

# The 10th GEOSS Asia–Pacific Symposium

Hanoi, Vietnam

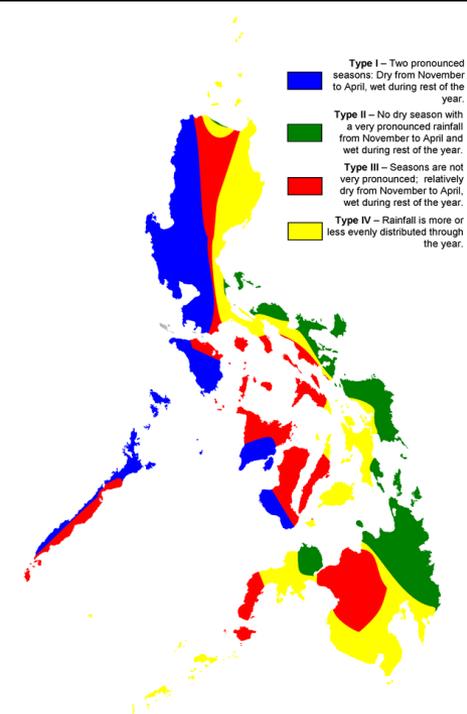
18-20 September 2017

## **Disaster Risk Reduction and Management National and Regional Initiatives Report from Davao City, Philippines**

DR. ANTHONY C. SALES, CESO III

Regional Director

Department of Science and Technology Davao Region



**The Philippines** has a tropical and maritime climate, characterized by relatively high temperature, high humidity and abundant rainfall

We expect around 20 tropical cyclones to enter or develop within the Philippine Area of Responsibility every year, and 8 to 9 would progress to landfall

Tropical cyclones and intense rainfall of seasonal monsoons make vulnerability to hydro-hazard a national priority concern that can be associated with the increasing number of people, industries and infrastructures that are located in hazard-prone areas



# Major Water Risks in the Philippines



**Drought**



**Flood**



**Water quality**

# Ecosystem Thresholds



Biogeochemical  
Flow

Climate  
Change

Biodiversity  
Loss

Human  
Pressures

Land  
System  
Change

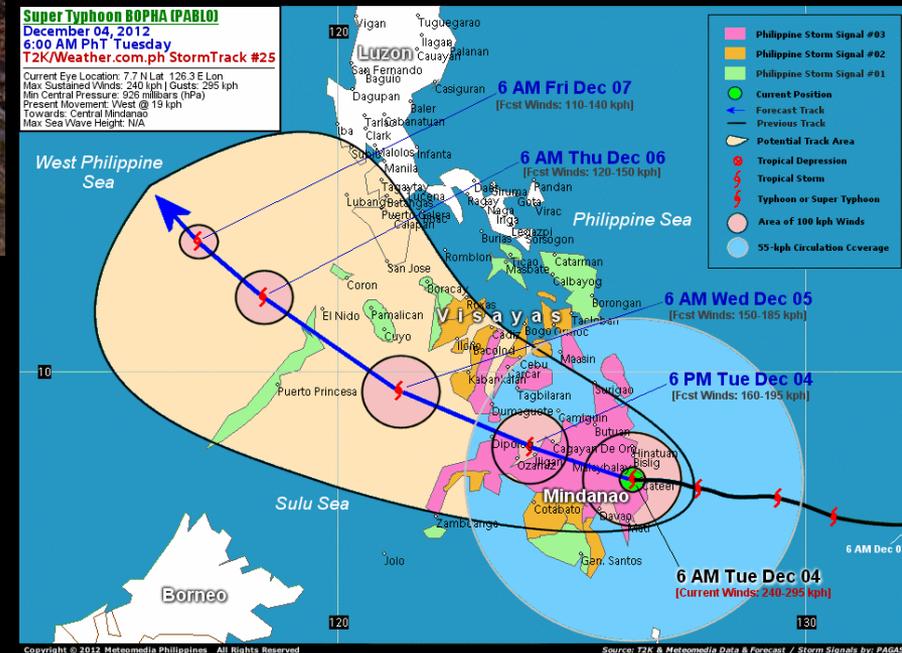
Increasing Population,  
Urbanization, Industrialization



# Typhoon Bopha (Pablo) 2012



**Total Estimate Cost of Damage: PHP37B**  
 (agriculture, infrastructure, properties)  
**Total Individuals Affected: 711,682**  
**families**  
**Total Casualties: 1,607 individuals**  
**Reported Missing: 834 individuals**



**Other immediate problems:**  
**WASH, Food Security, Health and Safety, Shelter, Logistics, Communication, Education**

# The impacts of Typhoon Bopha (Pablo)



**Infrastructure and Communication**



**Industries, Businesses, and Private Properties**



**Agriculture**



**Environmental Integrity**



**Education**



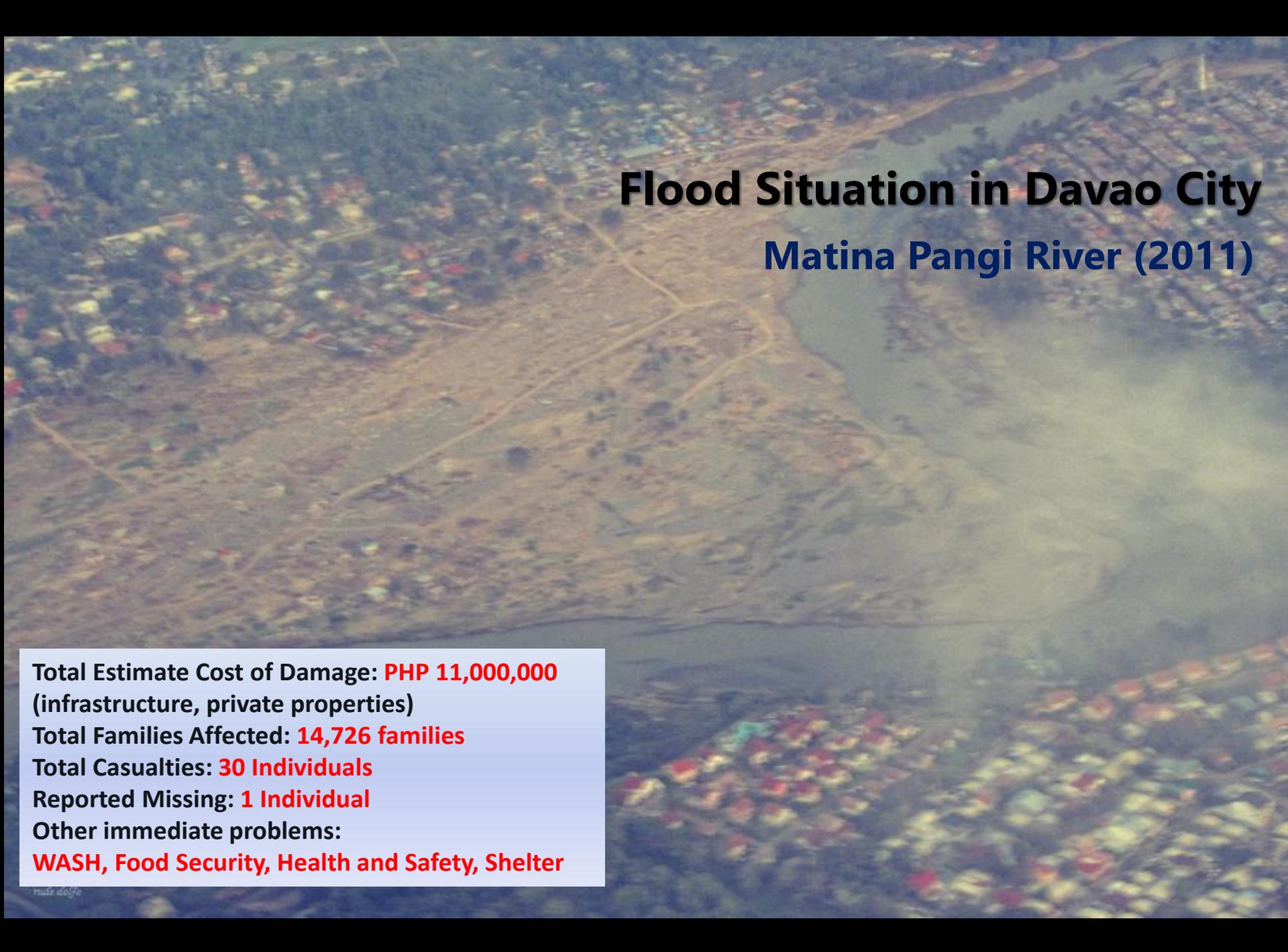
**Health and Safety**



**Livelihood**



**Lives**



# Flood Situation in Davao City

## Matina Pangi River (2011)

Total Estimate Cost of Damage: **PHP 11,000,000**  
(infrastructure, private properties)

