

# Remote Sensing Applications for Flood Management in ADB TA8074

Presentation by  
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# Contents

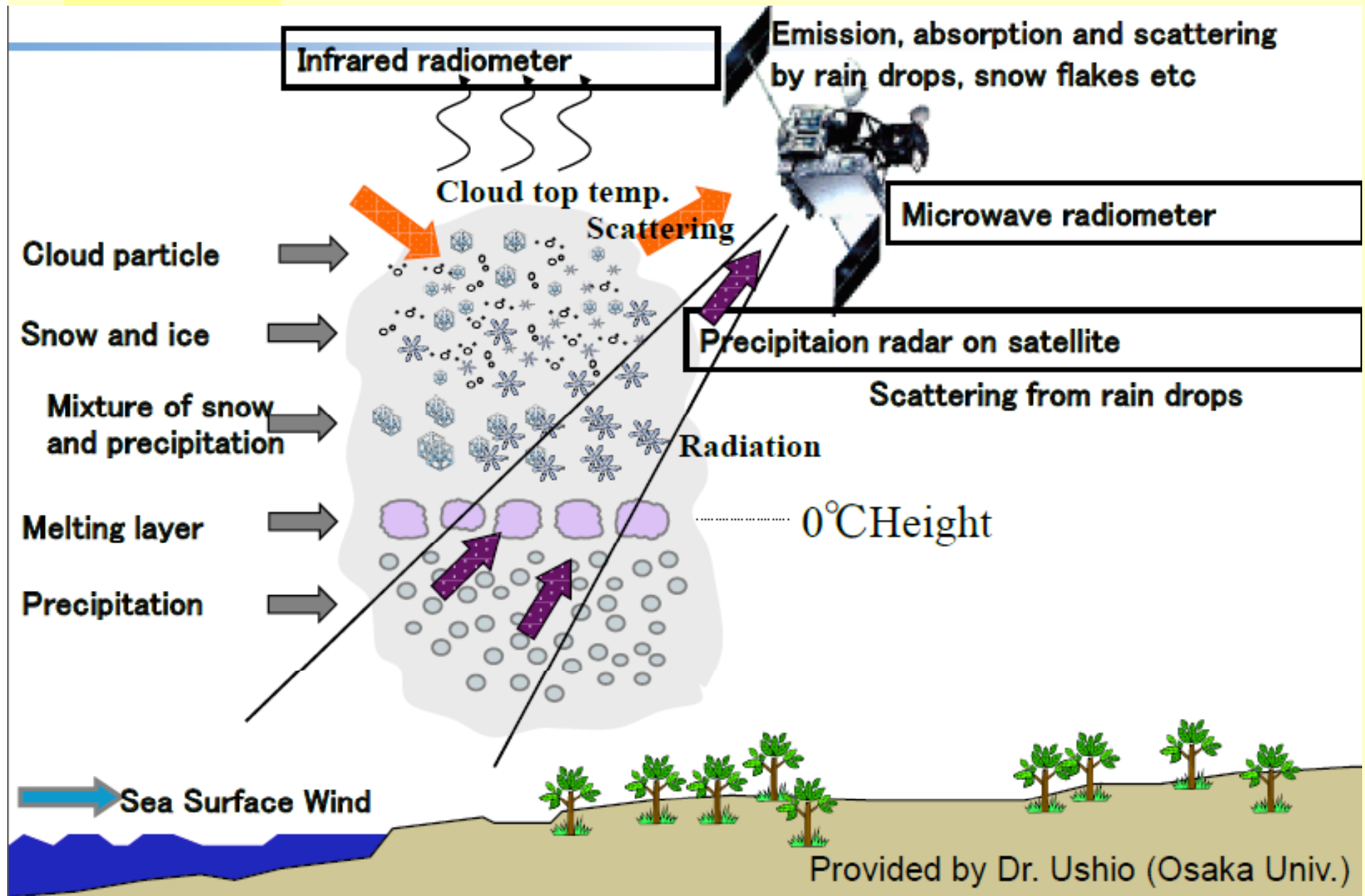
- Introduce the remote sensing applications for flood management in ADB TA8074 “Applying Remote Sensing Technology in River Basin Management”.

# Project Overview

- TA-8047 REG “Applying Remote Sensing Technology in River Basin Management”
  - JFPR funded, 2 million US\$
  - Philippines, Bangladesh, and Viet Nam
  - 2012/4 to 2014/12
  - Impact: reduction in losses from flooding events
  - Outcome: improved river basin management including flood risk management using Space Based Technology (SBT) and ICT
  - Output:
    - (i) **SBT** and ICT applied for flood risk management
    - (ii) Selected staff able to apply SBT and ICT in river basin management.
- Satellite-based Rainfall Data**

