WMO activities in Hydrology and Water Resources

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World Meteorological Organization
Organisation météorologique mondiale

Role of WMO in the field of Hydrology and Water Resources

WMO Convention

Art: 2(e): "to promote activities in operational hydrology and close co-operation between Meteorological and Hydrological Services"

Hydrology and Water Resources Programme

WMO OMM

Hydrology and Water Resources Programme

Overall objective:

To promote the effective use of hydrology in the framework of Integrated Water Resources Management to:

- Meet the needs for sustainable development and use of water and related resources;
- Mitigate water-related disasters;
- Ensure effective environmental management at national and international levels.

Long-Term ambitions for the WMO hydrological community

(a) No one is surprised by a flood

(b) Everyone is prepared for drought

(c) Hydro-climate and meteorological data support the food security agenda

(d) High-quality data supports science

(e) Science provides a sound basis for operational hydrology

(f) We have a thorough knowledge of the water resources of our world

(g) Sustainable development is supported by information covering the full hydrological cycle

(h) Water quality is known

Water Management Value Chain

REAL-TIME DATA COLLECTION	MODELLING & FORECASTING	EARLY WARNING DISSEMINATION	DECISION SUPPORT	RESPONSE TO WARNING
• World Hydrological Cycle Observing System (WHYCOS) • WMO Hydrological Observing System • Global Hydrometry Service Facility (HydroHub) • Global Hydrological Status and Outlook project	• Flood Forecasting Initiative (FFI) including Flash Flood Guidance System (FFGS) • Associated Programme for Flood Management (APFM) • Coastal Inundation Forecasting Demonstration Project (CIFDP)		• Water Resources Assessment • Associated Programme on Flood Management (APFM) • Integrated Drought Management Programme (IDMP)	

CAPACITY BUILDING

In support of the functions of National Hydrological Services

WMO OMM

Guidance material

Technical Regulations Volume III – Hydrology – 2006 ed.
Guide to Hydrological Practices – 6th Ed. – November 2008

Manuals issued or under preparation:

Manual on Low Flow Estimation and Prediction - 2008
Manual for the Estimation of Probable Max. Precipitation - 2009
Manual on Stream Gauging – 2nd Ed. – 2010
Manual on Flood Forecasting and Warning – 2011
Manual on Water Resources Assessment – 2018 webpage
Manual on Flood Risk Mapping - 2020
Guidelines to Evaluate End-to-end Early Warning Systems for flood forecasting - 2020

WMO HydroHub

helps countries in **acquiring, maintaining and sharing hydrological data** on a regular and sustainable basis across economic sectors and national borders.

WMO HydroHub components:

- **World Hydrological Cycle Observing System (WHYCOS)**
- **WMO Hydrological Observing System (WHOS)**
- **Global Innovation Hub**
- **Community of Practice (CoP) for Hydrometry**
- **Hydrological Services Information Platform (HSIP)**

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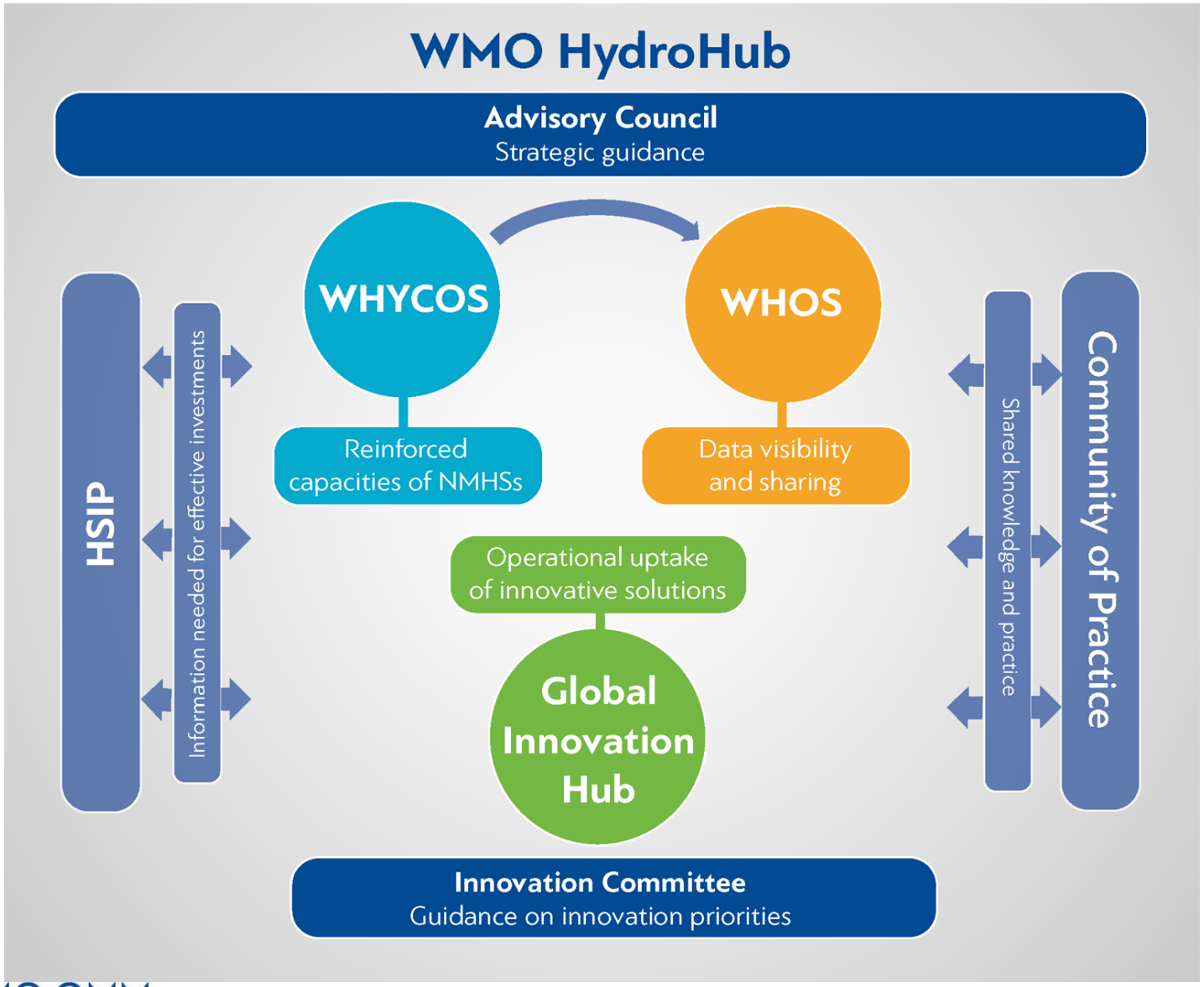
WMO HydroHub
Advisory Council
Strategic guidance
WHYCOS
WHOS
HSIP
Information needed for effective investments
Reinforced capacities of NMHSs
Data visibility and sharing
Shared knowledge and practice
Community of Practice
Operational uptake of innovative solutions
Global Innovation Hub
Innovation Committee
Guidance on innovation priorities