Total Families Affected: **14,726 families**

Total Casualties: **30 Individuals**

Reported Missing: **1 Individual**

Other immediate problems:

**WASH, Food Security, Health and Safety, Shelter**



# Davao City Flooding

in 2011

Thousands of families in 5 Barangays (***Ma-a, Matina Pangi, Matina Crossing and Talomo Proper***) were drenched in **10 feet** high flash flood for several hours due to heavy rain that poured on June 28, 2011, forcing families to seek for higher and safer grounds



# Damages of the Flash Flood Incident in Davao City Matina Pangi River (2011)



Infrastructure, Private Properties, and Businesses



Health and Sanitation, Safety, Households, Livelihood

# Disaster Risk Reduction and Management

National Initiatives in Philippines

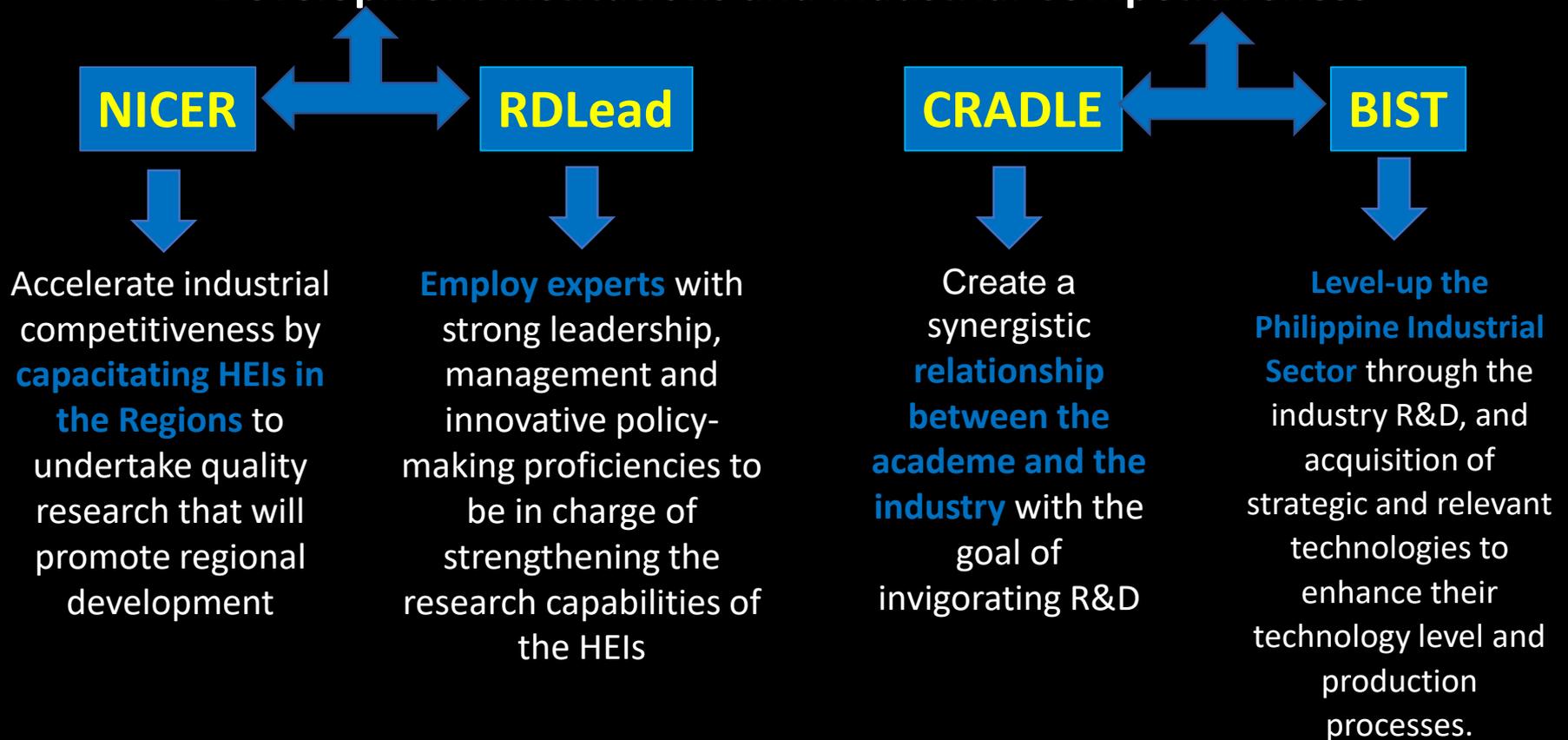
RA 10121

Vision: Safer, adaptive and disaster resilient Filipino communities towards sustainable development

Major Function of DOST: Chair of the Committee on Disaster Prevention and Mitigation

# SCIENCE FOR CHANGE

## Accelerated R&D Program for Capacity Building of Research and Development Institutions and Industrial Competitiveness



# PHL-MICROSAT



The PHL Microsat Program aims to build, launch and effectively utilize micro-satellite technology for multispectral, high precision earth observation.

# DIWATA I

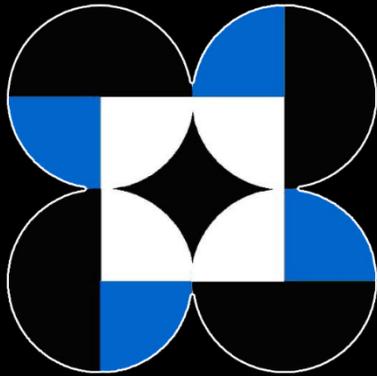
Diwata-1, was launched from the International Space Station (ISS) on the first quarter of 2016. It will be a Low Earth Orbit (LEO) Satellite with an estimated altitude of 400 to 420 kilometers and a speed of around 7 kilometers per second.





It is expected to provide remote sensing information that help address the needs of the Philippines for assessment of damages associated with disasters, as well as studying agriculture, fishery, forestry and changes in the environment.