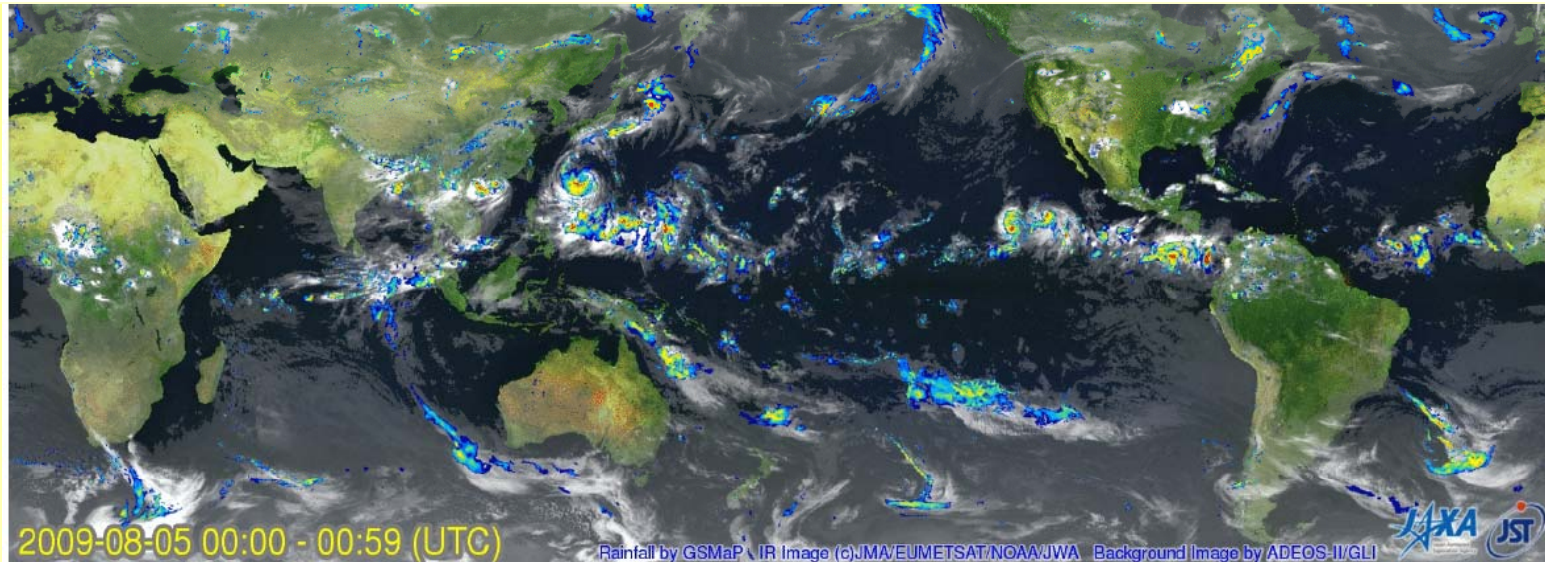


# Application of Satellite-based Rainfall Data



# Application of Satellite-based Rainfall Data

## Global Rainfall Map in Near Real Time by JAXA

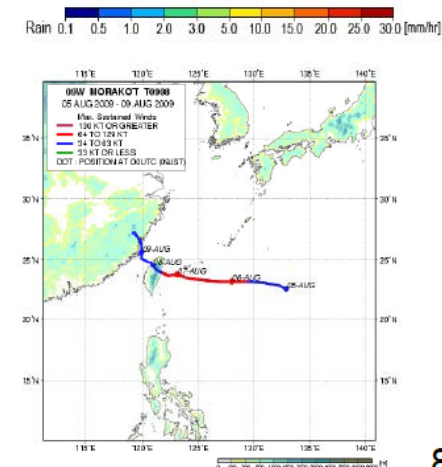


Typhoon MORAKOT (09W): Aug. 5 - 10, 2009 (Big impact in Chinese Taipei)

- Global rainfall map merging TRMM, AMSR-E and other satellite information
- Available 4-hour after observation, hourly update
- 0.1-degree latitude/longitude grid (Around 10 km x 10 km)

