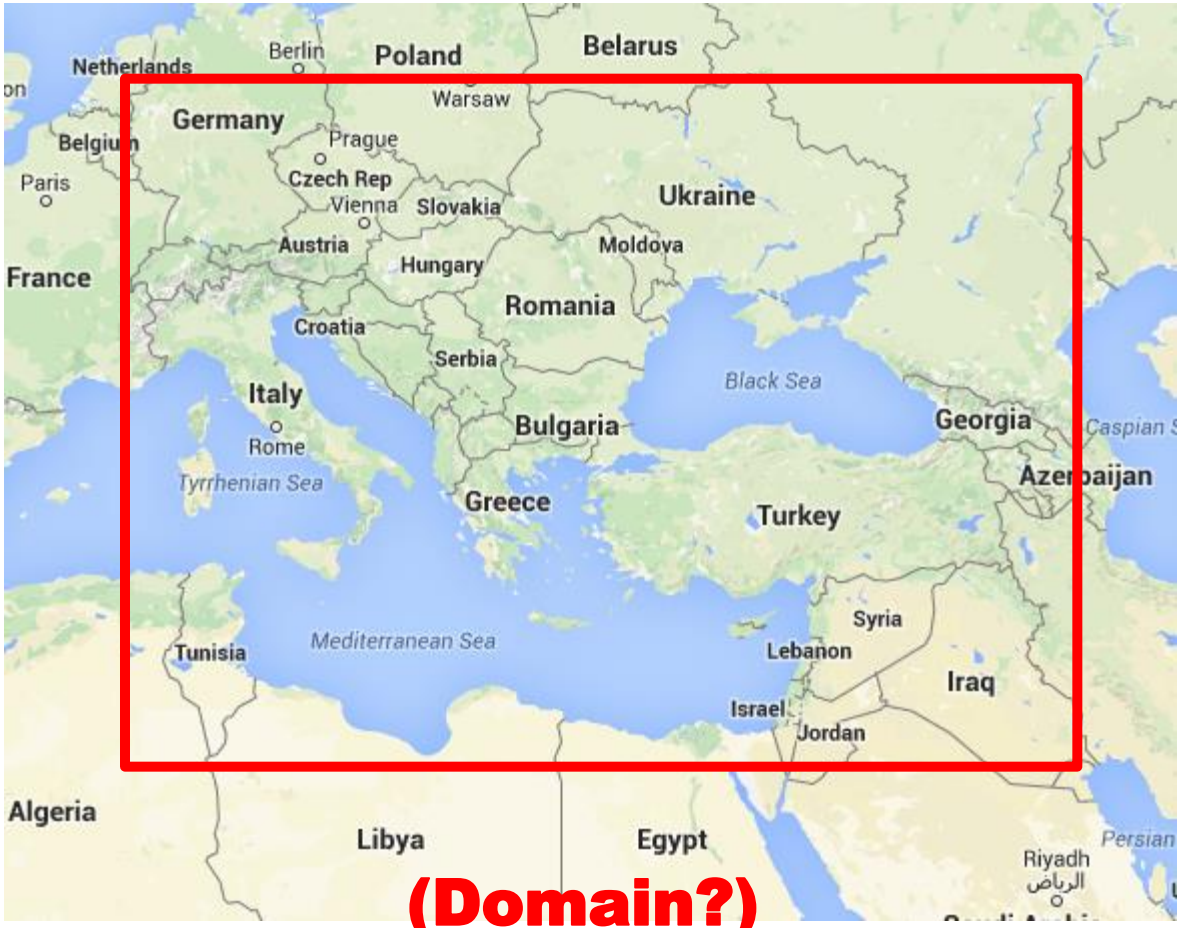
Countries in the region ?
Strong commitment from interested countries?)

Contributing Global NWP Centres ?
ECMWF, UKMO, DWD, MeteoFrance?

