WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

Second Session of the Commission for Weather, Climate, Water and Related Environmental Services and Applications SERCOM-2

Side Event
Launch of WMO Guidelines on CIF-EWS

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Organisation météorologique mondiale

Geneva
18 October 2022

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PART 1

Coastal Inundation Forecasting
CIFDP => CIFI

SERCOM-2 side meeting October 18, 2022

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Demonstration Project: CIFDP

https://community.wmo.int/activity-areas/marine/CIFDP

In 2009 JCOMM and CHy established CIFDP to facilitate the development of efficient warning systems to protect coastal communities' safety and to support sustainable development through enhancing coastal inundation forecasting and warning systems.

*: building **improved operational forecasts and warnings capability for coastal inundation**, that can be **sustained by the responsible national agencies***

- Identify and support end-user needs;
- Encourage full engagement of the stakeholders and partners in the CIFDP from early stages, for the successful development and implementation of this project;
- Transfer technology to the adopting countries;
- Facilitate the development and implementation of warning services;
- Support coastal risk assessment, vulnerability and risk mapping;
- Assist improved and informed decision-making for coastal inundation management

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Strategy for CIFDP/CIFI implementation

- CIFDP/CIFI is implemented through **national projects**, launched for a country that meets the essential requirement: national agreement;
- CIFDP/CIFI projects are **designed based on users' perspectives and requirements, considering existing and available open source techniques, which are feasible given the capacity within a country**. Final products should be operated and maintained by **national operational agencies** which have the responsibility/authority for coastal inundation warnings;
- The procedures/best practices developed through projects should be applicable to other (neighbouring) countries with common issues and interests, and should be closely linked to and cooperating with related projects and activities.

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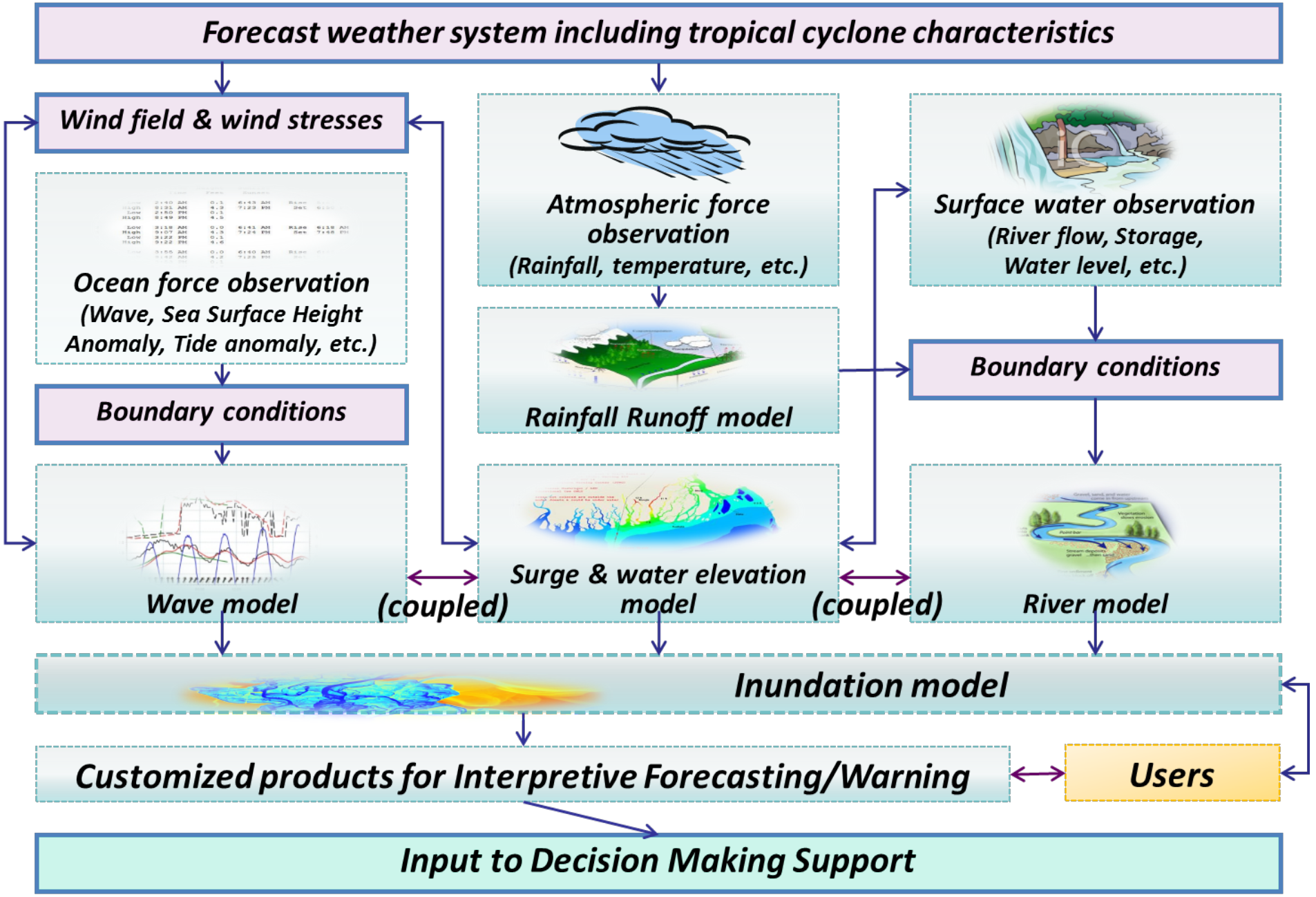
Conceptual diagram of CIFI forecast systems



