

The Future of Forecasts: IMPACT-BASED FORECASTING AND WARNING (IbFW) for TROPICAL CYCLONES

**Typhoon Committee Roving Seminar
30 June 2023**

**Senaka Basnayake, PhD
Asian Disaster Preparedness Center
Bangkok, Thailand**

Introduction: Asian Disaster Preparedness Center (ADPC)

Autonomous International Organization

Partnerships:



Over **36** years
of experiences in DRR & CR

Offices and representations:

- **Bangkok**, Thailand
- **Dhaka**, Bangladesh
- **Yangon**, Myanmar
- **Colombo**, Sri Lanka
- **Phnom Penh**, Cambodia
- **Jakarta**, Indonesia
- **Bihar**, India
- **Kathmandu**, Nepal
- **Manila**, Philippines
- **Hanoi**, Viet Nam
- **Addis Ababa**, Ethiopia

ADPC's strategic focus & cross-cutting themes



Safer communities and sustainable development through disaster risk reduction

Impact-based Forecasting and Warning (IbFW):

The Future of Forecast and Warning

"what the weather will be" into
"what the weather will do"

Moving from

What the weather **will be**:
(Meteorological Thresholds)

- 50mm in 24 hours
- 35 knot winds



To

What the weather **will do**:
(Impact Warnings)

- Roads flooded
- Communities cut off



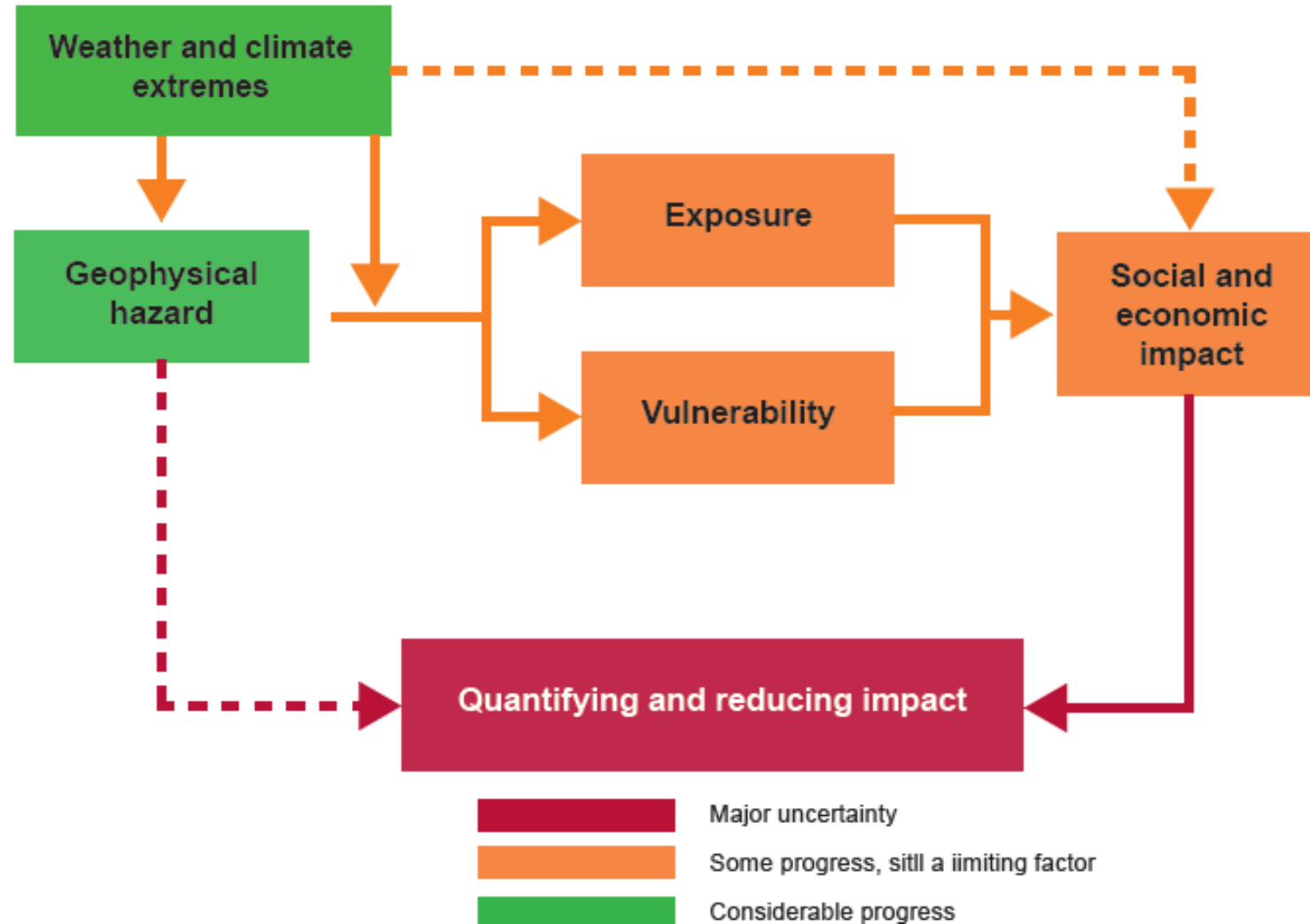
Source: UK Met (2020)

Definition of IbFW:

IbFW is a structured approach for combining **hazard, exposure, and vulnerability data to identify risk** and support decision-making, with the ultimate objective of encouraging early action that reduces damages and loss of life from natural hazards.

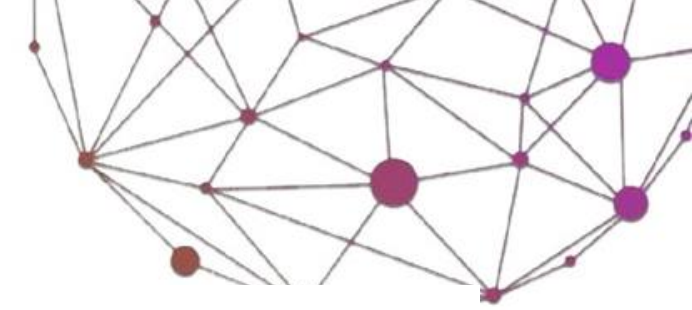
IbFW provides the **information needed to minimize the socio-economic costs of weather and climate hazards**. Organizations and individuals can make critical decisions to ensure that resources and supplies are in place to take early action and to respond as soon as it is safe to do so.

Key Elements of an IbFW:

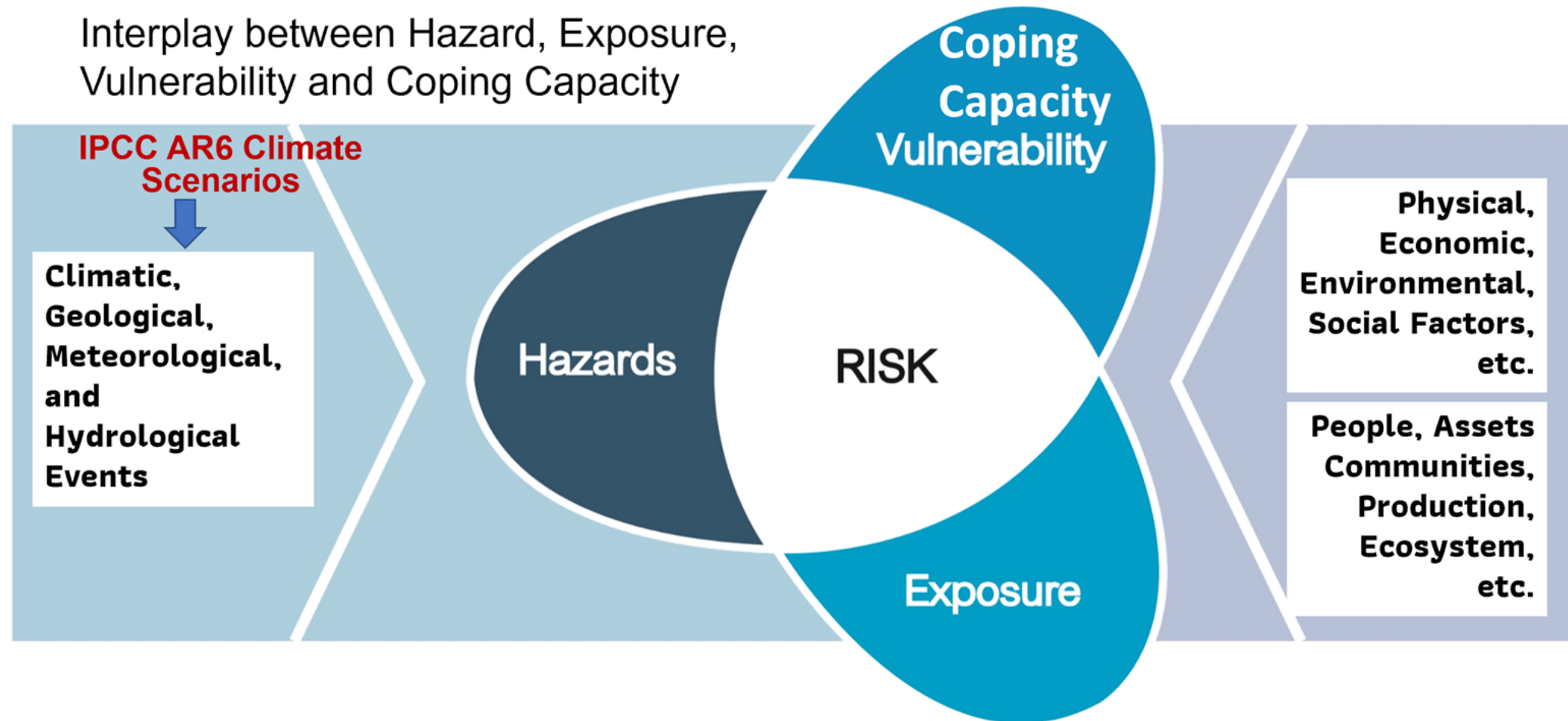


Source: WMO (2015)

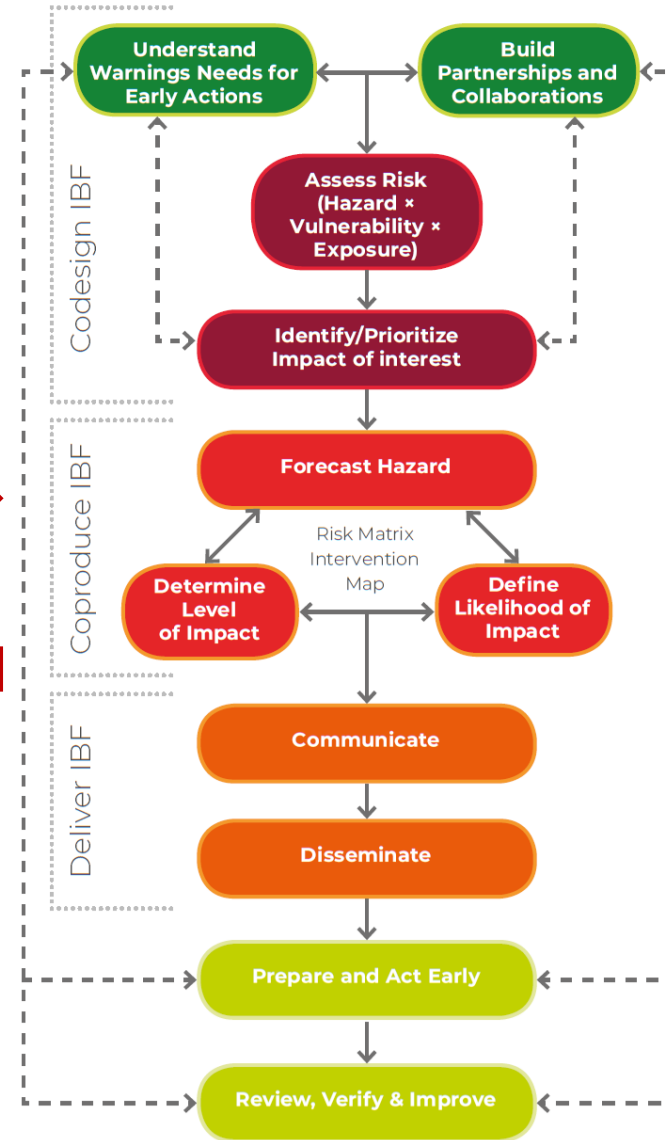
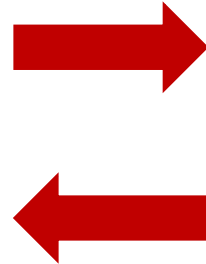
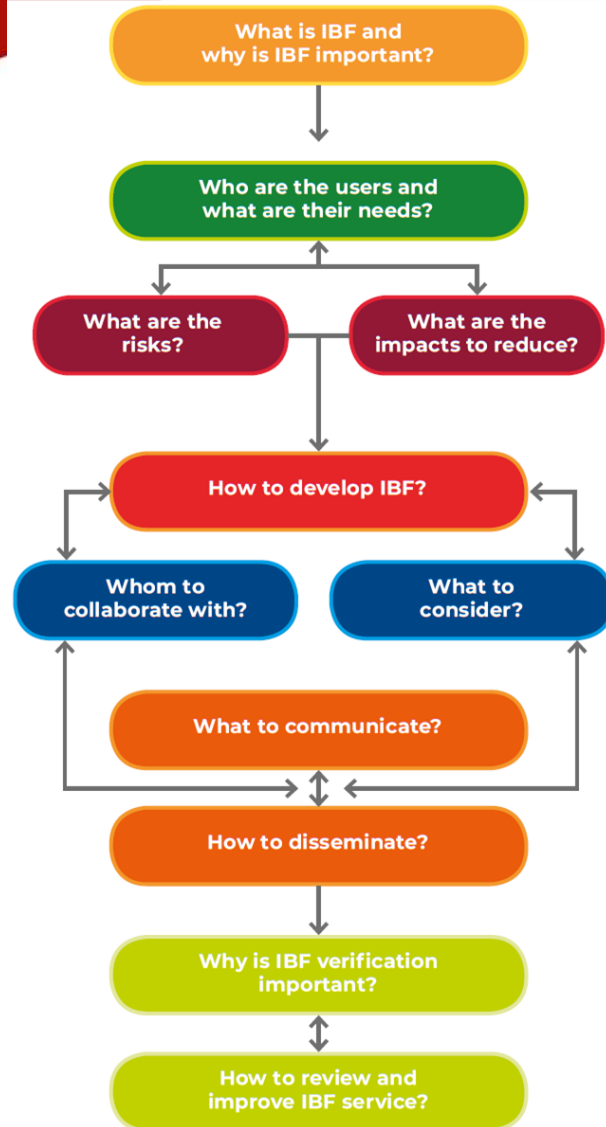
Understanding Risk and Linking Impact:



