International Land Cover/Land Use Changes Regional Science Team Meeting in South/Southeast Asia
13-15 January, 2016

Application of Remote Sensing and GIS Technology in Department of Meteorology and Hydrology

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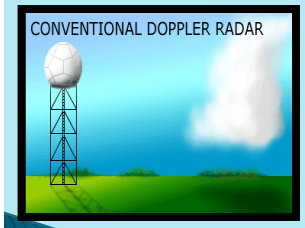
Contents of my presentation

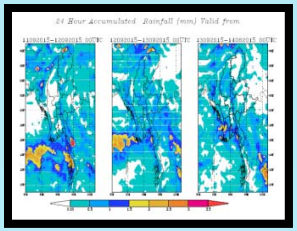
- Background Information of DMH
- Meteorological and Hydrological Observation Systems
- GIS and RS application in DMH
  - Developing Flood Hazard Map
  - Data Used
  - Methodology
- Future works and on going projects

Background Information of DMH

Role and Responsibility of DMH

- Early Warning System is main responsibility of DMH in case of Disaster Risk Reduction
- DMH are observing Meteorological, Hydrological and Seismological phenomena to provide necessary information for disaster prevention/ mitigation and development of socio-economic activities.








Warning, Bulletin, Forecast and News

- Cyclone Warning
- Storm Surge Warning
- Flood Warning
- Untimely Rainfall Warning
- Fog Warning
- Heavy Rain Warning
- Aviation Weather Warning
- Low flow water level
- Tsunami Warning
- Port Warning

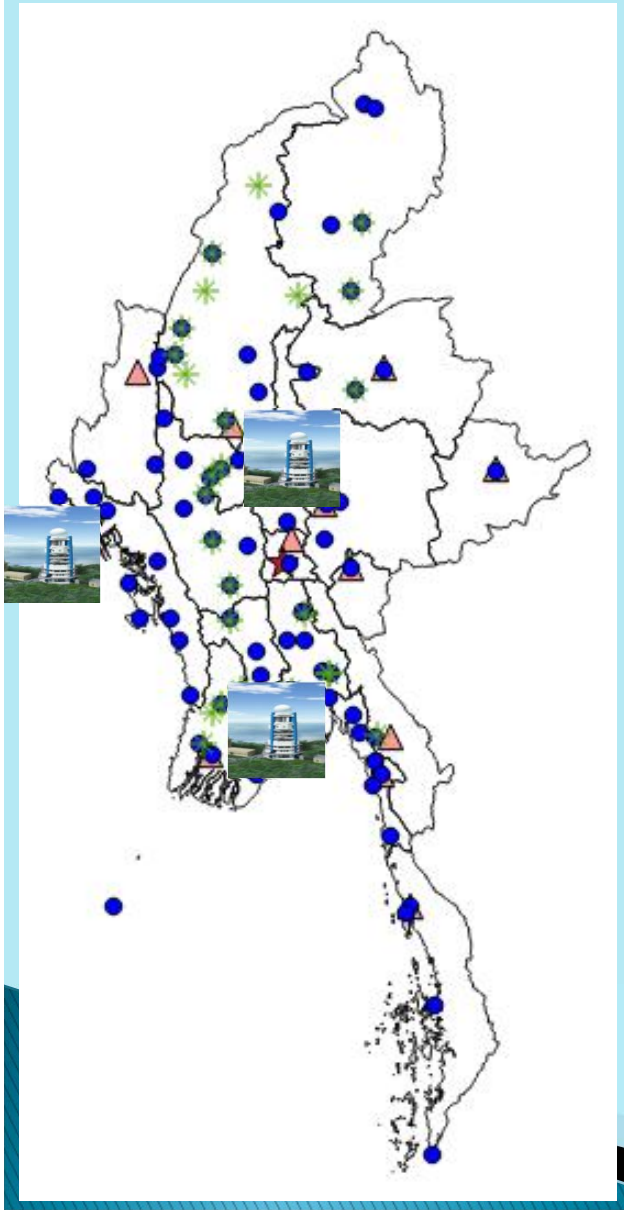
✓ Agro-meteorological Bulletin
✓ Bay Bulletin
✓ Flood Bulletin
✓ Special Weather Bulletin

❖ Daily Weather/Water Level
❖ 10 Days Weather/water level
❖ Monthly Weather/water level
❖ Seasonal Weather/River Flood Forecast
❖ Aviation Weather Forecast
❖ Marine Weather Forecast
❖ Special Forecast

- Earthquake News
- Rainfall / Temperature Records
- Cyclone News

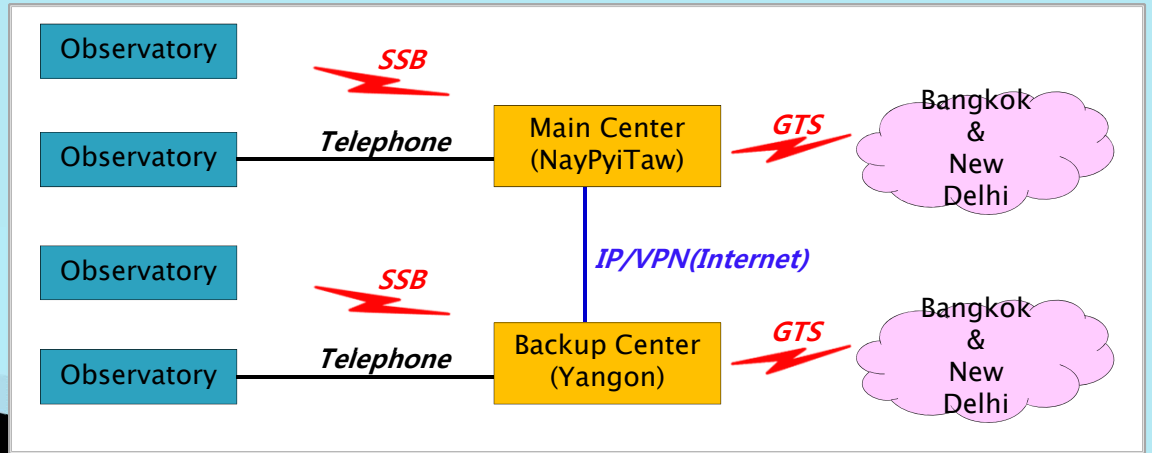
Existing Forecasting & Warning Services in DMH