CIFDP Implementation Plan

Implemented in a **phased approach** that leaves scope for adjustment in the next phases to fit the prevailing requirements:

Phase 0: Project preparation

- Engagement of the national agencies
- Ensured exchange of data/information

Initial National Agreements

Phase 1: Information gathering – Project Adaptation

- Assess national capabilities / System design
- National Coordination Team (NCT)

Stakeholders Workshop & Definitive National Agreement

Phase 2: System Implementation

- Forecasting Models
- Operational Warning System Development

System improvement & Training

Phase 3: Pre-operational testing

- User Guidelines, Training material

Multi-agency exercise & Training

Phase 4: Live Running and Evaluation

- System Updates, Support & Maintenance

Evaluation Workshop & communication

CIFDP Subprojects

Four separate and disparate subprojects were undertaken in:

- *Bangladesh (completed 2017),*
- *Caribbean (Hispaniola, completed 2018),*
- *Indonesia (Jakarta and Semarang, completed 2019)*
- *Fiji (completed 2019).*

Each had a different set of forcing mechanisms which, coupled with the varying degrees of capability, capacity and emergency management structure within the country, made them unique. Their successful implementation showed that integrated coastal inundation forecasting and warnings can be improved and coordinated by National Meteorological and Hydrological Services (NMHSs).

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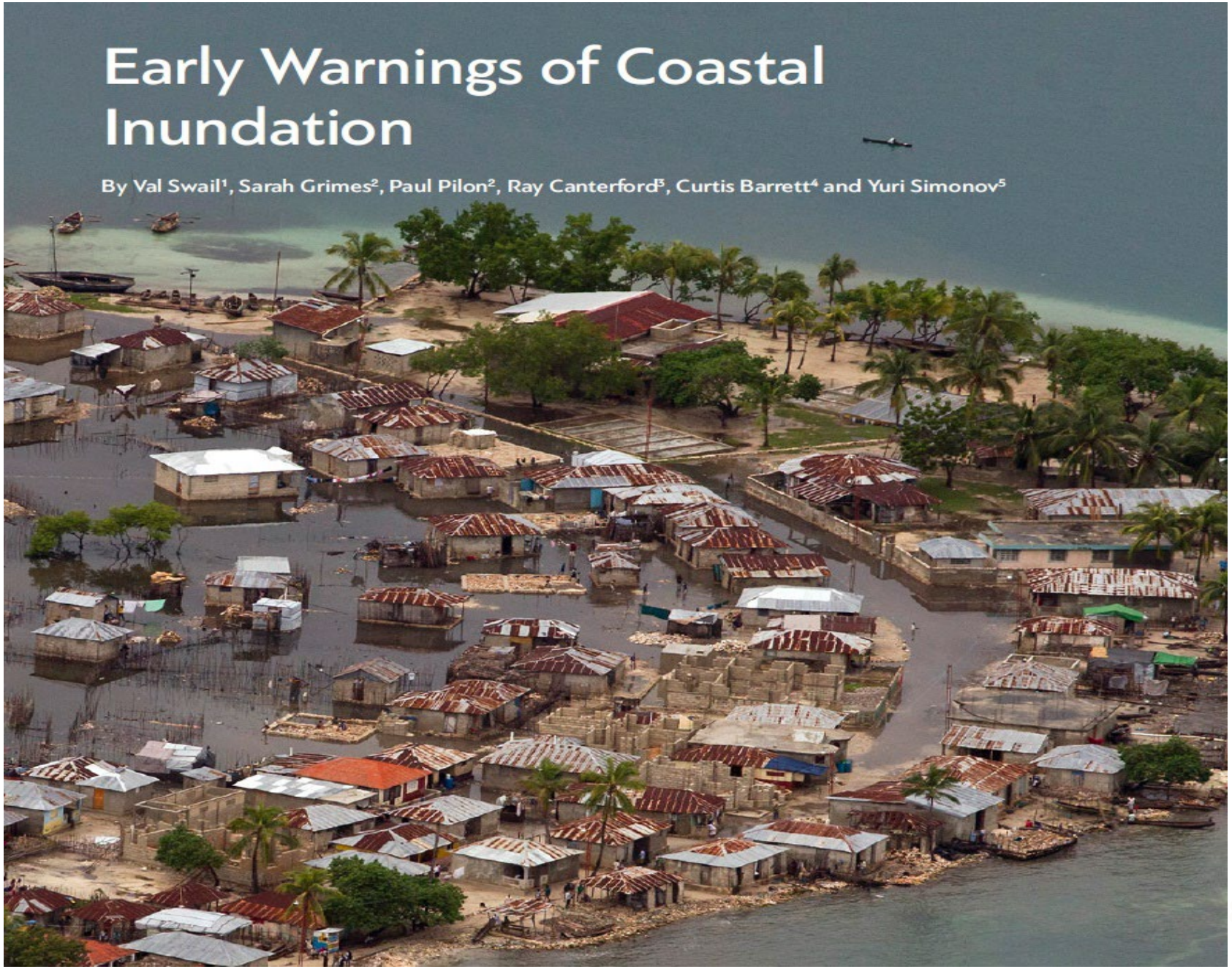

https://community.wmo.int/activity-areas/marine/CIFDP

Public Awareness videos

(in several languages)

[Coastal Inundation Video]

[Ocean Buoy Video]

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Thank you!

