Implementation Planning Workshop on
International Flood Initiative (IFI) in Asia-Pacific

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# National Report - Philippines

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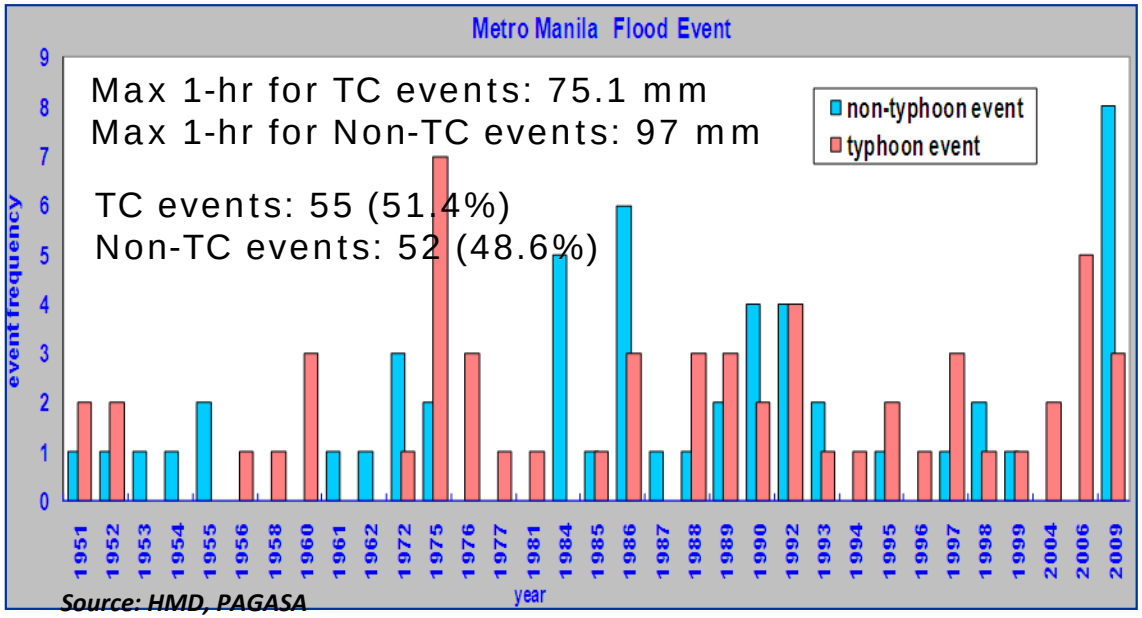
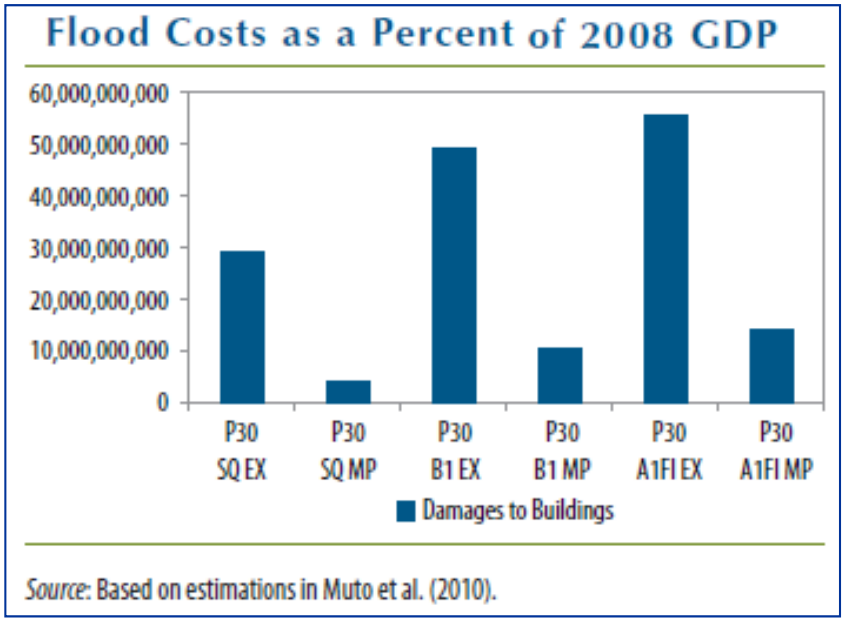
# Trends & Impacts of Flooding in Metro Manila




*Source: HMD, PAGASA*




**Metro Manila's regional GDP in 2008 was 468 billion PHP (National Statistical Coordination Board). Damage costs range from 3% of GDP (SQ-EX-10) to 24% (A1FI-EX-100).**

## Damage Costs from 1-in-10, 1-in-30, and 1-in-100-year Floods in Different Scenarios (2008 PHP)

| Flood Intensity | Without CC: SQ EX | With CC: A1FI-EX | Climate Change Damage Costs (2008 PHP) with an A1FI Scenario with EX |
|---|---|---|---|
| 1/10 | 15,276,335,523 | 19,388,093,046 | 4,111,757,522.59 |
| 1/30 | 40,164,225,177 | 68,964,812,770 | 28,800,587,593.15 |
| 1/100 | 64,727,999,688 | 111,892,101,862 | 47,164,102,174.61 |

*Source:* Muto et al. (2010).

**Climate change costs represent 1% (1-in-10 flood), 6% (1-in-30 flood) & 10% (1-in-100 flood) of GDP.**

***Source: Climate Risks and Adaptation in Asian Coastal Megacities: A Synthesis Report, 2010, ADB, JICA, WB***

# ⇨ PAGASA: The nation's meteorological and hydrological service (NMHS)

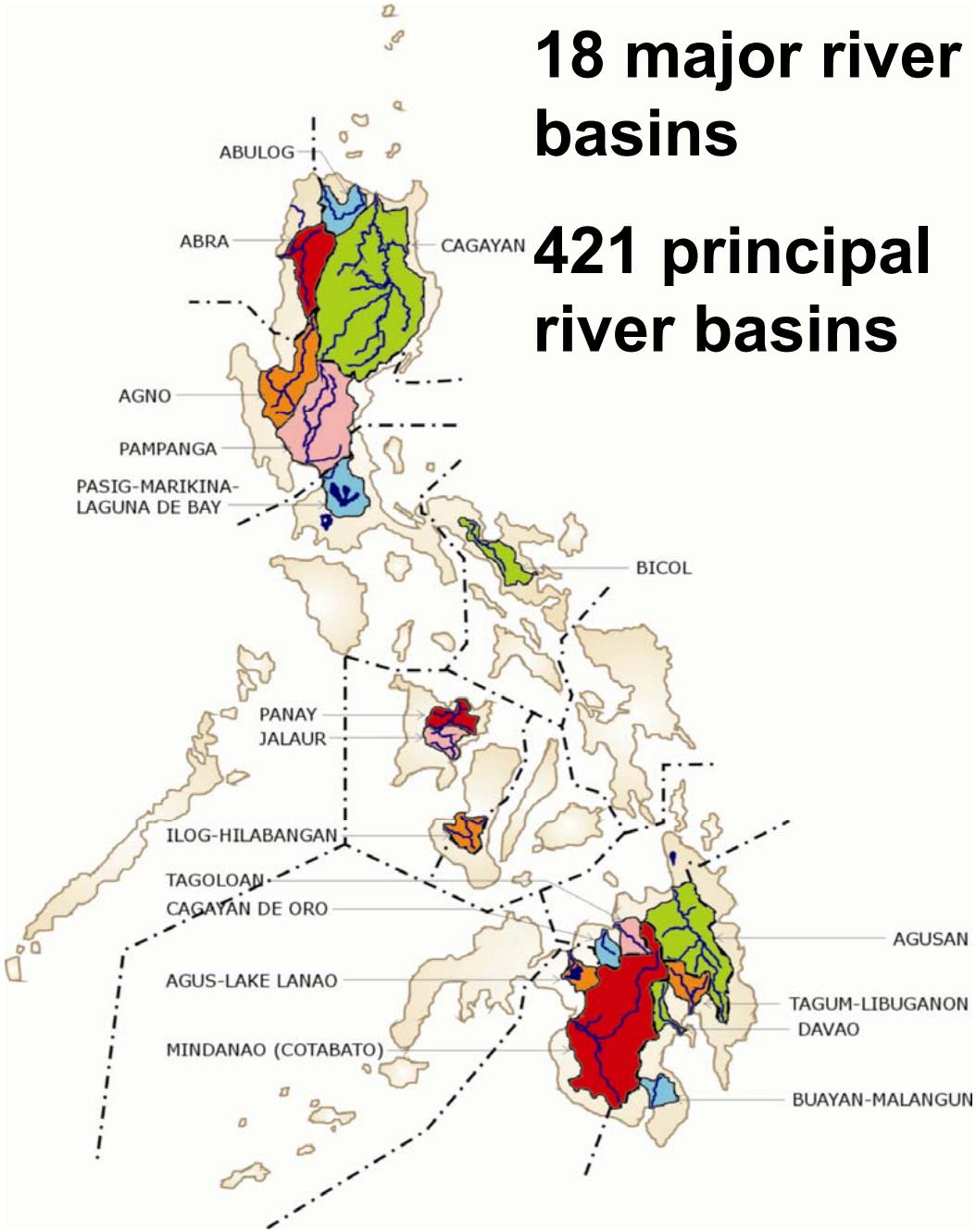
➲ **To provide weather, flood, climate and astronomical products & services to promote the people's safety and well-being, and contribute to national development**