<http://sharaku.eorc.jaxa.jp/GSMaP/>

Needs local calibration with ground rain gauge stations

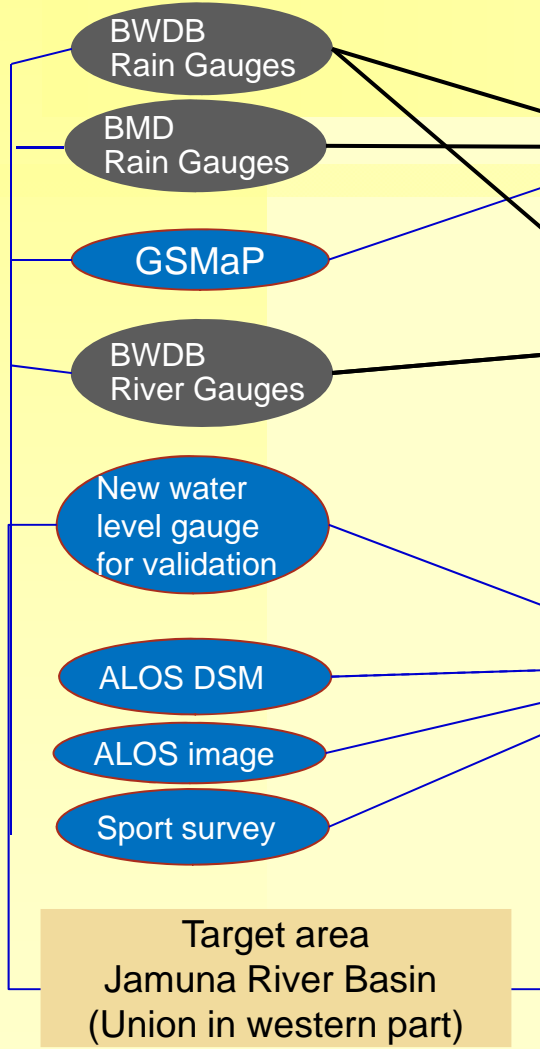


Images provided by JAXA

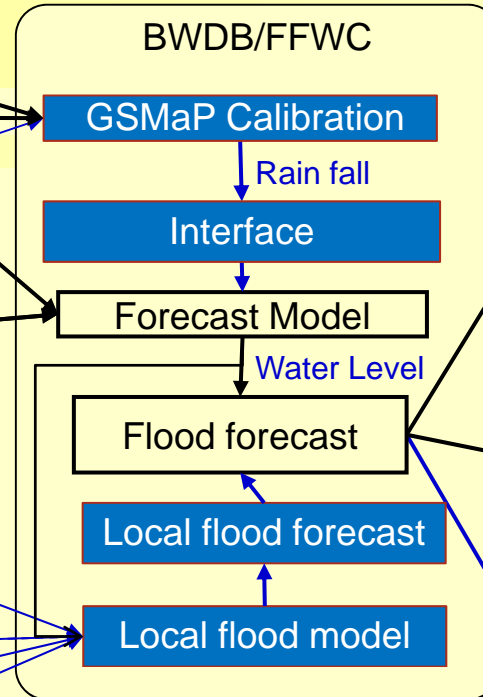
# Bangladesh

Blue: Introduced in TA

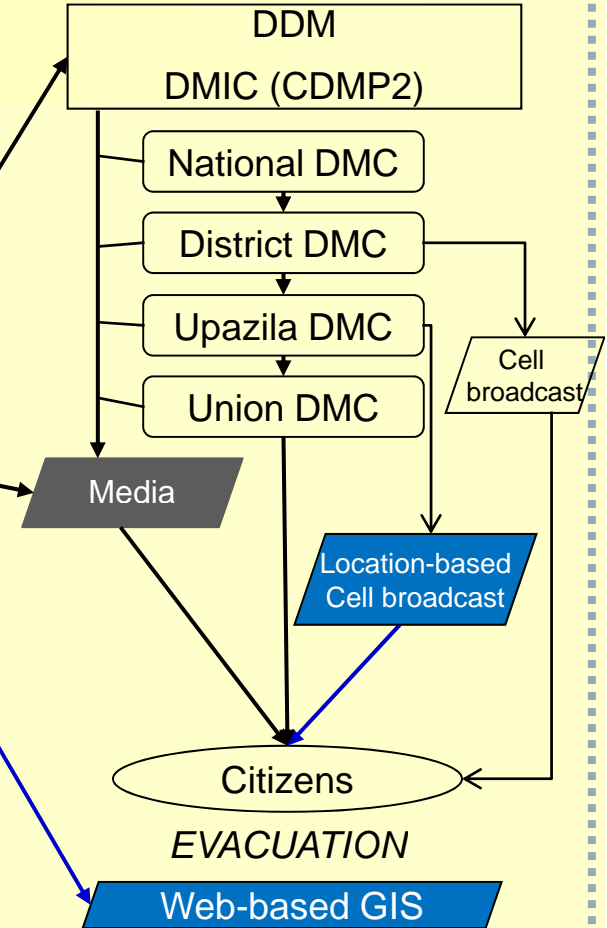
## Data Input



## Creation of flood warning



## Dissemination to Citizens



## Other outputs of TA

Strategies, guidelines, and programs for flood risk reduction applying SBT and ICT

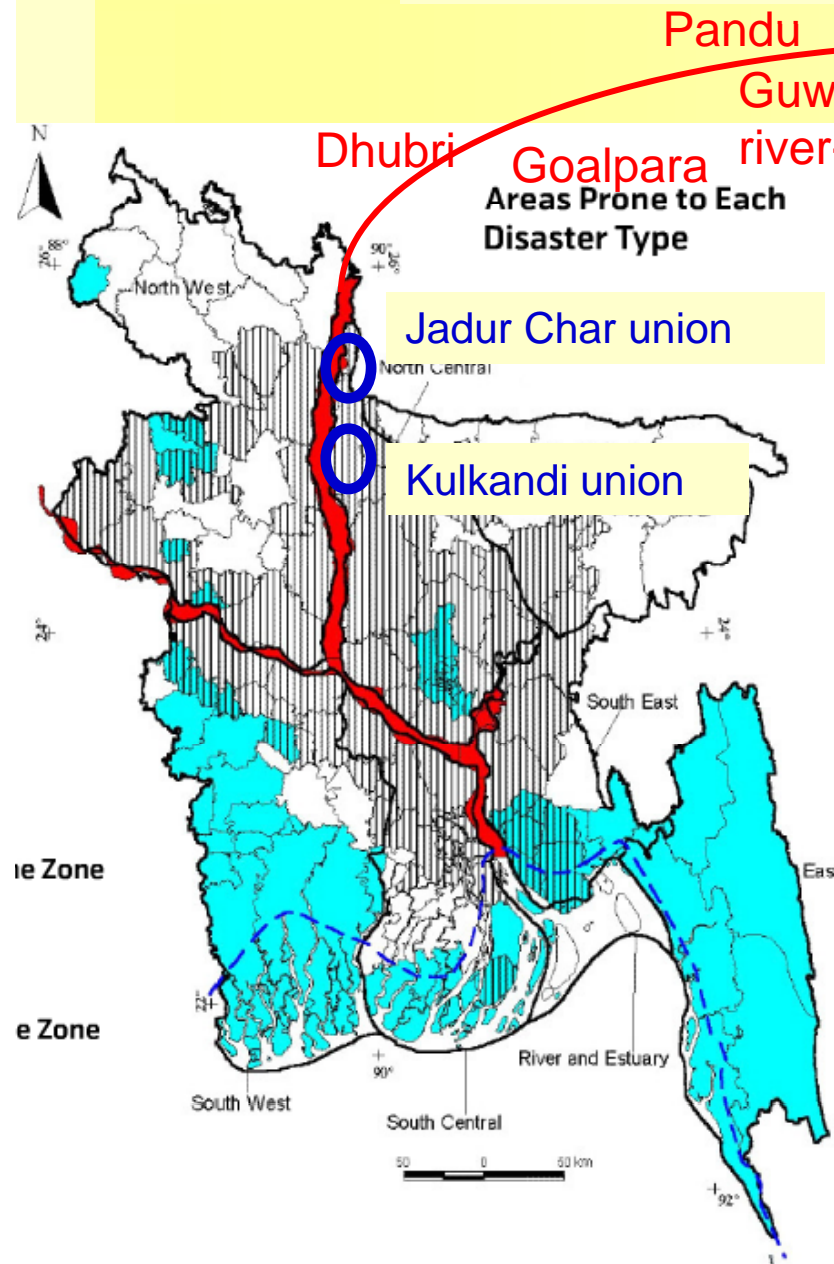
Strengthened staffs and stakeholders capacities through training and workshops

GSMaP : Global Satellite Mapping of Precipitation

ALOS DSM: Advanced Land Observing Satellite Digital Surface Model

ADB

# Target area in Bangladesh



## 1. GSMP application

- Jamuna River (inc. upstream in Indian and Chinese side)

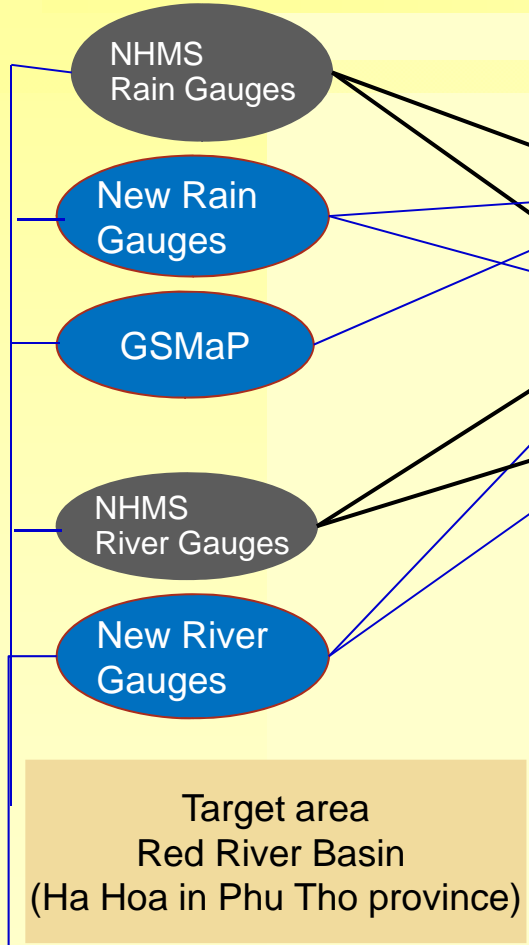
## 2. local flood modeling, location-based SMS, and Evacuation training