# DEPLOYMENT OF EARLY WARNING SYSTEM (DEWS) IN DISASTER PRONE AREAS



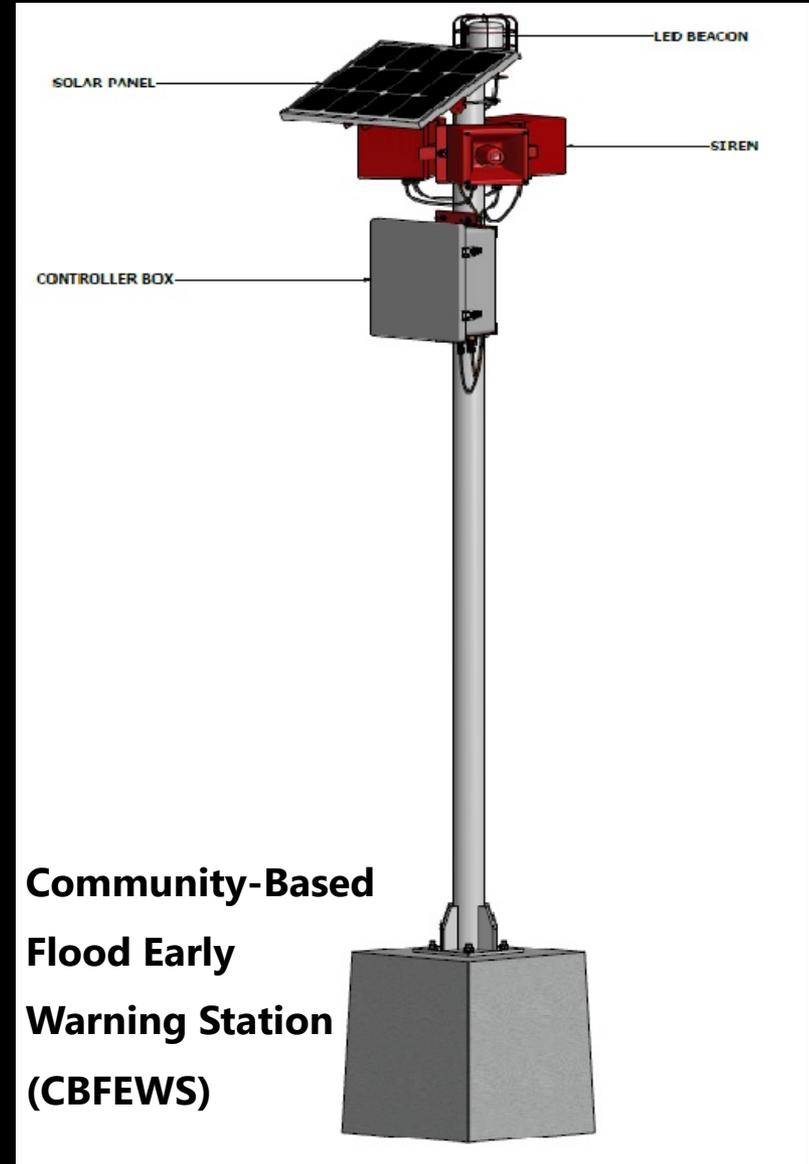
The DEWS is a project undertaken in cooperation with the Philippine Atmospheric, Geophysical and Astronomical Services Administration (DOST-PAGASA) and DOST Regional Offices.





It involves the installation of hydrometeorological devices (hydromets) such as Automated Rain Gauge (ARG) and Water Level Monitoring Station (WLMS) in different river systems and secondary tributaries to provide data that will be useful in protecting the lives, property and livelihood in various communities.

To complement these systems of hydrometeorological devices, an early warning system composed of sirens or beacons will be installed in communities affected by floods. The use of sirens or beacons as early warning of natural hazards is one of global best practices in informing unsuspecting communities thus improving disaster risk reduction.



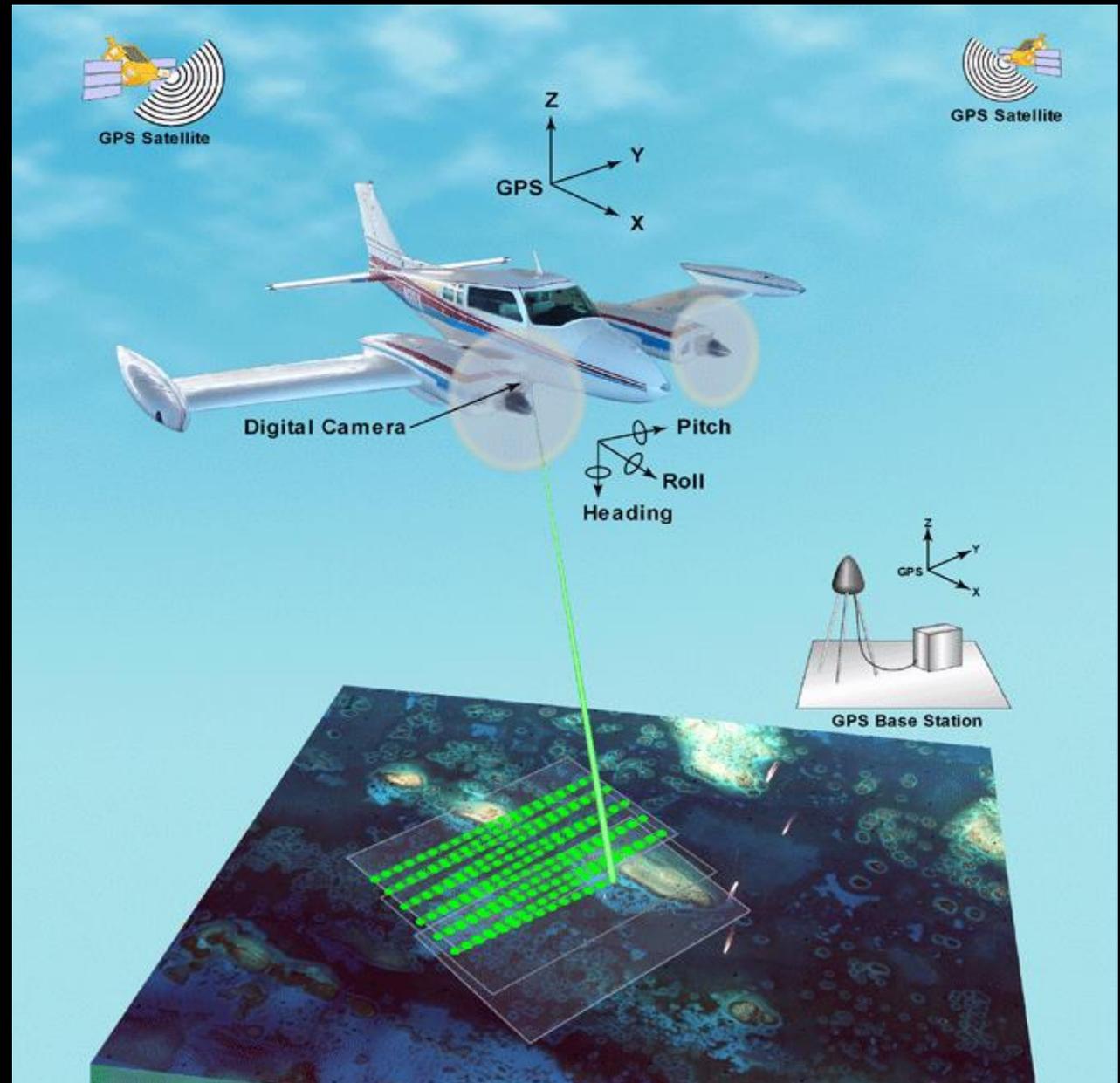
# GEOSAFER MINDANAO



Geo-informatics for the Systematic Assessment of Flood Effects and Risks for a Resilient Mindanao: aimed to cover the rest of Mindanao flood-prone areas with flood hazard maps through the cooperation of 5 Higher Education Institutions in Mindanao