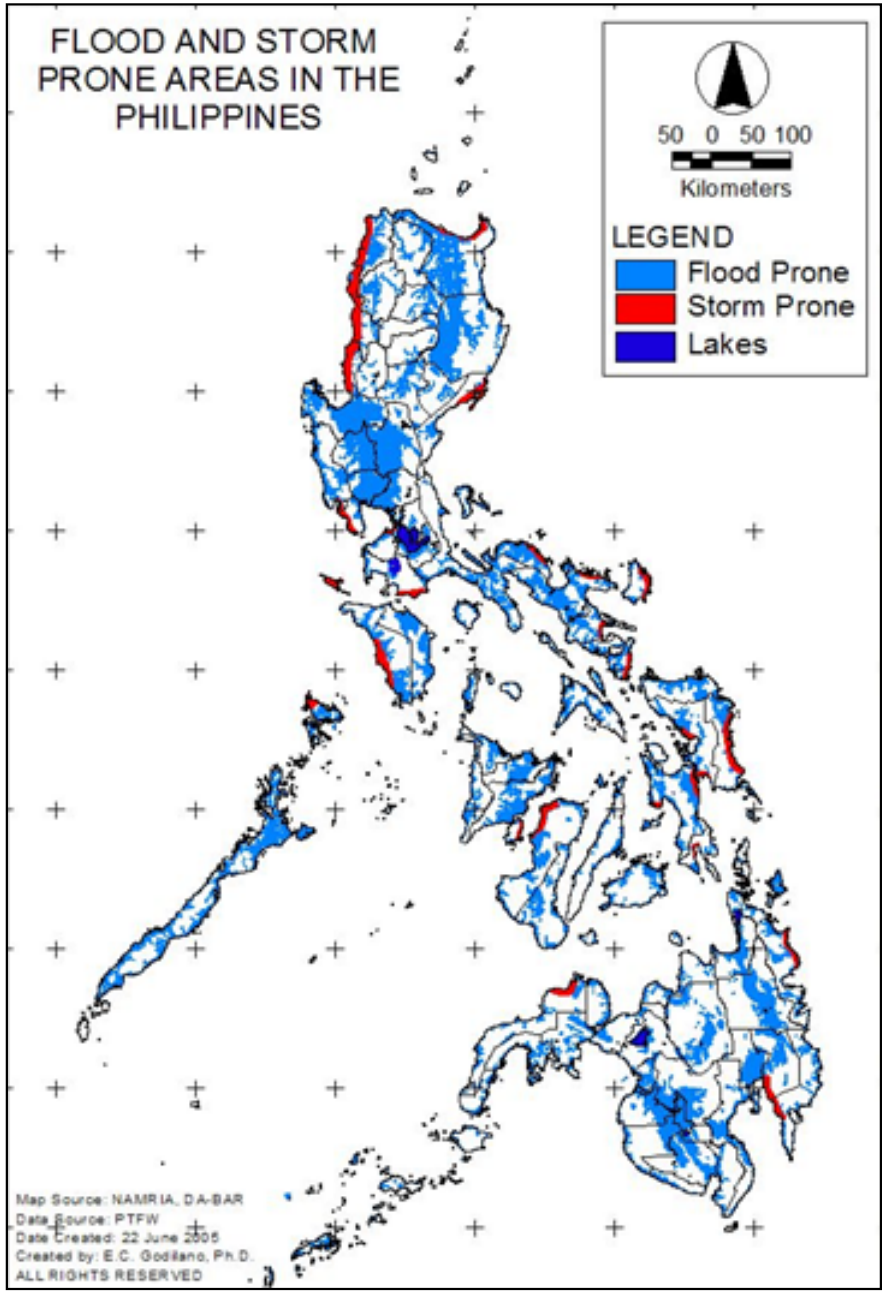
**PAGASA – an attached agency of the Department of Science and Technology (DOST).**

***The Philippines, represented by PAGASA, is a Member of the World Meteorological Organization (WMO), a specialized body of the United Nations.***