Meteorological Observation Network

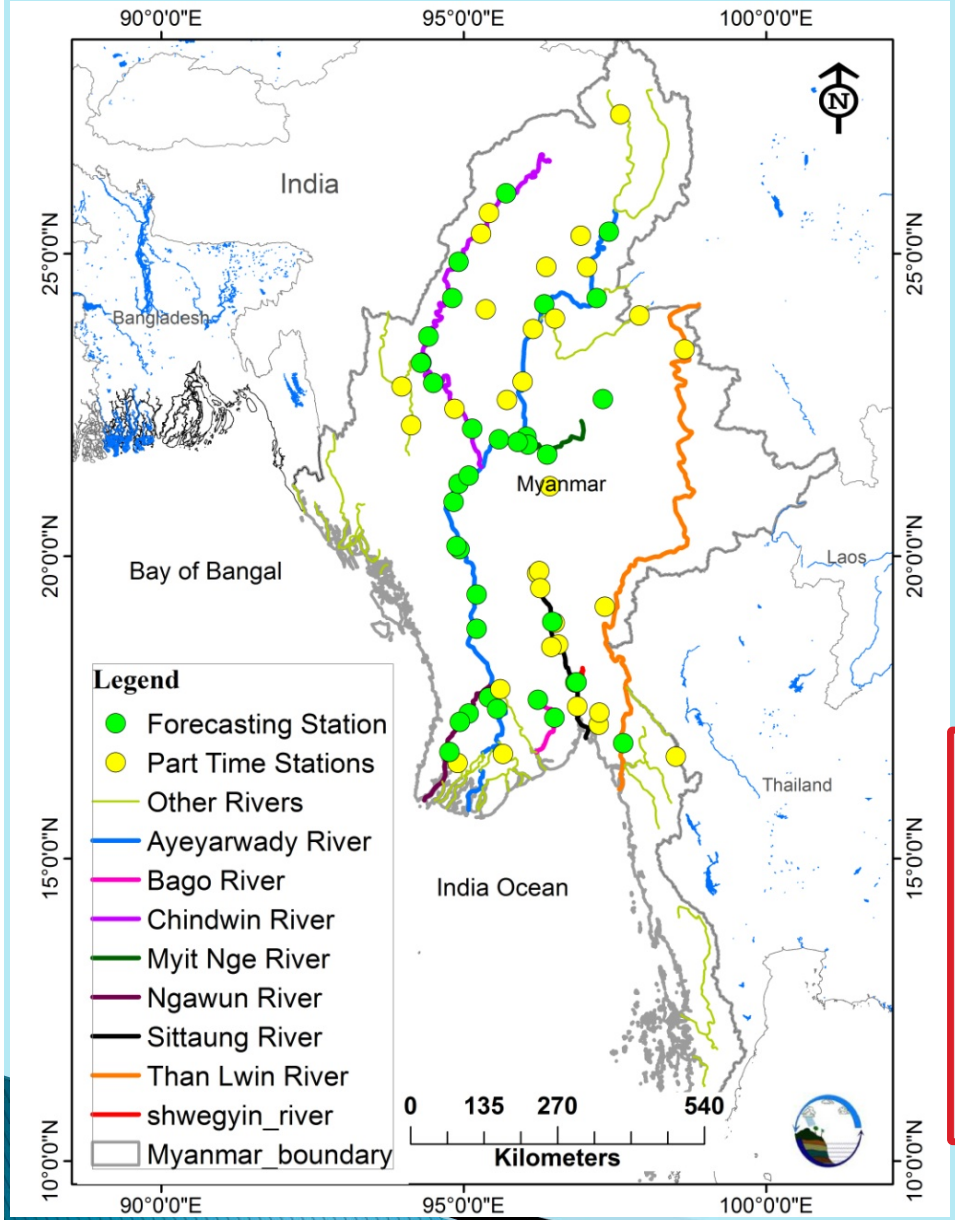


- (50) WMO Register (3)hourly Synoptic Observation Stations
- (1) Upper Air Observation Global Meteorological Observation System

Reporting Stations	**- 50**
Meteorological Stations	**- 64**
Agro meteorological Stations	**- 17**
Upper Air Station	**- 1**
Aviation Weather Stations	**- 8**



Location of Hydrological observation stations

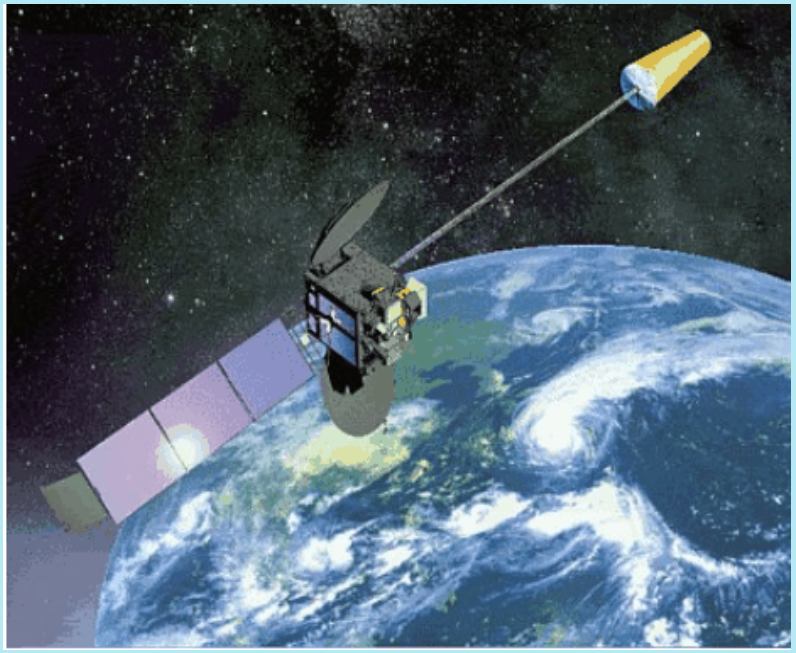


Ayeyarwady	- 16 stations
Chindwin	- 7 stations
Sittaung	- 2 station
Thanlwin	- 1 stations
Dokehtawady	- 3 stations
Bago	- 2 stations
Shwegyin	- 1 station
Ngawun	- 2 stations

- ✓ Hydrological Services in 1964
- ✓ Acid Deposition Monitoring in 2003
- ✓ Member of EANET (Acid Deposition Monitoring Network in Asia) in 2006

Satellite Data Receiving System

In Meteorological Services



MTSAT Data Receiving System installed on 25th January, 2011 at Multi-Hazard Early Warning Center, Nay Pyi Taw (donated by JICA)

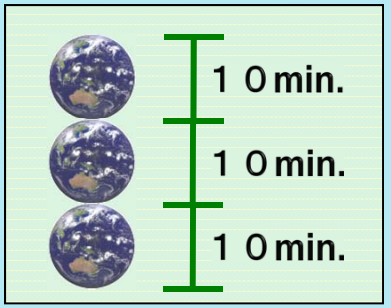
Himawari-8 began operation on 7 July 2015, replacing the previous MTSAT-2 operational satellite

Spatial

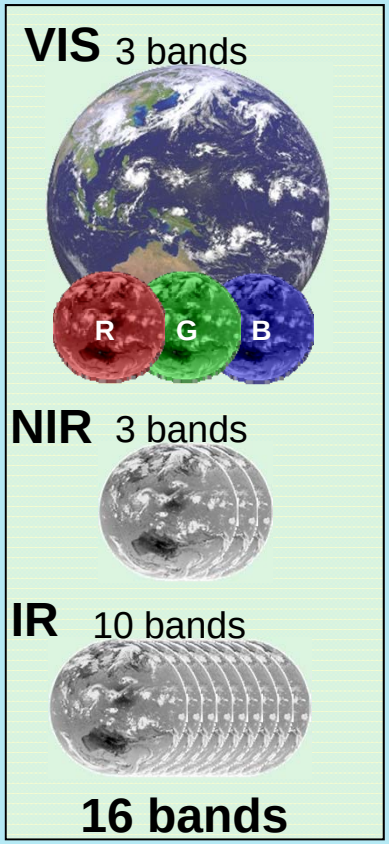
Himawari-8/9

VIS	0.5/1 km
IR	2 km

Temporal



Spectral

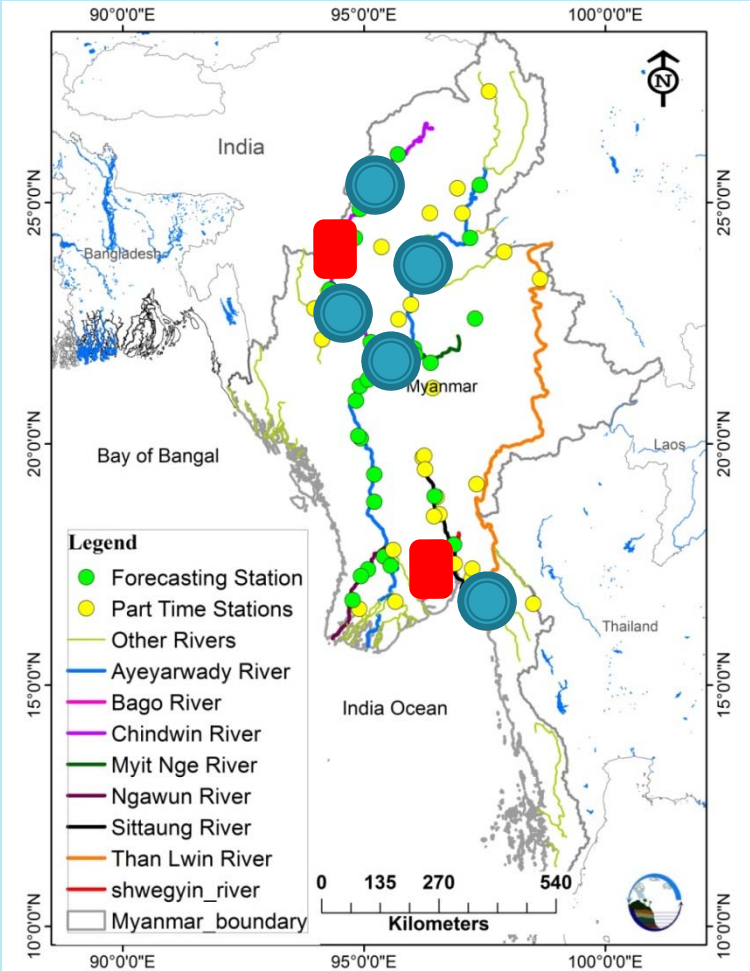


Himawari 8 (MTSAT) received November, 2015 in DMH Myanmar.