**Components of  
airborne LIDAR  
survey:**

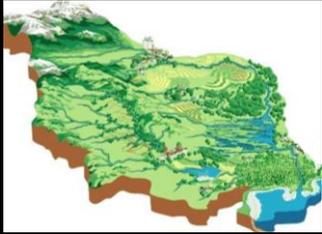
- GPS
- IMU
- Laser  
Rangefinder





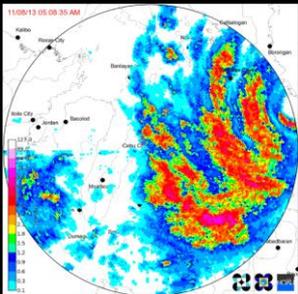
# DOST Project NOAH

Nationwide Operational Assessment of Hazards



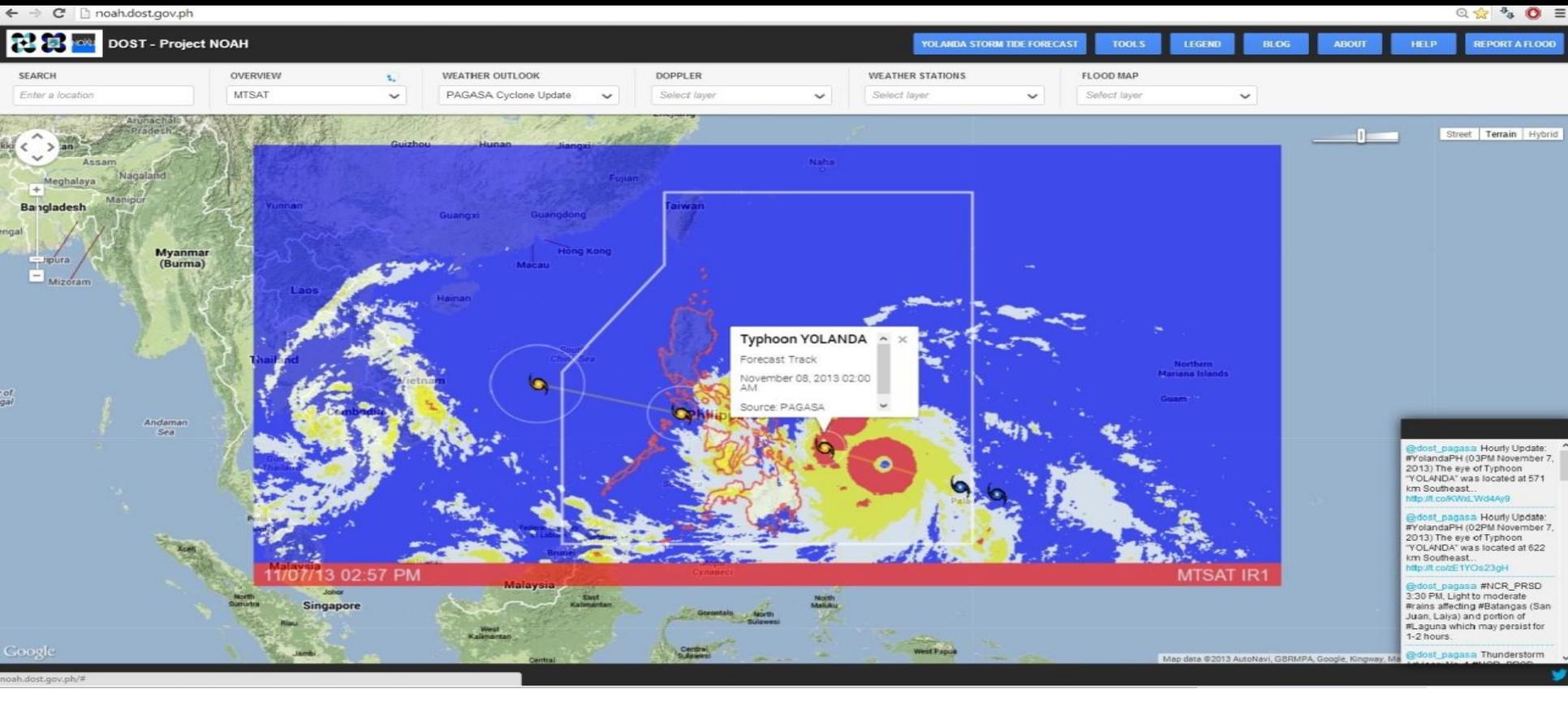
## Project NOAH aims to provide:

- flood mitigation system, specifically targeting a 6-hour flood early warning system for communities along 18 major river systems;
- enhancement of geohazard maps and;
- enhancement of storm surge vulnerability maps



# Project NOAH Website

noah.dost.gov.ph



# WebSAFE :

**WebSAFE**

**Question**  
In the event of  
Quezon City

**How Many**  
Quezon City

**Will**  
Need Evacuation

Calculate

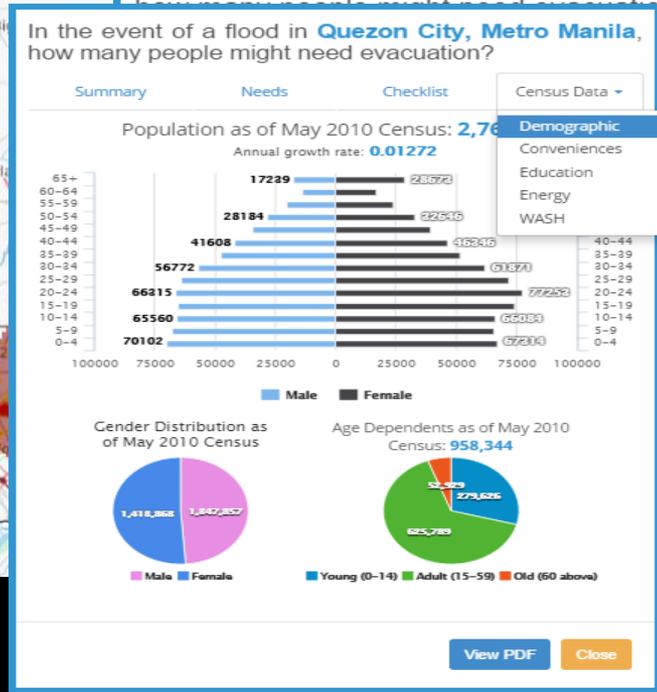
Reset

WebSAFE, an impact assessment tool based on InaSAFE, is a joint effort of Project NOAH and The World Bank.

In the event of a flood in **Quezon City, Metro Manila**, how many people might need evacuation?

In the event of a flood in **Quezon City, Metro Manila**, how many people might need evacuation?

In the event of a flood in **Quezon City, Metro Manila**, how many people might need evacuation?



**1.4**  
Poverty Incidence

View PDF Close

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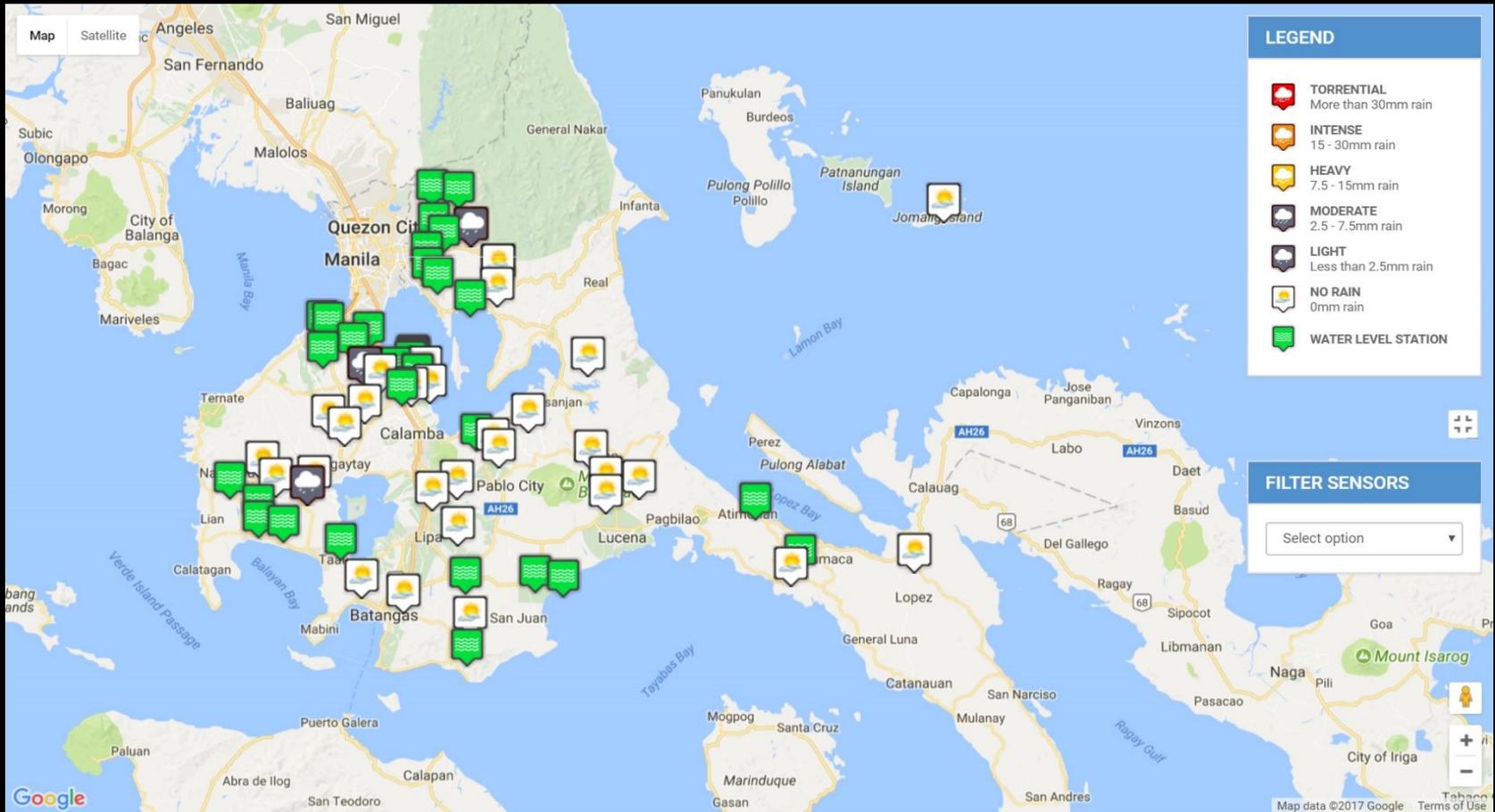
# Disaster Risk Reduction and Management

Regional Initiatives in Davao City, Philippines

# Project HANDA

is an ICT-enabled Disaster Risk Reduction and Management (DRRM) system used in the dissemination disaster-related updates.





monitoring of data from ASTI-developed hydromet sensors and warning/alarming systems for LGUs.