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PART2. Overview of Independent Assessment of CIFDP

- Requested by Joint WMO-IOC Commission on Oceanography and Marine Meteorology (JCOMM) and the WMO Commission for Hydrology (CHy)
- Curt Barrett (USAID) and Ray Canterford (WMO + UNESCO-IOC hazards expert)
- Formal TORs with comprehensive assessment criteria
- Was CIFDP still a Demonstration phase → operational?
- Should other CIF Projects be initiated?

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Approach to the Assessment of CIFDP

- **Extensive investigations** into the 4 regions of implementation-project outcomes – speaking to users important.

- **Interviews** based on a Questionnaire and additional guidance, including
  - Presidents of WMO CHy, JCOMM and Project members, Senior WMO Secretariat, incl DSG
  - Financial and donor partners

  - **Site Visits** to Dominican Republic and Fiji to evaluate systems

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Findings - site visits to evaluate CIFDP systems

Hispaniola – visit by Barrett

US/NOAA National Hurricane Center (NHC), provides the leading technical contribution in collaboration with the PSG and other partners – funding by USAID

Fiji – visit by Canterford

storm surge, extreme waves, tides, sea level rise (climate change) and hydrologic flooding, including serious Flash Floods, tsunami

Nadi expert flood forecasting system – CIASS – NIWA

Dr Graeme Smart high success rate

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Outcomes of Independent Assessment

- **Mr Val Swail (Canada) the CIFDP driving force and visionary**. He and his project teams undertook and achieved a major breakthrough with CIFDP over a decade!

- **Barrett and Canterford recommended** - a "WMO Coastal Inundation Forecasting Toolkit" should be developed to help other SIDS and developing countries → Agreed by Congress 18 (2019)

- **Single document** strongly supported by Senior WMO Secretariat

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PART 3. Guidelines on Implementation of a Coastal Inundation Forecasting – Early Warning System → CIF - EWS

From Resolution 15 (Cg-18):

(a) Further develop approaches for assessing national requirements and capabilities of EWS in areas prone to flooding (from multiple sources including but not limited to river-marine and geophysical related events) and impacts from severe weather and flash floods;

From Resolution 16 (Cg-18): task the technical commissions and other bodies with the development of guide(s) on procedures/mechanisms for effective support by NMHSs to their national disaster risk management, focusing on MHEWS operations, legislation and policy making and leveraging existing guidance material and good practices related to the four elements of MHEWS

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Guidelines on Implementation of CIF - EWS

And here it is!!

Published last week

3 years in preparation

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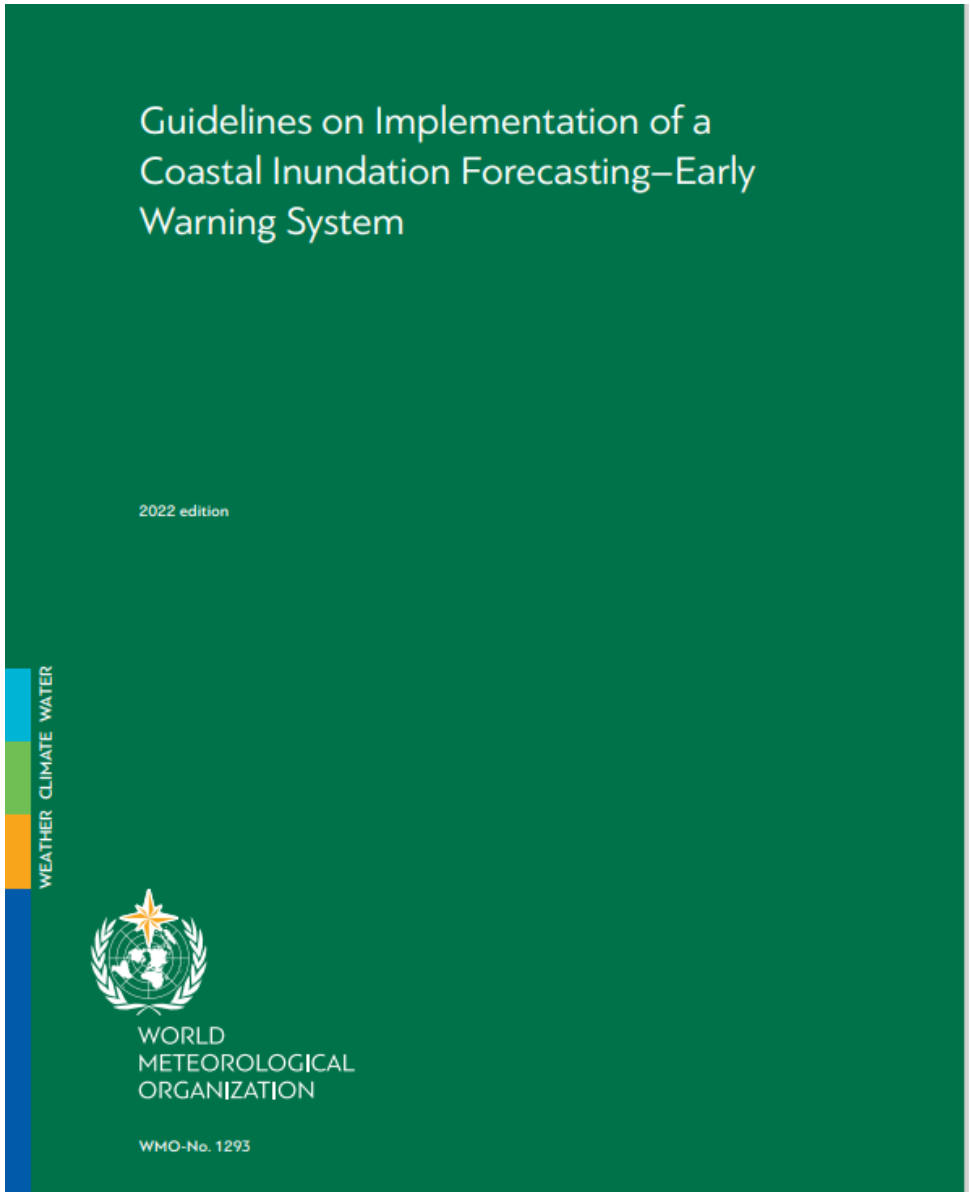