**18 major river basins**

**421 principal river basins**

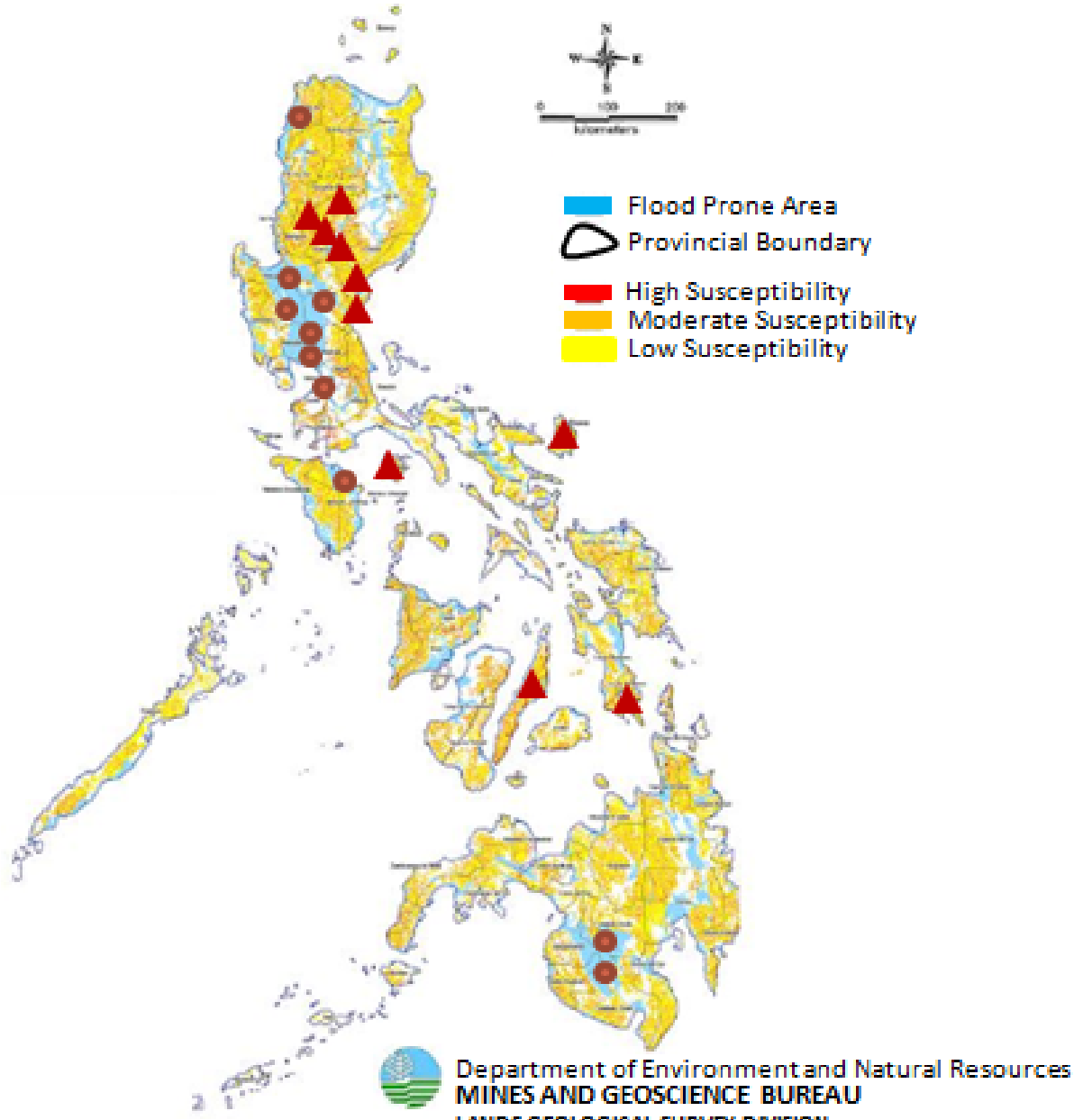


# Flood and landslide prone provinces in PH

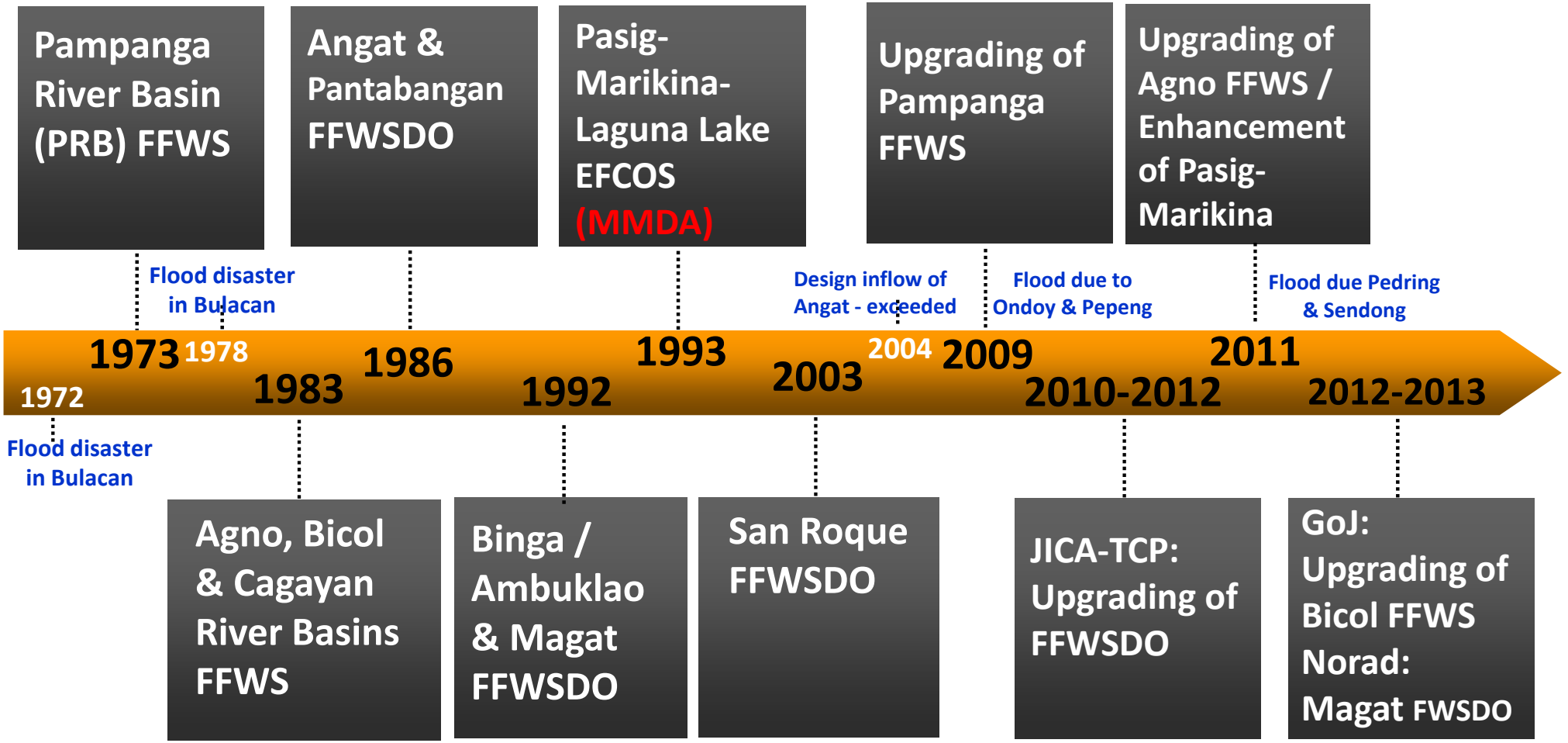
| TOP 10 FLOOD PRONE PROVINCES | | |
|---|---|---|
| 1 | PAMPANGA | 79.54% |
| 2 | NUEVA ECIJA | 51.20% |
| 3 | PANGASINAN | 48.12% |
| 4 | TARLAC | 47.11% |
| 5 | MAGUINDANAO | 42.52% |
| 6 | BULACAN | 39.85% |
| 7 | METRO MANILA | 33.16% |
| 8 | NORTH COTABATO | 30.09% |
| 9 | ORIENTAL MINDORO | 28.65% |
| 10 | ILOCOS NORTE | 27.90% |

| TOP 10 LANDSLIDE PRONE PROVINCES (ALL LEVELS OF SUSCEPTIBILITY) | | |
|---|---|---|
| 1 | BENGUET | 90.3% |
| 2 | MT. PROVINCE | 87.10% |
| 3 | NUEVA VISCAYA | 86.30% |
| 4 | KALINGA APAYAO | 84.70% |
| 5 | SOUTHERN LEYTE | 82.60% |
| 6 | ABRA | 82.10% |
| 7 | MARINDUQUE | 78.60% |
| 8 | CEBU | 77.60% |
| 9 | CATANDUANES | 77.40% |
| 10 | IFUGAO | 77.30% |



# The PAGASA and its Flood Early Warning System

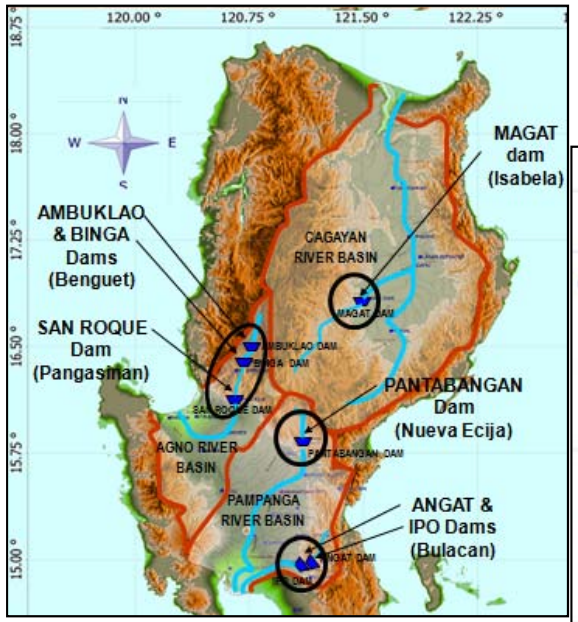
# Evolution of FFWS and FFWSDO in the PH