# *weather bulletins from PAGASA and volcano and earthquake bulletins from PHIVOLCS*

## Bulletins | Earthquake Information

DateTime: 14 Sep 2017 08:13:18 AM  
Location: 18.90N, 121.21E 035 km S 10 W of Calayan Cagayan  
Depth of Focus Km: 033  
Origin: TECTONIC  
Magnitude: Ms 2.4  
Expecting Damage: NO  
Expecting Aftershocks: NO  
Issued On: 14 Sep 2017 08:26 AM

DateTime: 13 Sep 2017 11:21:28 PM  
Location: 15.42N, 118.94E 103 km S 89 W of Palauig Zambales  
Depth of Focus Km: 018  
Origin: TECTONIC  
Magnitude: Ms 2.1  
Expecting Damage: NO  
Expecting Aftershocks: NO  
Issued On: 13 September 2017 11:30 PM

DateTime: 13 Sep 2017 11:03:23 PM  
Location: 12.79N, 123.65E 014 km S 25 E of Donsol Sorsogon  
Depth of Focus Km: 004  
Origin: TECTONIC

## Bulletins | Weather Bulletin

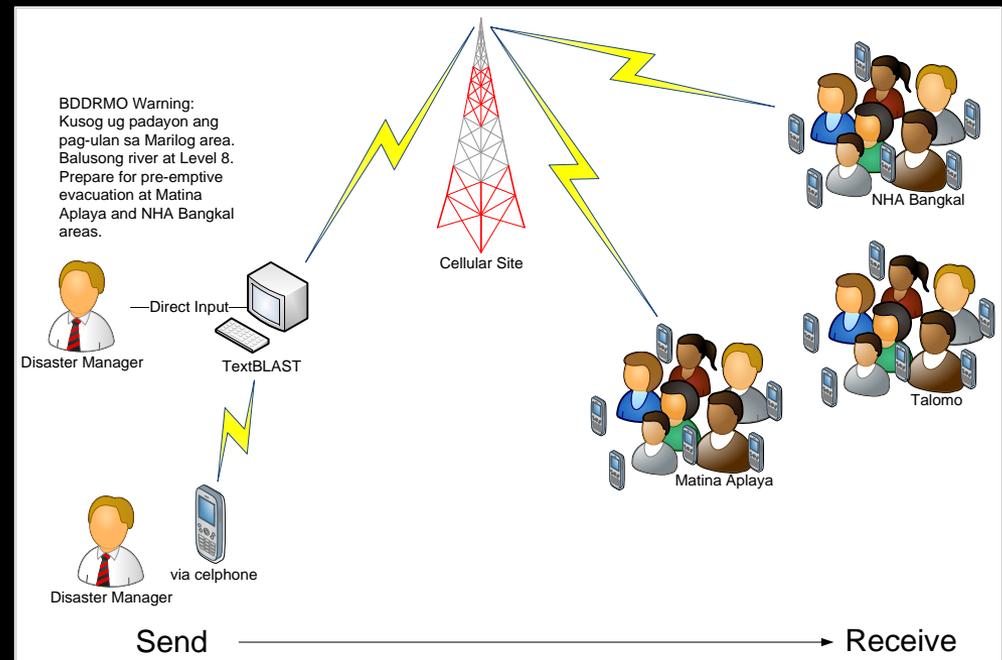
Issued at: 4:00 AM today 14 September 2017

SYNOPSIS: Intertropical Convergence Zone ITCZ affecting Palawan and Mindanao

SYNOPSIS: Intertropical Convergence Zone ITCZ affecting Palawan and Mindanao. Predicted Mean Sea Level Pressure Analysis 8:00 AM today 14 September 2017 Predicted Mean Sea Level Wind Analysis 8:00 AM today 14 September 2017 Satellite Image Surface Map Analysis TYPHOON TALIM 3:00 AM TROPICAL STORM DOKSURI 3:00 AM LOCATION: 700 KM NORTHEAST OF BASCO BATANES 26.1N 124.9E LOCATION: 740 KM WEST OF IBA ZAMBALES 15.8N 113.1E MAXIMUM SUSTAINED WINDS: 130 KPH MAXIMUM SUSTAINED WINDS: 85 KPH GUSTINESS: UP TO 160 KPH GUSTINESS: UP TO 105 KPH MOVEMENT: NORTH NORTHWEST AT 13 KPH MOVEMENT: WEST NORTHWEST AT 18 KPH FORECAST WEATHER CONDITIONS Place Weather Condition Caused by Impacts Palawan Cloudy skies with scattered rainshowers and thunderstorms. Intertropical Convergence Zone ITCZ Possible lightning occasional heavy rains strong winds and flash flooding. Mindanao Partly cloudy to cloudy skies with rainshowers and thunderstorms Intertropical Convergence Zone ITCZ Possible lightning occasional heavy rains strong winds and flash flooding. Metro Manila and the rest of the country Partly cloudy to cloudy skies apart from isolated rainshowers Localized thunderstorms Possible lightning occasional heavy rains strong winds. FORECAST WIND AND COASTAL WATER CONDITIONS Place Winds Coastal Waters Speed Direction Luzon and Visayas Moderate to Strong South to Southeast Moderate to Rough Mindanao Light to Moderate Southeast to South Slight to Moderate EXTREMES OF TEMPERATURE AND RELATIVE HUMIDITY FOR THE 24-HOUR PERIOD ENDING AT 8:00 PM TODAY Recorded at PAGASA Synoptic Station Science Garden Diliman Quezon City YESTERDAY Temperature C Maximum 32.8 1:00 PM Relative Humidity Maximum 95 6:00 AM Minimum 24.5 6:00 AM Minimum 58 1:00 PM TIDES AND ASTRONOMICAL INFORMATION Over Metro Manila Today Tomorrow Today Tomorrow Tidal Predictions for Manila Bay m Courtesy of NAMRIA High - - - Sunrise 5:45 AM - Low 12:09 PM 0.18 - - Sunset 5:58 PM - High - - 3:21 AM 1.

# TEXTBLAST (Text Broadcast Level Automated Sending Tool)

Development of a system that integrates Project HANDA to existing SMS based information system of OCD XI.