Interplay between Hazard, Exposure, Vulnerability and Coping Capacity

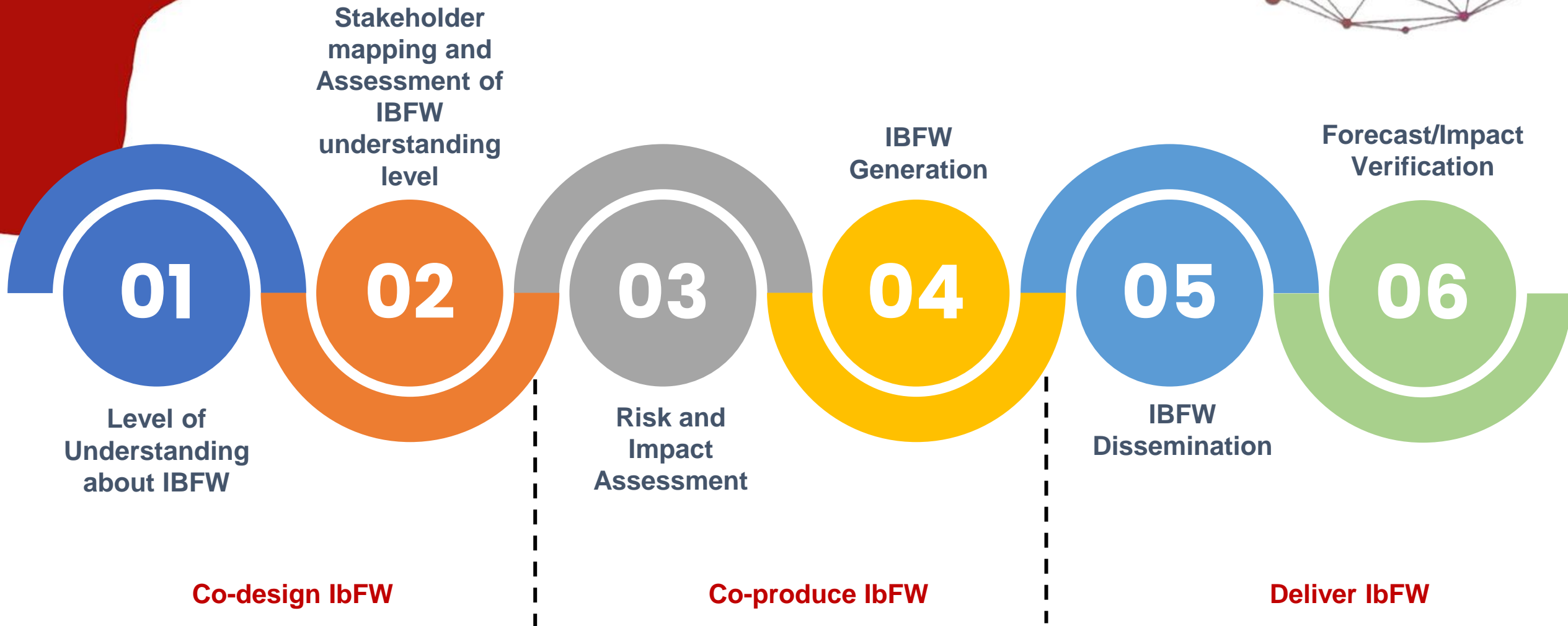


Key Steps of IbFW:



Source: UK Met (2020)

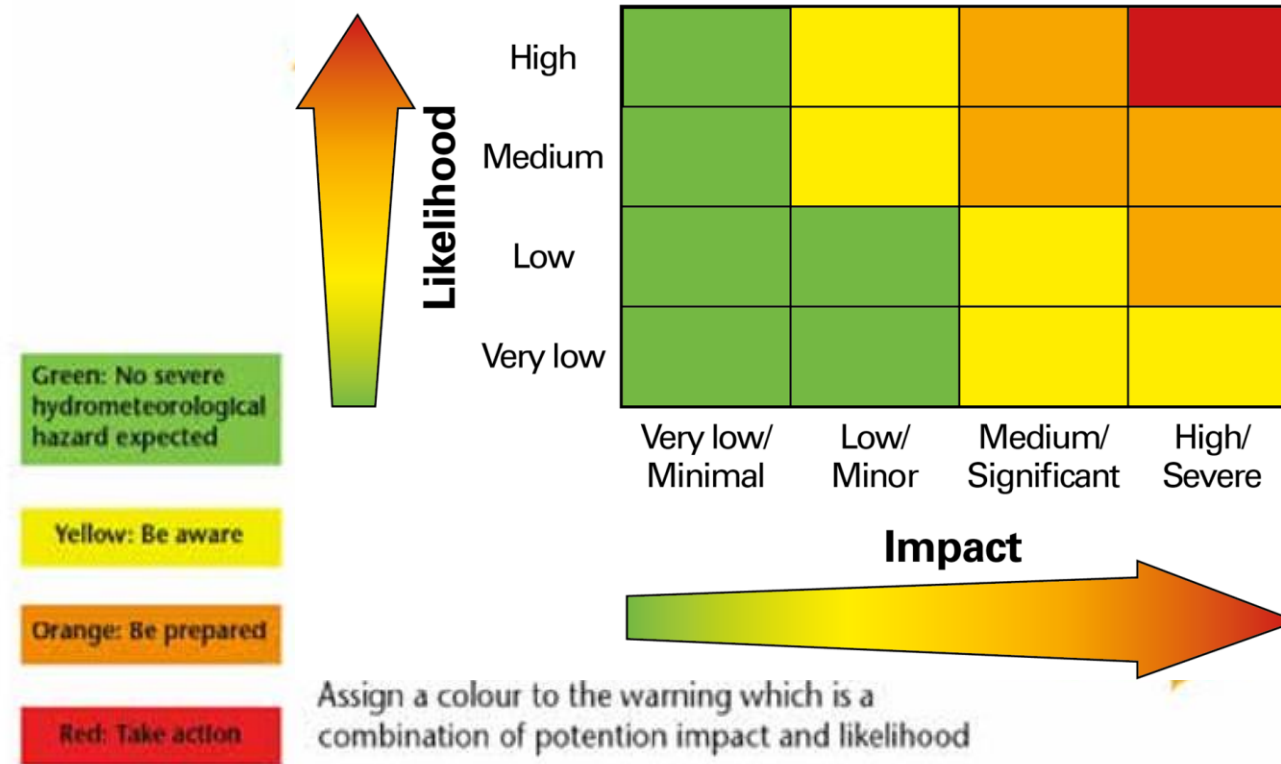
Key Points for IbFW Assessment:



IbFW Matrix:



Warning Risk Level (green, yellow, amber, red)

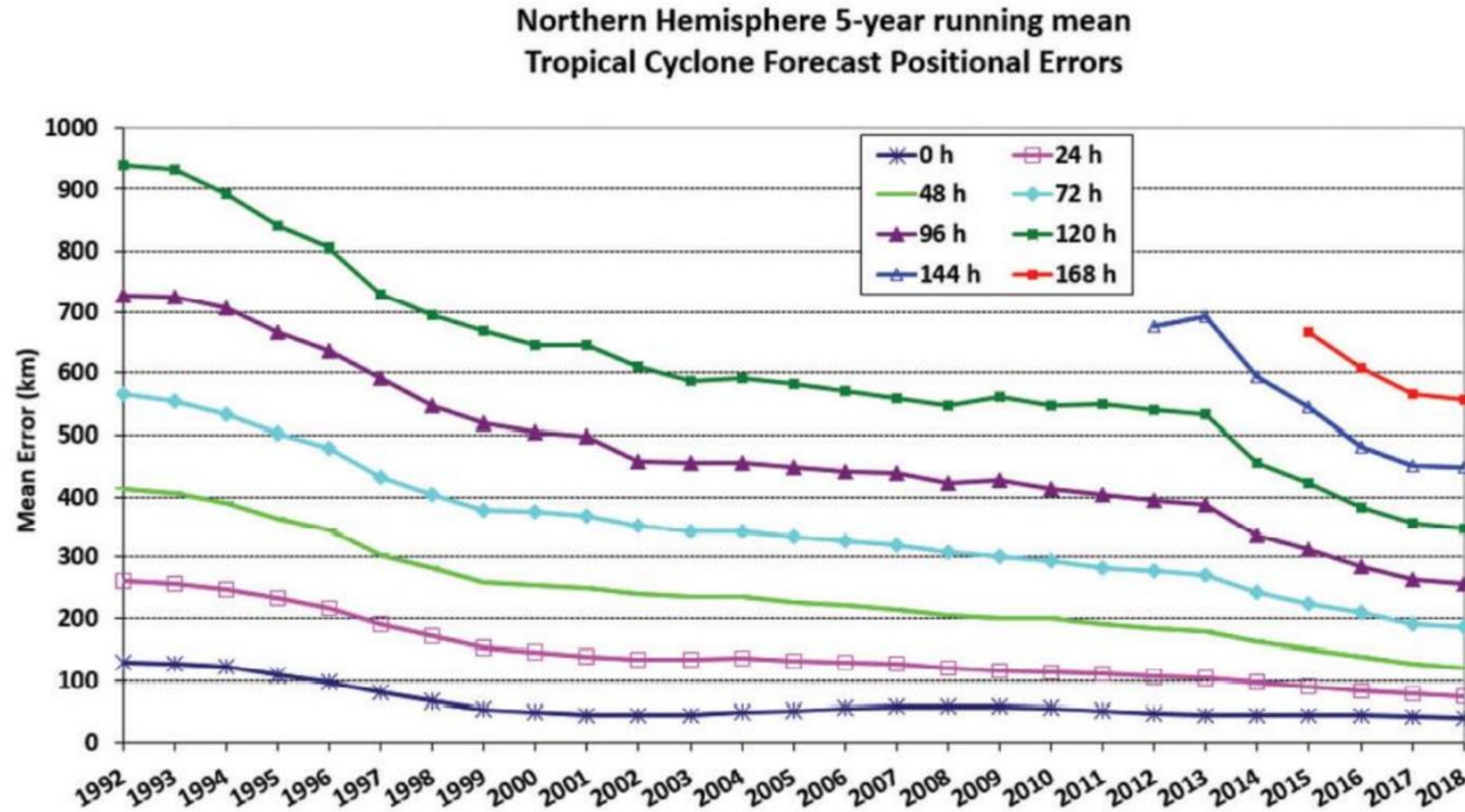


(Source: Met Office, United Kingdom)