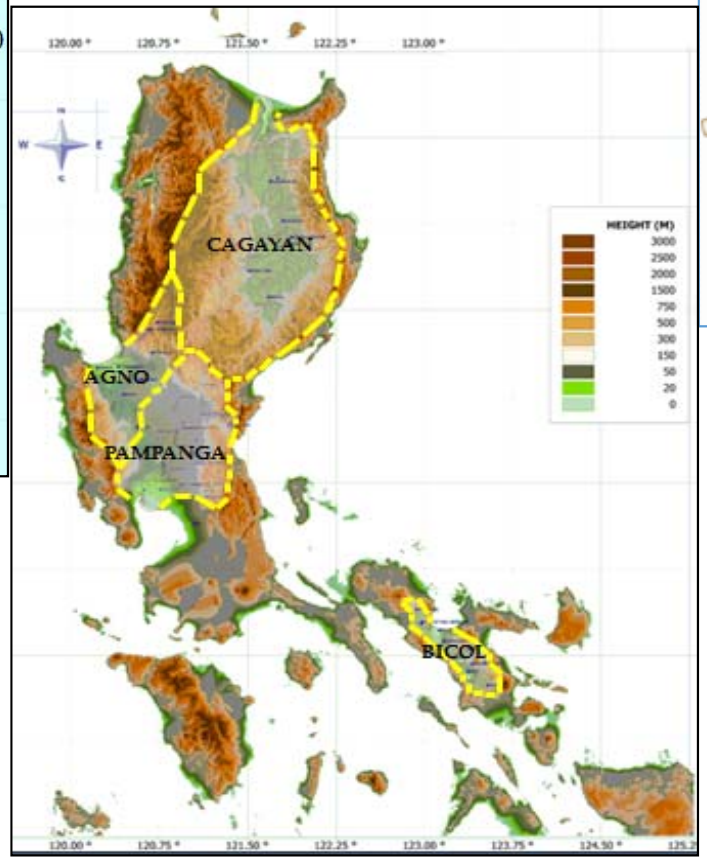


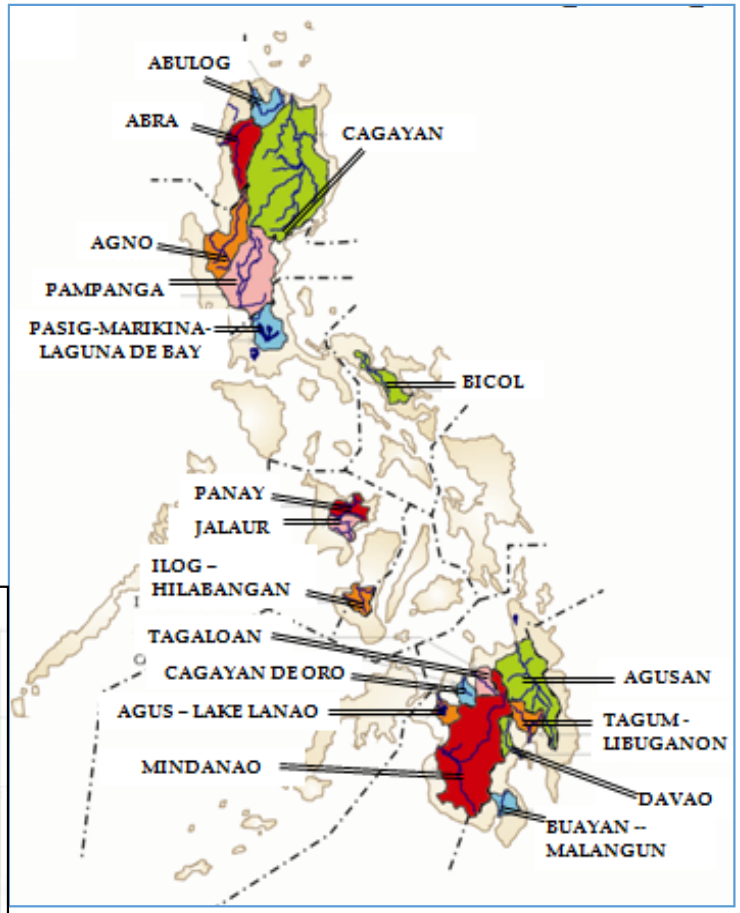

**EO 2011 – Ipo telemetered FFWSDO - operational**

**2012 – Caliraya FFWSDO will be operational**

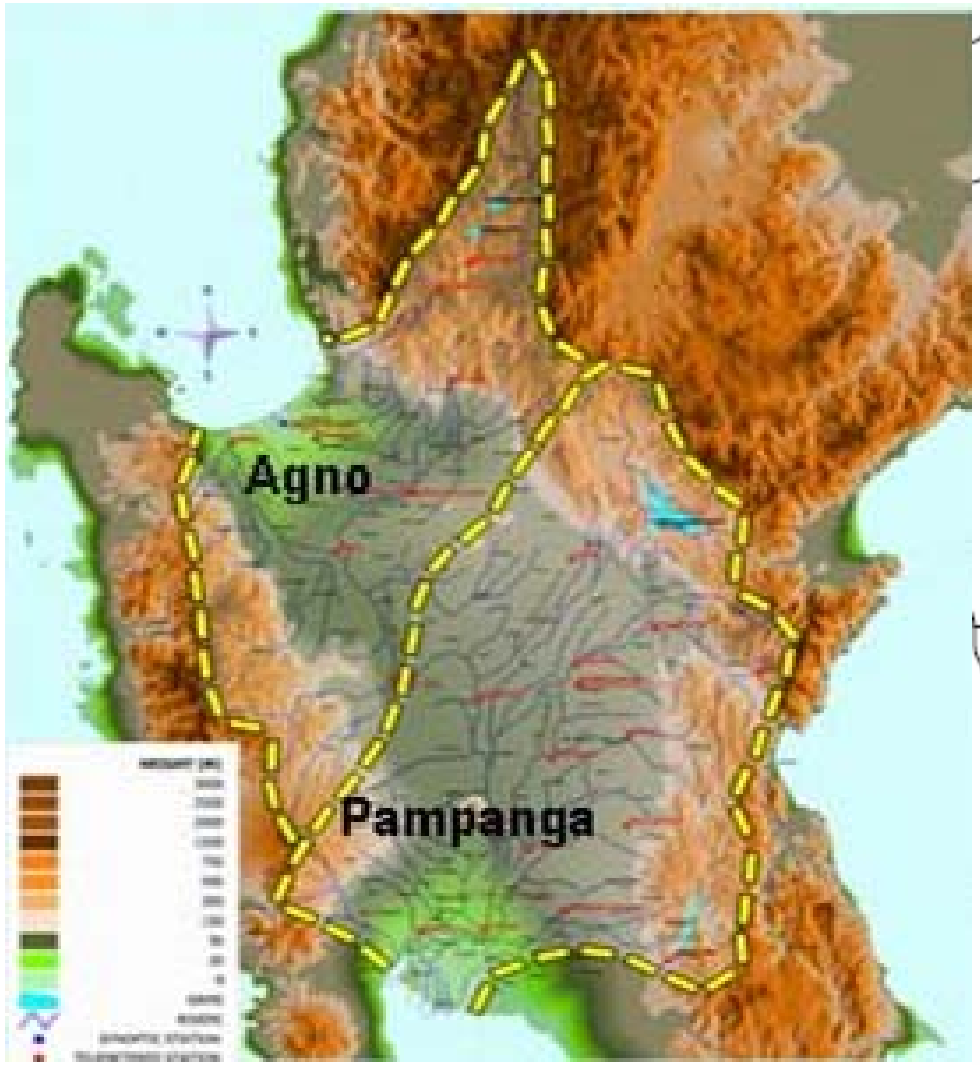
# NETWORK of Existing PAGASA HYDROLOGICAL Stations (Telemetered major river basins and dams)