- 10km x 10km area around Kulkandi union, Islampur Upazila, Jamalpur district
- 10km x 10km area around Jadur Char union, Roumari Upazila, Kurigram district

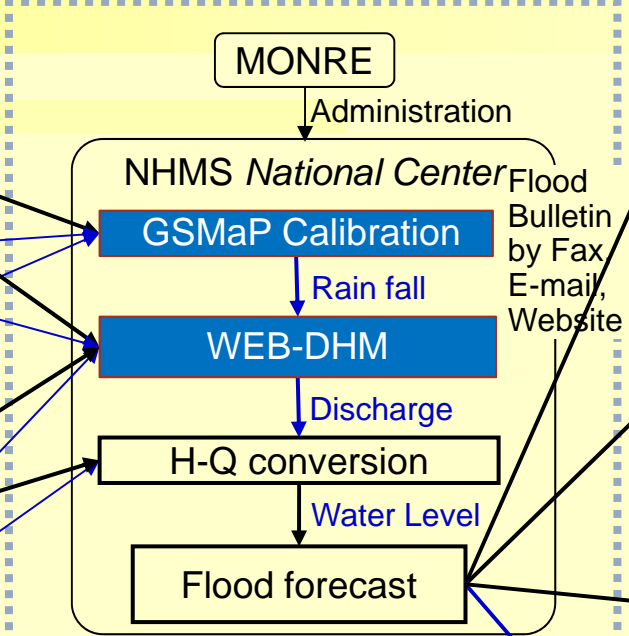
Blue: Introduced in TA

# Viet Nam

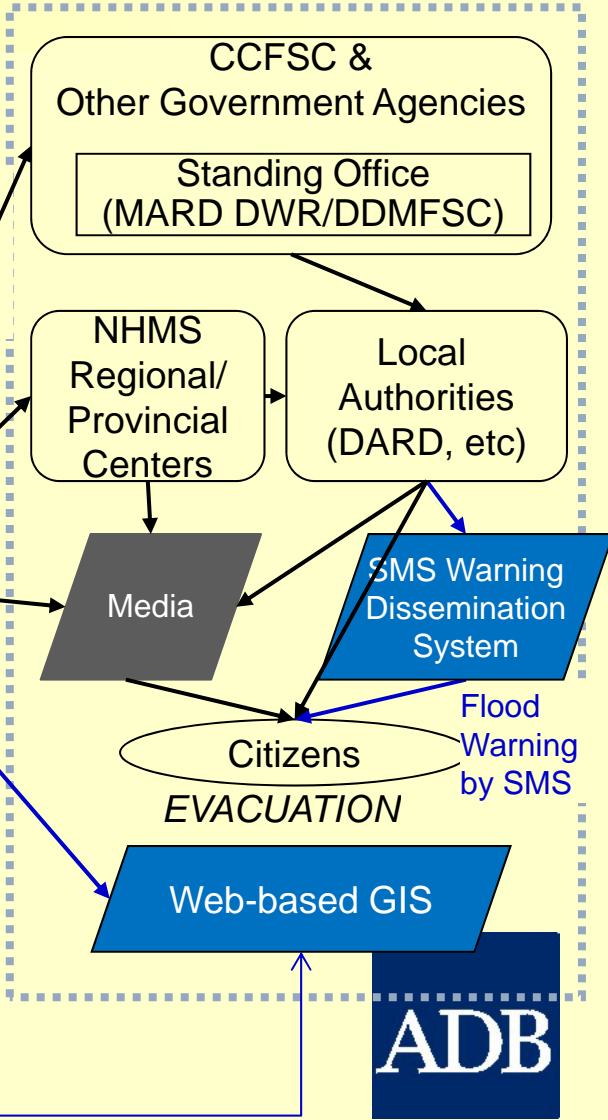
## Data Input



## Creation/Distribution of Flood Warning



## Information Dissemination to Citizens



## Other outputs of TA

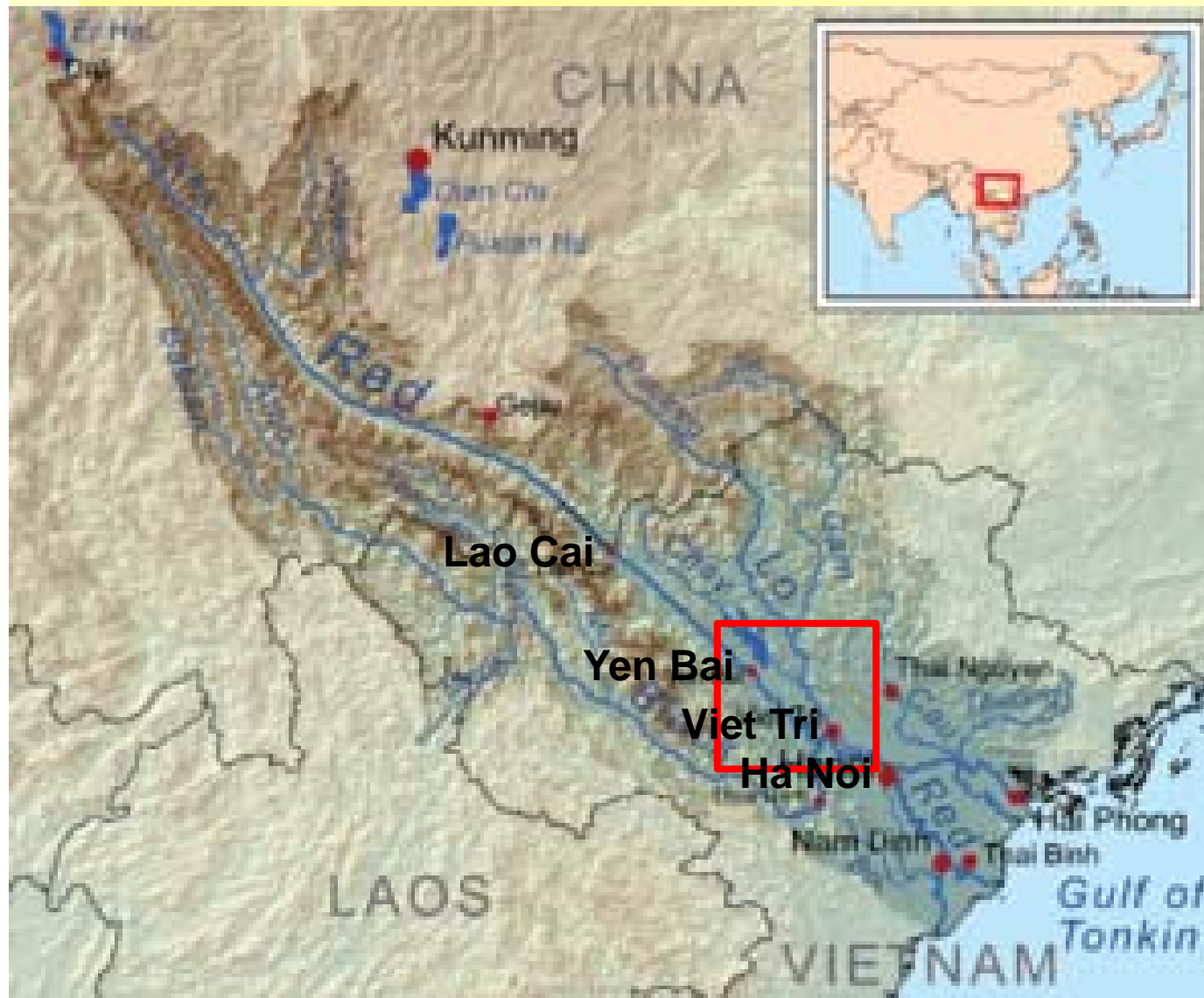
- Strategies, guidelines, and programs for flood risk reduction applying SBT and ICT
- Strengthened staffs and stakeholders capacities through training and workshops