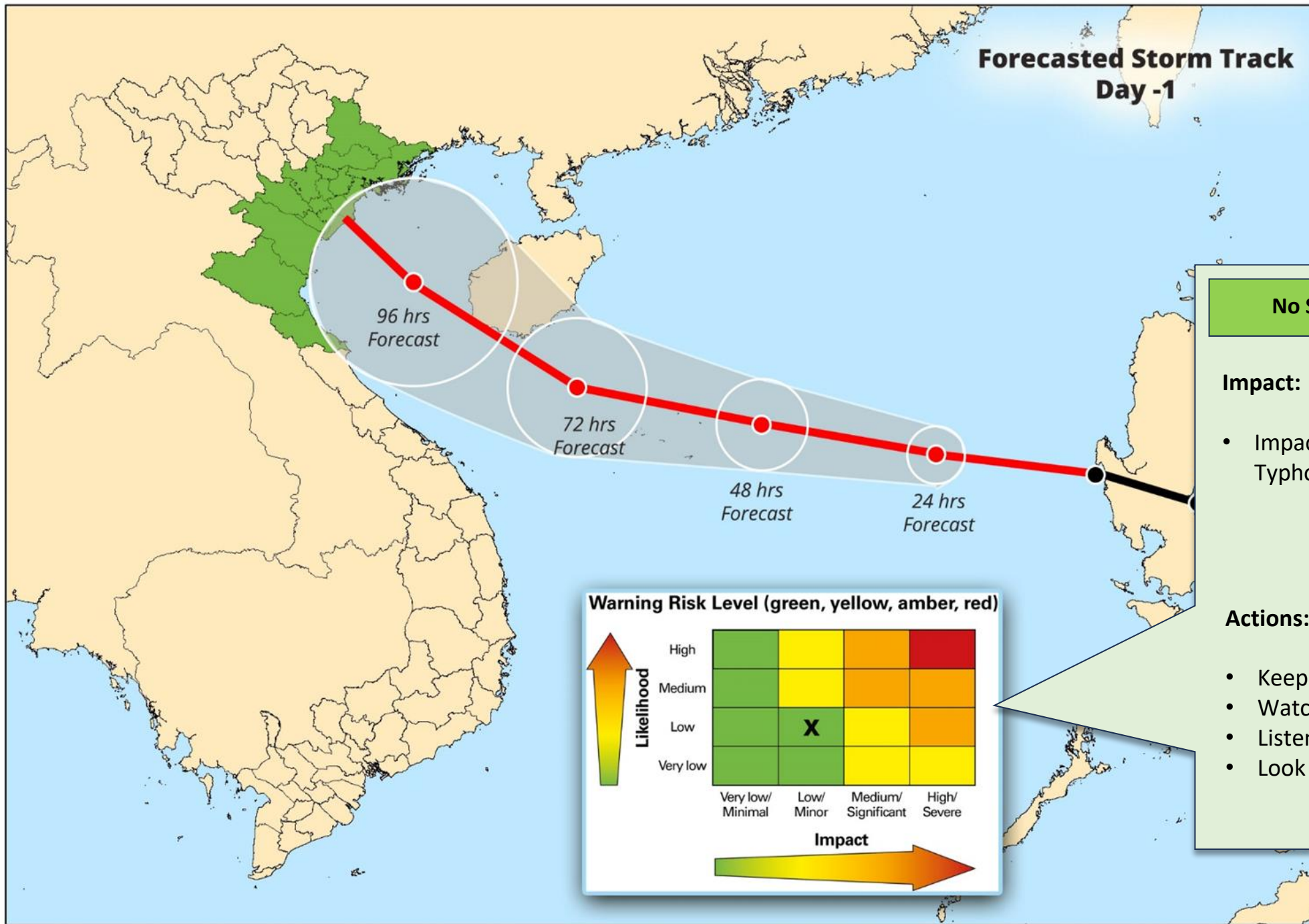


Understand the IbFW with a Typhoon Scenario

In the recent past most of NMHSs have significantly improved the storm forecasting



Source: PAGASA



No Severe Event Hazard Expected

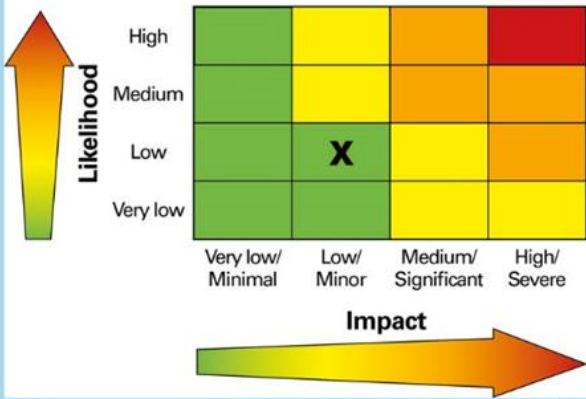
Impact:

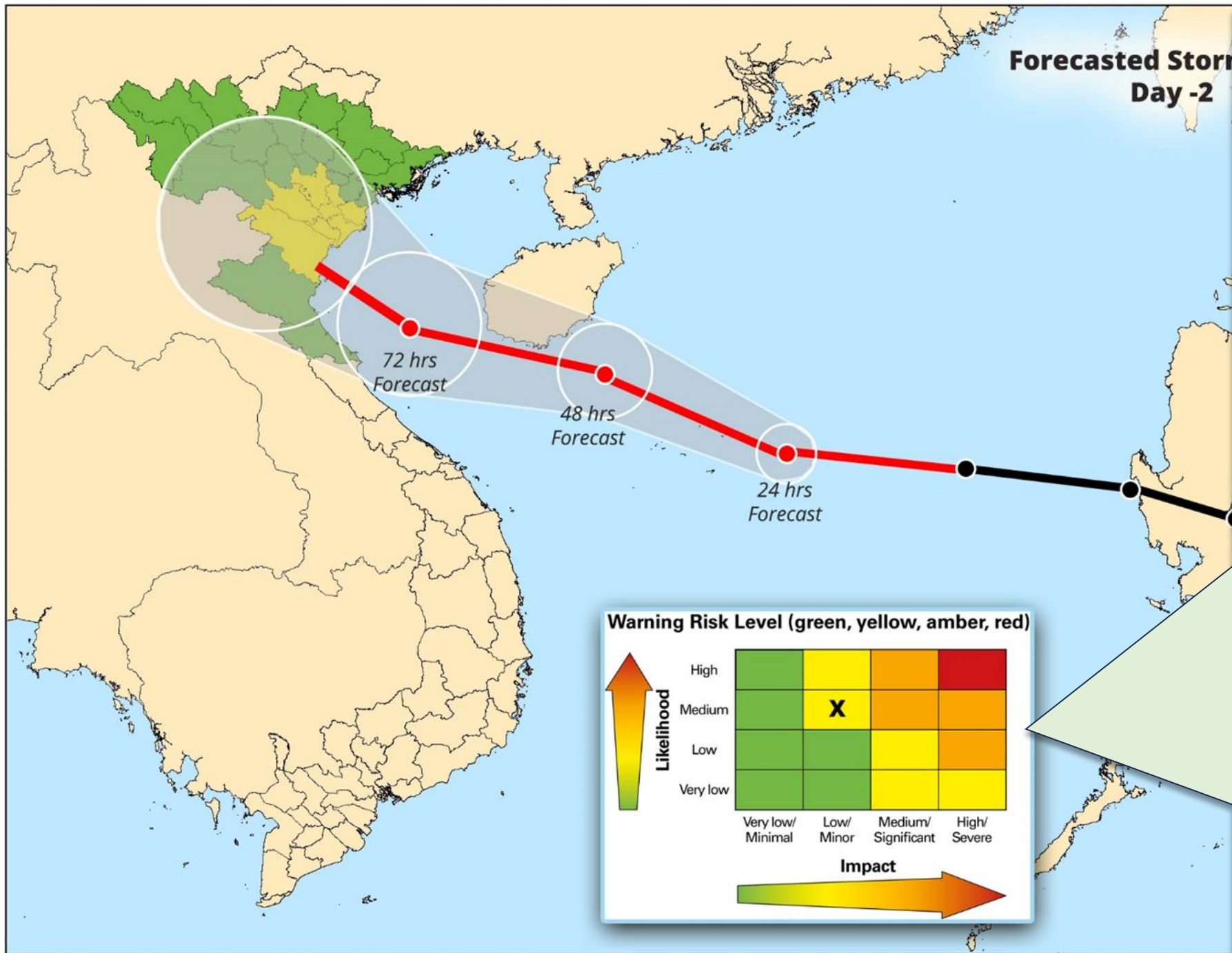
- Impacts are not yet visible as the Typhoon is faraway from Viet Nam

Actions:

- Keep an eye on the weather forecasts
- Watch TV,
- Listen radio,
- Look at Social Media

Warning Risk Level (green, yellow, amber, red)





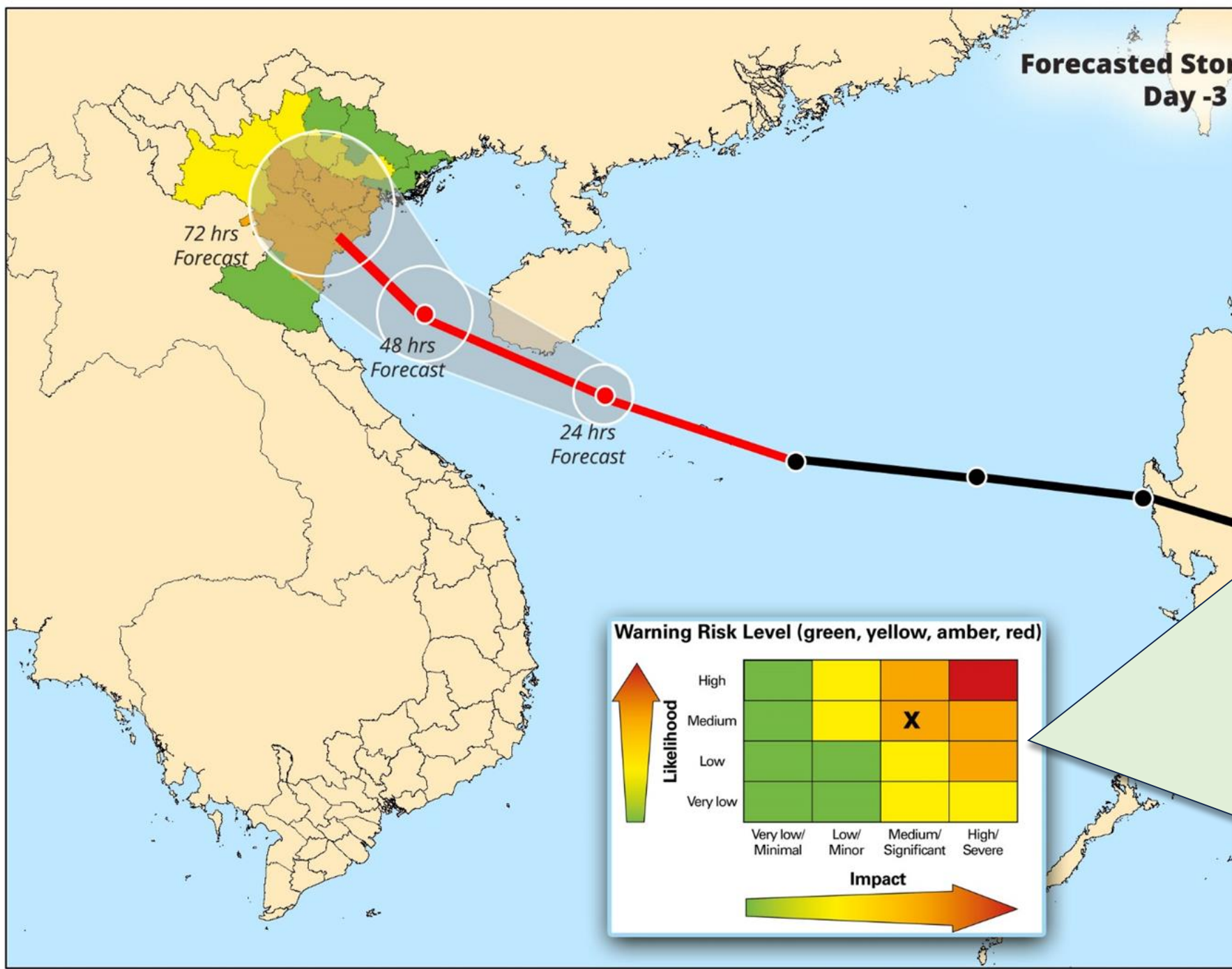
Be Aware

Impact:

- Trees blown over (Isolated)
- Damages to billboards (Isolated)
- Small scale damage to vegetation (Isolated)
- Roofs of non-engineered houses damaged (tin roof, thatch roof)
- Falling lamp posts

Actions:

- Remain alert
- Ensure you access the latest weather forecast for up-to-date information
- Prepare to act to protect life and livelihood in the designated locations,
- Prepare to act to protect livestock in the designated locations
- Prepare to act to protect property in the designated locations
- Identify the safe shelters with basic amenities for male and female and access to disabled



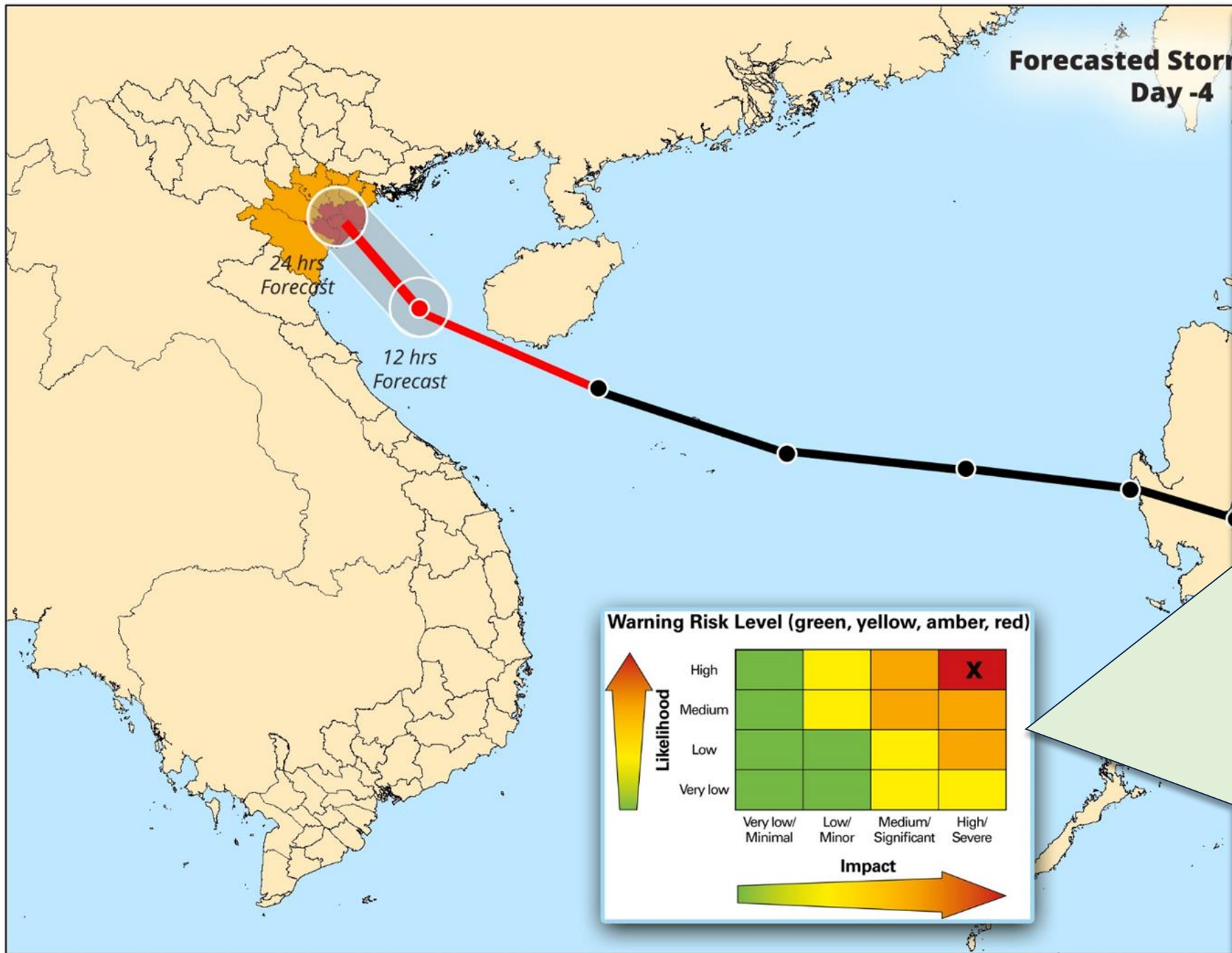
Be Prepared

Impact:

- Trees blown over (Isolated)
- Damages to billboards (Isolated)
- Small scale damage to vegetation (Isolated)
- Roofs of non-engineered houses damaged (tin roof, thatch roof)
- Falling lamp posts
- More trees blown over in larger areas that block roads
- More damage to agriculture
- Small boats affected that are used for transport and fishing
- Engine boats can still operate
- Some electricity poles damaged, causing minor outages
- More vulnerable houses collapse
- Significant damage to roofs of many houses
- Population displacement

Actions:

- Remain alert
- Ensure you access the latest weather forecast for up-to-date information
- Prepare to act to protect life and livelihood in the designated locations,
- Prepare to act to protect livestock in the designated locations
- Prepare to act to protect property in the designated locations
- Identify the safe shelters with basic amenities for male and female and access to disabled
- Secure property and livelihood assets.
- Be prepared to evacuate
- Be aware of the potential risk of flying objects in your area
- Follow civil protection orders
- Maintain radio/media watch for latest updates



Take Actions

Impact:

(Previous impacts +)

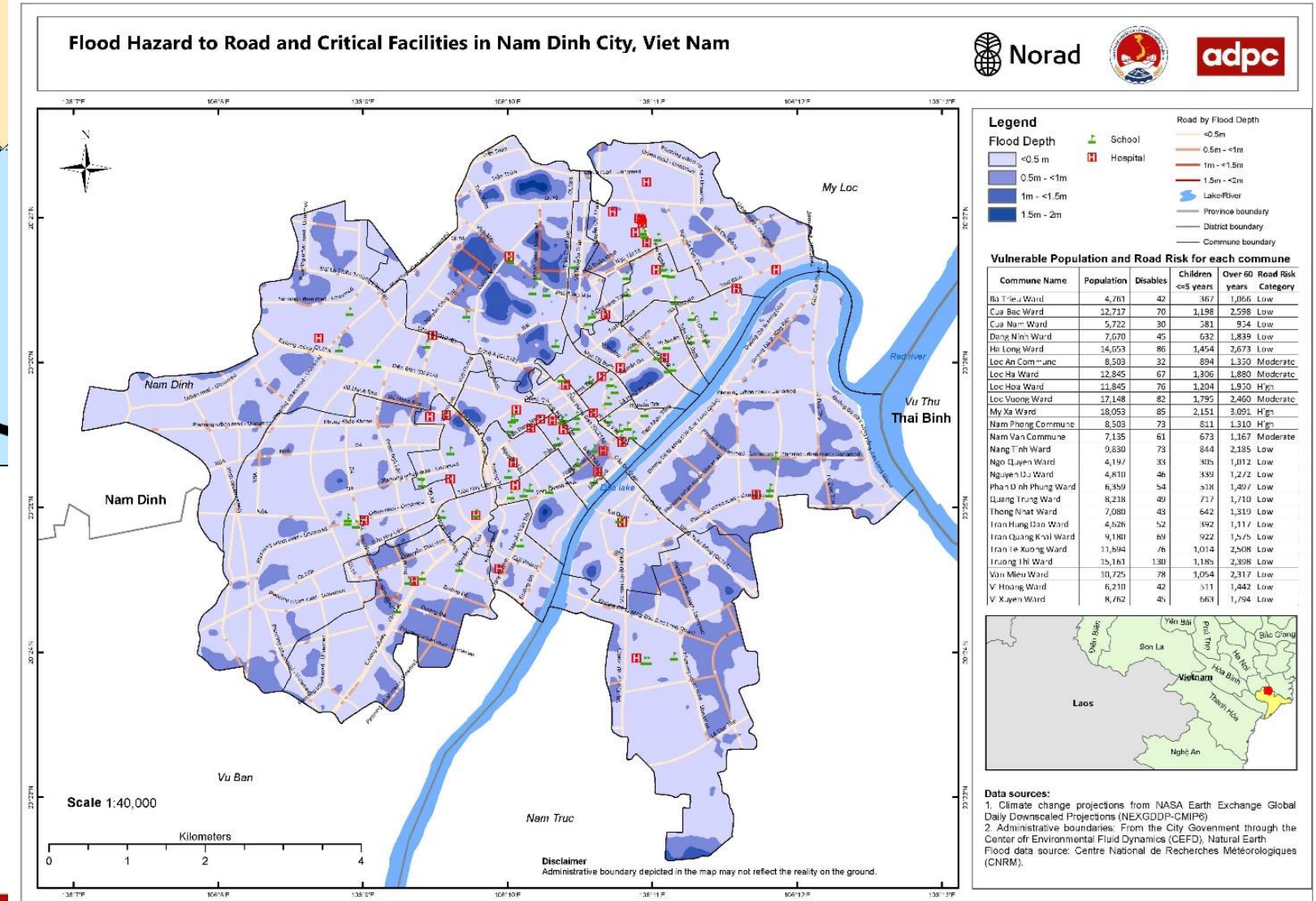
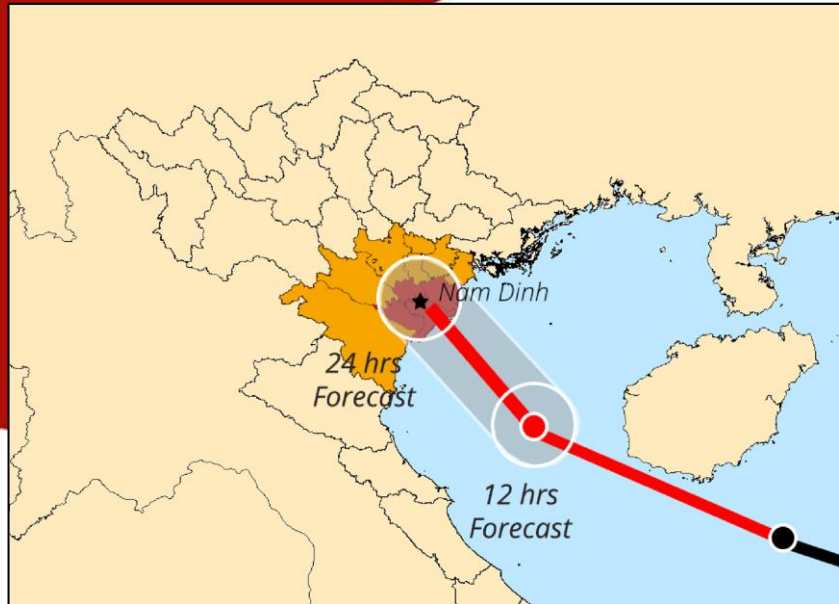
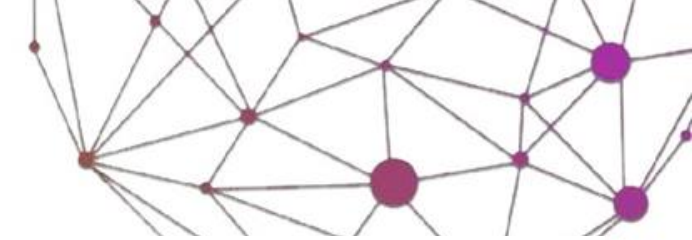
- Widespread damage to structures – houses and commercial buildings collapsing
- Widespread damage to infrastructure systems and services (shelter, transportation, schools, hospitals, energy supply, communication)
- Widespread damage to communication and electricity supply infrastructure
- Widespread delays to public transportation (Air, Road, Rail, Ship, Ferry)
- Loss of life of both people and animals
- Big trees fall down
- No more boats can operate, even big ships grounded
- Schools, hospitals and many public services, damaged and some cannot be used
- Loss of measurement equipment
- Widespread Loss of fishing boats and gear
- Financial losses to farmers and fishermen
- Crops, loss yield & cultivation
- Soil erosion
- Search and rescue impacted on a large scale

Actions:

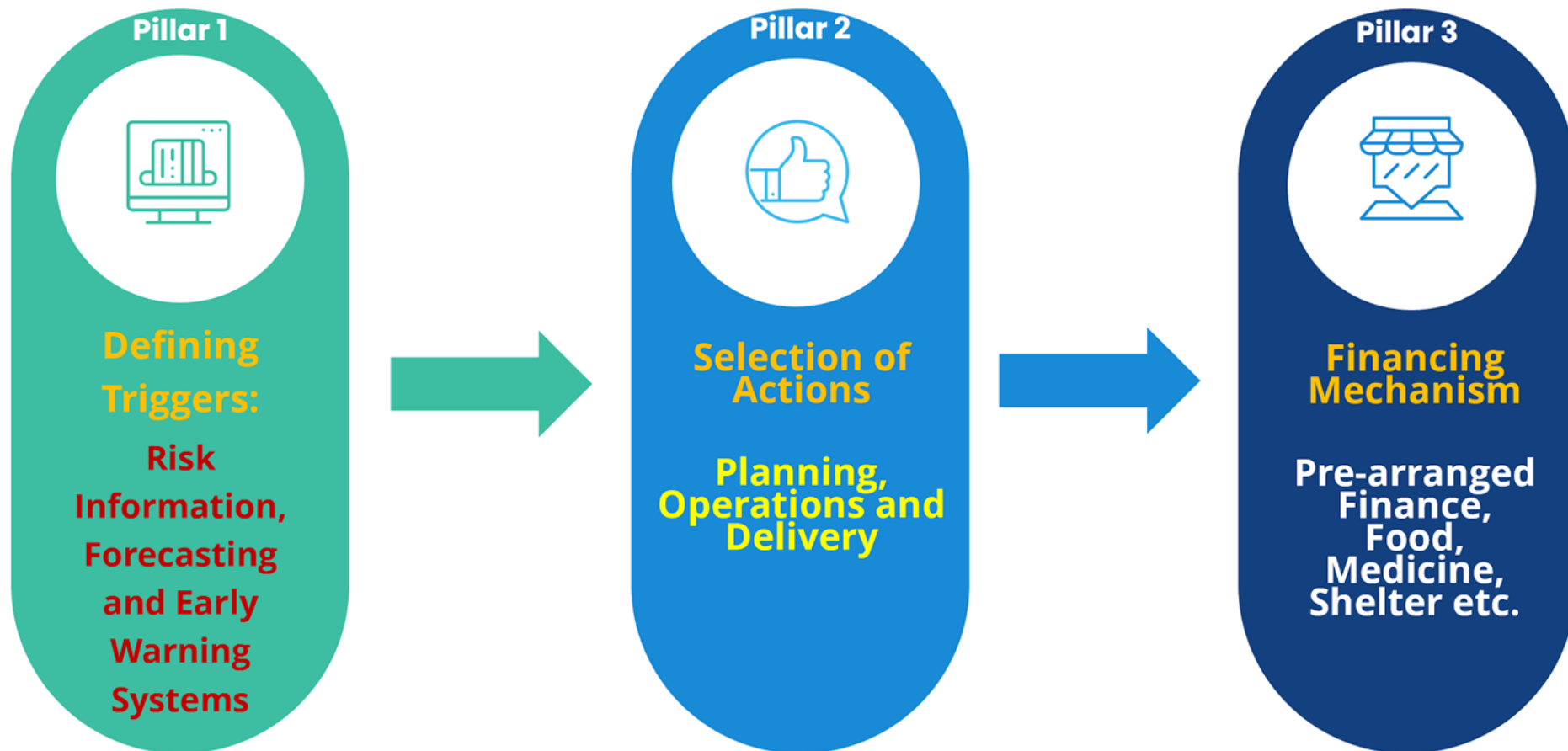
(Previous actions +)

- Evacuate if ordered to do so by disaster management authority
- Be prepared for extraordinary measures to protect life and property
- Be prepared with pre-arranged finance, food, medicine, shelter etc.

Secondary Impacts in Urban Scale: Detailed risk assessments are important for right actions



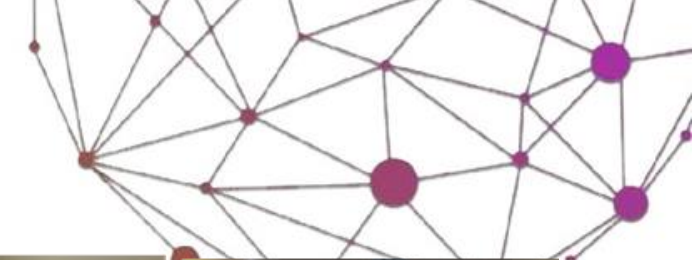
Anticipatory Actions:



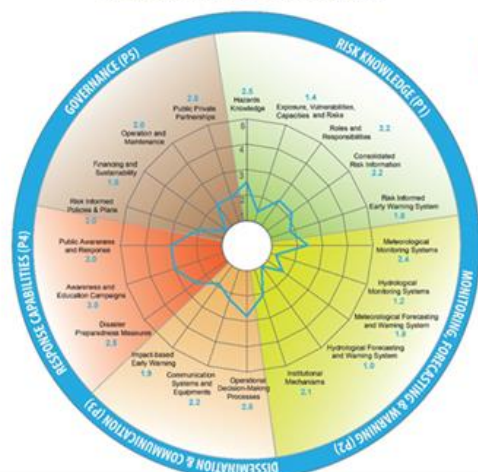
Source: ASEAN Framework on Anticipatory Action in Disaster Management

Stocktaking – Southeast Asia:

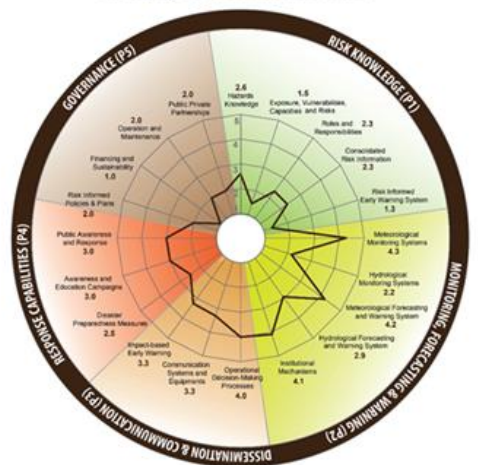
Cambodia, Myanmar, Viet Nam



EWS Capacity and Need Assessment in Myanmar

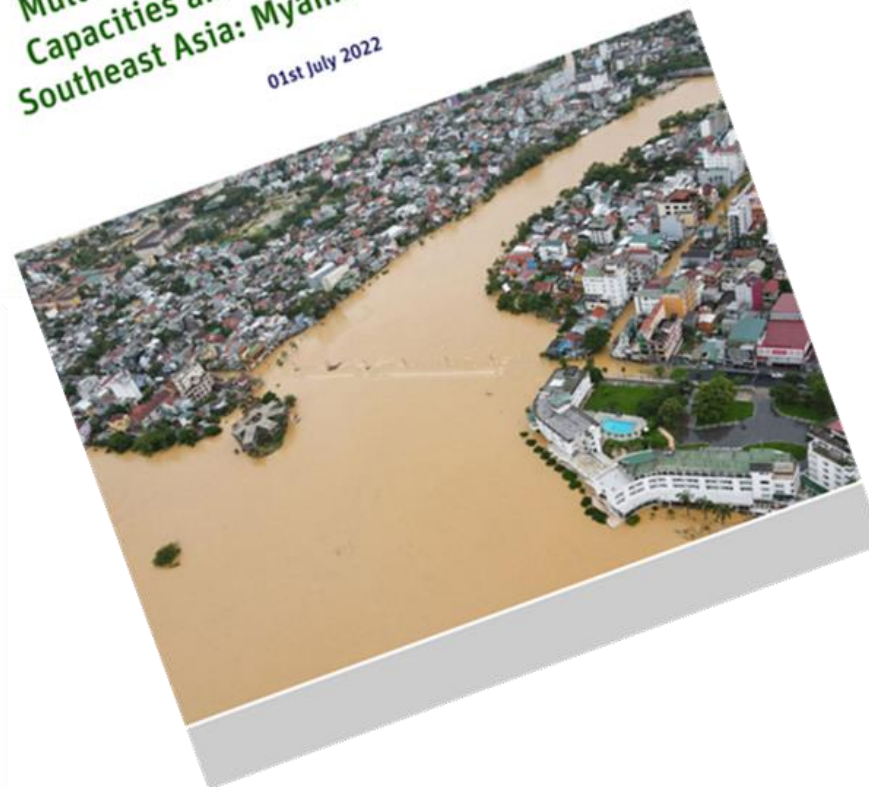


EWS Capacity and Need Assessment in Vietnam



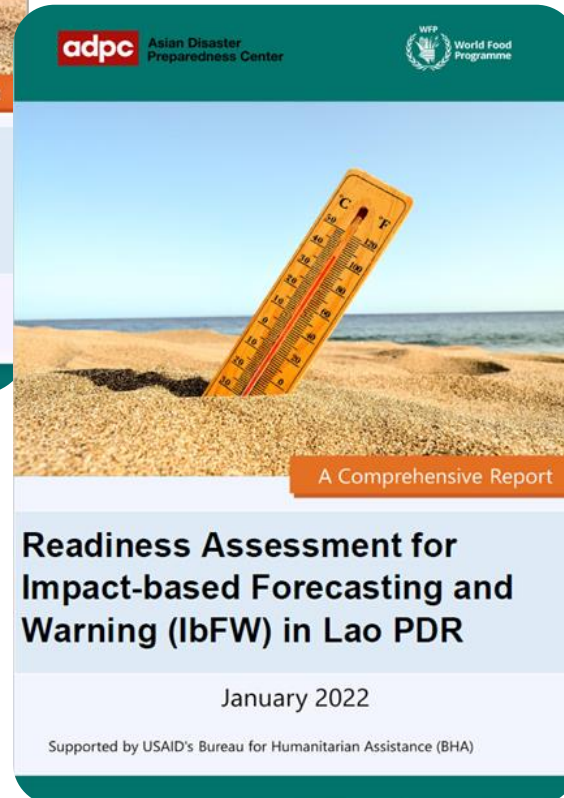
Multi Hazard Early Warning System Capacities and Needs Assessment in Southeast Asia: Myanmar and Viet Nam

01st July 2022

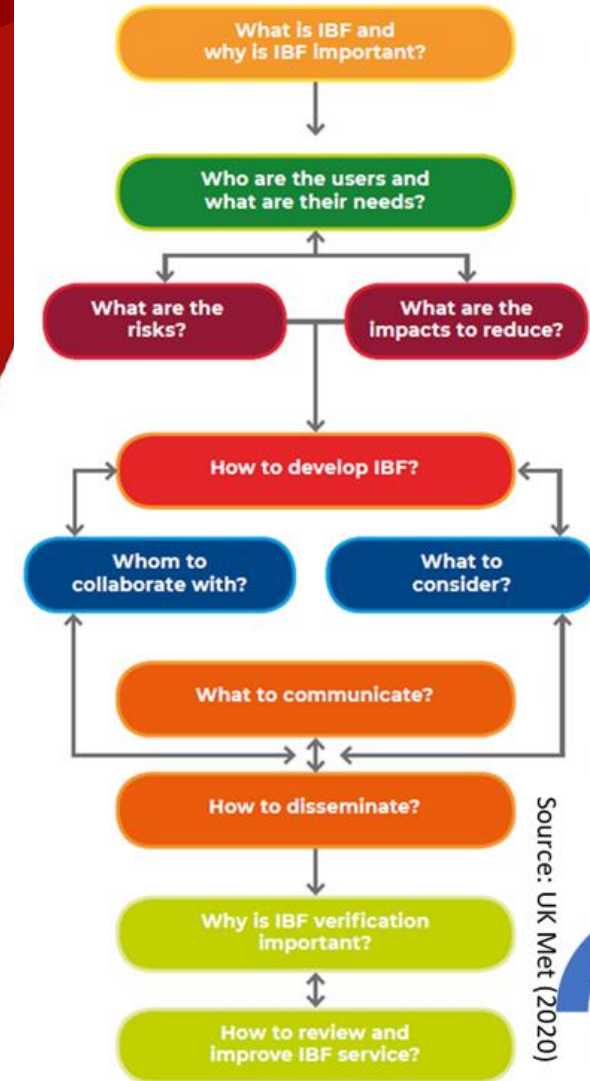


IbFWS Products:

Cambodia and Lao PDR



IbFW Readiness Assessment:



VNDMA



Viet Nam



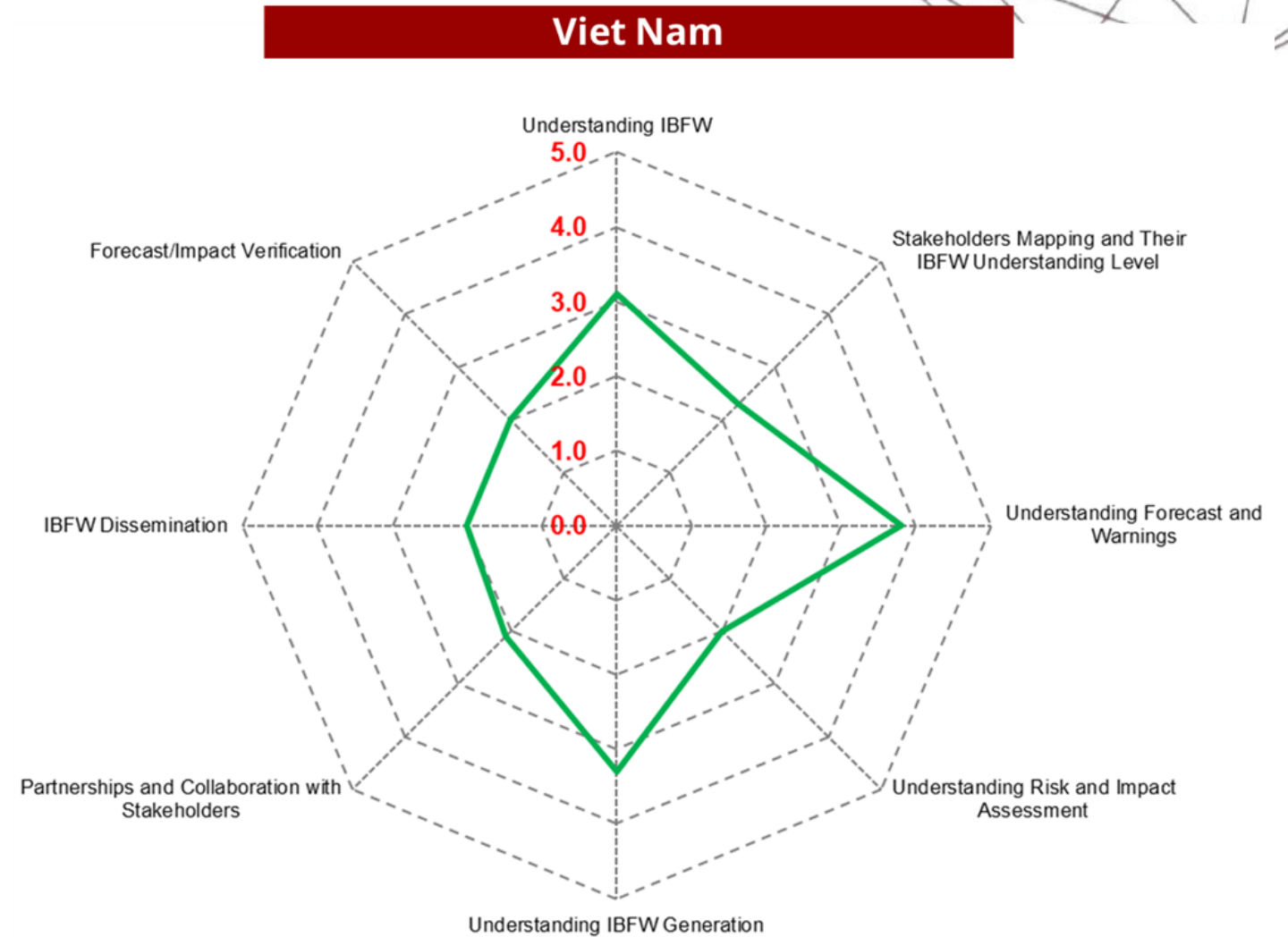
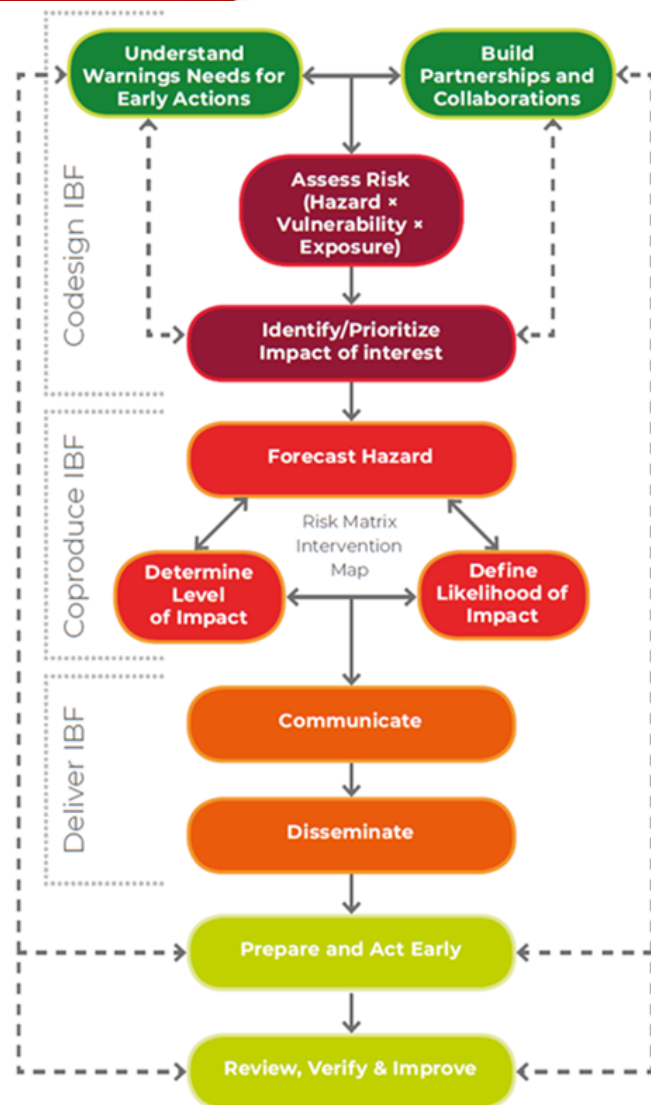
VNMHA



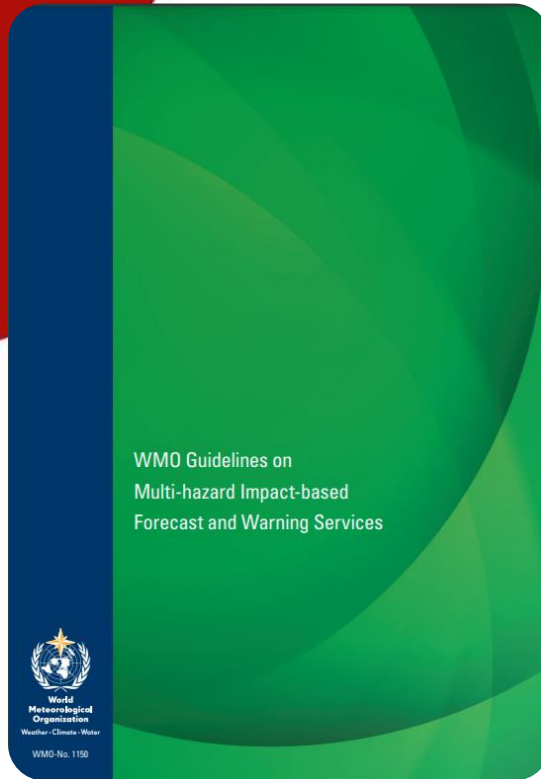
Sectoral Agencies



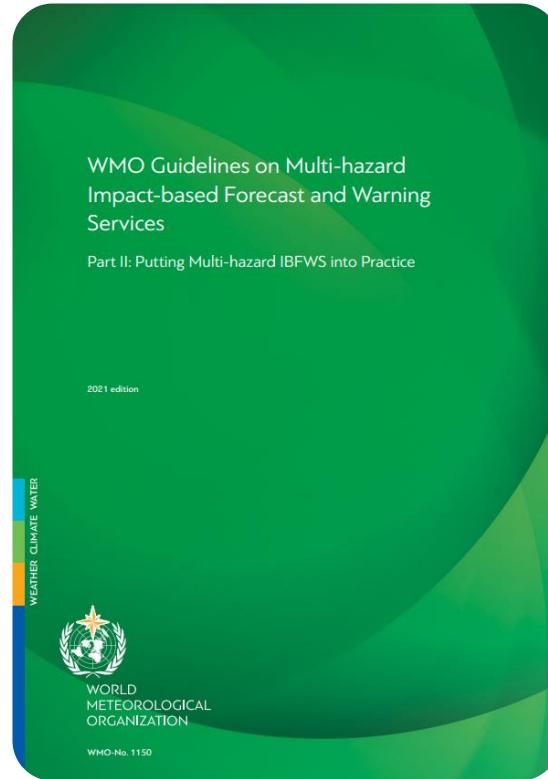
IbFW Readiness Assessment:



International and Regional Guidelines:



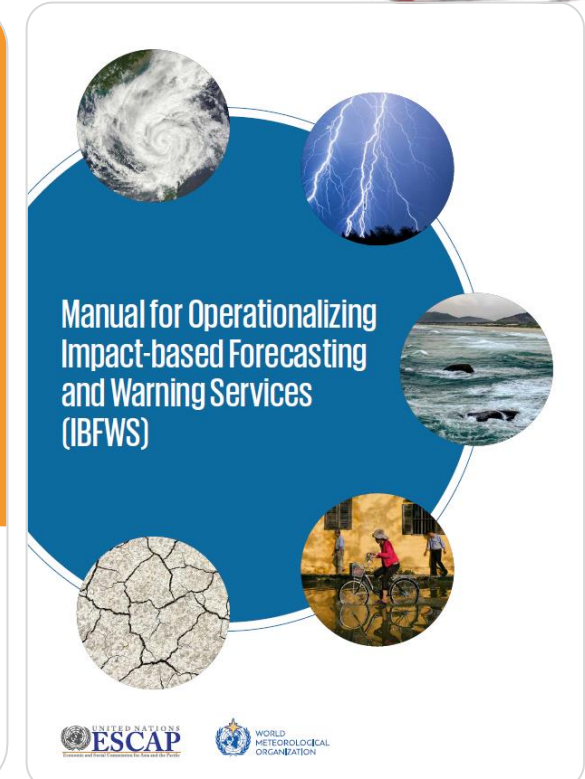
Source: WMO (2015)



Source: WMO (2021)

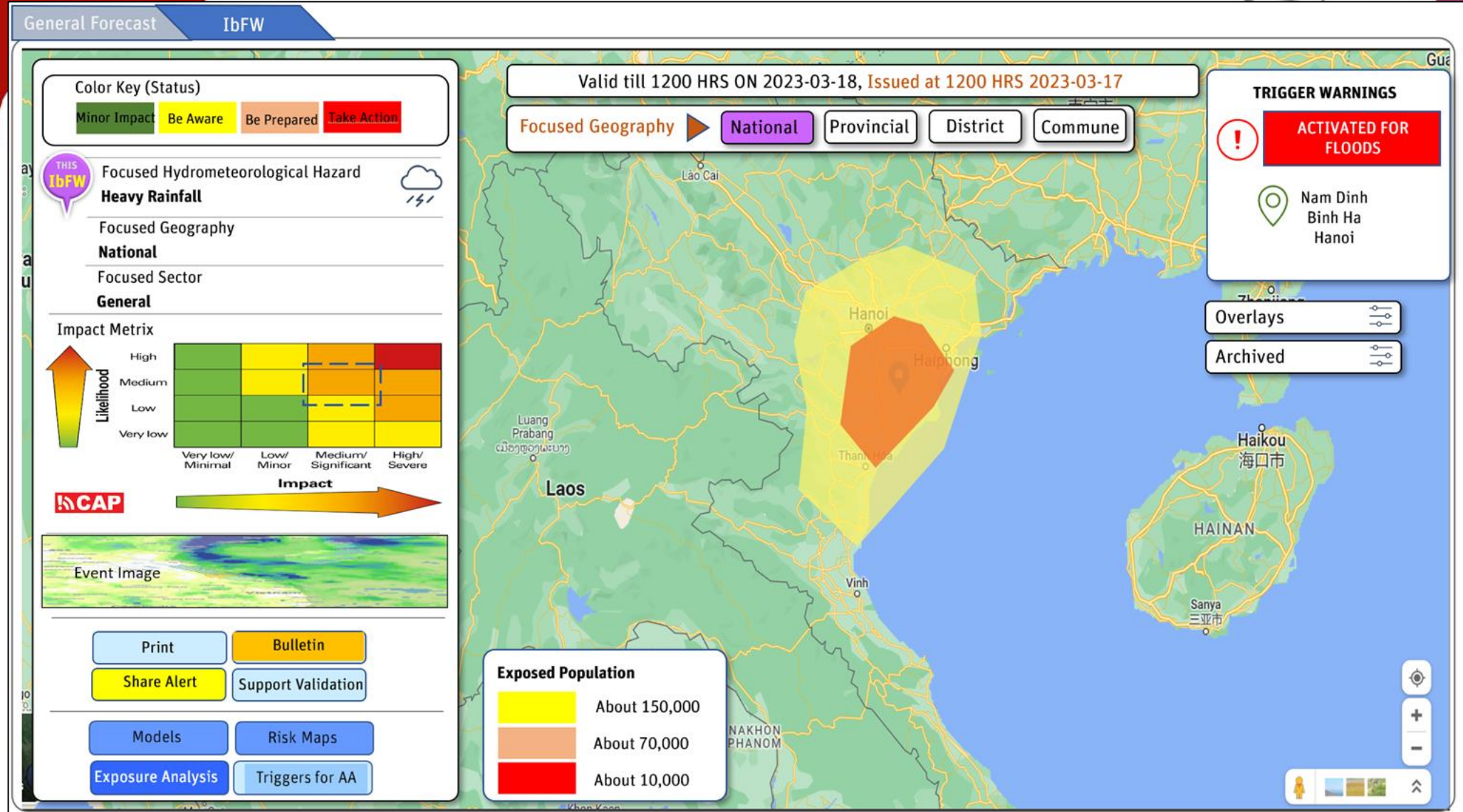


Source: MET Office, UK (2020)