The audience – who benefits from CIF-EWS

- WMO Member countries, especially SIDS and LDCs who need to increase support for vulnerable coastal communities
- The national meteorological and hydrological agencies needing to successfully implement a system
- Sponsors and donors for clarity on aims, outcomes and integrity of financial aspects
- Technical experts to enable a standardised approach and ‘achievable best practice’.

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What are the CIF-EWS Guidelines?

- They are a COMPLETE guide to planning, building and implementing an inundation forecasting and warning system.
- They are focused on SIDS and other least developed countries with vulnerable coastal communities.
- They take account of varying levels of in-country staffing and technical capacity.
- They start from instruments to data to models to forecast outputs to early warning services.

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Guidelines on Implementing CIF - EWS

The aims of the CIF-EWS Guidelines are to:

- Identify and support end-user needs;
- Encourage full engagement of all the stakeholders;
- Support coastal risk and vulnerability assessments;
- Transfer technology (soft, hard and intellectual) to the adopting countries;
- Facilitate the development and implementation of warning services; and
- Promote capacity building and sustainability of systems and processes.

Ten steps for implementation, designed for WMO Member countries and relevant Regional Associations to quickly commence the implementation of a CIF-EWS

Ten Steps for Building the CIF – EWS

Step 1: Coastal Natural Hazards, Modelling and Inundation Risk Analysis

Step 2: Stakeholder Inaugural Meeting with Government, Agencies & Sponsors

Step 3: Technical Assessment of Country & Regional Requirements

Step 4: End-To-End Communications Including the Last Mile

Step 5: Donor and Sponsor Engagement – Internal & External

Step 6: Establishing the Project, Concept of Operations and Links to WMO

Step 7: System Build - Project Development Plan to implement all components

Step 8: Testing of the CIF-EWS End-To-End System

Step 9: Critical Training for all EWS System Elements, including Public Education

Step 10: Go-Live Assessment in Consultation with all Stakeholders and WMO

Coastal inundation hazards for CIF-EWS

- Storm surges due to cyclones and other weather systems
- Riverine floods and flash floods near the coast
- Remotely generated swells
- Locally generated waves
- Tidal influences
- Sea-level rise due to climate change
- Inundation due to land subsidence
- Large-scale sea surface height anomalies (SSHAs)
- Tsunamis from geophysical and other events

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Step 1 – what are risks to communities?

- Thorough analysis of meteorological, hydrological and oceanographical risks, as well as geophysical risks
- Consider these individually and in parallel or sequentially
- Utilize statistics and modeling
- All aspects from storms to marine models to ocean models to floods (flash and riverine); and tsunami
- Guidelines discuss lack of data and what can be analyzed.
- Interactions - land floods and ocean/tidal impacts at coastline.

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Step 2 – Critical inaugural stakeholder meeting

- **All government agencies are aware** of the level of cooperation and commitment to make the CIF–EWS project successful, including:
- The NMHS (or NMS and NHS if different entities)
- The NDMO
- The telecommunications agency and State-owned media (which usually has a role in distributing emergency information)
- Navy/Coastguard/hydrographic agencies
- The oceanographical service(s)
- Other agencies with an immediate or long-term role in coastal inundation
- → **National Implementation Agreement – template provided**