# Target area in Viet Nam

Target Area: Red-THao River basin



# Target area in Viet Nam

Target Area: Thao River basin

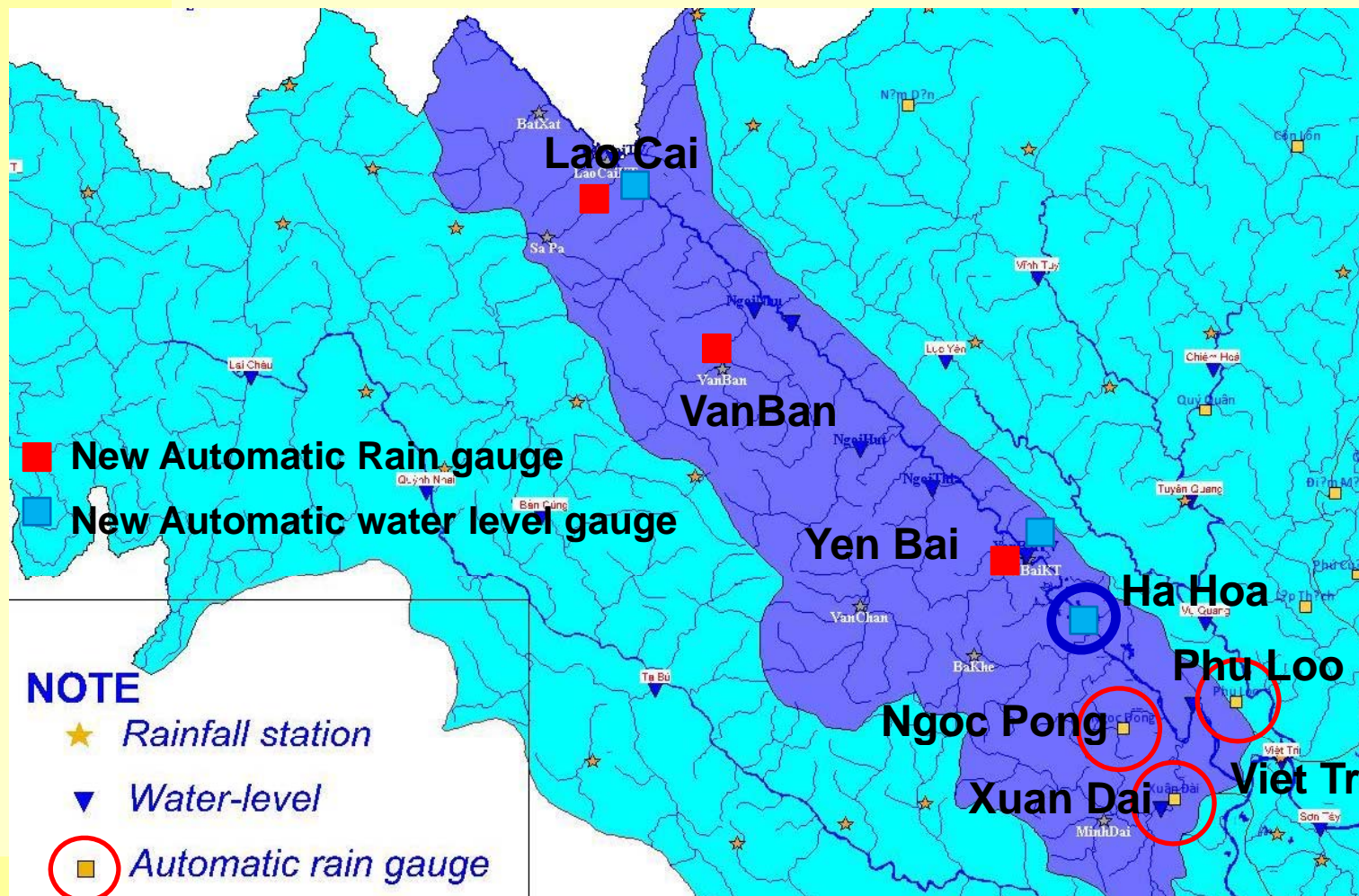
Pilot area(SMS and flood forecast): Ha Hoa in Phu Tho province