WHYCOS and related HYCOS projects

building and reinforcing **the technical, institutional and human capabilities of NMHSs** to hydrometeorological data collection and management and information production and dissemination.

Main challenge

Sustainability of project achievements

New WHYCOS Operating Model

Capacity and Needs Assessments

Project Advisory Services

Long-term Support

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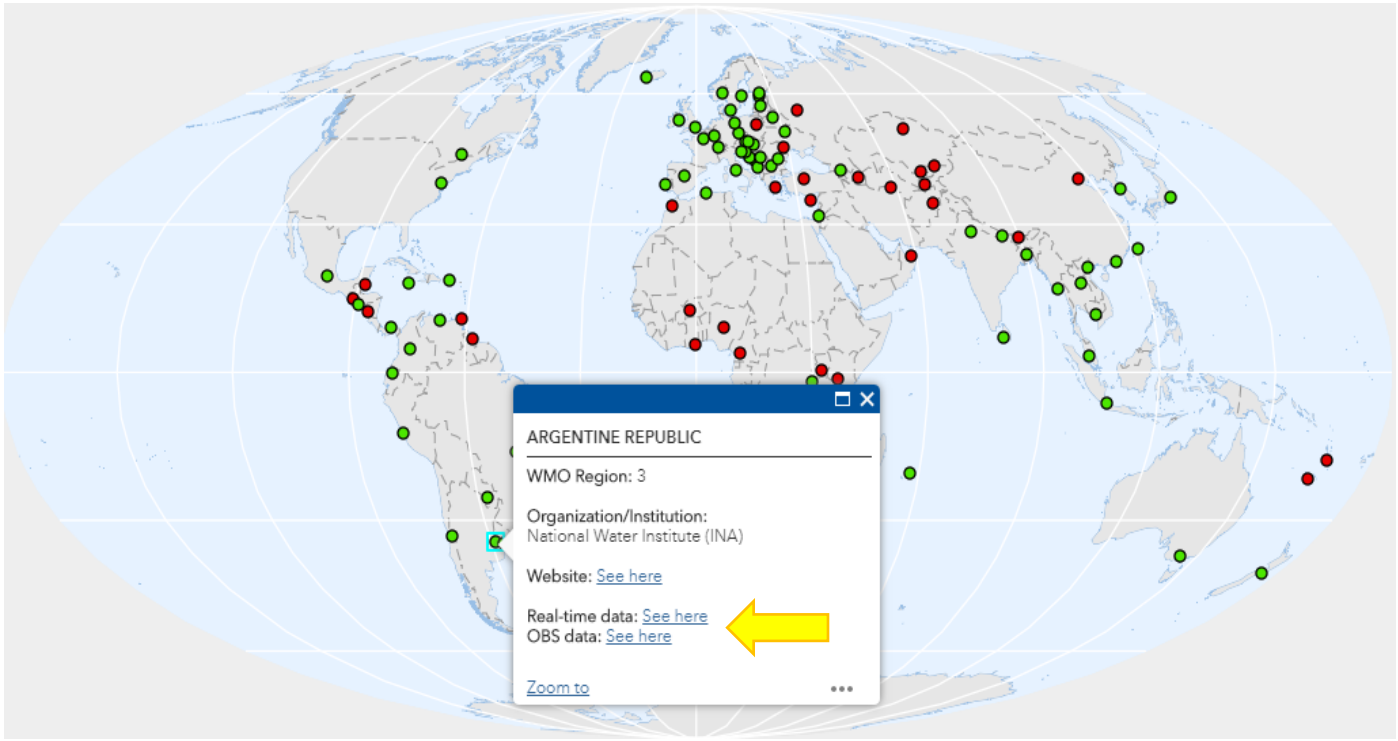
WHYCOS entry points

HYCOS components can be established at a **variety of scales**, from basins to large sub-continental regions which share common hydrological characteristics and challenges.