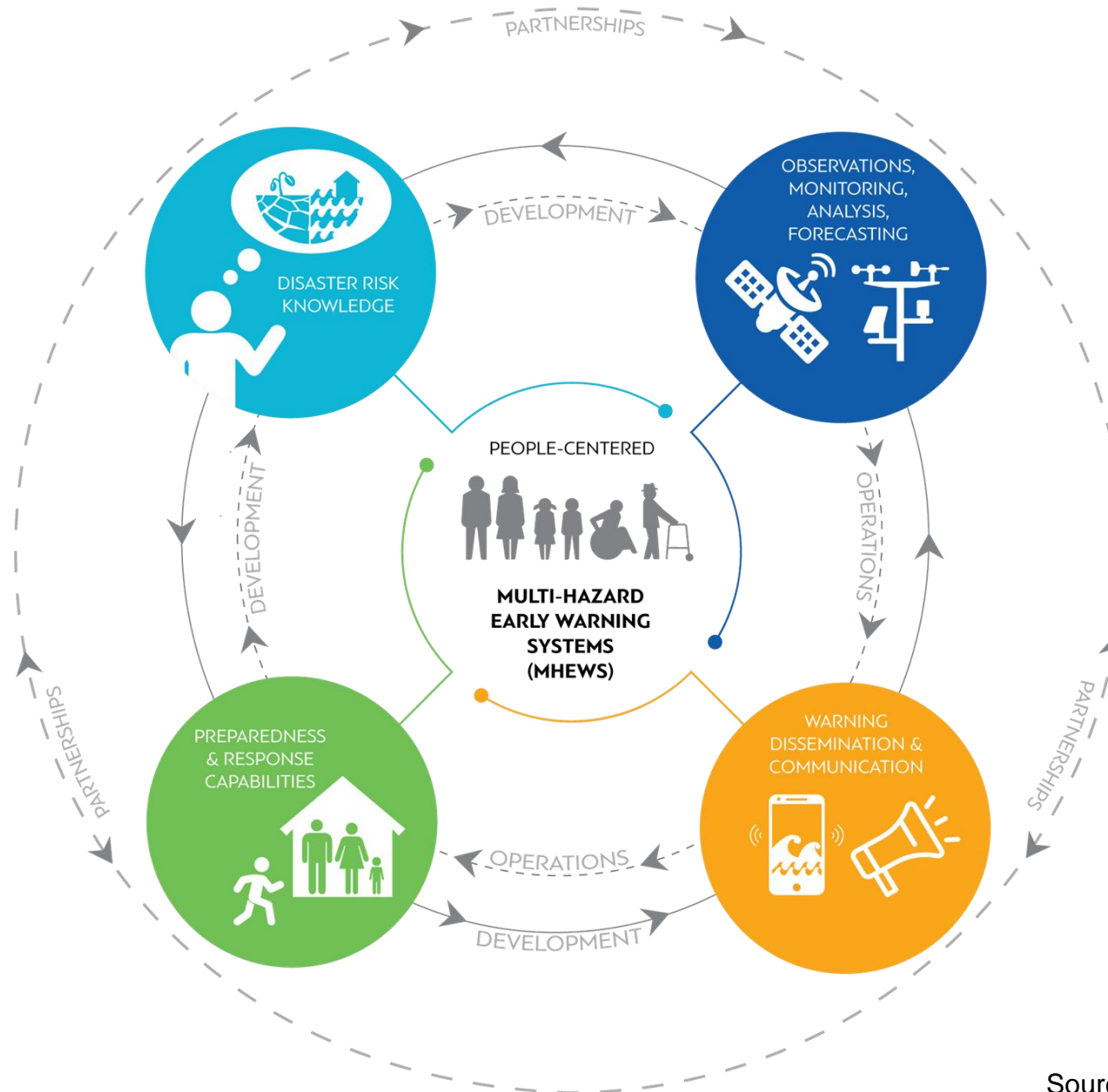


Source: UN ESCAP (2021)

Proposed DSS on IbFW for Vietnam:



MHEWS Pillars



MHEWS Pillars (Cont.)



Disaster risk knowledge

Systematically collect data and undertake risk assessments

- Are the hazards and the vulnerabilities well known by the communities?
- What are the patterns and trends in these factors?
- Are risk maps and data widely available?



Detection, observations, monitoring, analysis and forecasting of hazards

Develop hazard monitoring and early warning services

- Are the right parameters being monitored?
- Is there a sound scientific basis for making forecasts?
- Can accurate and timely warnings be generated?



Preparedness and response capabilities

Build national and community response capabilities

- Are response plans up to date and tested?
- Are local capacities and knowledge made use of?
- Are people prepared and ready to react to warnings?



Warning dissemination and communication

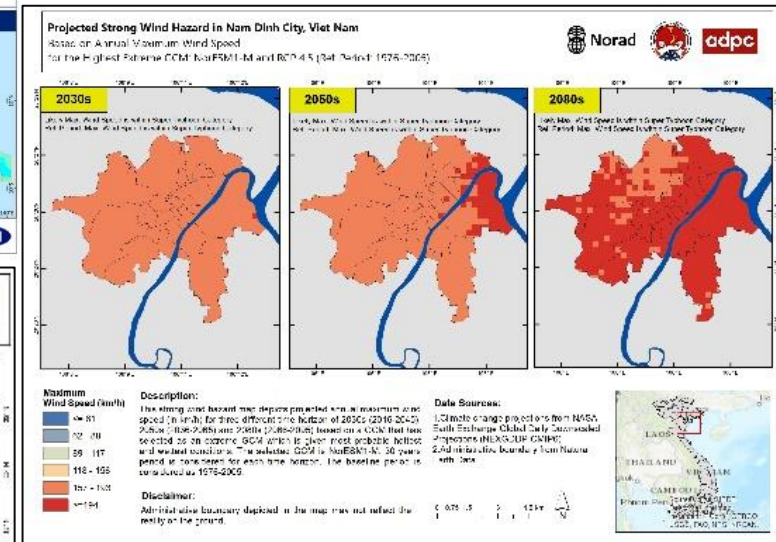
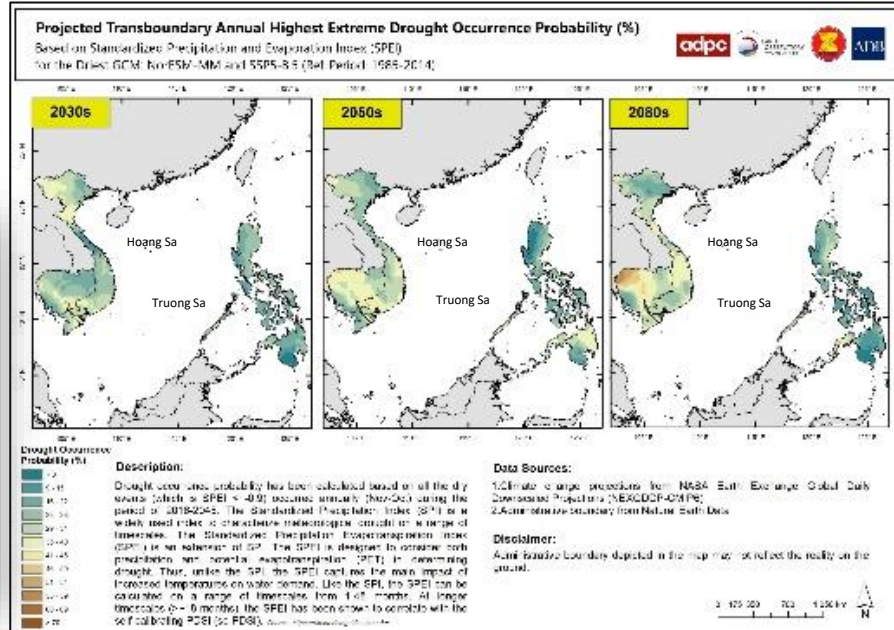
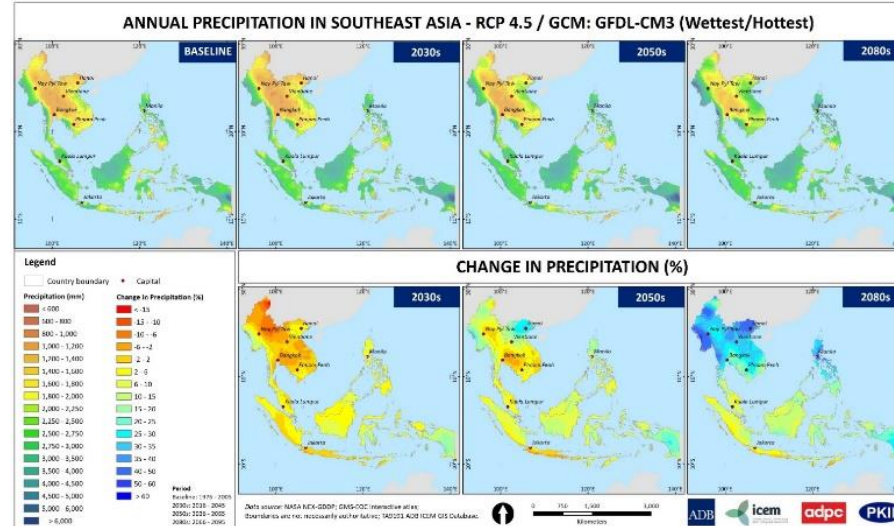
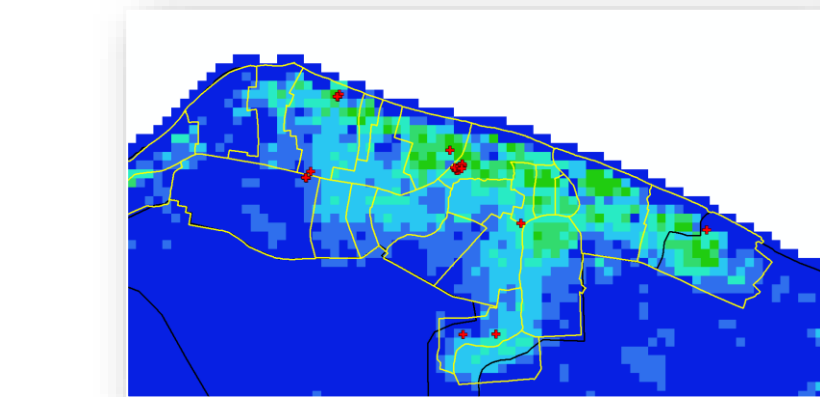
Communicate risk information and early warnings

- Do warnings reach all of those at risk?
- Are the risks and warnings understood?
- Is the warning information clear and usable?