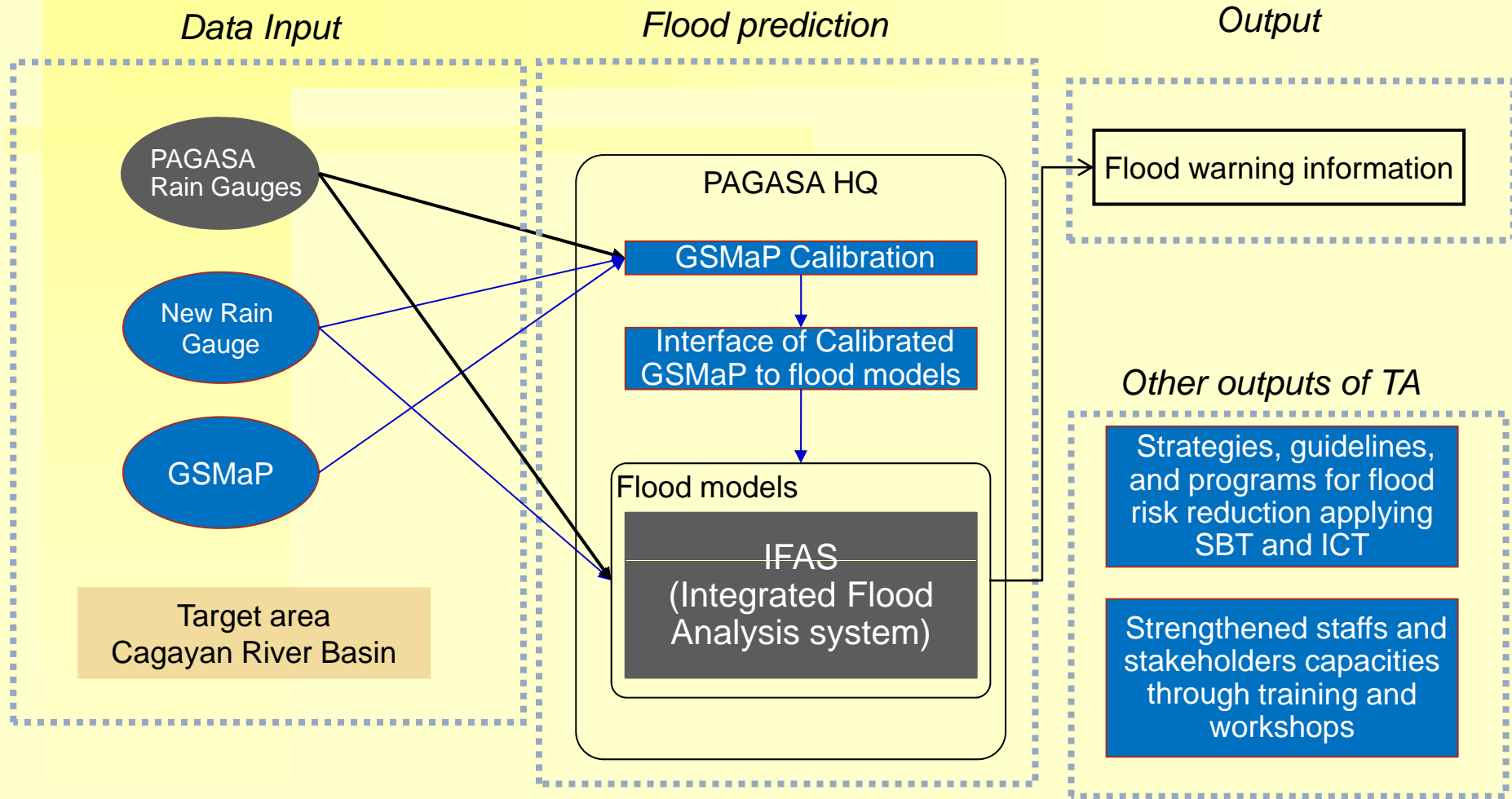
21,000 families (5 persons/family) live in outside of dike system

# New rain gauge and water level gauge installation

- New automatic telemated rain gauges will be installed for GSMAp calibration.
- New water level gauge will be installed in Ha Hoa for validation of flood model.
- Water level gauges in Lao Cai and Yen Bai will be upgraded.
- The number of gauges installation will be decided based on the cost estimate.