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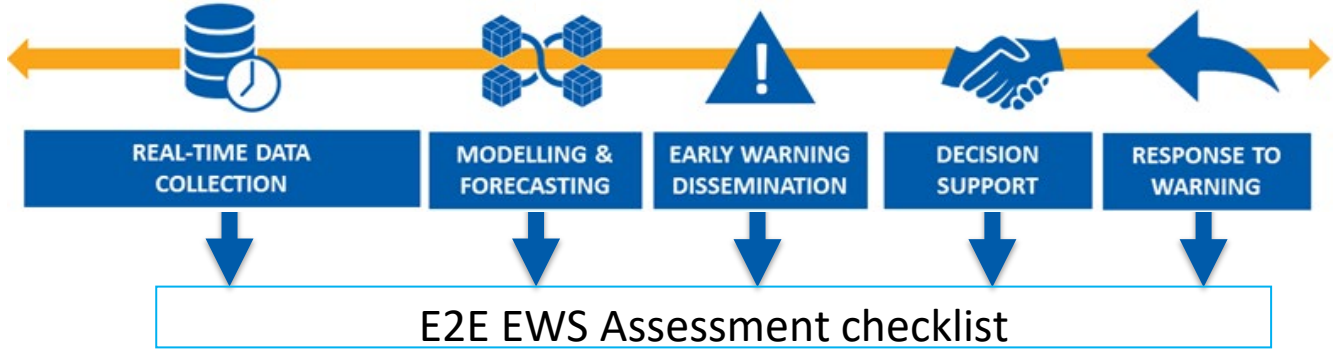
Step 3 - Technical Assessment of Country and Regional Requirements

- Institutional mapping
- Infrastructure including Backups
- Real-time data, historical data, and ancillary information
- Data management
- Existing capabilities in ocean, marine, hydrological, and weather models and forecasts
- Warning Dissemination and Communication Systems
- Staff capabilities
- Sustainability



These are the critical elements of a successful CIF-EWS and form the basis of the Project Development Plan (PDP) and requests for **financial and technical** assistance.

Step 4 - End-to-end communications Including the Last Mile

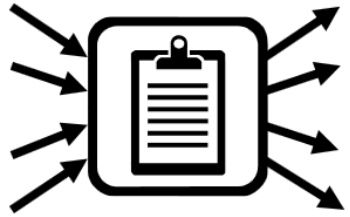
- Organizational and decision-making process
- Dissemination and communication systems and equipment
- Impact-based early warnings

Dissemination and communications architecture.
CAP serves as a "universal adaptor" for alert messages (Adopted from WMO, 2013b).

All-Hazards

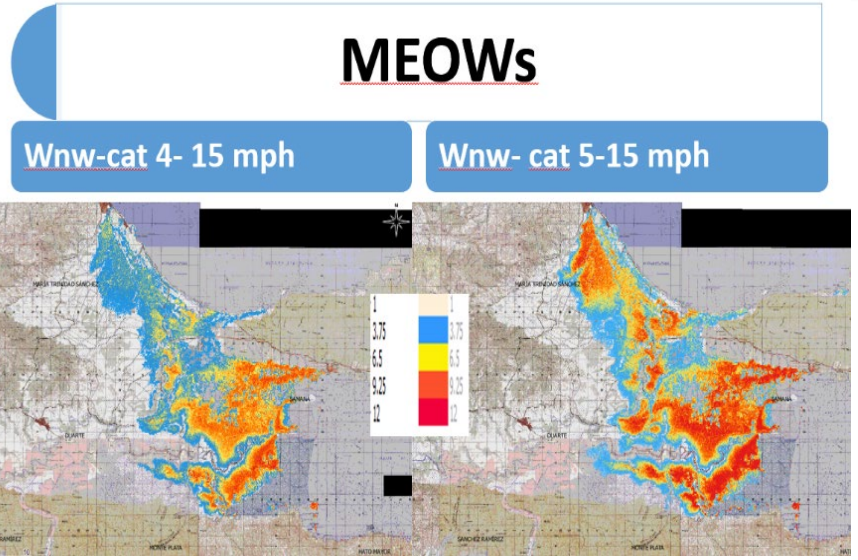
inundation, flood, landslide, earthquake, volcano, tsunami, typhoon/ hurricane, fire, disease

Common Alerting Protocol



All-Media

sirens, television, telephones, cell phones, satellites, Internet, radio, fax



Example of Coastal inundation warning message, issued by ONAMET with the help of CIFDP-C for the coastal zone of Dominican Republic (provided by Mr. M. Campusano, April 2020).

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Step 5 - Donor and Sponsor Engagement – Internal and External

Establishing a CIF-EWS Project Proposal for Sponsors and/or Government

- Background information for Country/Region implementation of CIF Early Warning System
- Justification
- Project Summary
- Overview and Activities
- Risk identification and management matrix
- Cost Breakdown

Background information for Country/Region implementation of CIF Early Warning System

Target country/Region	List your country and/or region for implementation
Contributes to Government Strategic Goals	Safety for Coastal Communities and Avoidance of infrastructure losses
Lead Agency in country	National Meteorological and Hydrological Service (NMHS) or NMS and NHS if separate, but joint lead including with other agency in a country responsible for coastal inundation forecasting
Other concerned Department(s)	Ministries National Disaster Management Agency Government Departments Response Agencies, including Police Ports Agencies Marine Agencies Hydrological Agencies Airports NGOs, others
Project Director	See PDP, Section 7.3 for description of role.
Project Executive	See PDP, Section 7.3 for description. Usually headed by CEO of NMHS.
Project team members	See Section 7.3
Implementing entity(ies)	NMHS National Hydrological Authority (if not within NMHS), In country Department of Emergency Services or similar

Steps 6 and 7 Commence formal Project

- Establish the Project with selection of officers and experts
- Links to WMO for advice
- Commence a Concept of Operations (CONOPS)
- Develop Project Development Plan - financial accountability