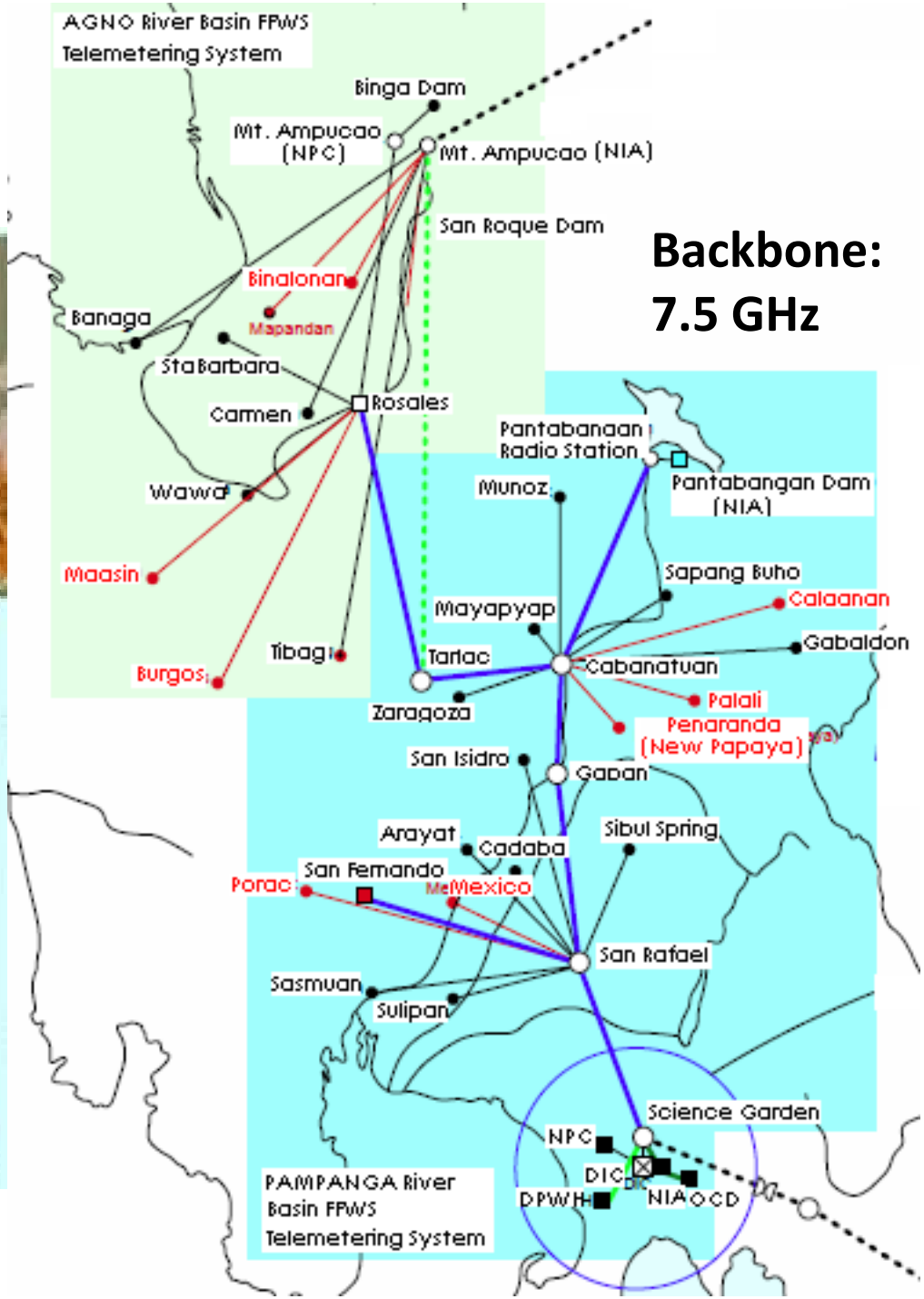


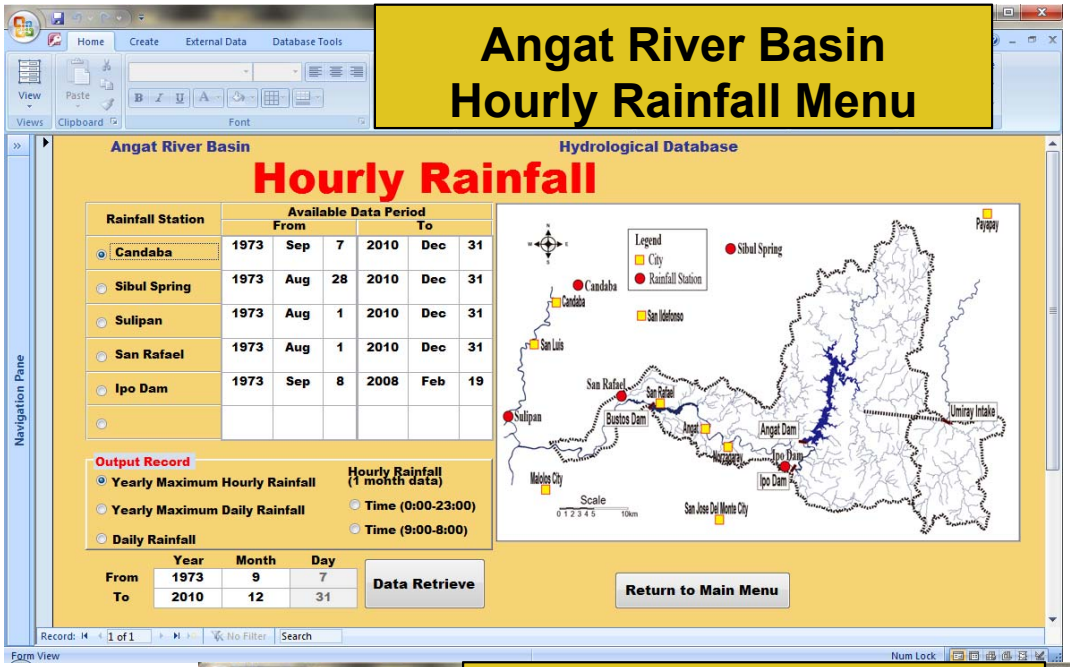
# Upgraded FFWS: Pampanga & Agno river basins