- **NMHSs (individually or as a group)** can make an official request to WMO for the development of a HYCOS project
- **Formal regional institution or river basin authority** can approach WMO and make a request on behalf of its member countries
- **Development agencies and donors** can make a request for WMO technical support to conduct Capacity and Needs Assessments
- **External projects** carried out through major funding sources or initiative can include a HYCOS component

WHOS implementation: Phase I

Map interface with links to those NHSs that make their real-time and historical hydrological data available online.



https://public.wmo.int/en/our-mandate/water/whos

WHOS implementation: Phase II

An **architecture** (**"system of systems"**) allowing to link hydrological data providers and users by integrating various commercial and freely available hydrological information tools, systems and services.

Who can use WHOS?

WHOS is open to **all users and institutions** from any country or level of government.

What does WHOS apply to?

- any type of hydrological data and information
- any type of hydrological information tools and applications
- hydrological models with calibrations (under development)

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Hydrological Services Information Platform (HSIP)

aimed at providing **up-to-date information** needed for effective hydromet investments, including information on NMHSs capacities as well as information on past and ongoing hydromet development activities in the country(ies)/region.

Hydrology Online Survey will be send to Hydrological Advisers in October 2019:

- **General questionnaire**
- **INFOHYDRO questionnaire** (related to data collection and management)
- **Questionnaire on Hydrological Forecasting**

SurveyMonkey

Should you have any questions: hydrosurvey@wmo.int

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WMO OMM

What is MCH?

MCH stands for:

Meteorology, **C**limatology and **H**ydrology database management system (DBMS).

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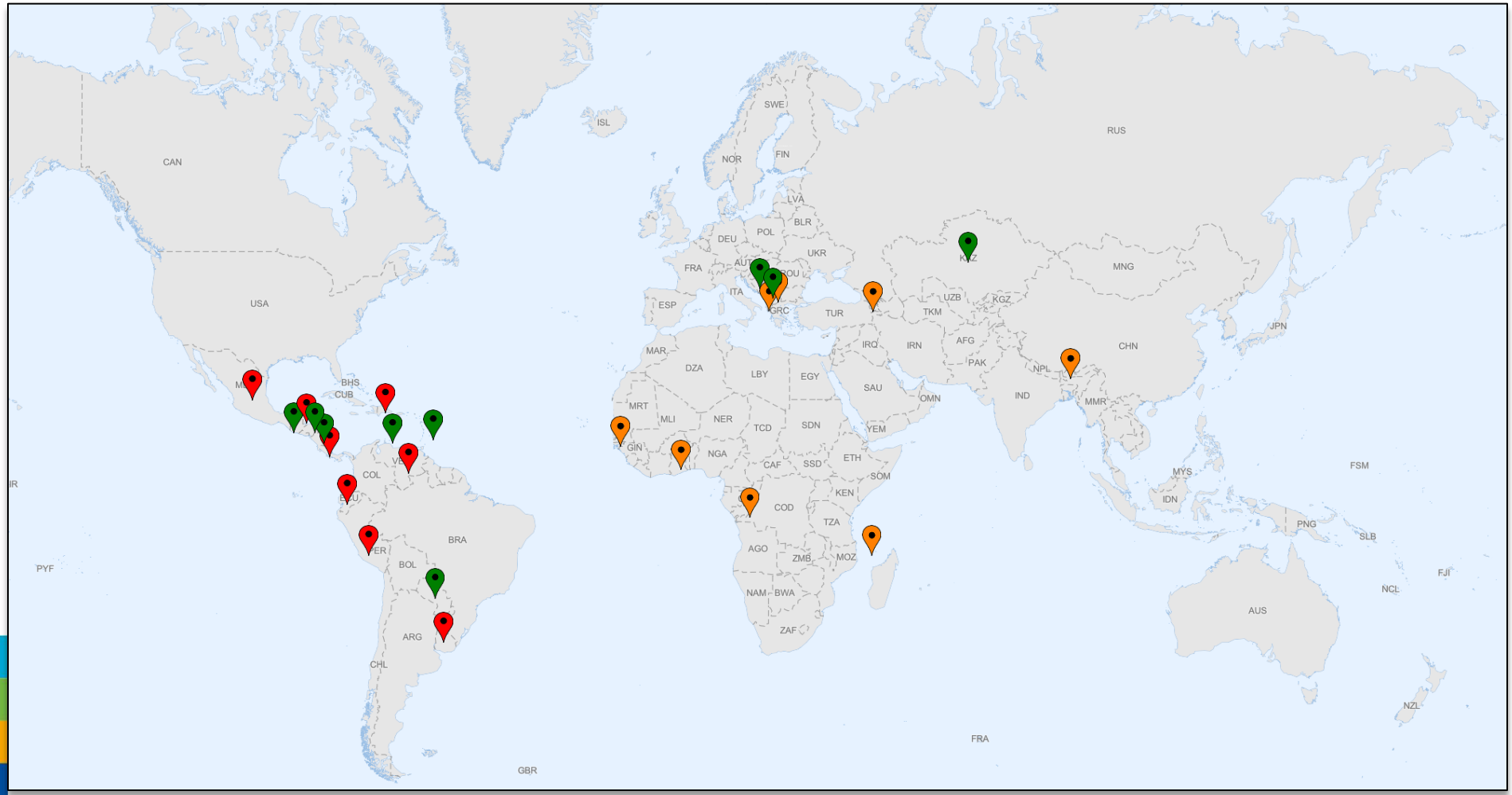
Background

- Developed by Mexico
- Adapted for Meteorology by the Iberoamerican Programme of Cooperation of National Meteorological and Hydrological Services
- Ownership transferred to WMO in 2011
- 2012 Translated into English
- 2012 Ghana - pilot country for the English version
- 2013 Establishment of the MCH User Community
- 2014 Translated into French