Applications of GIS and RS in Hydrological Division

Developing Flood Hazard Maps

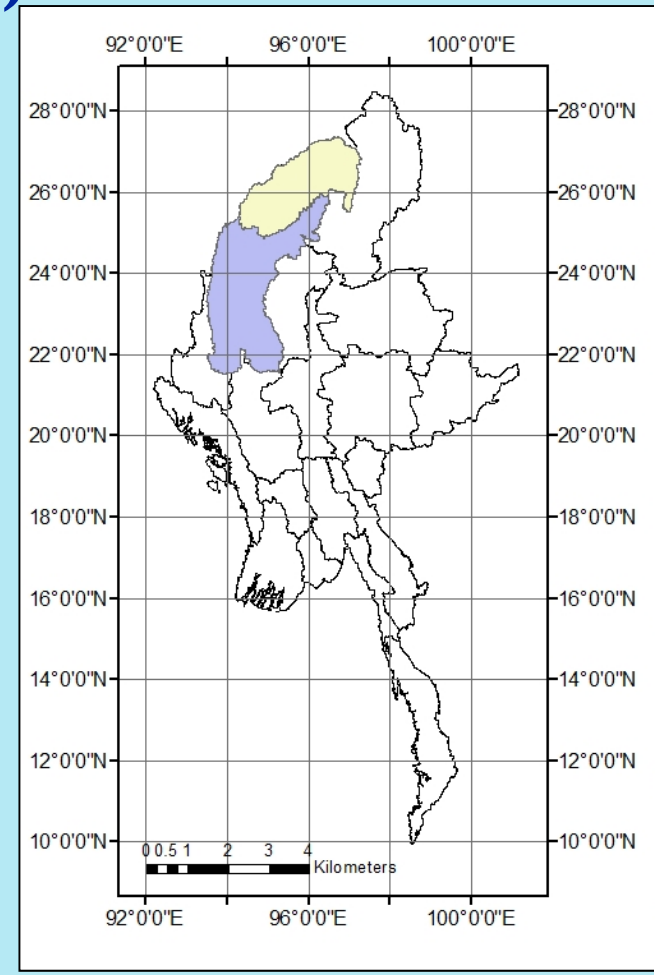
- In 2013, RS & GIS section was extended to make the Flood Hazard Map for risk mitigation solution.
- After RS & GIS section was established, flood hazard map for 100 years return period in Homalin City, Hpa-an City, Mandalay City, Katha City and Kalewa City were developed by using **HEC-RAS Model and ArcGIS** 10.0 Software.
- At present, RS & GIS section is still working to develop the Flood Hazard Map for 100 years return period in Mawlaik and Bag Cities.
- By using RRI model, RS & GIS section is analyzing to develop the flood inundation map for Mawlamyine, Yangon, Mandalay.
- RS & GIS section is still trying to develop flood risk mapping

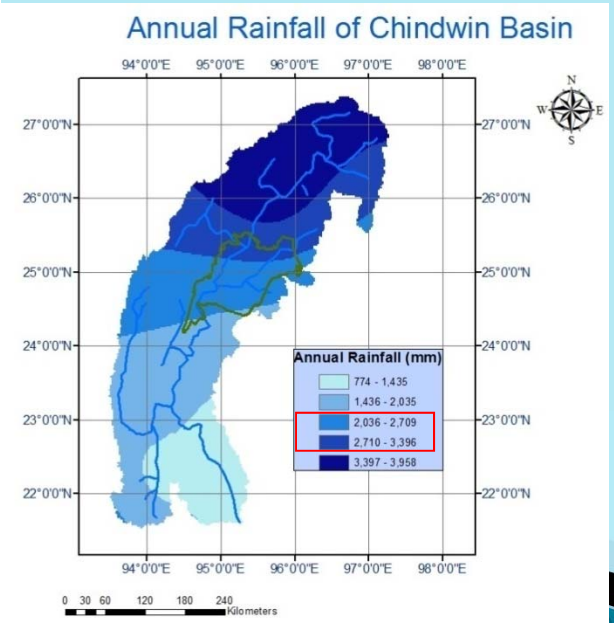


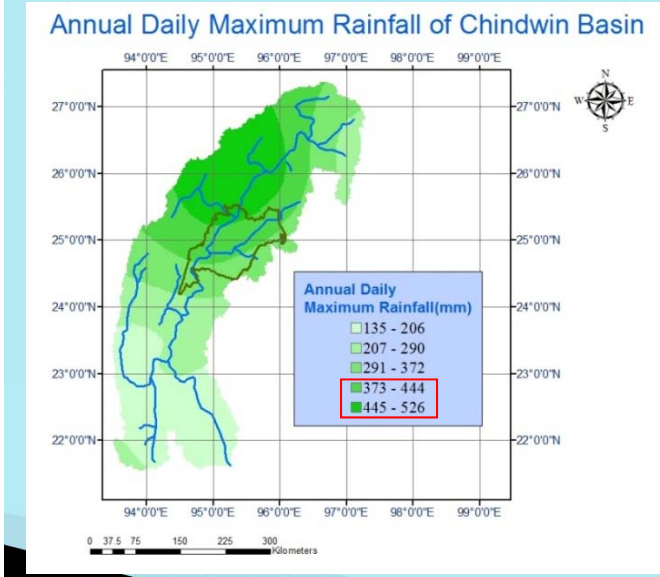
Development of Flood Hazard Map for Homalin City (supported by JAXA and GIC of AIT)

Objectives

- To develop flood hazard maps for Homalin township for different return periods
- To make use of ALOS/PALSAR images in flood area delineation
- To identify percentage damage to residential buildings in the study area by field survey and flood hazard maps
- To calculate total population affected by floods of different return periods