Multi Hazard, Vulnerability and Risk Assessment



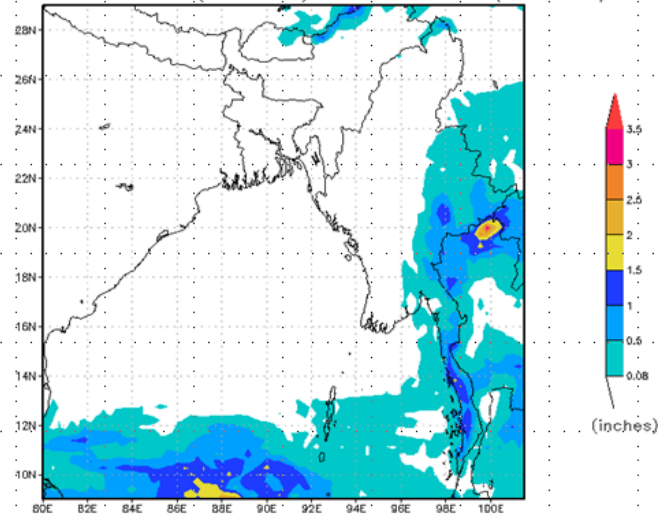
- No Flood
- < 1 m
- 1-2 m
- > 2 m



- **Detection, Monitoring and Forecasting**

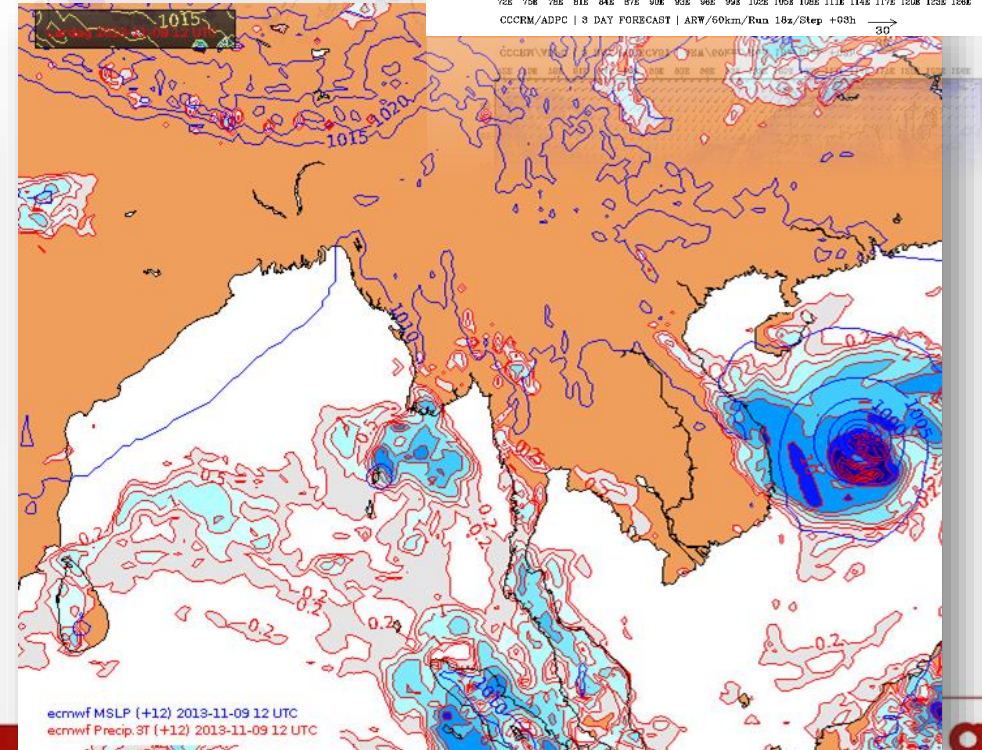
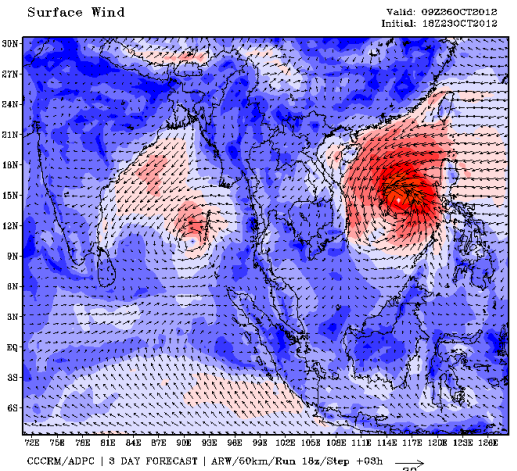
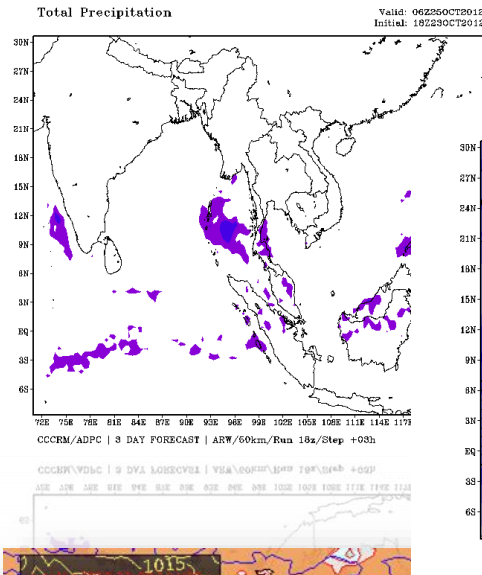
Strengthening capacity of the NHMSs on detecting, monitoring and forecasting of weather phenomena

DMH MYANMAR EXPERIMENTAL WRF(30 km) RAINFALL (inches) FORECAST(72 hr)
Based on GFS 06:30 MST of (02-03-2013) Valid for 06:30 MST of (05-03-2013)



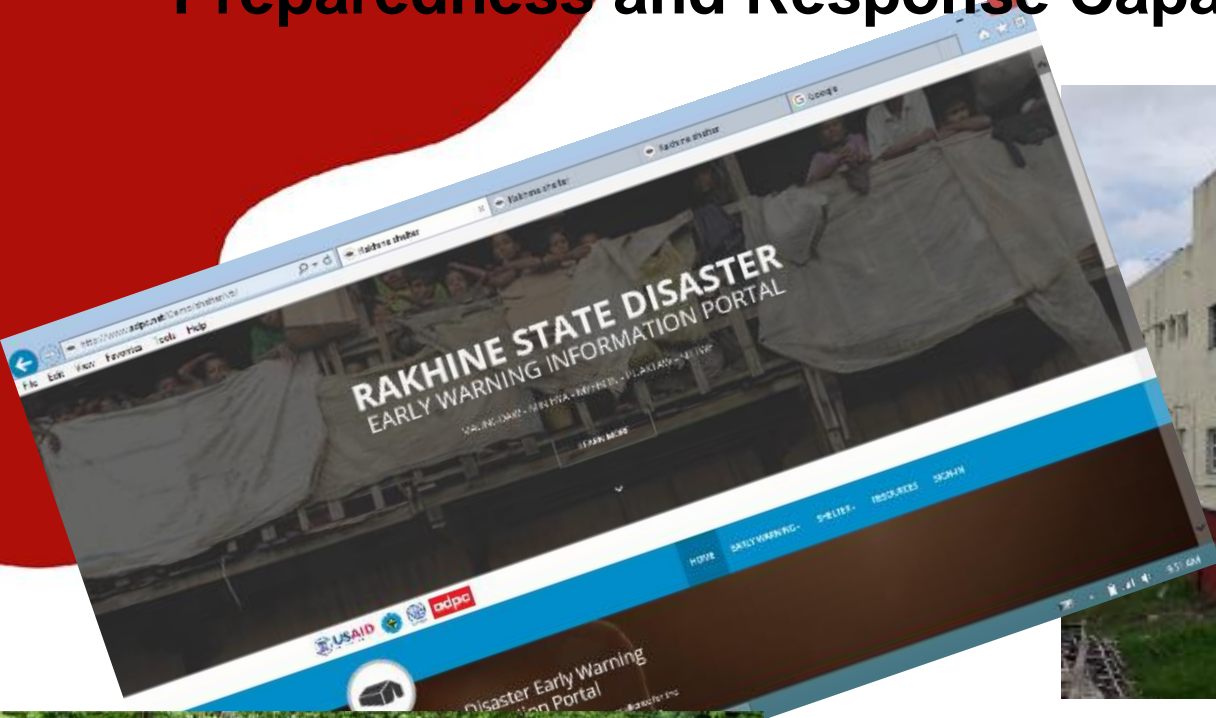
GRADS: CCLM/IGES

2013-03-02-12:52



adpc

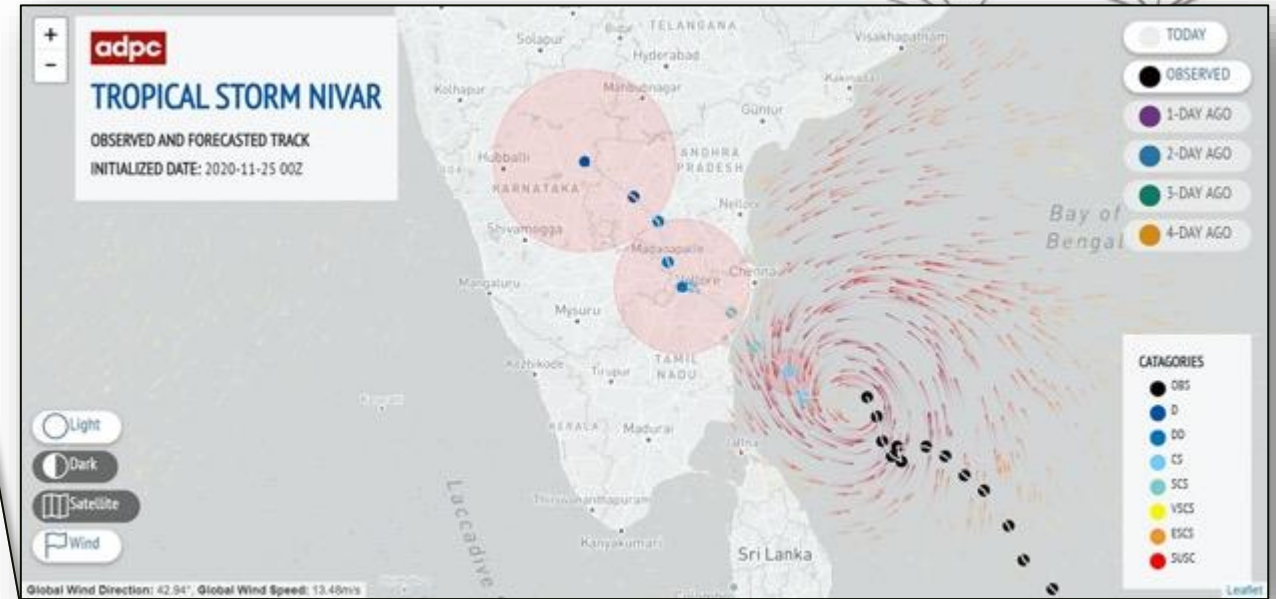
• Preparedness and Response Capabilities



Warning Dissemination and Communication



<http://stormtrack.adpc.net>



VAMCO

ETAU

ATSANI

VAMCO

BUREVI

NIVAR

AMPHAN

Interactive web platform helps to track tropical storms in the Indian Ocean and the East Sea. The Bulletin provides more comprehensive information of the track and probable impacts

adpc

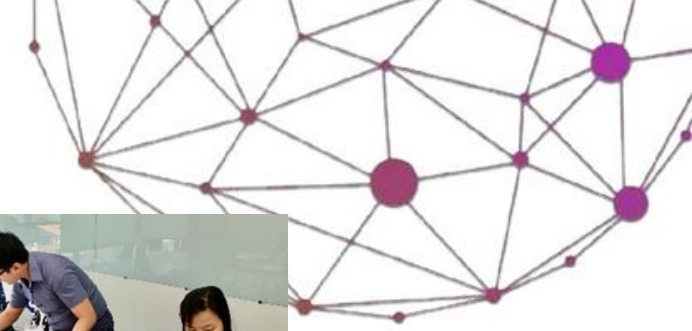
Cross Cutting: Gender and Diversity Inclusion

- Gender Equality Monitoring (GEM) Platform
- Framework for Integrating Rights and Equality in Disaster Risk Reduction and Climate Resilience:



**FRAMEWORK FOR INTEGRATING
RIGHTS AND EQUALITY IN
DISASTER RISK REDUCTION AND
CLIMATE RESILIENCE**

Cross Cutting: Capacity Building



**Participants at the
TNA Workshop**

**CBDRM and
HEDRMF
Orientation
Workshop**



Participants at the TNA Workshop



Partnerships with Key Institutions in Asia and The Pacific





THANK YOU FOR YOUR ATTENTION



www.adpc.net



Asian Disaster Preparedness Center - ADPC



@ADPCnet



Asian Disaster Preparedness Center (ADPC)