Installed in 26 countries/institutions



WMO OMM

Used operationally

Under implementation

Not used

Where has it been installed

Spanish version

- CIIFEN - Centro Internacional para la Investigación del Fenómeno de El Niño (Ecuador)
- Costa Rica
- Dominican Republic
- Guatemala
- Honduras
- Mexico (National Water Commission)
- Nicaragua
- Paraguay
- Peru
- Uruguay
- Venezuela

French Version

- Comoros
- Commission International du Bassin Congo - Oubangui - Sangha **CICOS** (RDC, Congo)

English version

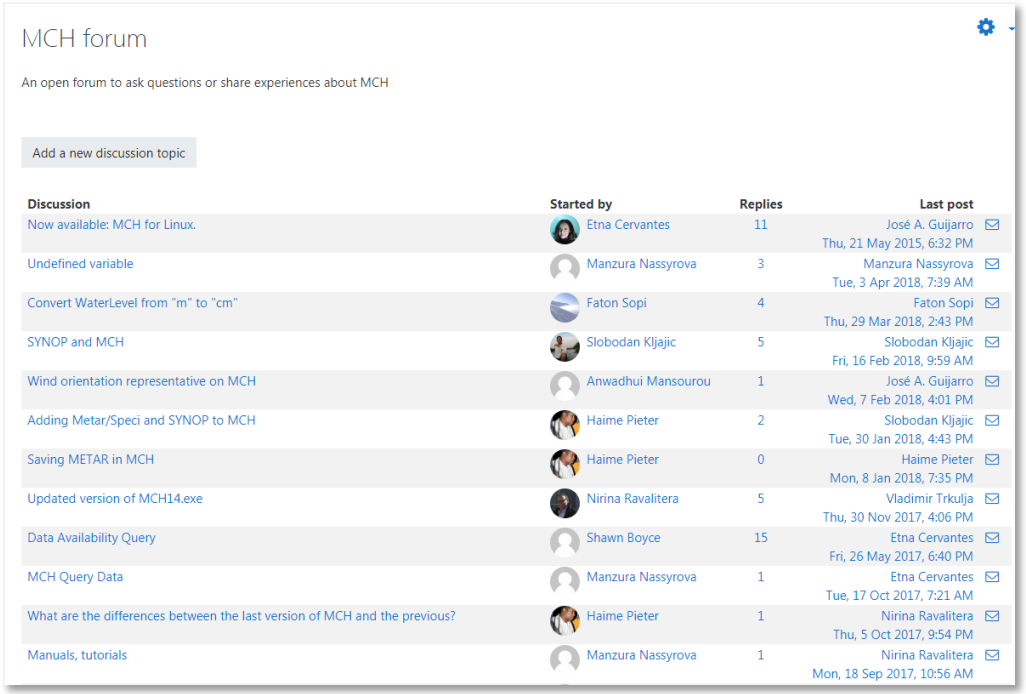
- Albania
- Armenia
- Belize
- Bhutan
- Bosnia and Herzegovina
- CIMH - Caribbean Institute for Meteorology & Hydrology
- Curacao
- Ghana
- Gambia
- ICPAC (IGAD Climate Prediction and Application Center)
- Kosovo
- Kazakhstan
- North Macedonia

Current status

- Latest version
  - Version 2018
- Used operationally in 9 countries
- Under implementation in 8 countries
- User community

  200 Users registered

  10-15 Active users



MCH forum

An open forum to ask questions or share experiences about MCH

Add a new discussion topic

Discussion	Started by	Replies	Last post
Now available: MCH for Linux.	Etna Cervantes	11	José A. Guijarro Thu, 21 May 2015, 6:32 PM
Undefined variable	Manzura Nassyrova	3	Manzura Nassyrova Tue, 3 Apr 2018, 7:39 AM
Convert WaterLevel from "m" to "cm"	Faton Sopi	4	Faton Sopi Thu, 29 Mar 2018, 2:43 PM
SYNOP and MCH	Slobodan Kljajic	5	Slobodan Kljajic Fri, 16 Feb 2018, 9:59 AM
Wind orientation representative on MCH	Anwadhui Mansourou	1	José A. Guijarro Wed, 7 Feb 2018, 4:01 PM
Adding Metar/Speci and SYNOP to MCH	Haime Pieter	2	Slobodan Kljajic Tue, 30 Jan 2018, 4:43 PM
Saving METAR in MCH	Haime Pieter	0	Haime Pieter Mon, 8 Jan 2018, 7:35 PM
Updated version of MCH14.exe	Nirina Ravalitera	5	Vladimir Trkulja Thu, 30 Nov 2017, 4:06 PM
Data Availability Query	Shawn Boyce	15	Etna Cervantes Fri, 26 May 2017, 6:40 PM
MCH Query Data	Manzura Nassyrova	1	Etna Cervantes Tue, 17 Oct 2017, 7:21 AM
What are the differences between the last version of MCH and the previous?	Haime Pieter	1	Nirina Ravalitera Thu, 5 Oct 2017, 9:54 PM
Manuals, tutorials	Manzura Nassyrova	1	Nirina Ravalitera Mon, 18 Sep 2017, 10:56 AM

Advantages

- **OPEN SOURCE** based (No license fees, Not a “black box”)
- **A configurable system** (you define your variables and stations etc.), and allows you to connect external modules
- **Manages** Hydrological, Climatological and Meteorological **data under a unique platform**
- **Multilingual**, using an external text file, currently available in Spanish, English and French
- **Minimum system requirement**

How and where can you get MCH?

- An official request signed by the Permanent Representative of your country with WMO

Flash flood is a flood of short duration with a relatively high peak discharge in which the time interval between the observable causative event and the flood is less than six hours.

FFGS and Objectives

- FFGS is a forecaster's tool designed to provide hydrometeorologists with **readly and accessible observed and forecast data**, and other information to produce timely and accurate flash flood watches and warnings for a location.