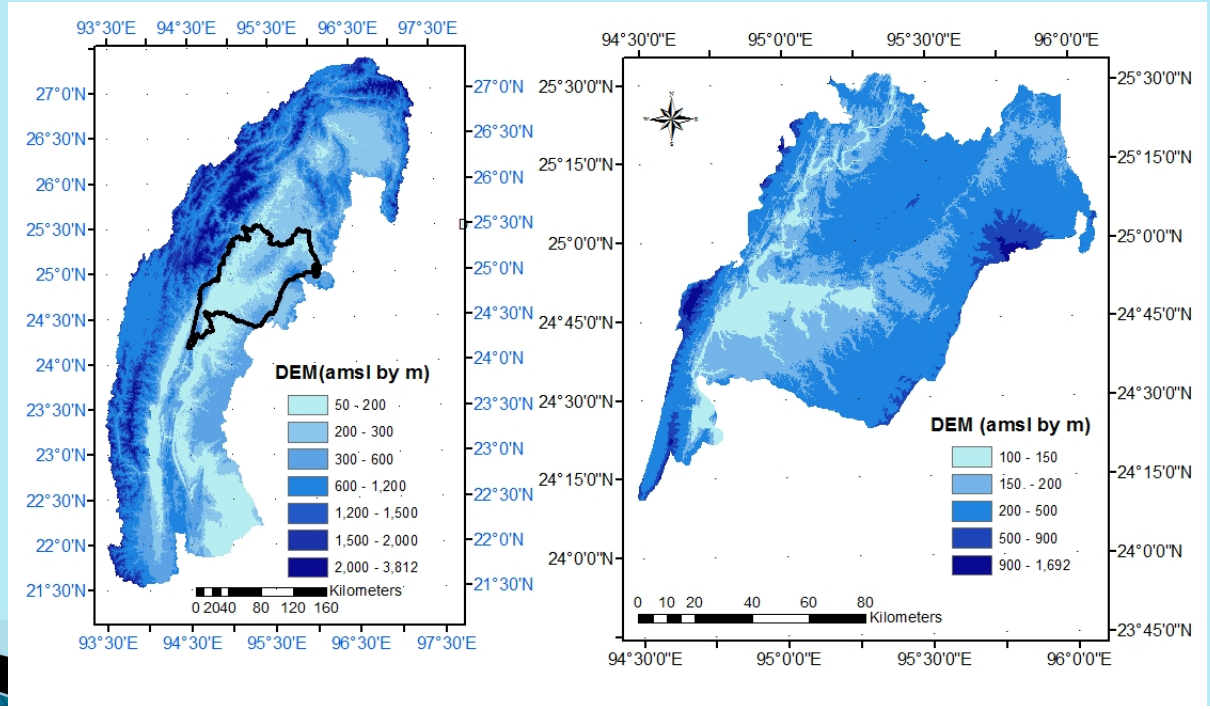




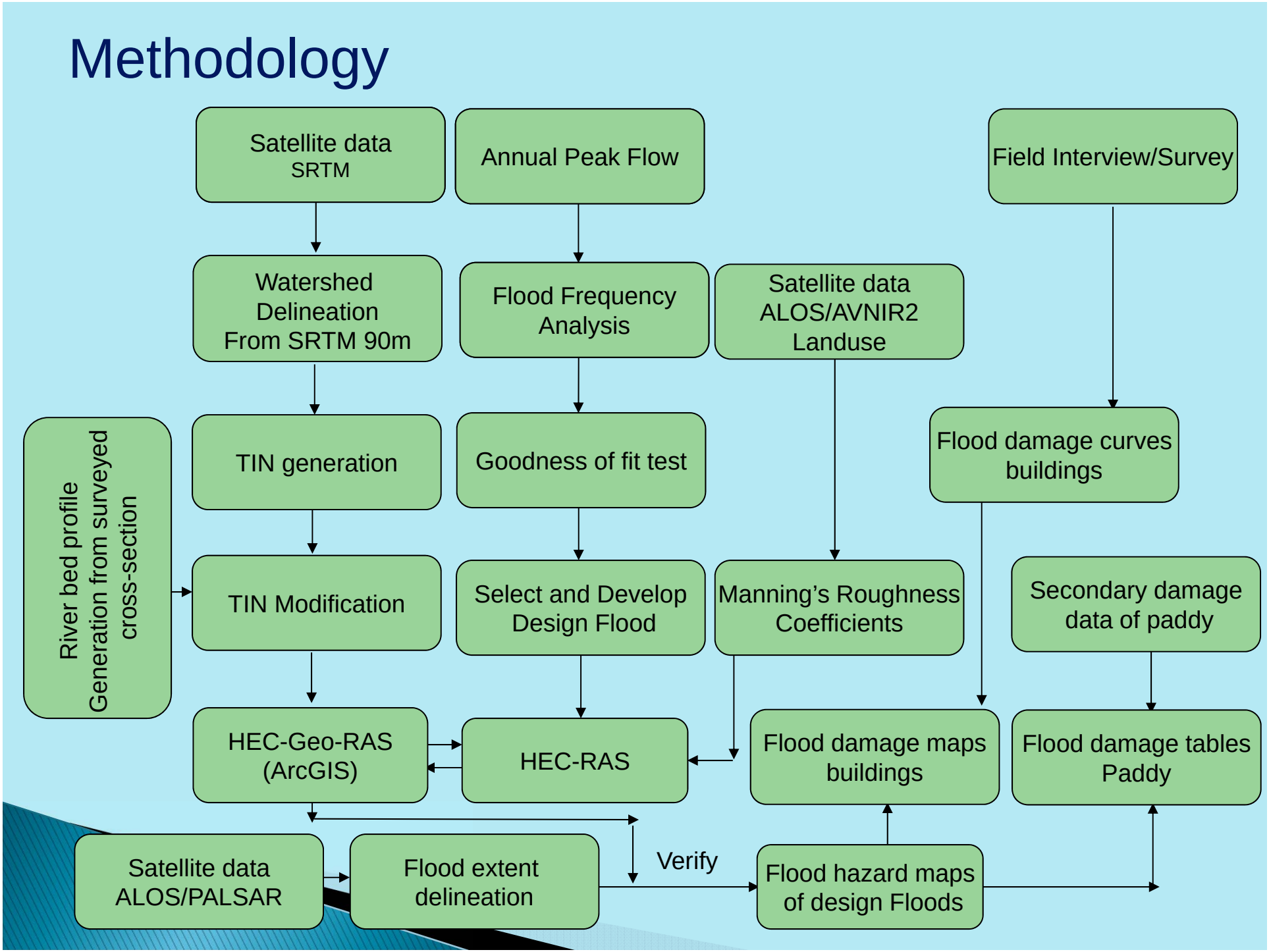


Data Used

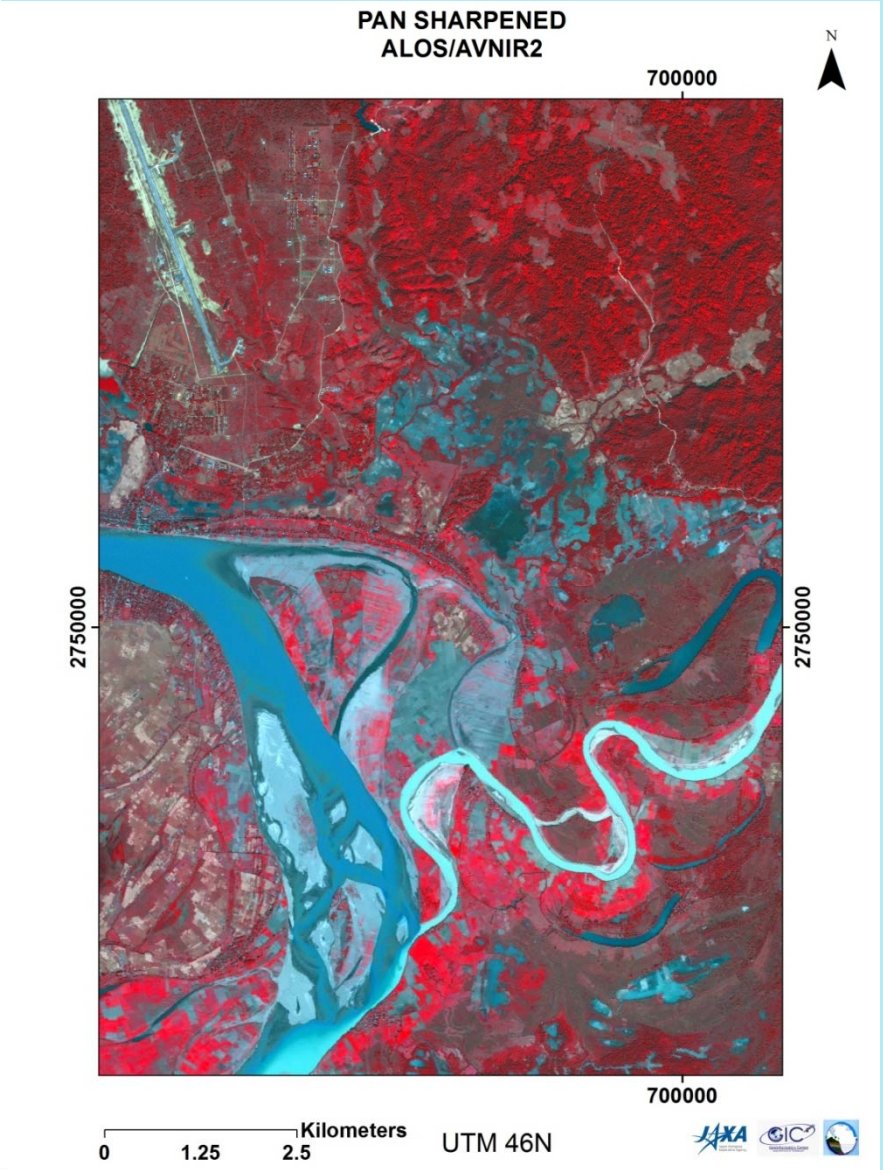
- Hydrological data
  - Annual Peak Discharge 1968-2011
  - Water Level 1968-2011
- Topographic data
  - SRTM 90 m
  - River bed profiles at the u/s and d/s gauge stations
- Satellite data
  - ALOS (AVNIR2, PALSAR)
- Population Data
  - Total population district level in the study area (2004)
- Ancillary Data
  - GIS shape files of rivers, banks, roads, schools, monastery, market etc.