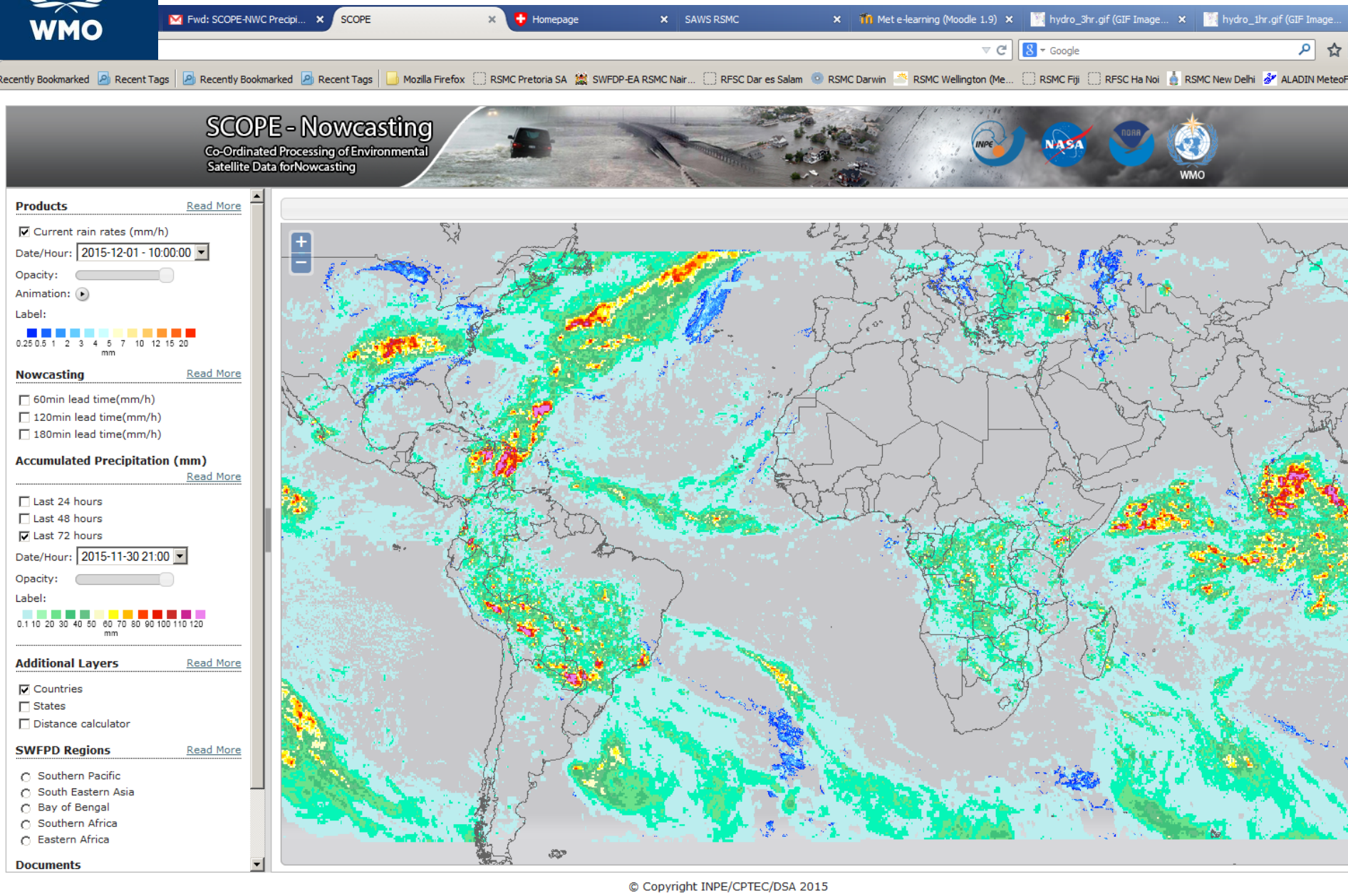
Contributing Regional Centres ?

Project domain and Potential Focus ?

- Strong winds ?
- Heavy rains ?
- Severe Thunderstorms?
- Hail Storms?
- Heavy snow with blizzards?



SCOPE NWC precipitation products



Capacity Development:
SWFDP Training Activities

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 preferably held every year and 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)*

Capacity Development:
Additional Opportunities through SWFDP

In addition

- Training at ECMWF (e.g. on interpretation of ECMWF products etc.)
- DWD annual training on COSMO
- Regional Training Centres (training programmes on forecasting aligned with the SWFDP)
- NOAA/NCEP Monsoon Desk

Capacity Development:
In 2014

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

Capacity Development:
In 2015

In 2015:

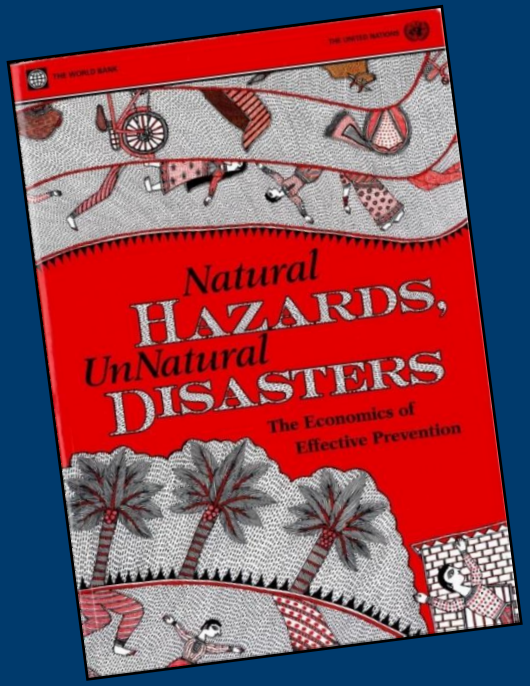
- In-country SWFDDP-Southwest Pacific Training Workshops (DPFS/PWS) for 9 Island States (continued since March 2015)
- One-week SWFDP-Central Asia Training workshop (DPFS/PWS) (Moscow, July 2015)
- Two-week SWFDP-Southeast Asia & Bay of Bengal Training Workshop (DPFS/PWS) (Ha Noi, September 2015)
- Two-week SWFDP-Southern Africa Training workshop (DPFS/FFGS/PWS) (Pretoria, 9-20 November 2015) & RSMC Training Desk
- Two-week SWFDP-Eastern Africa Training workshop (DPFS/PWS/AgM) (Addis Ababa, 16-27 November 2015)

In addition: 2 NWP scientists were sponsored for COSMO training at DWD (Germany) in March 2015; and 5 forecasters (including 1 from Kenya, 2 from Senegal) were sponsored for training at ECMWF in October 2015

Investment during pre-disaster or Spending during post-disaster?

- We can not stop severe weather and hydrometeorological hazards from happening, but we can prepare for it, including through improving severe weather forecasting and warning services for hydrometeorological hazards

- Investment during pre-disaster mode (e.g. capacity development of the NMHSs to issue impact-based forecasts and risk-informed warnings, disaster management, and strengthening of multi-hazard early warning systems (MHEWS) etc.) save funds required during post-disaster phase (e.g. for rehabilitation activities and reconstruction etc.) through keeping the damages from disasters at minimum and ensuring safety of lives



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Thank you

Abdoulaye Harou
Alice Soares
Ata HUSSAIN
(DPFS Division)

"Spending on improving weather forecasting and sharing data have high returns."
Natural Hazards UnNatural Disasters –
The Economics of Effective Preveniton, WB, UN (2011)