- **Enhance NMHSs capacity to issue flash flood warnings and alerts;**
- **Mitigate adverse impacts of hydrometeorological hazards;**
- **Enhance collaborations between NMHSs and DMAs;**
- **Generate flash flood early warning products by using state-of-the-art hydrometerological forecasting models;**
- **Provide extensive training to the hydrometeorological forecasters;**
- **Foster national and regional developments and collaborations; and**
- **Support WMO Flood Forecasting Initiative.**

Flash Floods and FFGS in Numbers

In an average year flash floods kill over **5,000** unsuspected people

FFGS serves almost

3 billion

people around the world saving lives and decreasing economic losses.

Flash floods occurs quickly, within 6 hours of the rain event.

16 FFGS Projects

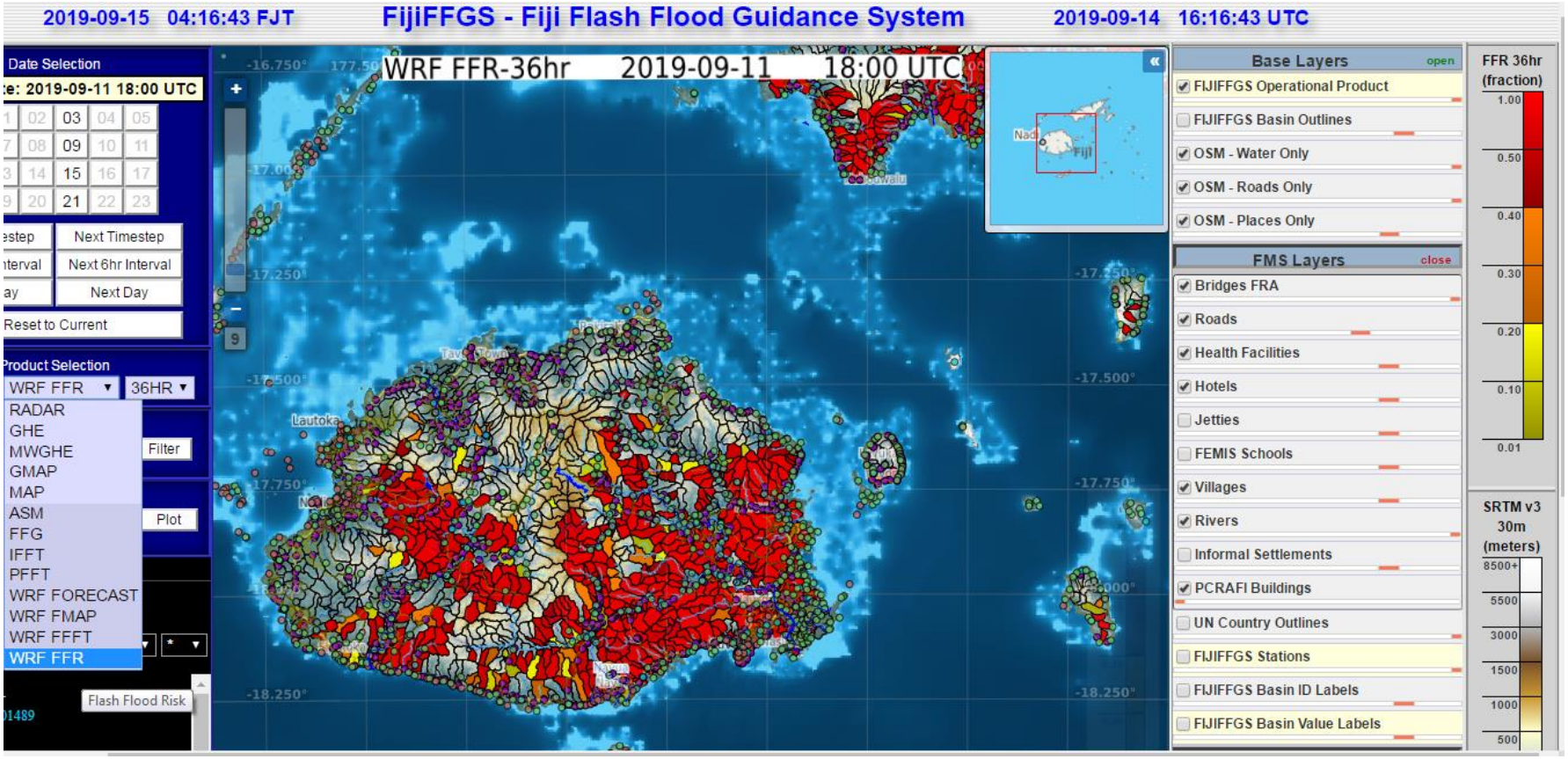
More than **20** Hands-on FFGS trainings