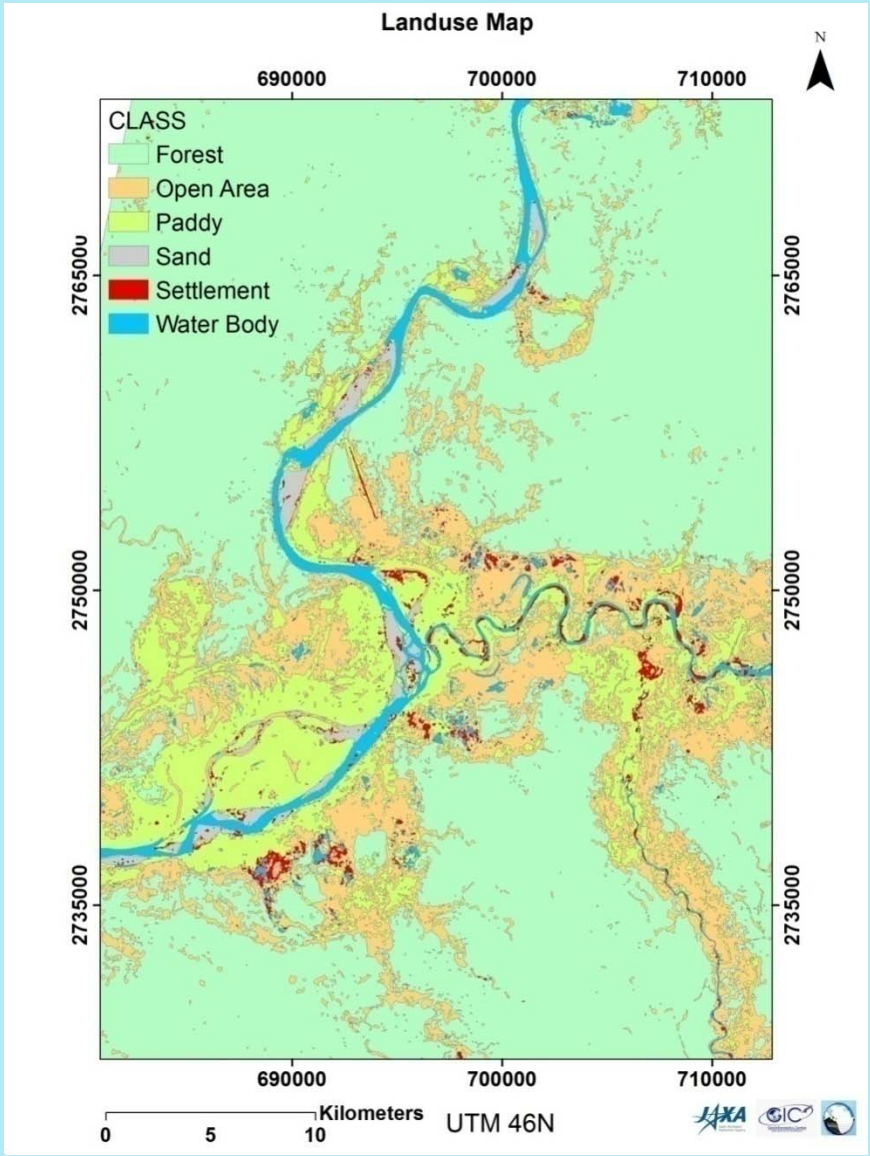


Methodology

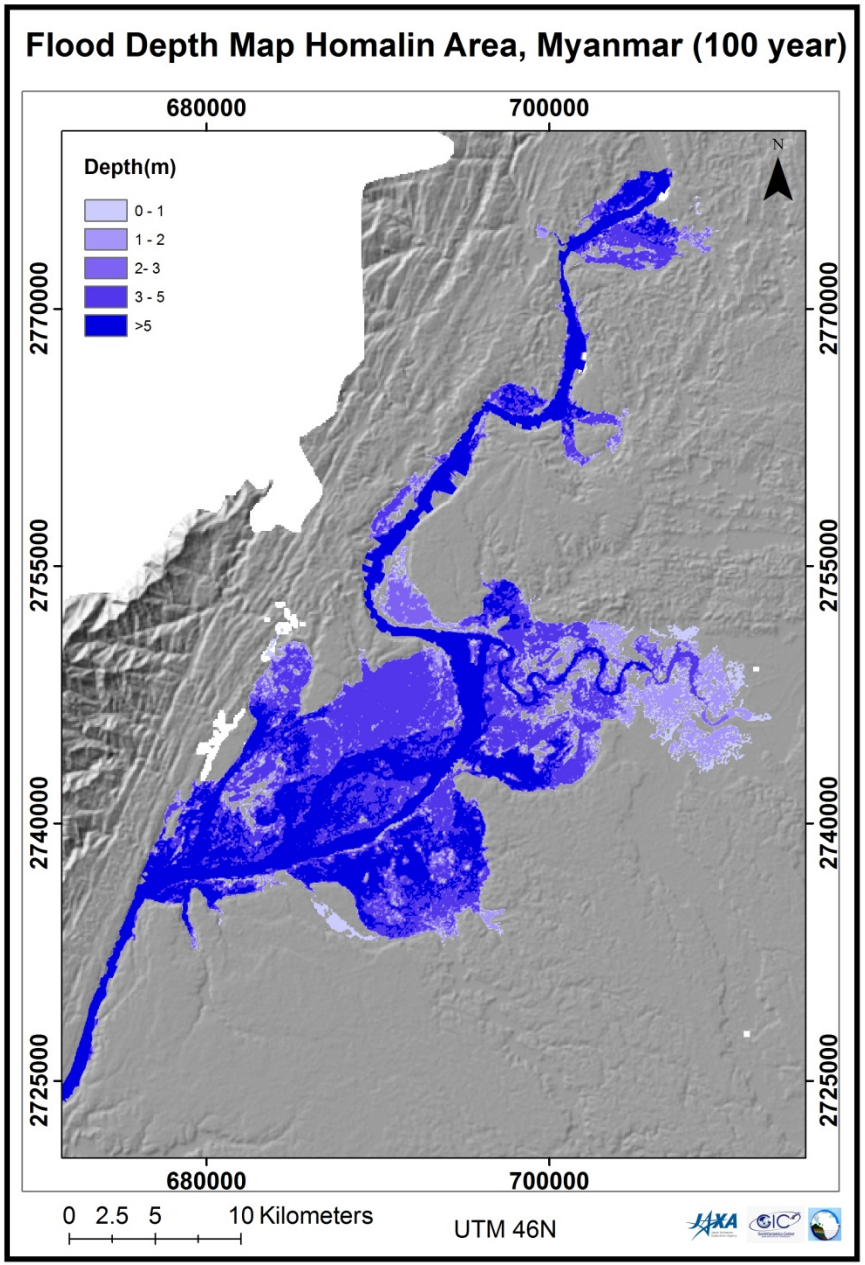


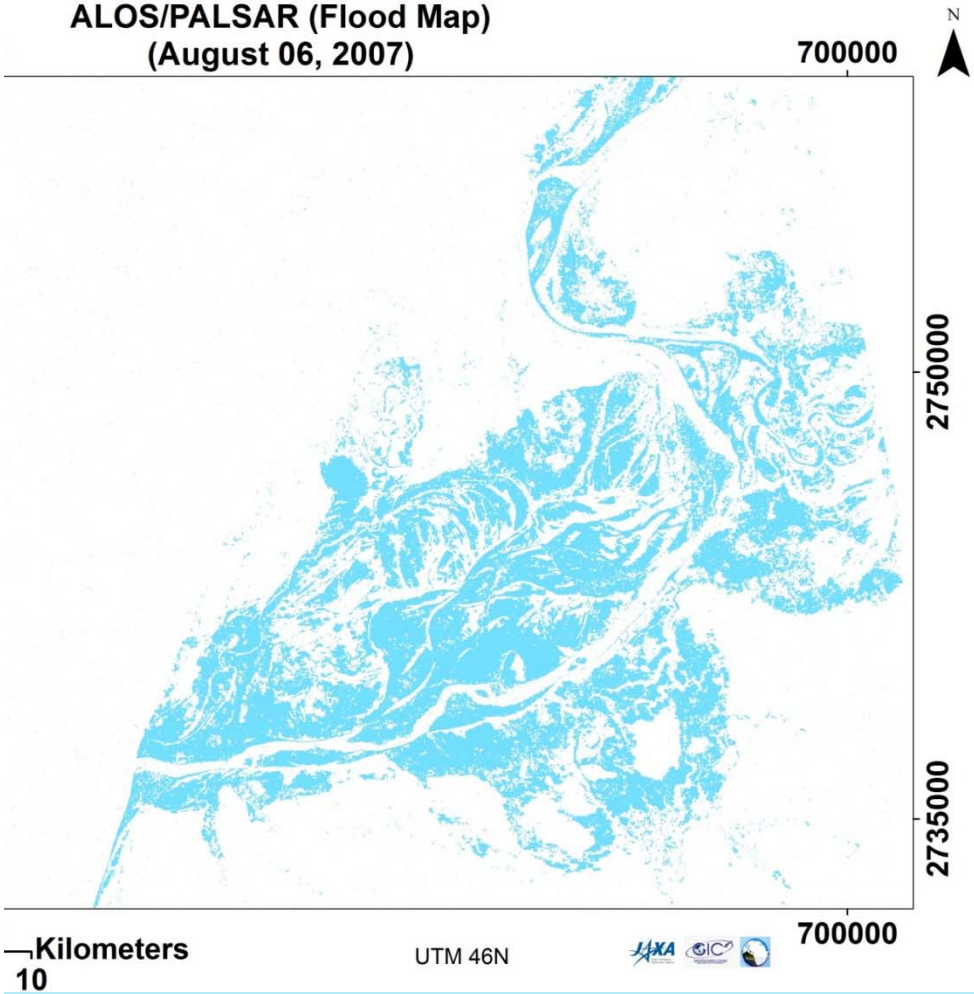
Landuse Map for Homalin Area





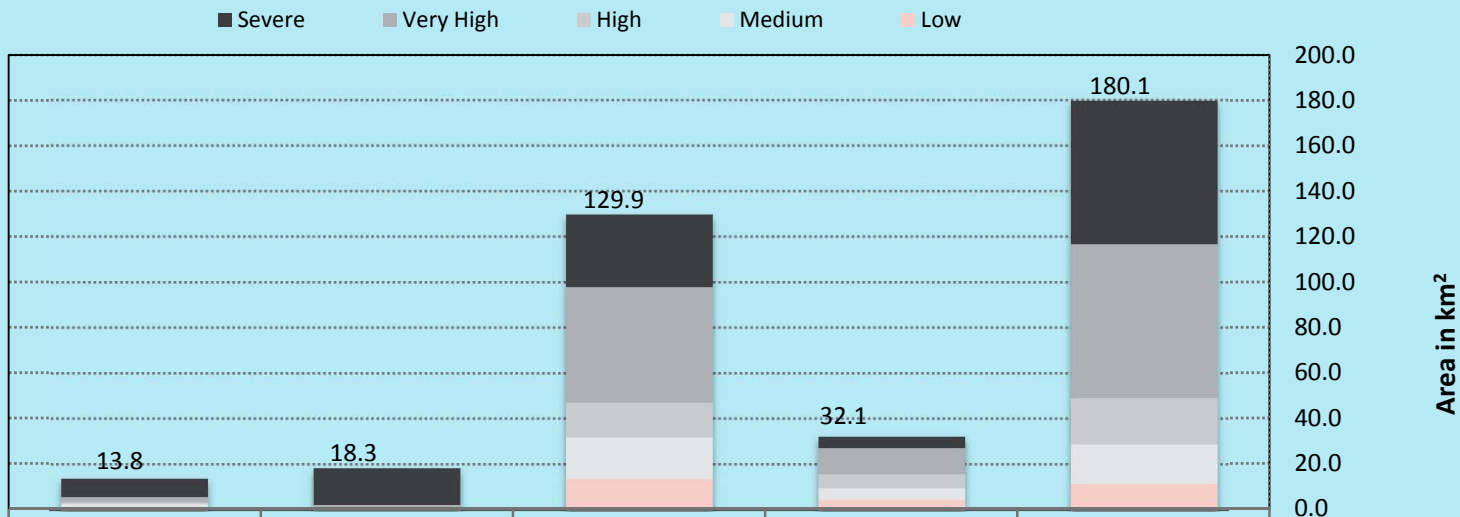
Flood Depth Map of Homalin Area for 100 year return period flood





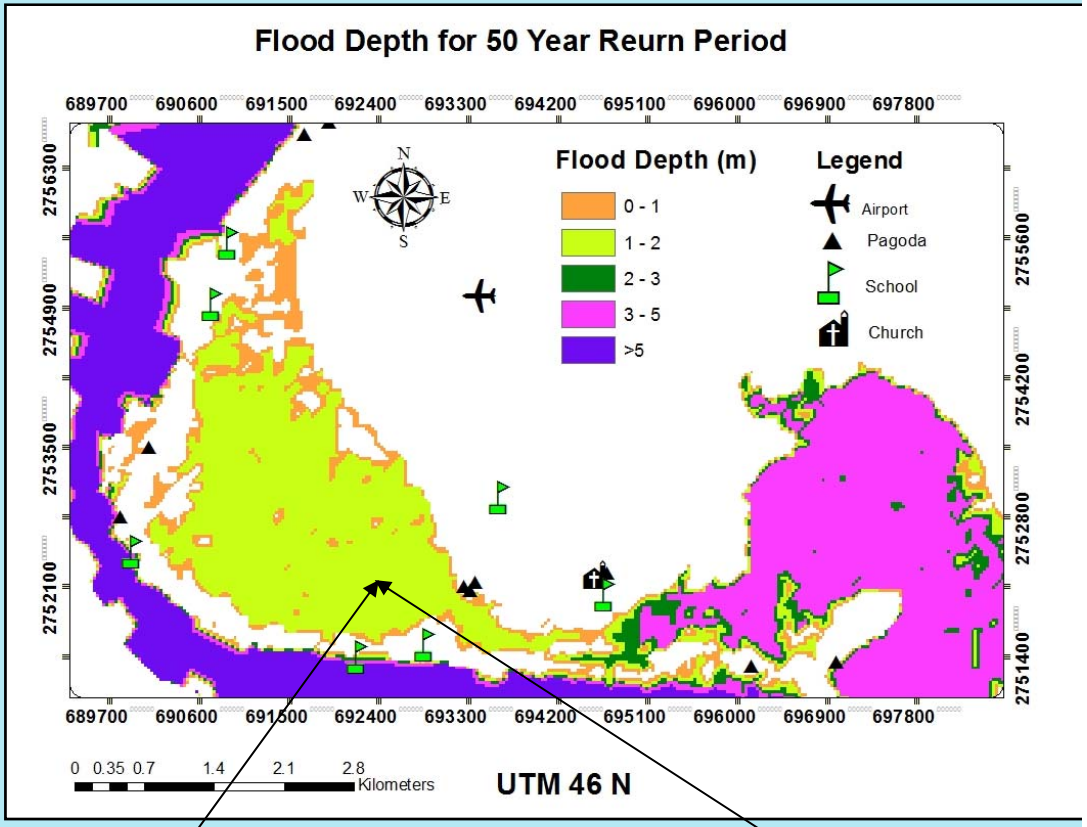
Class	Flood Depth (m)
Low	0–1