# Davao Central 911

Central 911 functions as both a call center and a dispatch center that links residents with the emergency resources of the government. The Emergency Computer Aided Dispatch (ECAD) system developed by Davao Light allows Central 911 to immediately locate the origin of emergency calls



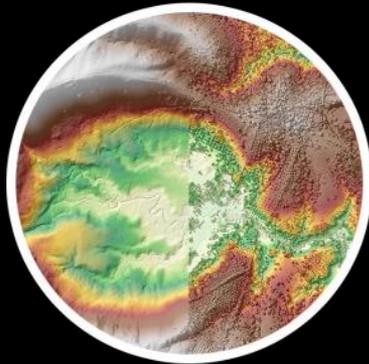


# UNIVERSITY OF THE PHILIPPINES MINDANAO

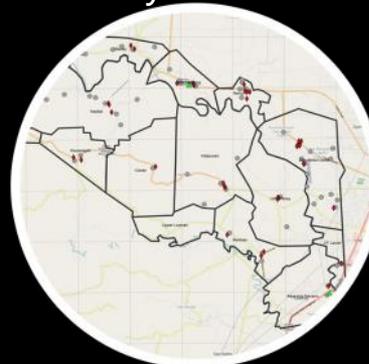
## PHIL - LIDAR 1

An expansion of the DREAM Program, aims to produce 3-D flood and hazard maps for the 2/3 of the Philippine river systems

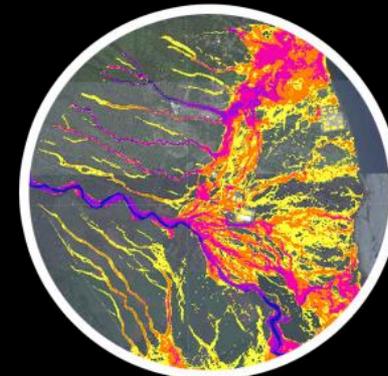
Aside from addressing disaster risk reduction and climate change adaptation, the resource information to be generated from this project will also be useful in providing the information requirements of various sectors in the country



**Digital Elevation Model**



**Critical Facilities**



**Flood Map**

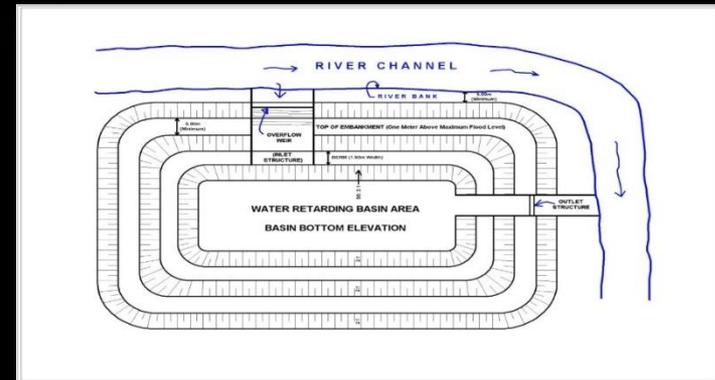
# Major Investments in Water-related Infrastructure in Davao City

## A. Expansion of Level 3 System of Davao City Water District

- **Water Source:** Tamugan
- **Scope of Expansion:**
  - Improve water service in current service area (107 of 182 barangays of Davao City)
  - Cover 11 new barangays, 7 of which are in DRB
- **Facilities to be established:**
  - Intake structure and raw water transmission line
  - Water treatment plant
  - Run-of-river hydropower electric plant for the water treatment plant
  - Treated water transmission lines
  - Distribution mains, storage facilities, pipelines

## B. Retarding Basin to Mitigate Flooding

- **Retarding Basin:** temporarily diverts and collects flood discharge above carrying capacity
- **Priority 1:** immediately upstream of city's residential and commercial area (**Barangay Mandug**)
- **Other uses:** irrigation, recreation, fishing



# Enhancing Sustainability of MSMEs and the Communities Through Low-Cost Sanitation Technology: the **Vertical Helophyte System**



# Flood Drills

To further strengthen and improve DRRM measures, particularly flood warning systems, 30 warning posts will be installed all over the region in a projected span of two years. The first warning post has already been installed in Samuel Village in Toril, Davao City. Each warning station will have a siren, beacon, and a public address system.



# Sustainability Science Project

The major outputs of the multi-sector Sustainability Science Project “Demonstration Site in Enhancing Resilience of Urban Water Systems” in Mindanao” was the development and turn-over of Barangay hazard maps and distribution of IEC materials to the LGUs and key stakeholders, the identification of most vulnerable barangays against hydro-hazards, as well as the 15- year Sustainability Science Plan for Davao City.



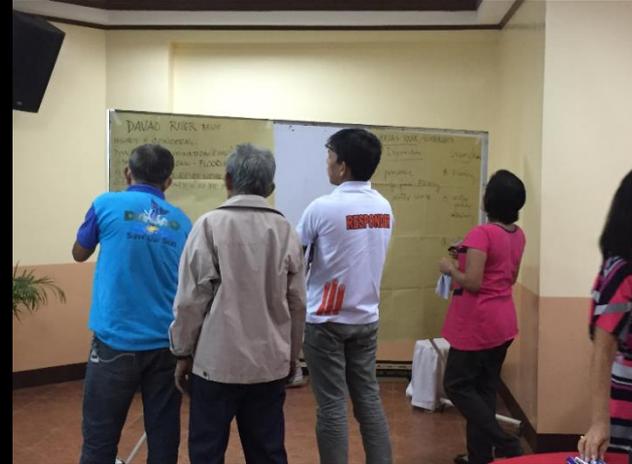
# IWRM TRAINING FOR LGUs

*“Application of Integrated Water Resources Management (IWRM) Concepts and Other S & T Approaches Towards Hydro-Hazards”*

3-day event organized by HELP Davao Network, in partnership with Department of Science and Technology Region XI, Department of Environment and Natural Resources Region XI, City Environment and Natural Resources Office and Mindanao Development Authority



It was participated by barangay officials from the identified most vulnerable barangays to disasters of urban water systems – Mandug, Lubogan, Calinan, Tigatto and Maa, other LGUs from Barangay Waan, 76-A Bucana, and 10-A, other Government Agencies and Private Sectors



# Continuous professional development for scientists, engineers, managers and policy makers in the water sector



Conducted several technical for a for local actors and stakeholders of water -continuing



**Australian Awards Fellowship Program**  
*"Disaster Risk Reduction for Community Resilience and Safeguarding Livelihoods in the Philippines"*  
14<sup>th</sup> October – 12<sup>th</sup> November 2015  
International WaterCenter, Australia



Sent key participants to the NARBO IWRM Training Programs 2012, 2014, 2015

# Davao River Basin Master Plan (DRB: 2013-2014)

- The formulation of a master plan for the management and development of Davao River Basin (DRB) was aimed at addressing these threats particularly on water security and flooding. The DRB is the second biggest basin in the Davao Region and is eyed as potential additional source of water supply for Davao City and hydropower for Mindanao
- The approach in the formulation of the master plan was anchored on the **Integrated Water Resources Management (IWRM)** approach

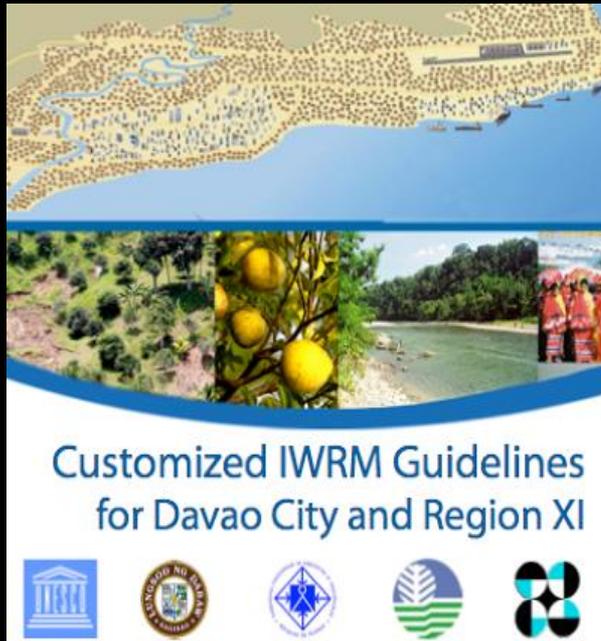
Developed the interdisciplinary material –  
**Customized IWRM Guideline for  
Davao City and Davao Region** – which is a  
relevant input to water education initiatives



*UNESCO IWRM Guidelines was localized and customized based on the actual experiences of Davao City and Davao Region thru the participative engagement of all stakeholders involved in planning of the Davao Water Action Plan and drafting the resolution for the Region-wide adoption of IWRM Guidelines.*

Series of Consultations and Planning Sessions among a Full Spectrum of Stakeholders in Davao Region in 2011

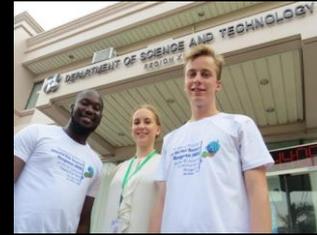
## Outcomes



- **Davao Water Partnership**
- **Water Vision for Davao Region**
- **5-year DRR Action Plan for Matina Pangi River**
- **Regional Development Council Resolution for the Adoption of IWRM Davao Water Partnership Action Plan**