64 countries

More than **200** Trained forecasters

50 WMO Certified FFGS Programme Trainers

FFGS Products



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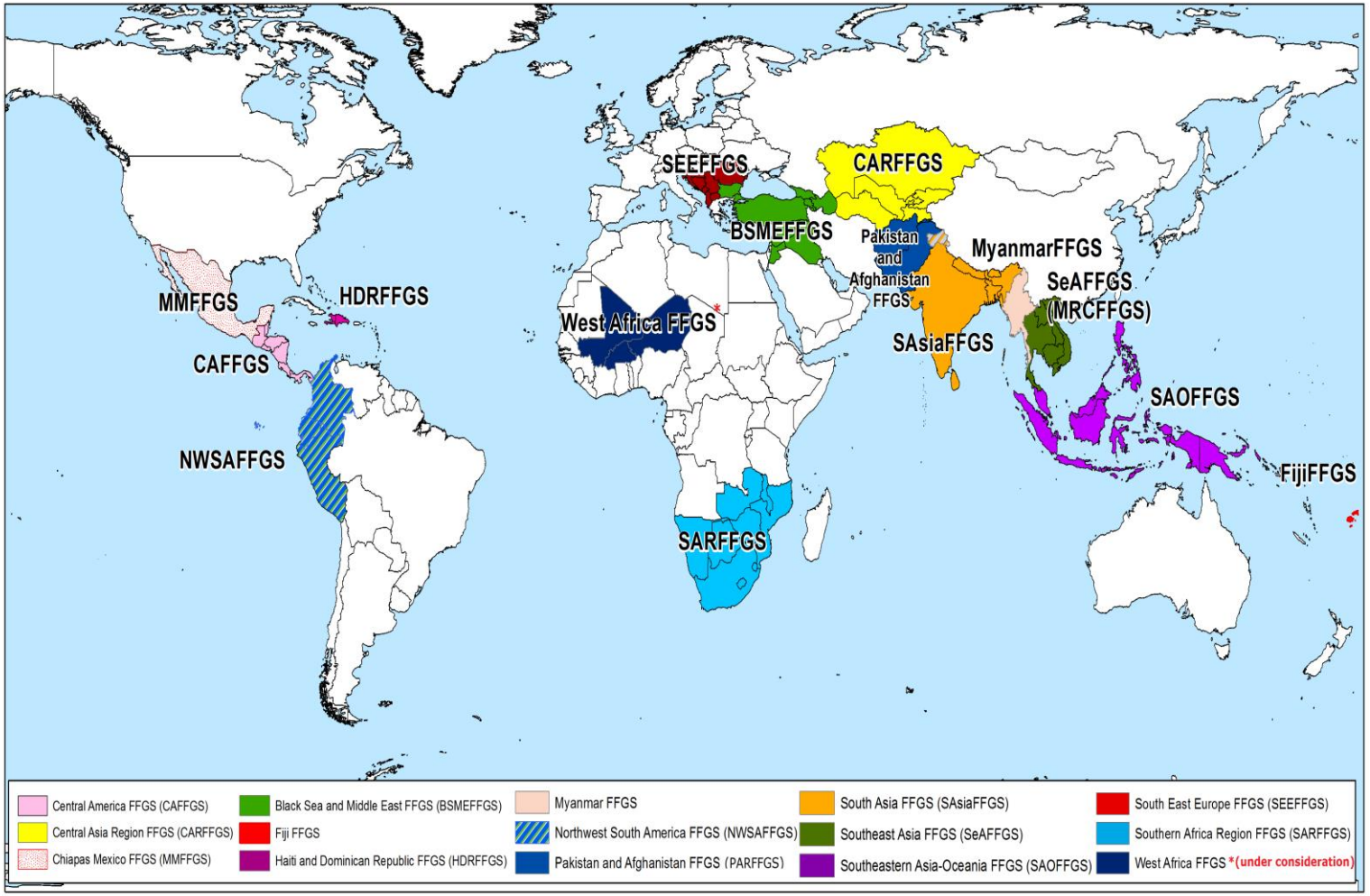
FLASH FLOOD GUIDANCE SYSTEM WITH GLOBAL COVERAGE



Associated Programme on Flood Management (APFM)

WORLD METEOROLOGICAL ORGANIZATION

Joint Initiative Global Water Partnership

Technical Support Unit	embedded in the WMO Hydrology and Water Resources Branch
Founded	in 2001
Contributors	FOEN (Switzerland), MAE (France), CONAGUA (Mexico) and USAID (in the past: Japan, the Netherlands, Germany and Italy)

Mission

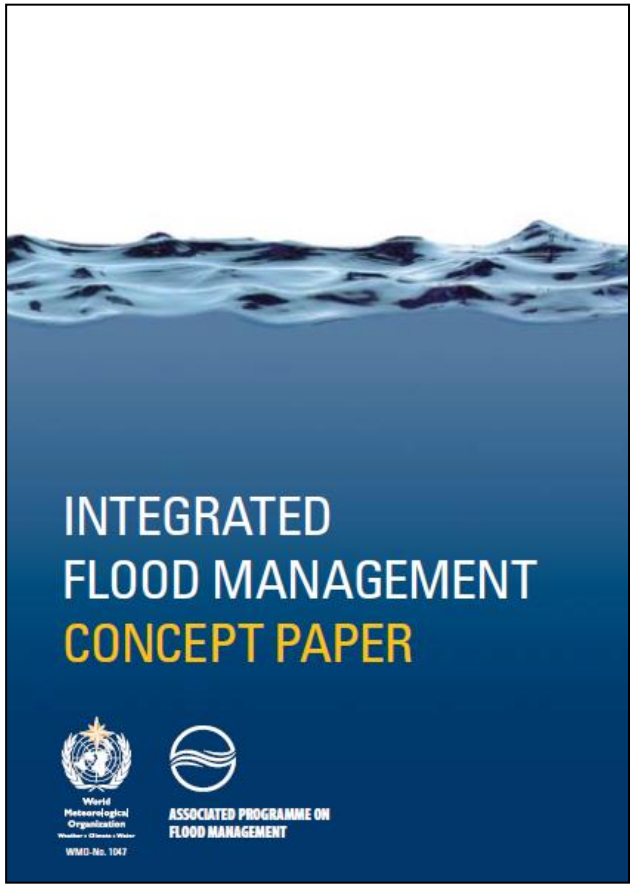
To support Members/countries in implementing Integrated Flood Management

Integrated Flood Management definition

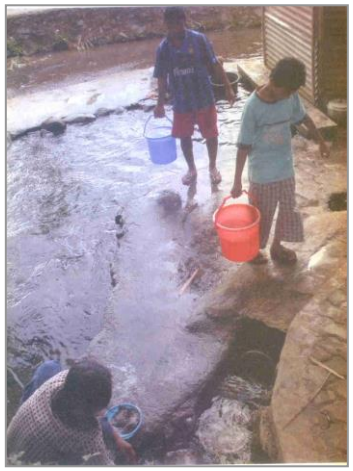
"Integrated Flood Management is a process that promotes an integrated, as opposed to fragmented, approach to managing floods."