Medium	1–2
High	2–3
Very High	3–5
Severe	>5

Flood Area per Land use class (100 Year)

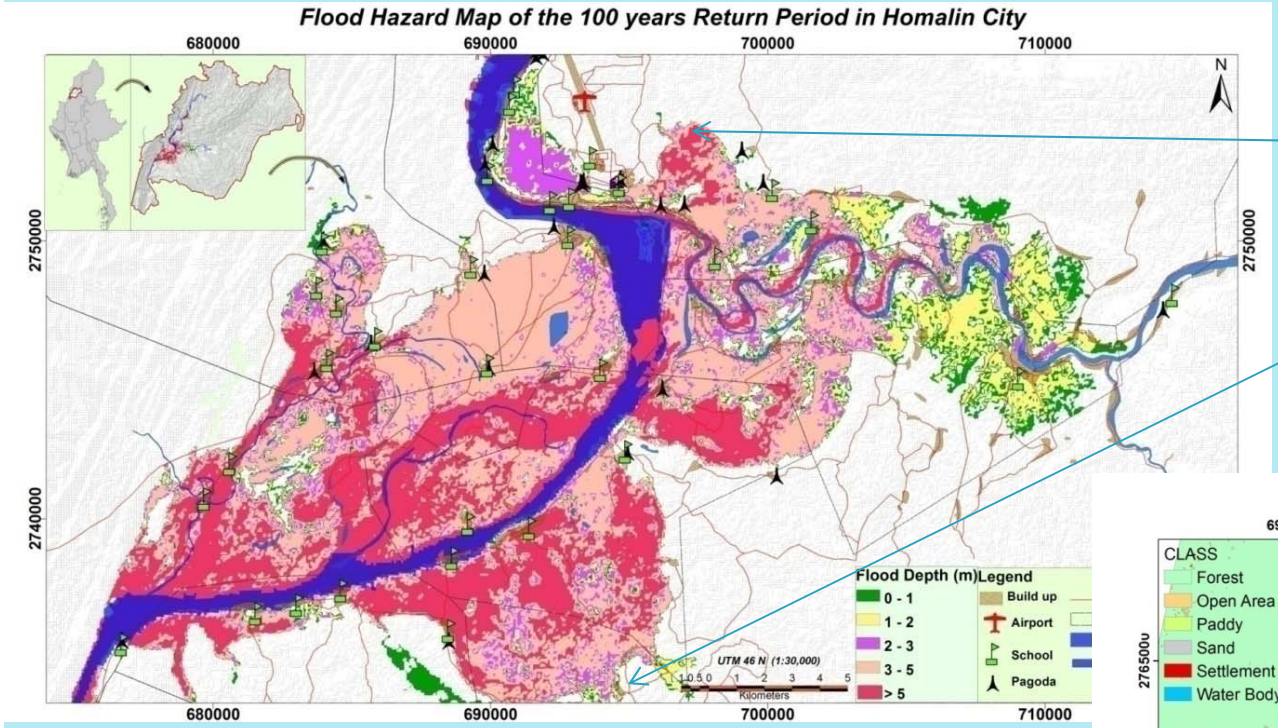


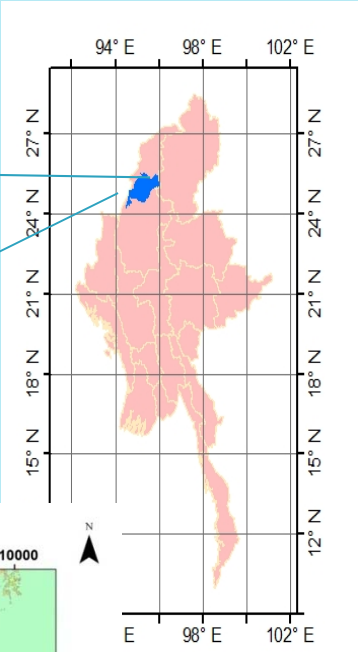
	SATTLEMENT	SAND	OPEN_AREA	FOREST	PADDY
Severe	8.0	16.3	31.7	4.7	63.3
Very High	2.6	1.3	50.8	11.6	67.8
High	0.8	0.3	15.7	6.2	20.1
Medium	1.8	0.3	18.2	5.1	17.3
Low	0.7	0.2	13.6	4.5	11.6