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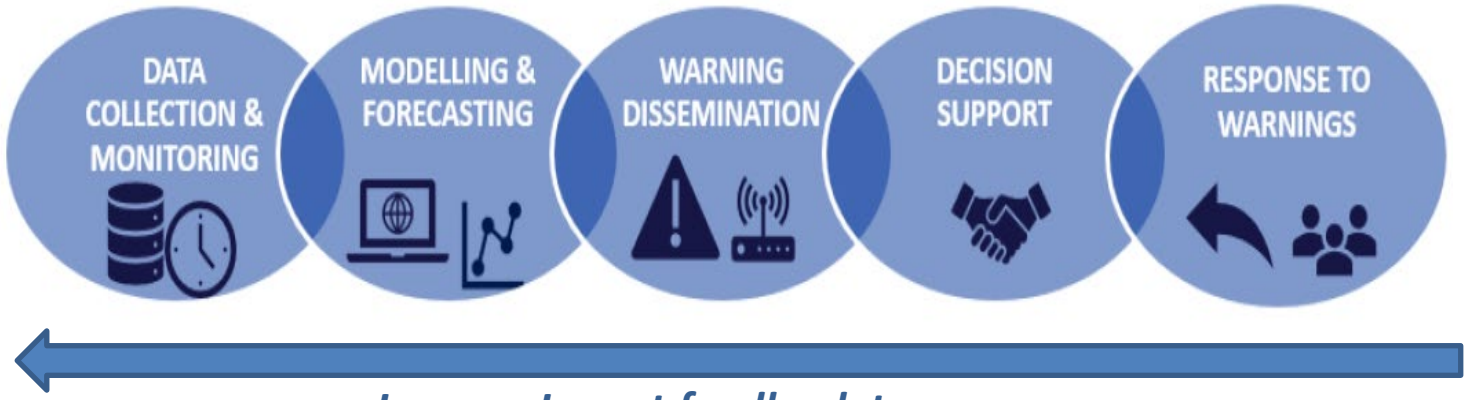
Step 8 - Testing of the CIF-EWS End-to-End System

The main components (figure) have to be checked during the pre-operational testing period or desk-top exercise:

- Data collection and monitoring
- Data management
- Models and Forecasts
- Forecasts and warning product dissemination and communication to users
- Decision support system and response to warnings



Main components of E2E EWS chain, with feedback. (Diagram from WMO Assessment Guidelines Brochure and the commonly used for all forecasting systems.)

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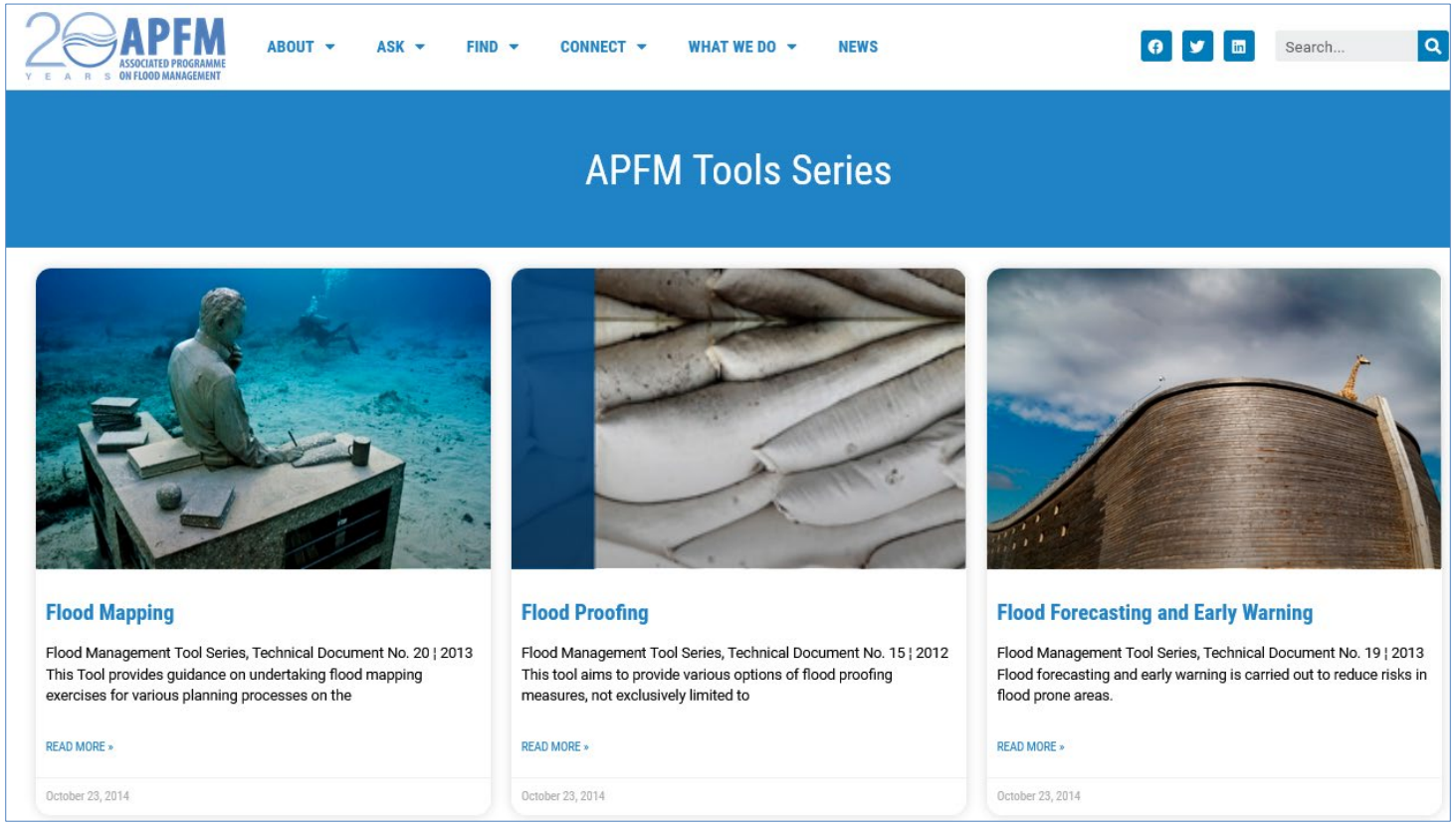
Step 9 Part 1 - Critical Training – Hydrology