# Philippines

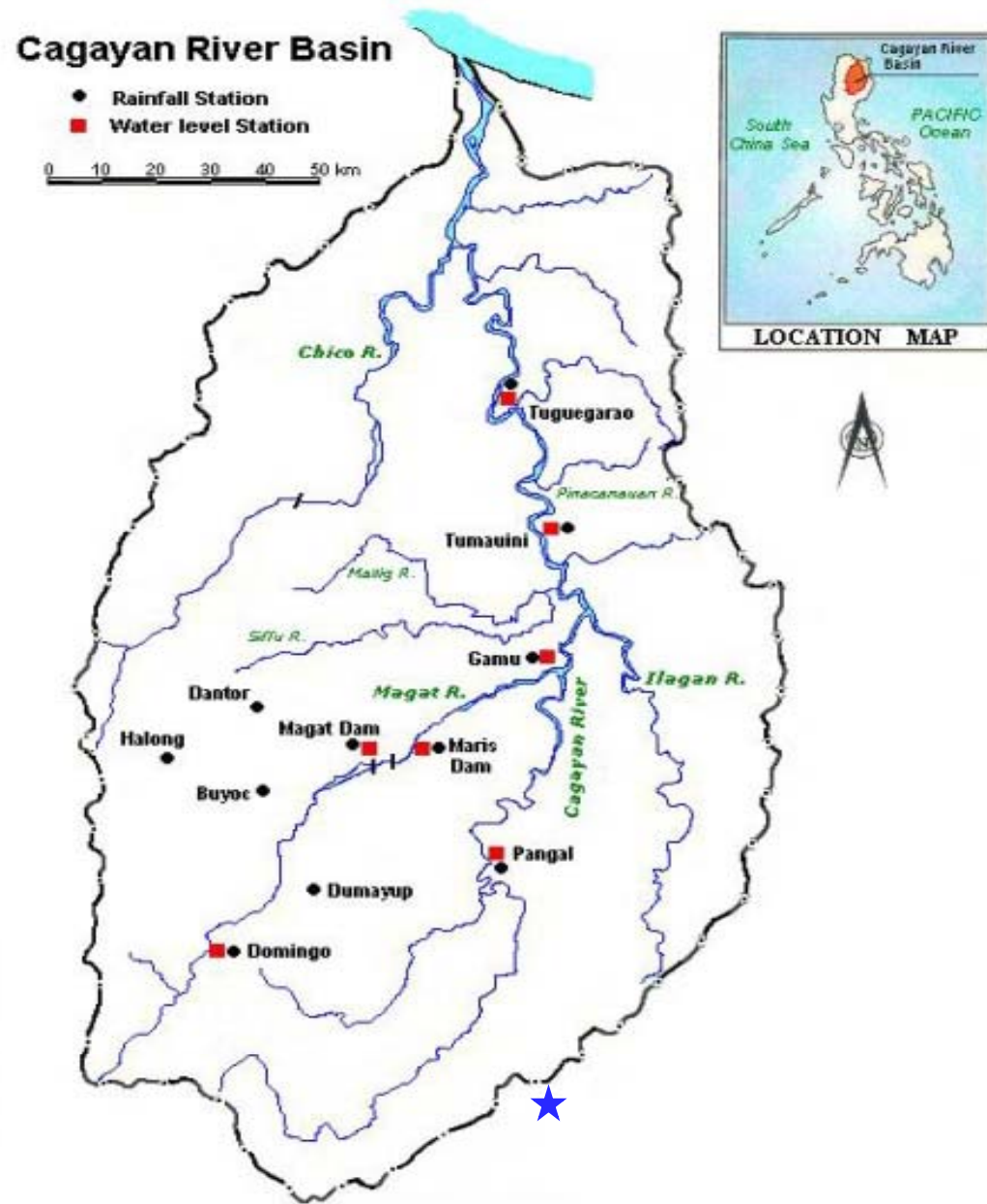


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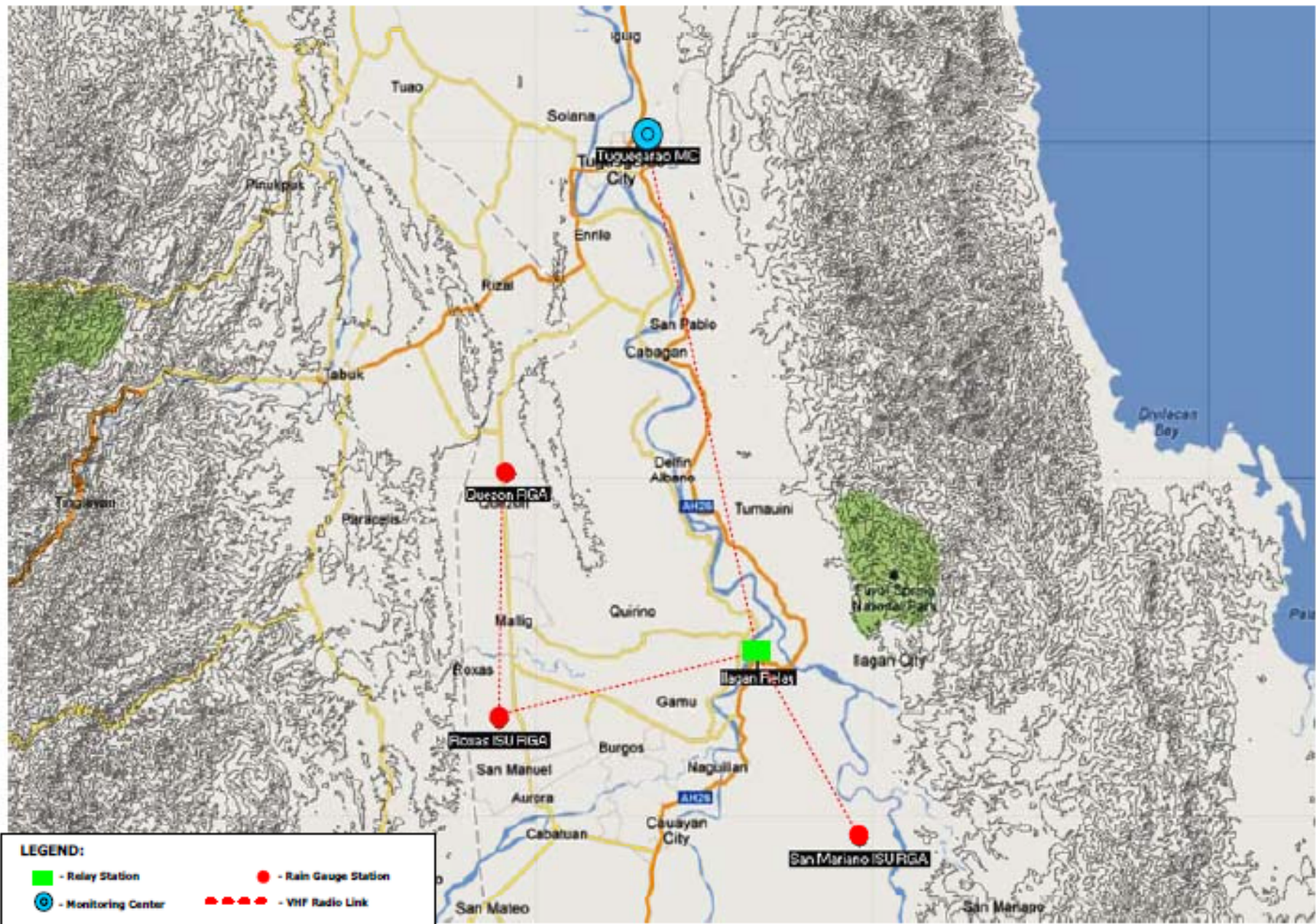
GSMaP : Global Satellite Mapping of Precipitation