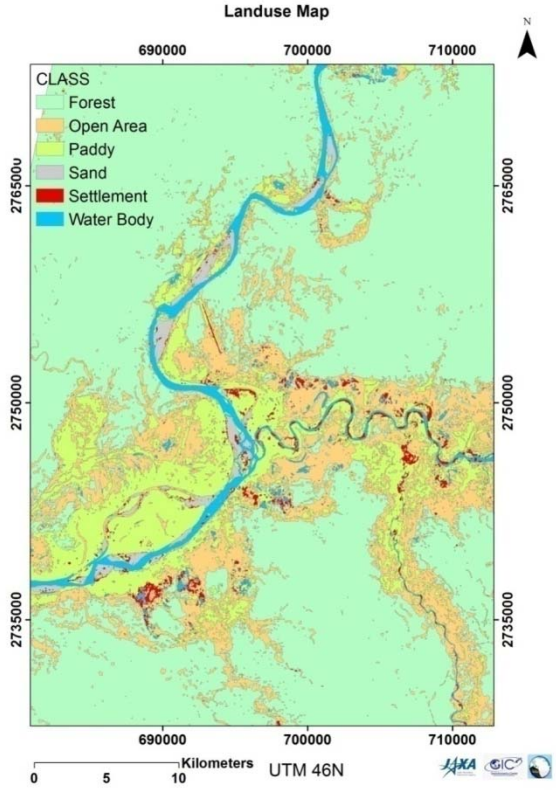
Flood Depth Verification



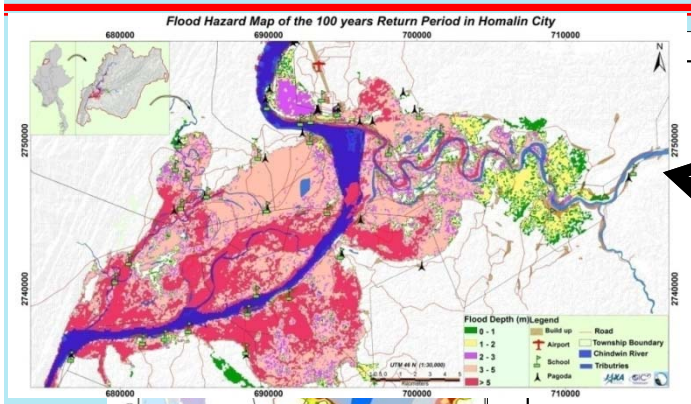
Flood Hazard Map for the 100 years Return Period in Homalin City

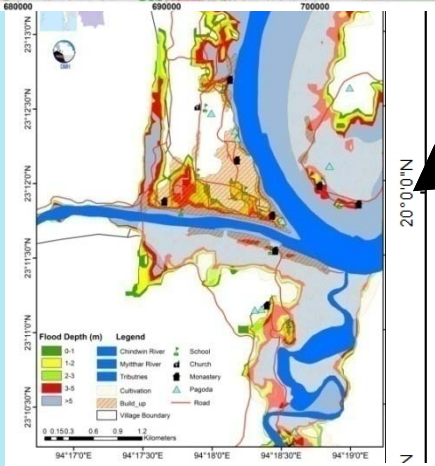


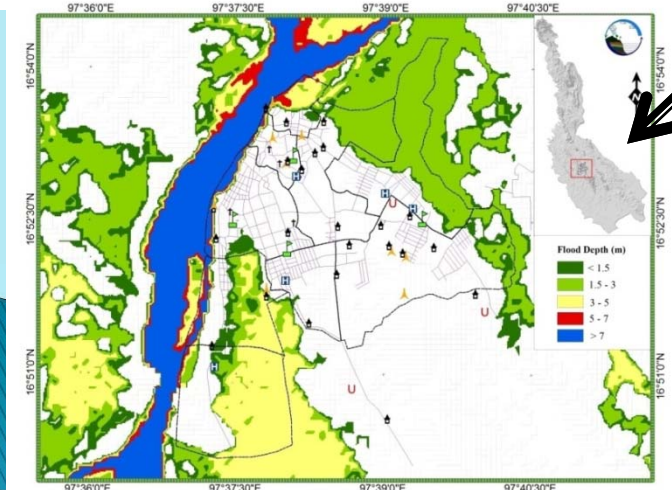


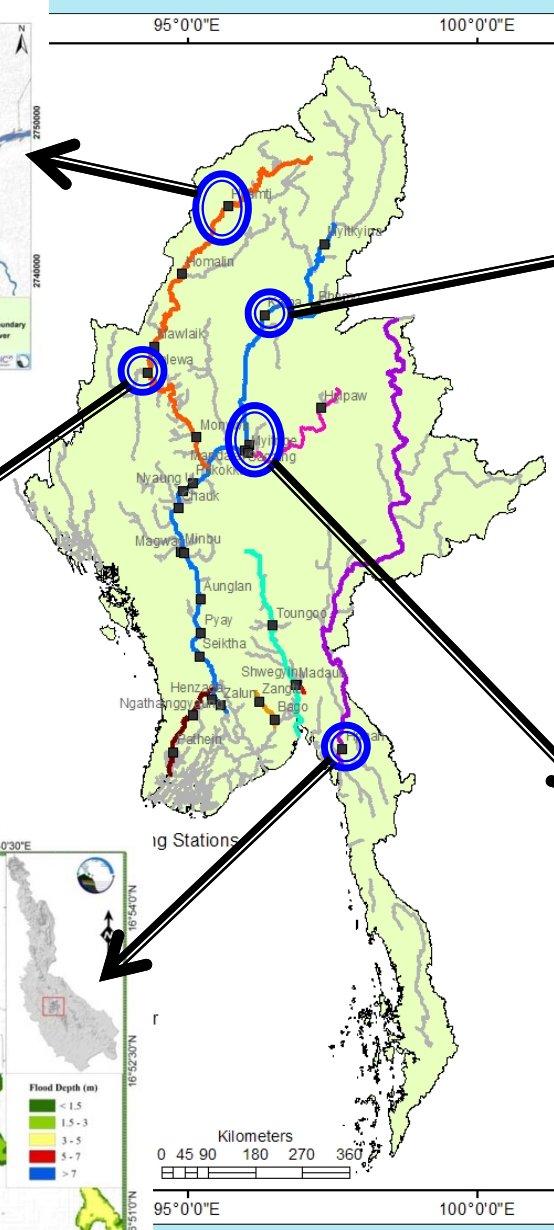


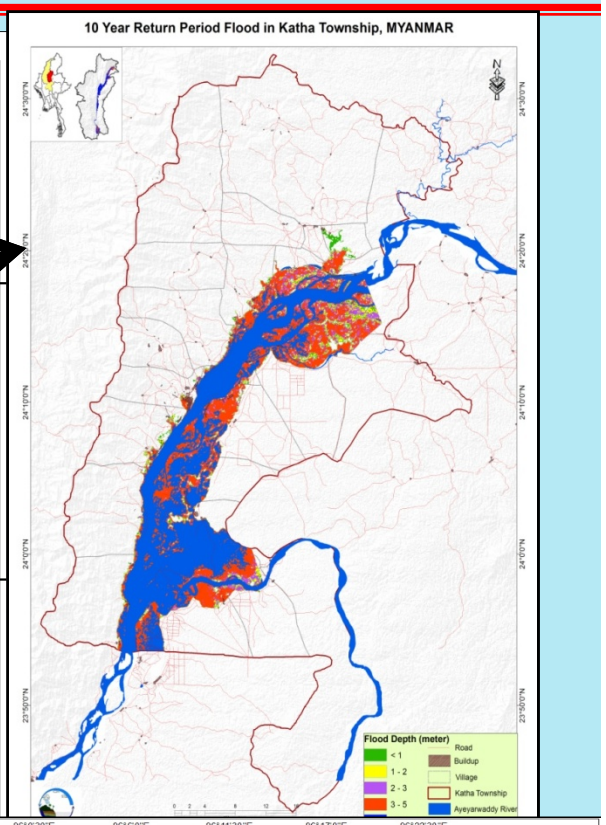
Flood Hazard Mapping

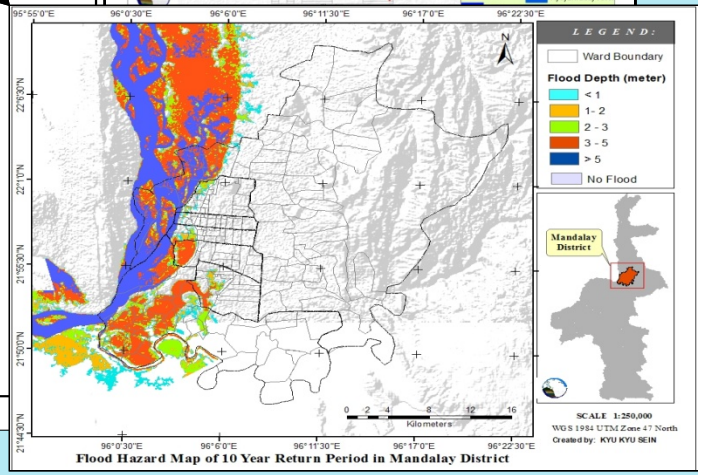












Future works

Hazard maps and risk assessment maps for

- Rainfall
- cyclone (wind, storm surge)
- earthquake
- Tsunami
- Landslide
- Drought