Objectives:

- **maximizing net benefits** derived from the use of floodplains
- **minimize loss of life** due to flooding
- consider **environmental preservation**
- balancing development needs with flood risk towards **sustainable development**



Traditional interventions of Flood Management



- Emphasis on **'Control' rather than 'Management'**
- River **morphological behaviour** is not factored
- Structural measures generally **disturbe eco-system** balance and give a **false sense of security** to people
- Rather than mitigating flood risk we largely succeeded in only **shifting** them **spatially & temporarily**
- Planned in isolation from other development issues and on local scales (**local and partial solution**)

- Problem primarily addressed based on engineering solutions (**monodisciplinary**)
- Comprehensive flood management policies are **neglected policy issues**
- Non-structural measures:
  - weak coordination
  - poor communication strategies
  - limited or passive community participation

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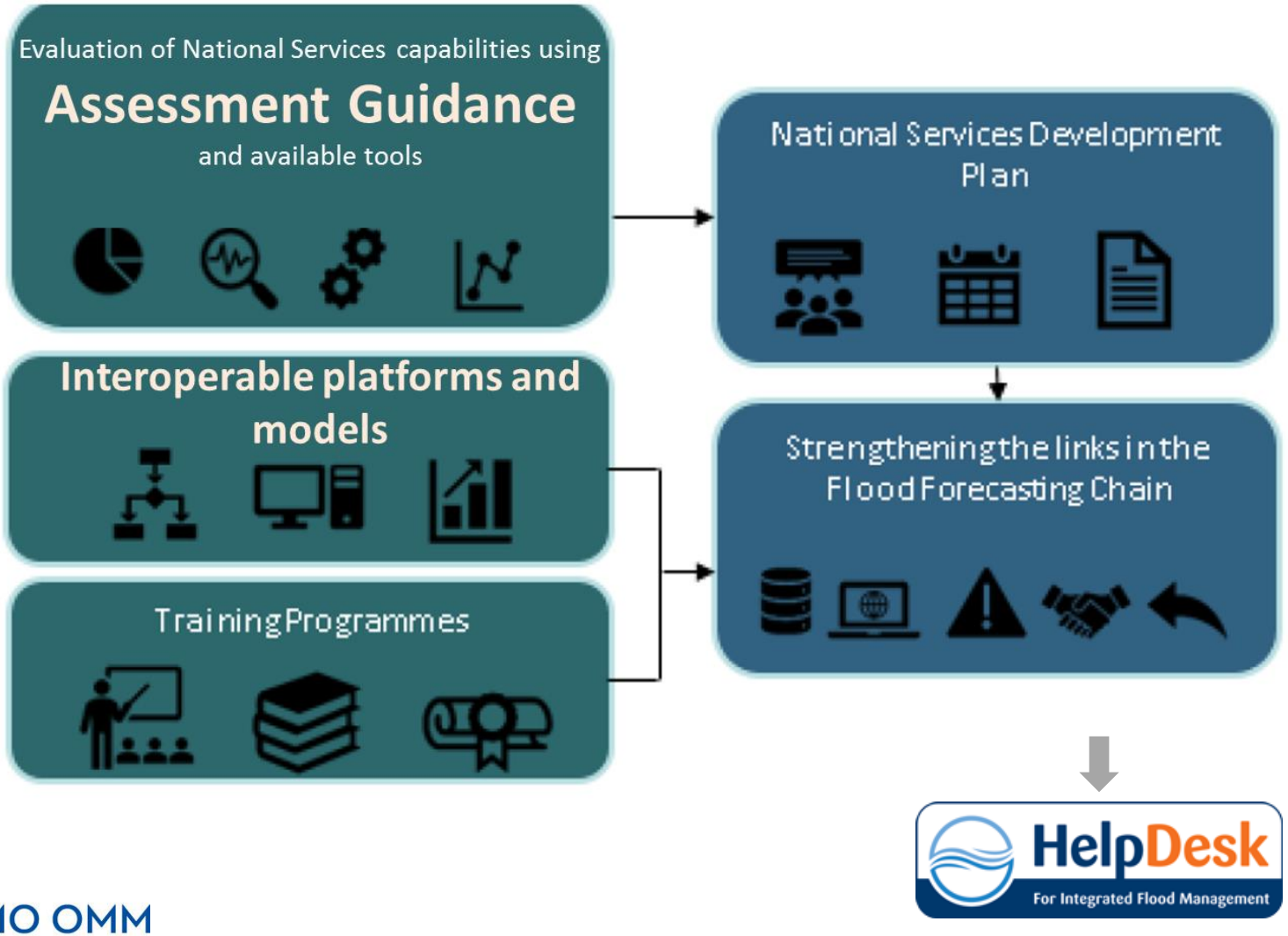
FFI Main Activities



Courses on Stream Gauging

- In 2010, the International Association for Hydro-Environment Engineering and Research (IAHR) and WMO agreed to cooperate in the development of a course on stream gauging based principally on the 2nd edition of the WMO Manual of Stream Gauging.
- The training material for the course is available in four languages at:

  https://www.hydroref.com/wmo/communities/

Distance Learning in HWR

- Trainers Workshop on DL Delivery of Hydrology Courses in Boulder, in December 2011
- 11 participants from eight institutions, potentially covering all WMO regions.
- Participants were trained in designing, adapting and translating if needed, and delivering DL courses based on the WMO/COMET model.