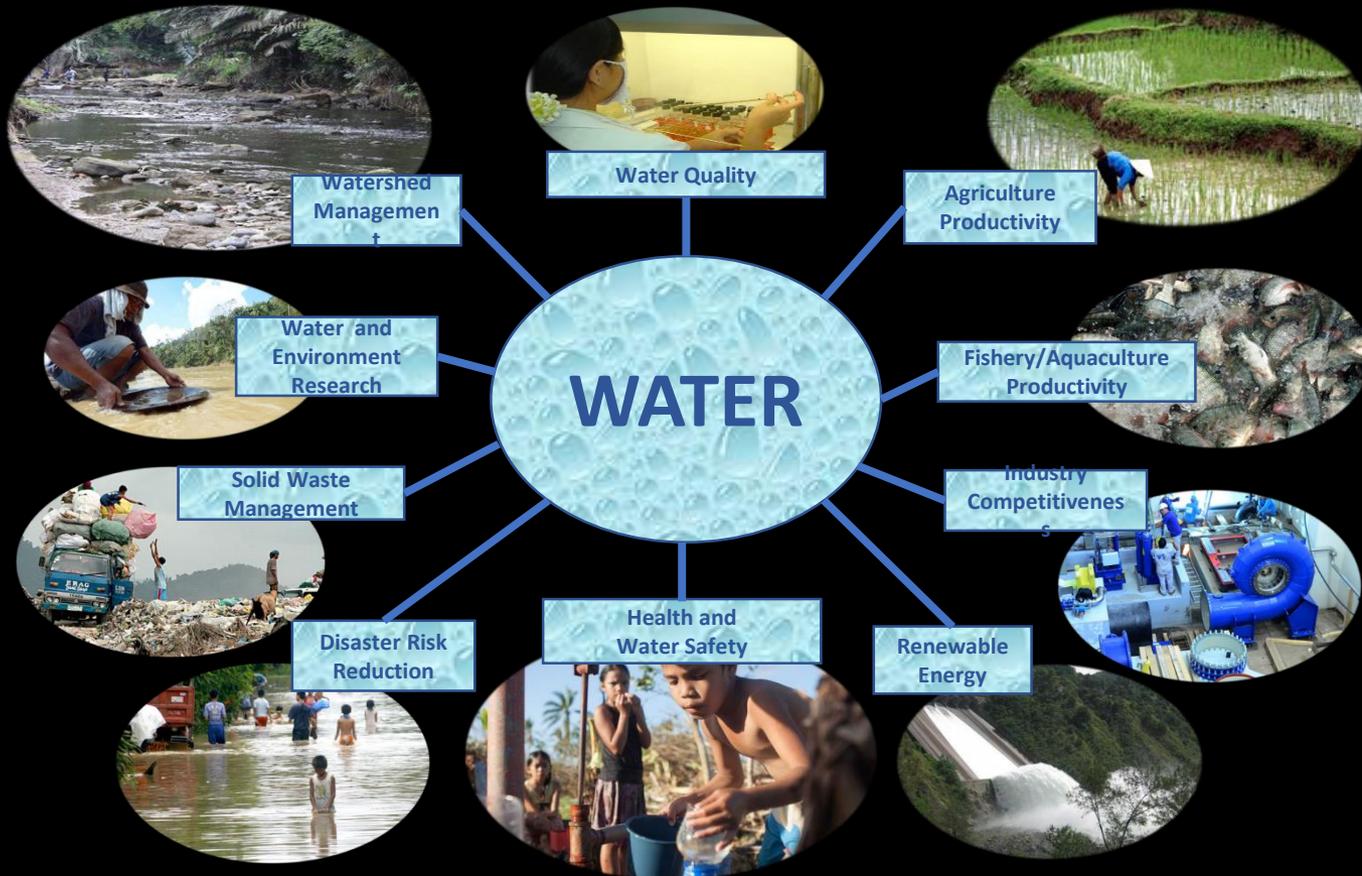
Visit <http://rdc.nro11.neda.gov.ph/docs/iwrm.pdf>

# Furthering Knowledge thru Research and Development



Title	Lead Researchers/Partners	Key Findings
Microclimate in Davao City	Van Larenstein Hall University, DOST XI, HELP Davao Network	Urbanization results to Davao City as Heat Island (increased temperature); Need for additional weather stations; and Need for improved data sharing and management
Tides and Floods and Davao City	Van Larenstein Hall University, DOST XI, HELP Davao Network	Need for improvement in drainage systems and flood control infrastructures; Need for improved reporting/recording of flood incidences
Assessment of the extent of implementation of standards and procedures for water safety in the Philippines	DOST XI, HELP Davao Network, UIC	Low level of implementation of water safety plans among drinking water providers ;Quality of drinking water in certain areas do not comply with the PNSDW of 2007; Need for development of a comprehensive advocacy, partnership and networking strategy to enforce PNSDW 2007
Assessment of the water situation and the safety of wastewater and sanitation in selected parts of Davao City	Oulo University, DOST XI, HELP Davao Network	Domestic and industrial waste management practices affect the level of contamination of the wastewater of the locations; There is need for reinforcement of the laws on waste management should be strengthened; Conversion from waste to energy is highly needed

# R&D in Water



# Furthering Understanding thru Consultations

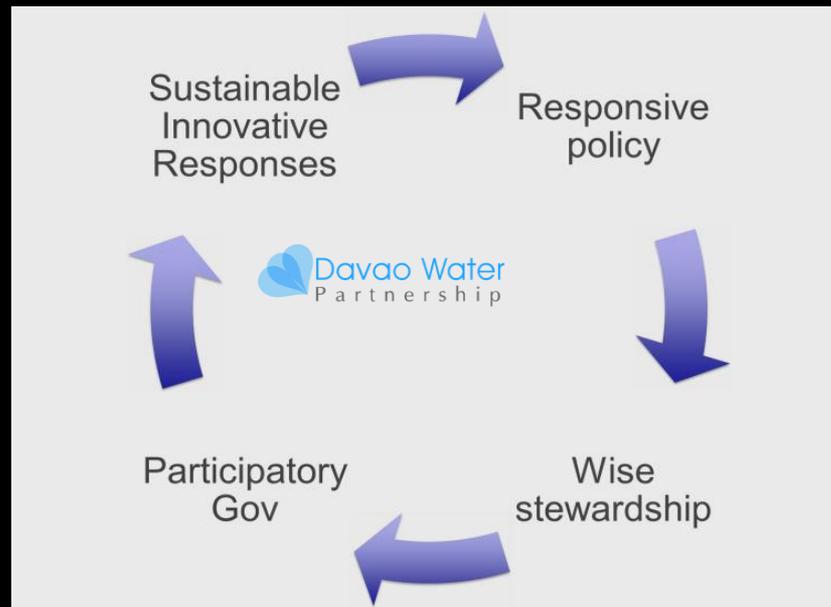


Series of Consultation and Planning Session among a Full Spectrum of Stakeholders in Davao Region for the Development of Customized IWRM Guideline and Davao Water Action Plan (2010, 2011)

Mindanao-wide consultation on priority issues and conflicts in water use and management (BIMP-EAGA Summit, October 2014) :  
food, agriculture and fisheries; domestic and industrial use; energy; climate change and hydro hazards; special concerns of Indigenous communities, women and youth

Consultation with Local Government Units and key stakeholders on demonstrating disaster resilience of urban water system in Davao City (2016)