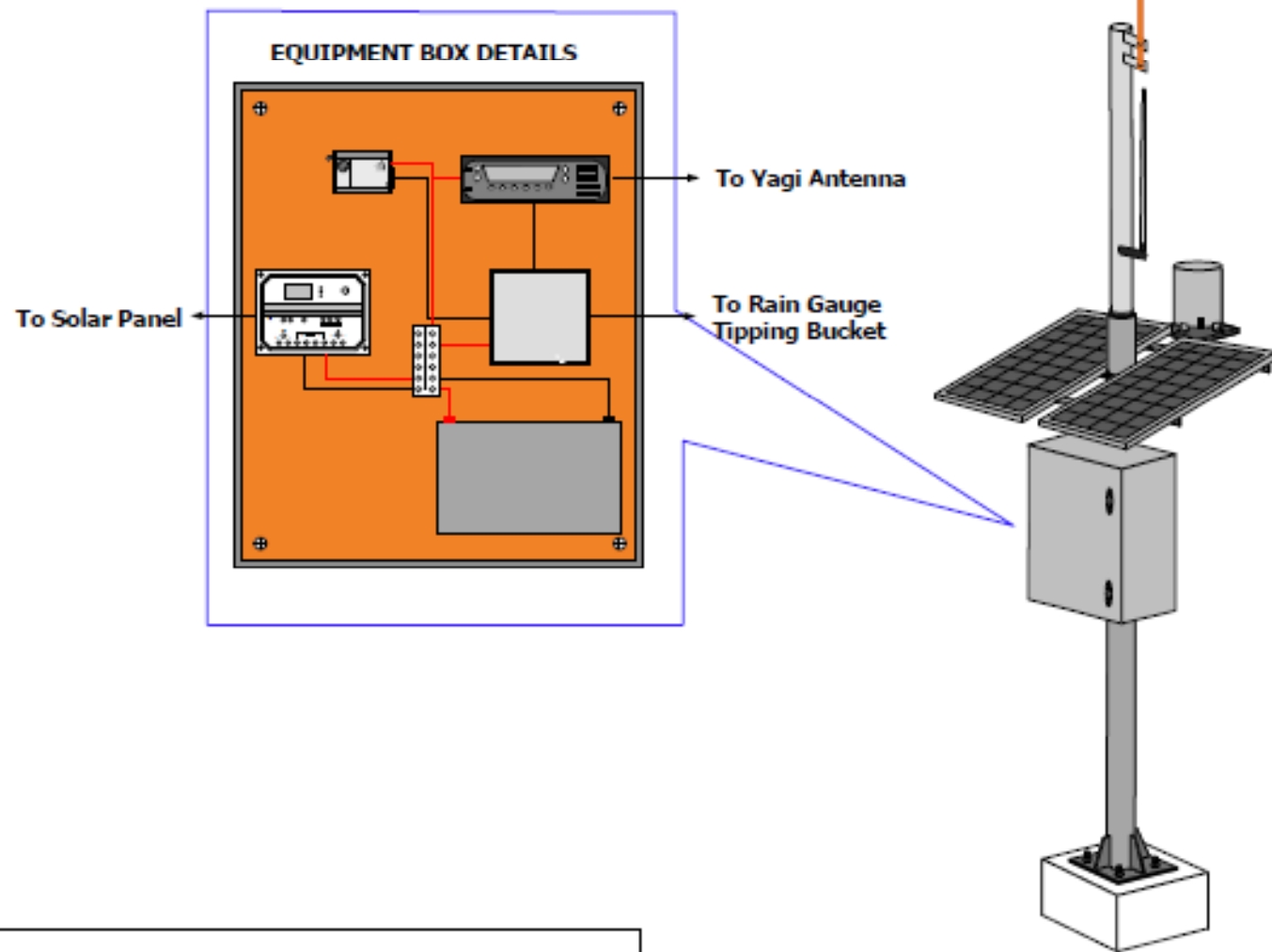
# Target area



# CAGAYAN VALLEY RAIN GAUGES GEOGRAPHICAL MAP AND STATIONS



# CAGAYAN VALLEY RAIN GAUGES RAIN GAUGE STATION ( SAN MARIANO, ROXAS AND QUEZON )

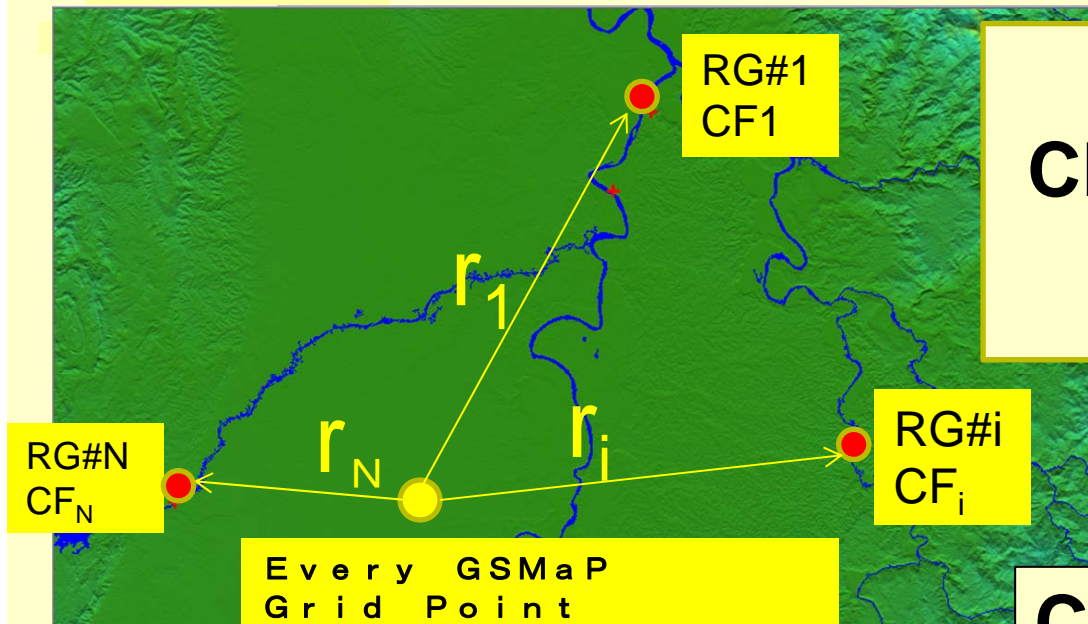


**LEGEND:**

	-Base Radio		- Yagi Antenna		- Solar Controller		-Solar Panel
	-GSM Modem		- Battery Backup		- Site Controller		-Rain Gauge

# Calibration Method

$$\text{Calibrated GSMaP}_{\text{GSMaPGrid}} = \text{GSMaP} \times \text{CF}_{\text{GSMaPGrid}} \times \text{fh}(\text{hg})$$



$$\text{CF}_{\text{GSMaPG}} = \frac{\sum \frac{\text{CF}_i}{r_i}}{\sum \frac{1}{r_i}}$$

$$\text{CF}_i = \text{Rg}_i / \text{fh}(\text{h}(i)) / \text{GSMaP}_i$$

$i$  : nuber of automatic rain gauge

$\text{CF}_i$  : Calibration Factor ( $i$ )

$\text{RG}_i$  : Rain fall value at rain gauge ( $i$ )

$\text{GSMaP}_i$  : GSMaP value at rain gauge ( $i$ )

$r_i$  : Distance between the target point and rain gauge ( $i$ )

$\text{fh}$ : function of location altitude from sea level ( $\text{h}(i)$  :RG alt.,

$\text{hg}$  :target area average altitude)



# Other Methodologies

- Several alternative methods are also considered as;
  - a) constants are set as a ratio of average and variance of GSMaP to Rain Gauge values
  - b) consider location altitude in the average and variance evaluation
- Our goal is to establish reliable GSMaP calibration method for flood warning

# Lessons Learned

- Importance of thinking about how output could be practically used by users.
  - Output is water level from the flood model.
  - Outcome is to mitigate damage by providing the alert to citizens.
  - Important to support the following
    - Clarify meaning of output – make guideline to interpret
    - Accessibility of output for users – make website

# Conclusion

- Under TA8074, ADB has been developing the methodology of calibrating GSMaP in the target rivers of Bangladesh, Philippines and Viet Nam.
- Data will be collected and the system will be tested in the flood season of 2014.

# **Thank you!**

**If you have any questions,  
please contact  
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