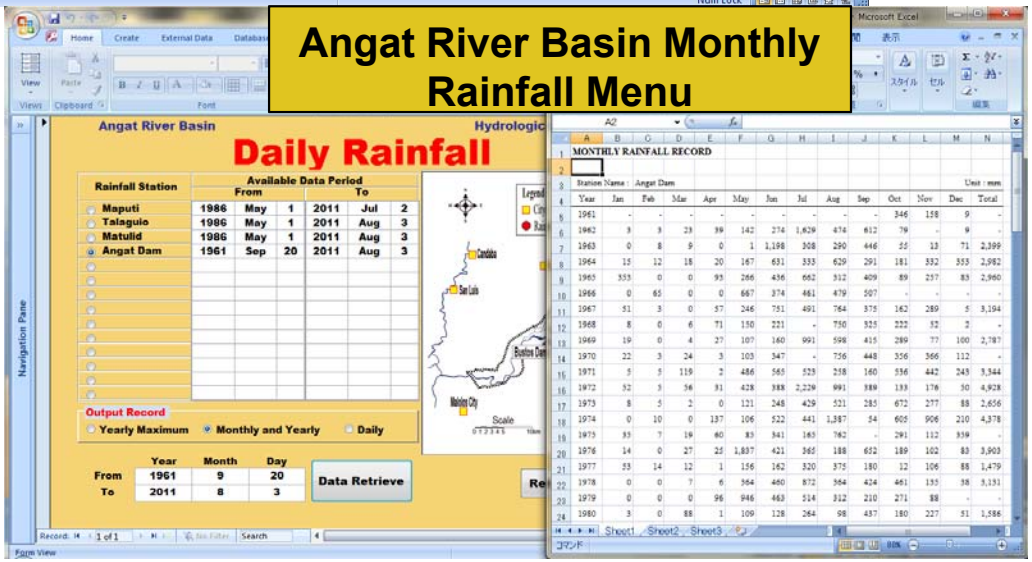


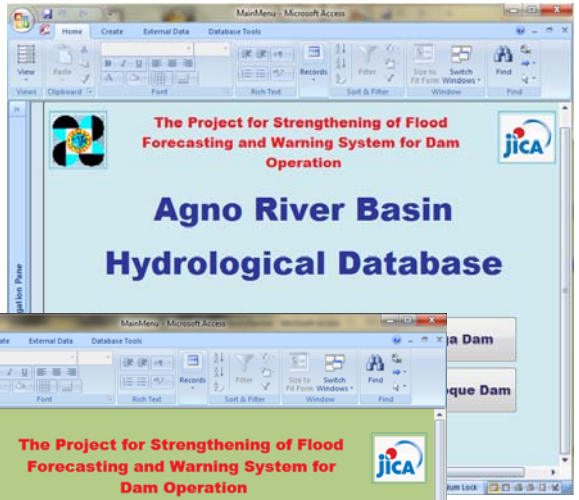



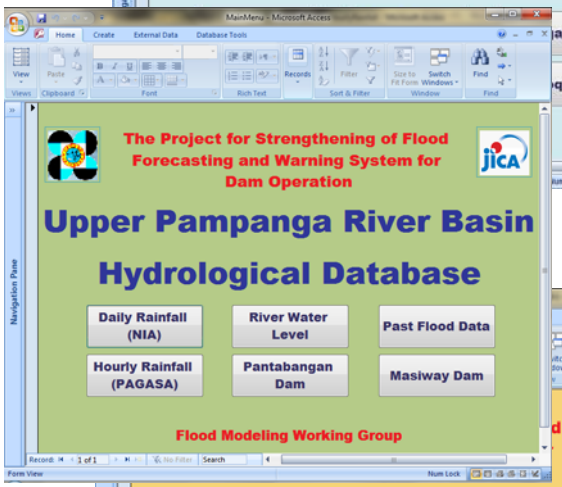

**Backbone: 7.5 GHz**

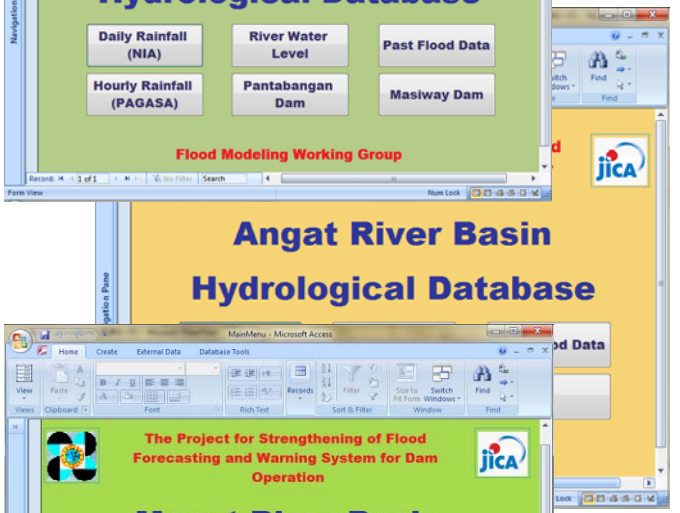
# Hydrological Database

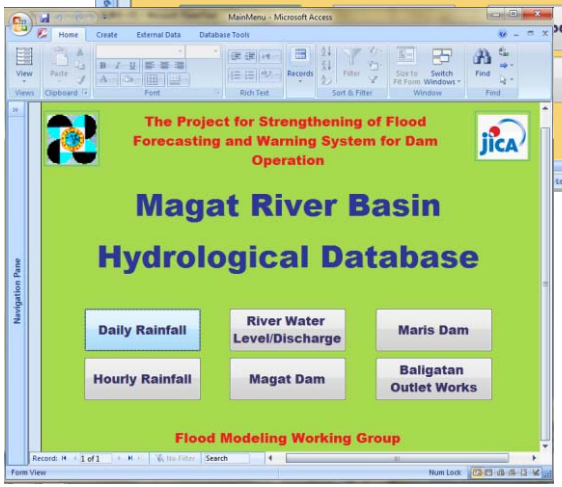


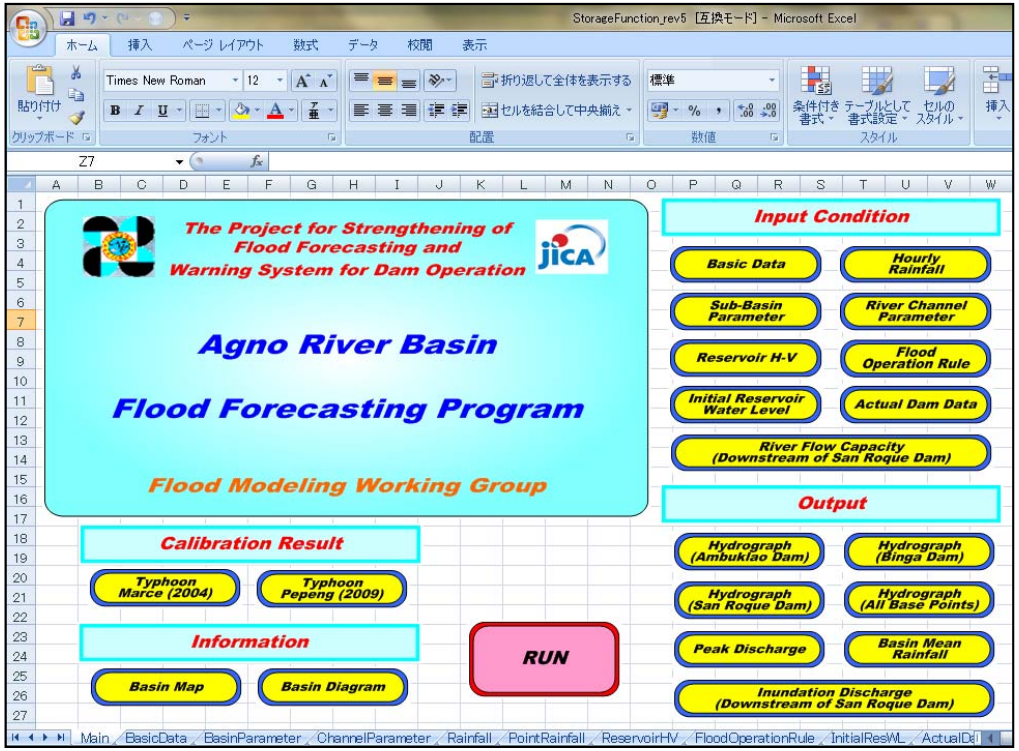



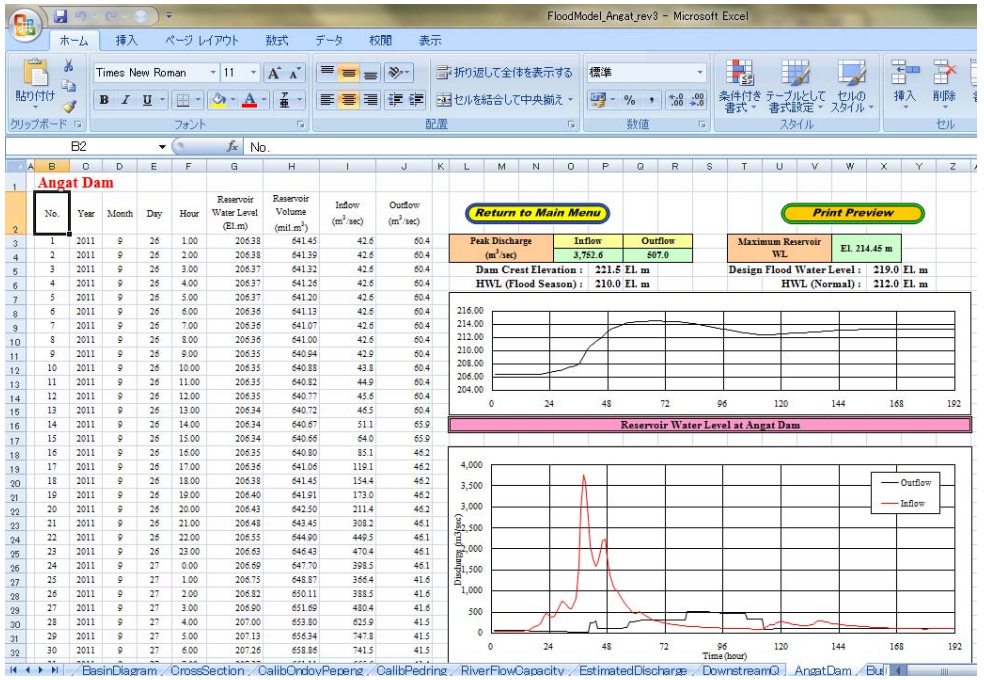



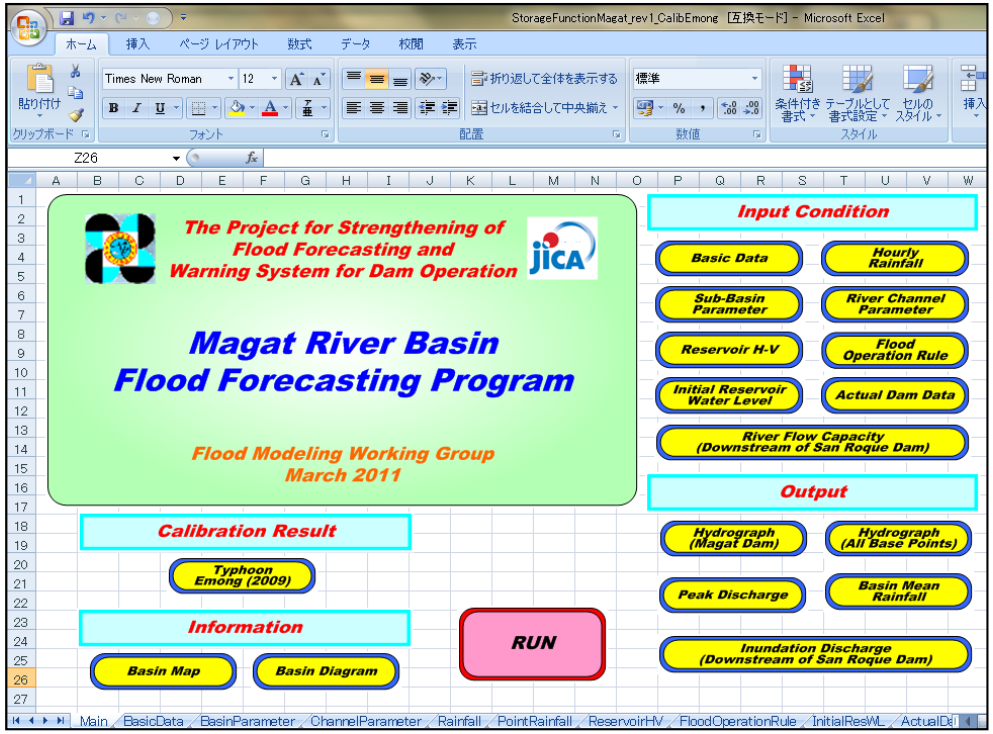



# Flood Forecasting Model



# Community Based Flood Early Warning System (CBFEWS)

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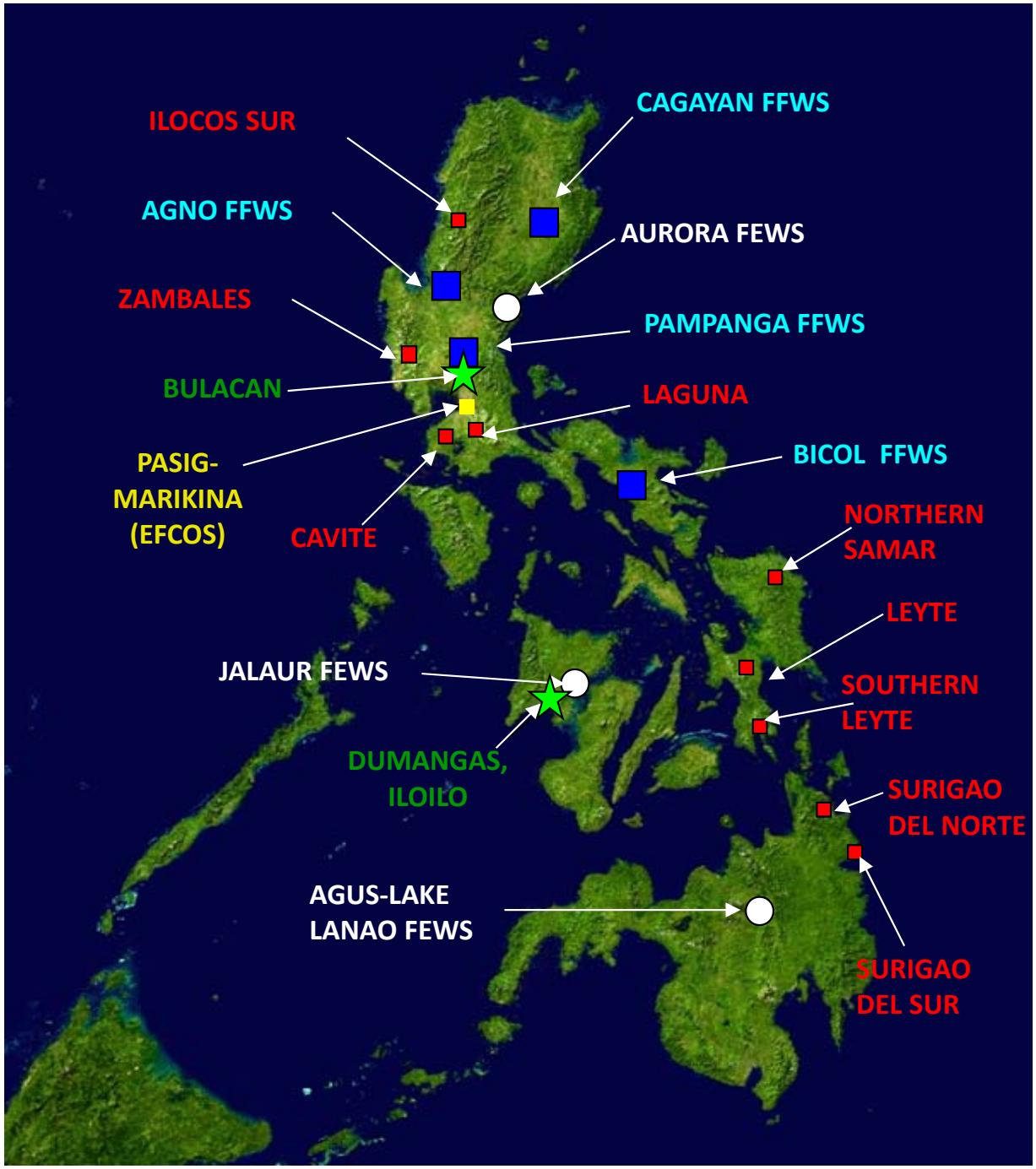