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Distance Learning

- Used for general hydrology courses http://etrp.wmo.int/moodle/
- Delivered in partnership with COMET (USA), National Water Academy (India), IMTR (Kenya) and NIWA (New Zealand)
- Hydrology Courses based on suites of existing COMET modules with supportive, instructor-led, DL environment, 7-weeks long in average
- Two levels: Basic (International edition ready) and Advanced
  and
  One special course on hydrometry for field technicians
- Since 2011, in Asia, Africa and the SW Pacific:

- 12 Basic courses – 545 participants – 79% completion
- 4 Advanced – 193 participants – 80% completion
- 2 Technicians – 72 participants – 42% completion

S. No.	Project Name	Funded by	Broad Objectives	Budget (in USD)
1	PROHMSAT-Plata	USAID-OFDA	Enhancement of the Hydrometeorological Forecasting and Early Warning System in La Plata Basin – using FFGS and WHOS	1.3 Million
2	Volta Flood and Drought Management Project	Adaptation Fund	Establishment of a decision making system for flood and drought within the Volta Basin (6 countries)	7.92 Million (7,920,000)
3	WMO Afghanistan Early Warning System (completed in March 2019)	USAID-OFDA	Strengthening the national weather, water and climate services of Afghanistan for the end-to-end early warnings of the hydrometeorological disasters.	2.35 Million (2,354,800)

S. No.	Project Name	Funded by	Broad Objectives	Budget (in USD)
4	CREWS Afghanistan	CREWS (Multi donor trust fund)	Strengthening the institutional framework for service delivery for the early warning of the national disasters through: (i) Enhancing flood forecasting and warning capacities (ii) Enhancing public weather, climate and hydrological services (iii) Enhancing the agrometeorological services including drought monitoring programme (iv) Establishing a quality management system (v) Developing a modern impact based weather forecasting system	0.97 Million (970,000)

S. No.	Project Name	Funded by	Broad Objectives	Budget (in USD)
5	WMO Hydromet Expert Services for Central Asia	World Bank Group	Providing expert services to Kyrgyz Republic, Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan for the successful implementation of the following World Bank Projects: (i) Central Asia Hydromet Modernization Projects (ii) The Climate Adaptation and Mitigation Program for Aral Sea Basin (iii) Strengthening Early Warning of the Mountain Hazards in Central Asia	32,000
6	CREWS Pacific SIDS - Flash Flood Guidance System for Fiji (FijiFFGS)	CREWS ECC Canada	Advance capacity of national meteorological and hydrological services to develop early warnings of flash floods and related secondary hazards, such as landslides in Fiji.	0.78 Million (779,400)

S. No.	Project Name	Funded by	Broad Objectives	Budget (in USD)
7	Building Seamless Multi-Hazard Early Warning System (CREWS) - CREWS Caribbean (Dominican Republic)	CREWS ECC Canada	Development and implementation of a riverine flood forecasting system in Hispaniola and establish synergies with other initiatives/projects within the region.	0.56 Million (560,000)
8	CREWS Burkina Faso	CREWS (Multi donor trust fund)	Building capacity of the National Meteorological and Hydrological services and strengthening cooperation with authorities and the public, to enhance early warning systems with a seamless approach.	0.5 Million (500,000)

S. No.	Project Name	Funded by	Broad Objectives	Budget (in USD)
9	Building Seamless Multi-Hazard Early Warning Systems (CREWS) - Southeast Asia: Southeast Asia Flash Flood Guidance System (SeAFFGS)	CREWS ECC Canada	Advance capacity of national meteorological and hydrological services to develop early warnings of flash floods and related secondary hazards, such as landslides in Southeast Asia, covering the countries of Cambodia, Lao PDR, Thailand and Viet Nam.	1.16 Million (1,165,200)

S. No.	Project Name	Funded by	Broad Objectives	Budget (in USD)
10	CREWS West Africa	CREWS (Multi donor trust fund)	An operational severe weather, flood and climate forecast system, underpinned by on-going observations and continuously updated historical data, that provides monitoring and forecast outputs and products, as well as related knowledge, in support of CREWS-related activities in Burkina Faso, Mali, Niger, and other countries in the region, through enhanced capacity by regional centers to support national level provision of risk information and end-to-end early warning services.	0.56 Million (560,000)
11	CREWS Chad	CREWS (Multi donor trust fund)	To support the strengthening of national capacity to deliver climate, hydrometeorological and early warning services in selected sectors and communities.	HWR budget to be determined (WMO Budget – 0.98 million)

S. No.	Project Name	Funded by	Major activities/Objectives in hydrology	Budget (in USD)
12	CREWS Togo	CREWS (Multi donor trust fund)	To support the strengthening of national capacity to deliver climate, hydrometeorological and early warning services in selected sectors and communities.	HWR budget to be determined (WMO Budget – 1.3 million)
13	Myanmar Flood and Landslide Emergency Recovery Project	Myanmar Government (Through World Bank Group)	Providing technical expertise for the effective implementation of the World Bank Project in Myanmar for strengthening: (i) Water resources management, decision support systems and capacity building (ii) Modernization of the hydrometeorological observation network and information system (iii) Enhancement of the navigation in Ayeyarwady River	4 Million (under WMO Budget) (4,000,000)

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Thank you

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