Flood forecasting training and competencies:

- Hydrometry
- Data collection
- Flood modelling, forecasting and warning
- Flash floods

Associated Programme on Flood Management Tools Series



Distance Learning Course in Hydrology I: Basic Hydrological Sciences
https://community.wmo.int/distance-learning-course-hydrology-i-basic-hydrological-sciences

Step 9 part 2 Critical Training – Competency & Public Awareness

WMO No.1209 – Compendium of WMO Competency Frameworks

- Section 2.5: Marine Weather Forecaster
  - ➢ Includes competency requirements for a Marine Weather Forecaster(MWF)

WMO No.1293 – Guideline on Implementation of a Coastal Inundation Forecasting-Early Warning System(EWS)

Step 9: Critical Training all EWS Elements including Public Awareness

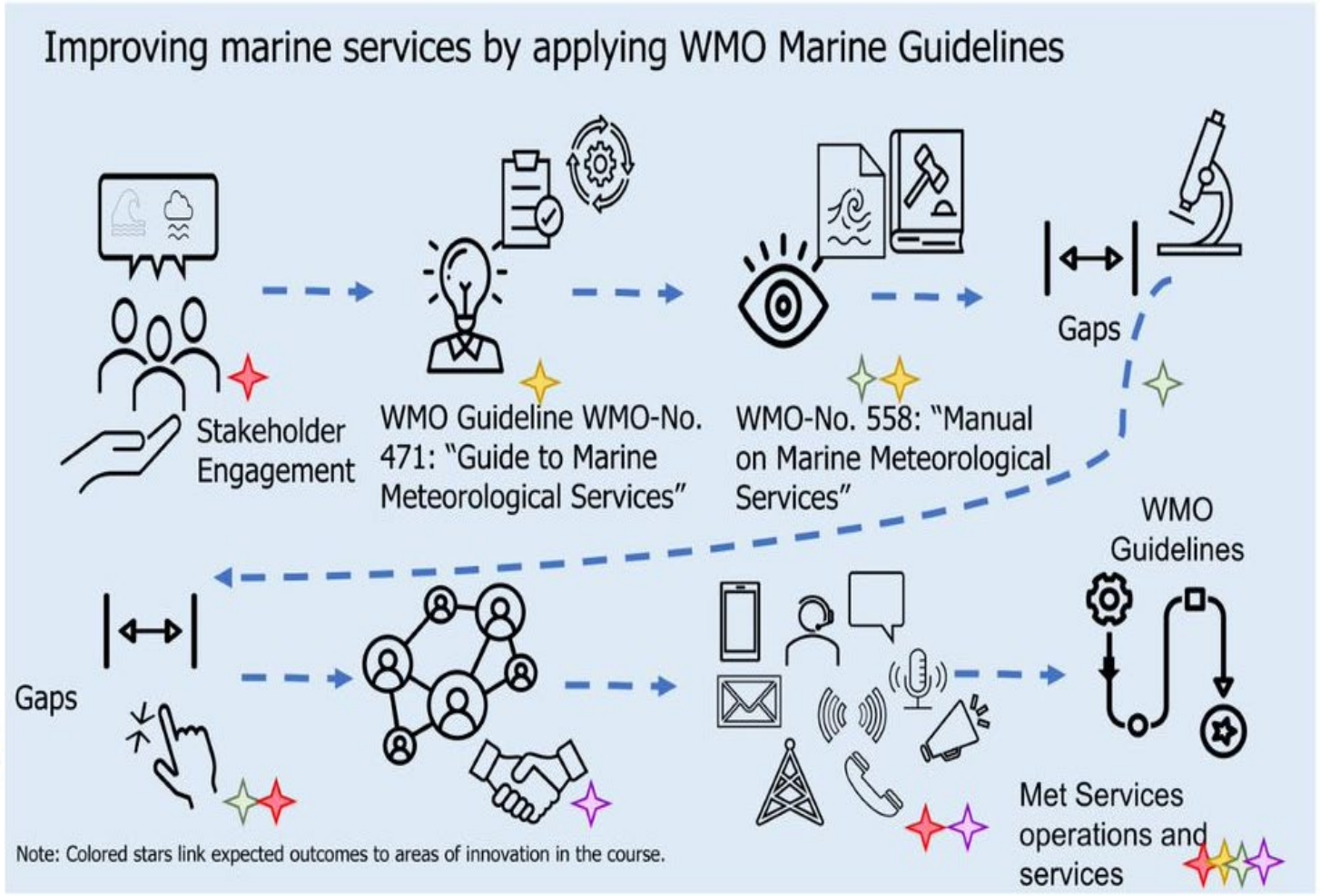
- ➢ Ocean and marine forecasting training and competencies
- ➢ Flood forecasting training and competencies
- ➢ Public Education/Awareness