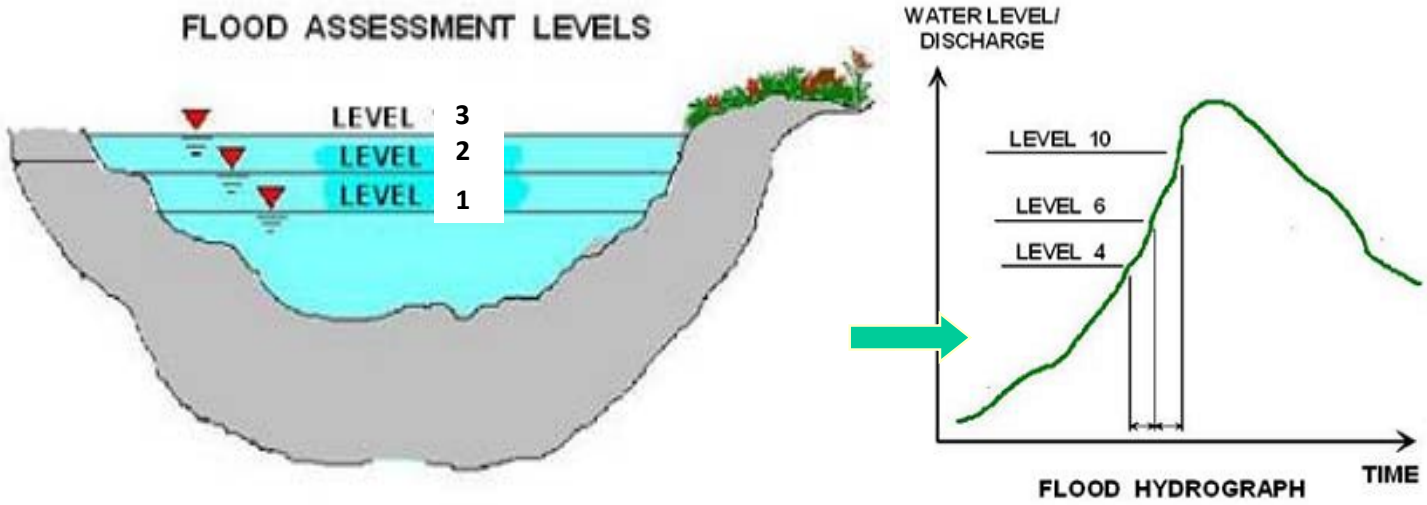



- GOVT. OF JAPAN (TELEMETERED)
- GOVT. OF JAPAN (TELEMETERED) (UNDER MMDA)
- GOVT. OF KOREA (TELEMETERED)
- UNDP- AusAID Community based
- LGU INITIATIVE

# Threshold for Warning:
## Assessment Water Levels



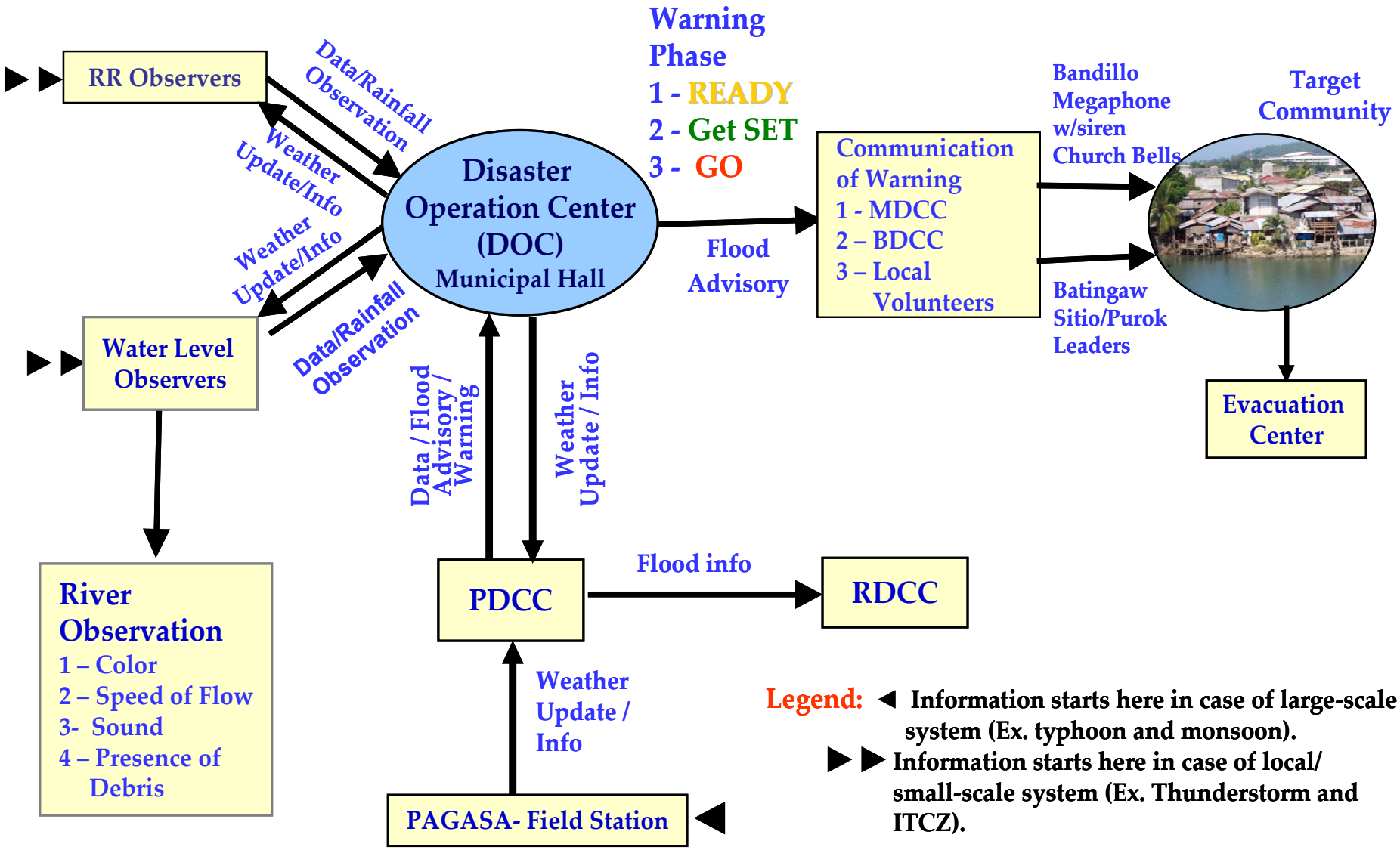

| | Actual Water Level (m) | Meaning | Flood Warning |
|---|---|---|---|
| Level 1 | 1.1 m | Awareness | READY |
| Level 2 | 1.5 m | Preparedness | GET SET |
| Level 3 | 2.0 m | Response | GO |