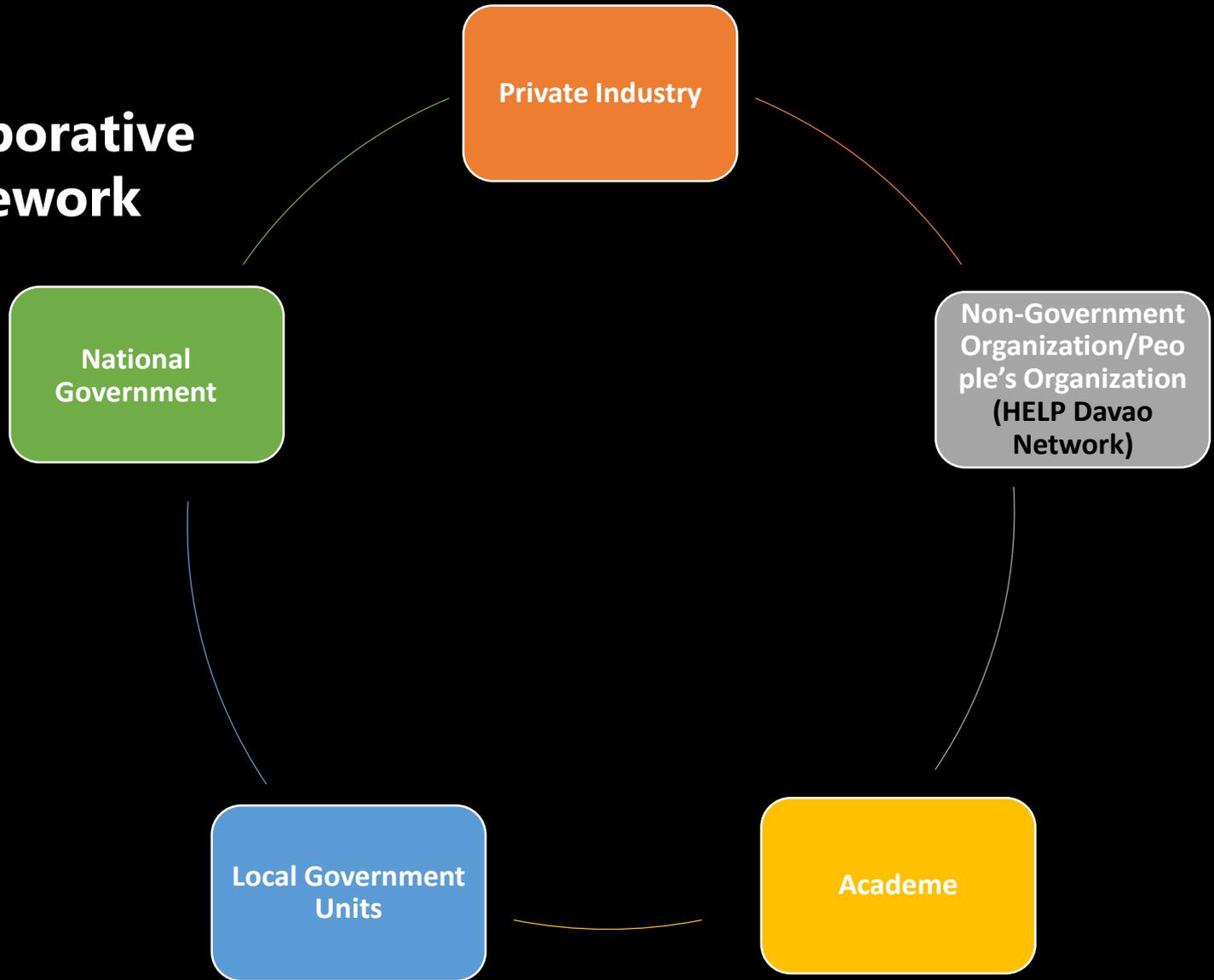
# Furthering Cooperation thru Partnerships

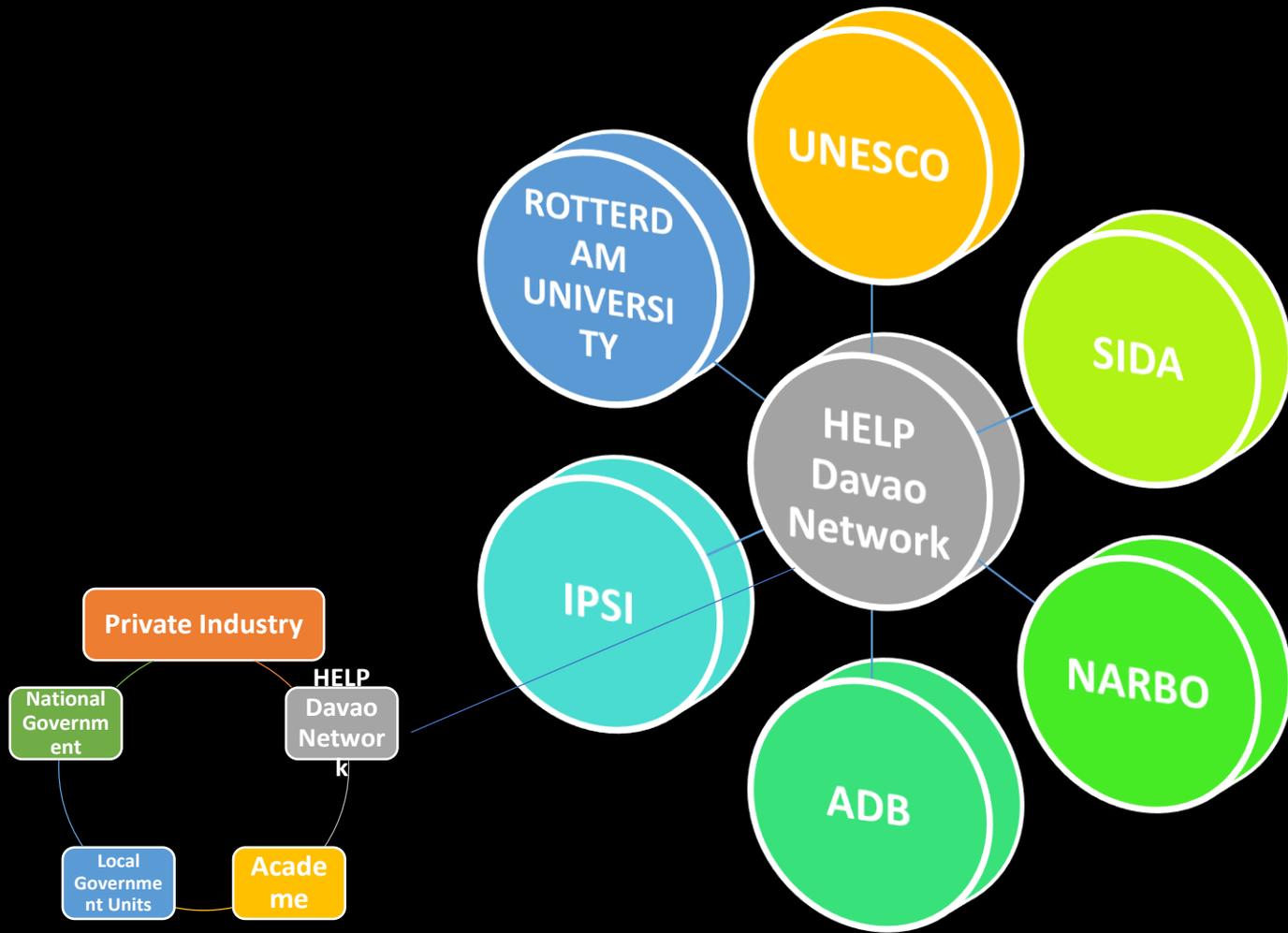


## HELP Davao Network:

A Multi-Sector Network of Volunteers Towards Wise Management of Davao River Basin

# Collaborative Framework





# Sustaining Implementation thru Enabling Policies, Resolutions and Programs



# Major Outcomes:

- **Demonstration of technologies for rehabilitation and upgrading of water conveyance systems**
- **Improvement of monitoring systems responding to climate vulnerabilities**
- **Developed/Improved integrated management of urban water systems towards climate change**
- **Improved capacities and awareness among educational institutions and local communities in the context of climate change adaption**

## **Lessons Drawn from Experiences in Davao Region, Philippines:**

- (1) The need to customize and localize actions and plans to suit the existing norms and capacities.
- (2) Collective engagement and commitment of all stakeholders concerned.
- (3) The commitment and empowerment of primary actors who shall take lead in implementing actions.
- (4) The need for sharing and complementation of available information, human resources, technologies, infrastructures, programs and other resources.
- (5) The need to continuously enhance and integrate information and data for science-based decision making.
- (6) Sustaining implementation efforts thru enabling policies and frameworks.
- (7) Foster inter-linkages and global partnerships.

**THANK YOU!**