Early warning system for

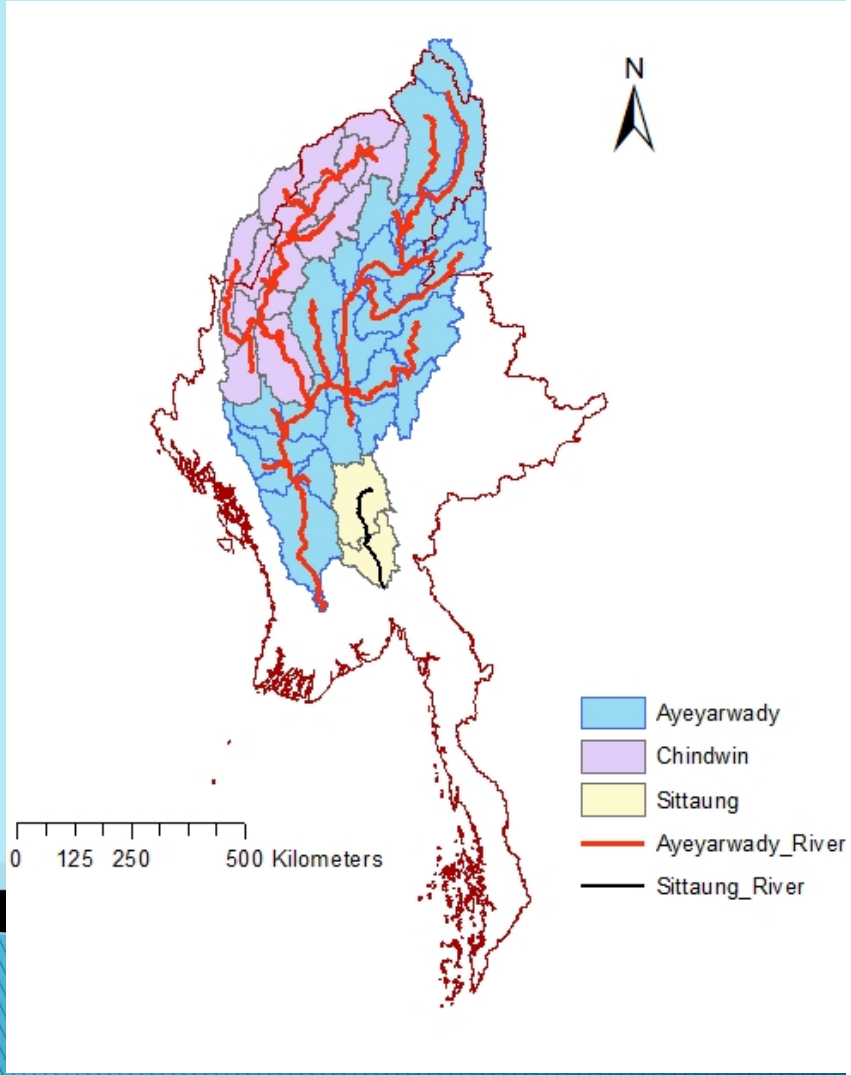
- **Install Automatic Weather Observation System**
- **Install the automatic telemetry system**
- **Install flood monitoring system (CCTV for surveillance)**
- **Upgrade the water level gauging network**
- **Upgrade the communication and dissemination systems**
- **Upgrade the Early Warning Center**

On going projects, Objective and activities

Project I- Development and Implementation of User-Relevant End-to-End Flood Forecast Generation for Myanmar (April 2014 – March 2017)

Objective:

- Enhancing meteorological and hydrological monitoring capacities for the generation of long-lead location-specific flood forecasts
- Development of flood forecast models for Chindwin, Ayeyarwady and Sittoung basins
- Development of Decision Support System (DSS) to communicate relevant, long-lead, location-specific flood risk information



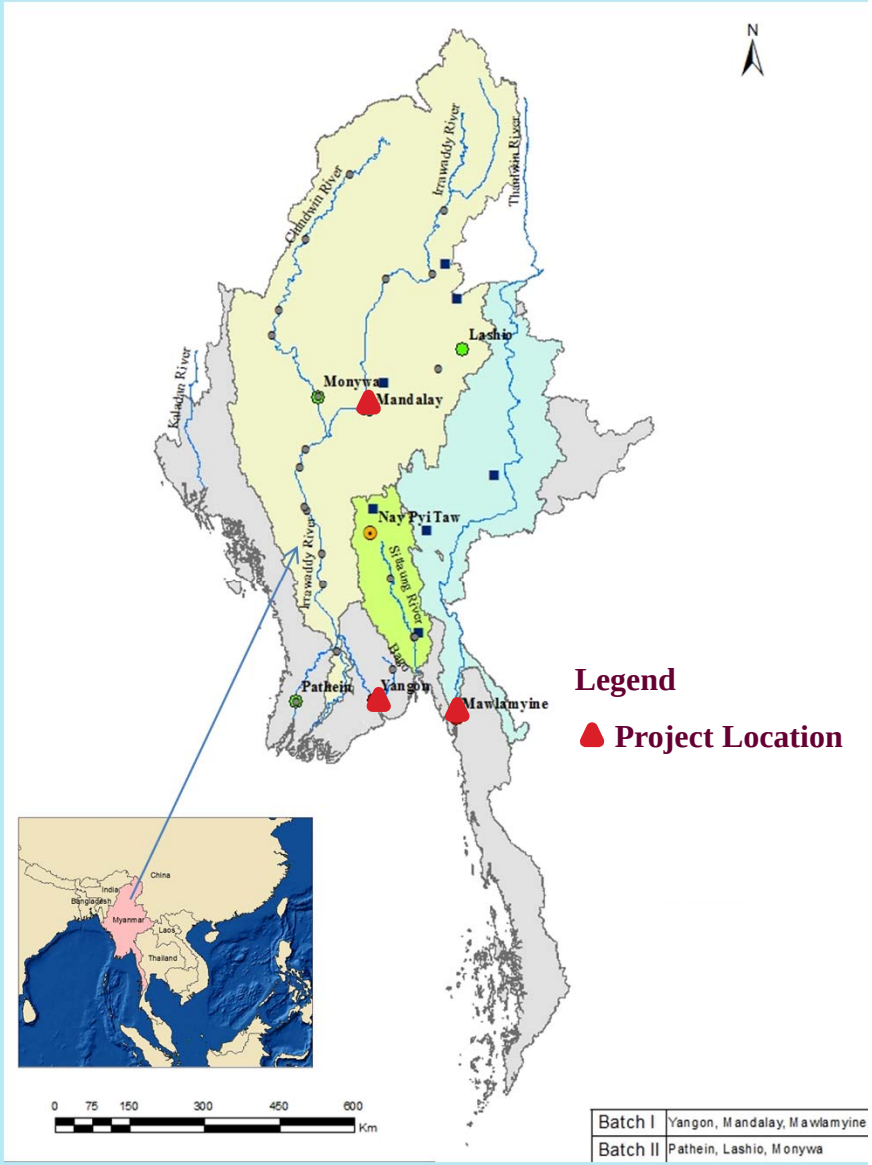
On going projects, Objective and activities

Project II- Transformation of Urban Management(ADB TA-8456) Part II- Flood Management(*funding by ADB, technical assistance by CTI & ICHARM-Japan*)

Implementation period: July 2014 to April 2016

Objectives

- Hydro-meteorological analysis related to flood and storm surge;
- Flood and storm surge risk assessment;
- Capacity development of the DMH;
  - ✓ Training for the DMH officers on the RRI and storm surge analysis
  - ✓ Training activities on hydro-meteorological model
  - ✓ Business plan to strengthen institutional capacity
- Capacity development of organizations relevant to flood and storm surge risk assessment.



On going projects, Objective and activities

Project III- Hydro-met observation and information system modernization

(AYEYARWADY INTEGRATED RIVER BASIN MANAGEMENT PROJECT)

Period: 31 March, 2015 to 31 March, 2020

Sub components;

A. Institutional and Regulatory Strengthening, Capacity Building and Implementation Support

B. Modernization of Observation Infrastructure, Data Management Systems and Forecasting

C. Enhancement of Hydro-met Service Delivery Systems

Objective:

- To improve quality of weather, climate and hydrological information services in Myanmar.

Project IV- Improving flood forecasting capacity of DMH to strengthen flood Early Warning System in Myanmar (Supported by Norway Gov. and technical assistance by ADPC) (2015-2017)

Main Objectives

The main objectives of this program are to;

- Adopt and calibrate a suitable hydrological model (numerical) for one river basin in Myanmar;
- Develop flood hazard maps for a selected river basin in Myanmar; and
- Improve end-to-end flood early warning system in Myanmar.

Thanks for your kind attention