**Values are arbitrary and will be modified when sufficient data becomes available.**

# Flood Warning Protocol
# (Batingaw)

| Warning Signal/ Info | Water level at the monitoring station | Meaning |
|---|---|---|
| 1 bell or 1-second of brief siren for every 2 seconds for 30 seconds | Water level has reached **Alert Level** | **READY** – People are made **aware** of an impending flood. |
| 2 bells or two 1-second siren for every 2 seconds for 30 seconds. | The **Alert Level** reached the **Alarm Level** in **30 minutes or less** | **GET SET** – People are advised to **prepare** for a possible flood. |
| Continuous ringing of bells or siren for 20 to 30 seconds. | Water level at the monitoring station reached **Critical Level** | **GO** – People are advised to **respond/ evacuate** for an expected flood. |

# Communication Scheme of a CBFEWS



# Provinces where CBFEWSs were installed

# Surigao Del Norte


During the Revisit of Ready Team on 6016 May 2008: Success stories were noted in the municipalities of Hinatuan, Barobo &Tagbina in SDS, in Libjo for Dinagat Island & in Mainit & Surigao City.

Observed data were used to forewarn the threatened communities, i.e. before the landslide that occurred in Surigao City in Feb 2008 and in Hinatuan river basin.

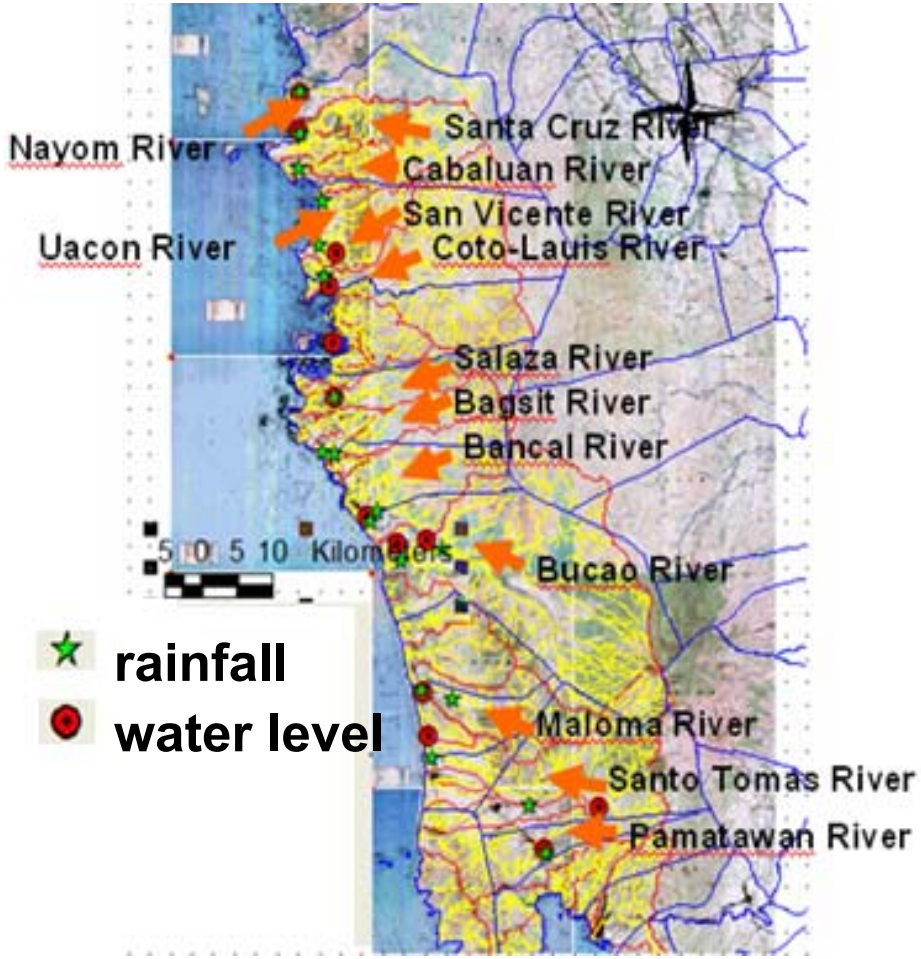
# Surigao del Sur

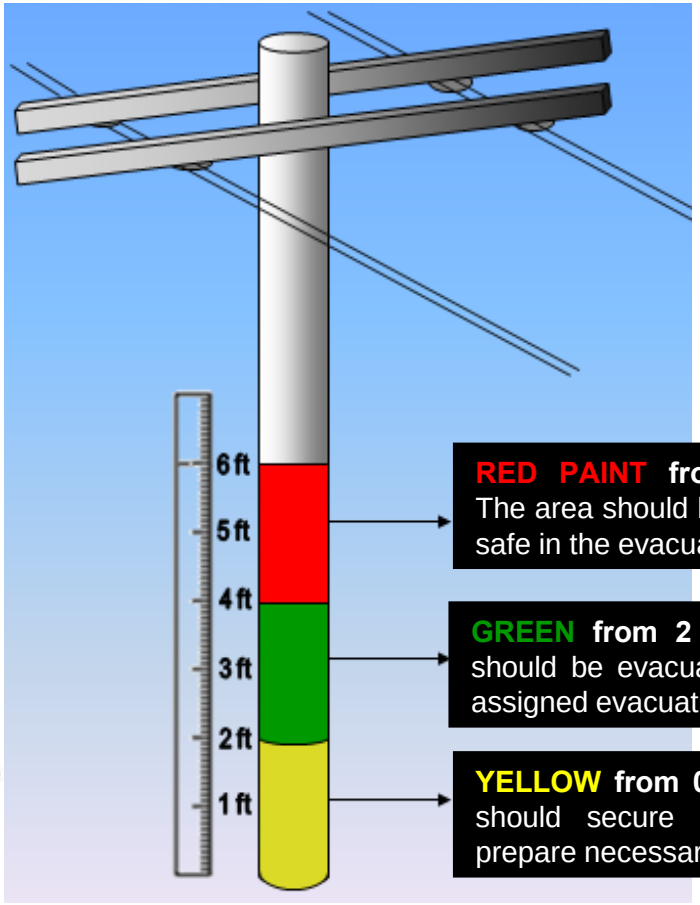
Overall, fewer people are being killed as a direct result of floods, thanks to improvements in warning systems and better preparedness.

- In May 2009, the province of Zambales was devastated by flooding due to passage of a storm but no casualties were recorded. This was mainly attributed to the community based flood early warning system (CBFEWS) in place.


**- On 16 Dec 2011, Surigao del Sur recorded 2 casualties compared to Cagayan de Oro and Iligan City (more than 1000) due to the passage of TS Washi. In 2005, CBFEWS was established under the UNDP Ready project. People in the area still remember the lessons during the flood drills conducted. LGUs immediately convened the local DRRMC in anticipation of storm Washi.**

# Zambales




## Olongapo City:

## Colors of Beauty & Safety

**RED PAINT from 4 to 6 ft. – high risk.** The area should be cleared. Everyone should be safe in the evacuation centers.

**GREEN from 2 to 4 ft. – evacuate.** Families should be evacuate their homes and go to their assigned evacuation centers.

**YELLOW from 0 to 2 ft. – get ready** Families should secure all of their possessions and prepare necessary items for evacuation.

**15 digital & 3 manual raingauges (Zambales); 5 digital raingauges - Olongapo City**
**20 water level gauges (15 in Zambales, 5 in Olongapo City)**

**Zero casualty during passage of TY Emong in May 2009**

Thank you.