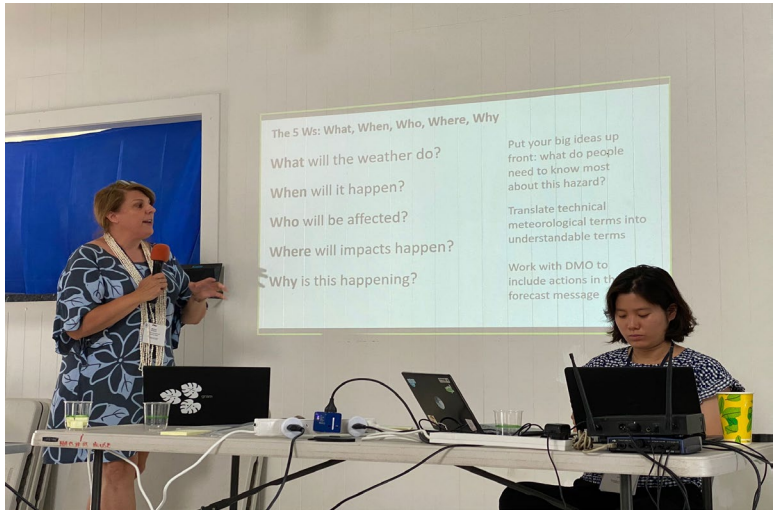
Public Awareness videos on Coastal Inundation & wave Buoys created and adapted geographically and by languages for;-

- 9 Pacific countries
  - (PNG/Tuvalu/Solomon/Vanuatu/Cook Islands/Federated States of Micronesia/Samoa/Fiji)
  - English, French and local languages
- Caribbean Islands
  - Creole, English, French and Spanish
- South America
  - Spanish language

Step 9 cont. - Critical Training – WMO Marine Services Course

- Wide range of areas including Stakeholder engagement, marine competencies, capacity development, improvement of marine service delivery.
- Pacific Islands example: incorporated Coastal Inundation and the importance of Risk Assessment, plus a Case Study/role play of a Tropical Cyclone triggering coastal inundation





Step 10 – Go- Live Assessment

Responsible person		Operationally ready (yes or no)	Signature
PROJECT TEAM LEADS (SEE SECTION 3.7)			
IT		Y/N	
MODELS		Y/N	
TRAINERS		Y/N	
ETC		Y/N	
		Y/N	
		Y/N	
IMPLEMENTING AGENCIES **NMHS, NDO,**		Y/N	
Community education undertaken		Y/N	
Community understands products and messaging and can implement correct response actions		Y/N	
Other concerned ministries and agencies **Government departments** **Response agencies, including police** **Ports agencies** **Airports** **NGOs, other department(s)**		Y/N	
WMO compliance (Project Director)	Including instruments/training/QMS	Y/N	
Head, lead agency in country		Satisfied that all elements of the CIF–EWS are ready? Y/N	

In conclusion – the Guidelines are a one-stop-shop / toolkit!

- The guidelines provide a range of ready-to-use advice and templates to determine any country's:
  - ✓current technical capacity – what to check, what is needed!
  - ✓areas of risk – template guidance!
  - ✓project management – simple ways of satisfying agencies and donors.
  - ✓Templates for sponsors and other stakeholders.
  - ✓How to engage with vulnerable communities
  - ✓How to achieve success and sustainability

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Blueprint for the future – *Early Warnings For All*

- United Nation Secretary General's recent challenge to the World Meteorological Organization (WMO) to "*spearhead new action to ensure every person on Earth is protected by early warning systems within five years*".

- The CIF-EWS guidelines are suitable for countries **to immediately** commence planning and engagement wi

- Important for UN Decade of Ocean Science for Sustainable Development

EARLY WARNINGS FOR ALL

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

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CIF-EWS - MHEWS ?

- CIF-EWS meets the definition of a MHEWS in the definitions of Congress 18 resolutions.
- It has several hydrological, meteorological and oceanographical hazards – sequentially or jointly
- CIF-EWS guidelines can readily be adapted for other hazards and EWS as the basis of any multi-hazard EWS.
- The CIF-EWS guidelines are now ready to be used immediately. They are not a “plan or a strategy”, but a real on-the-ground opportunity

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Sincere thanks for input at various stages

- Mr Val Swail (Canada), founding Chair / Co-Chair of CIFDP.
- Reviewers Mr Curtis Barrett (United States of America), Mr Leandro Kazimierski (Argentina) and two that remain anonymous.
- The WMO Secretariat staff: Dr Sarah Grimes, Mr Giacomo Teruggi Mr Cyrille Honoré, Dr Hwirin Kim, Mr Misaeli Funaki and Mr Nakul Prasad
- Thank you to all who contributed, **especially Dr Sarah Grimes** from the MAR Secretariat for her constant support and encouragement over the last four years

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Thank you for listening
Merci

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