



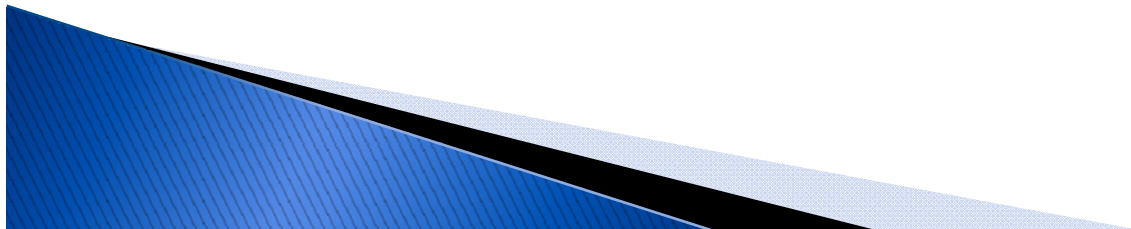
Mr Hla Saw
Assistance Director
Department of Meteorology and Hydrology
Ministry of Transport,
Myanmar

27 to 29 November, 2013



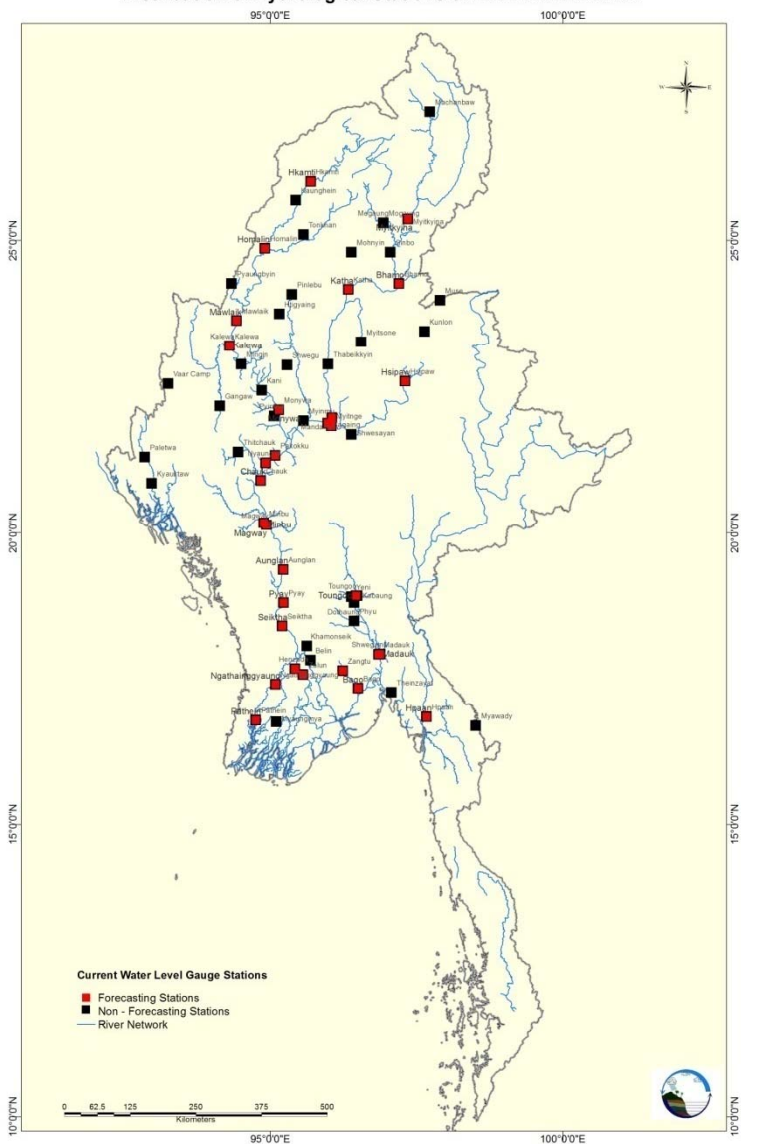
Contents

- Utilization of Remote Sensing Data
- Joint Mini-project with JAXA
- Future Plan



Current status of hydro-meteorological observation

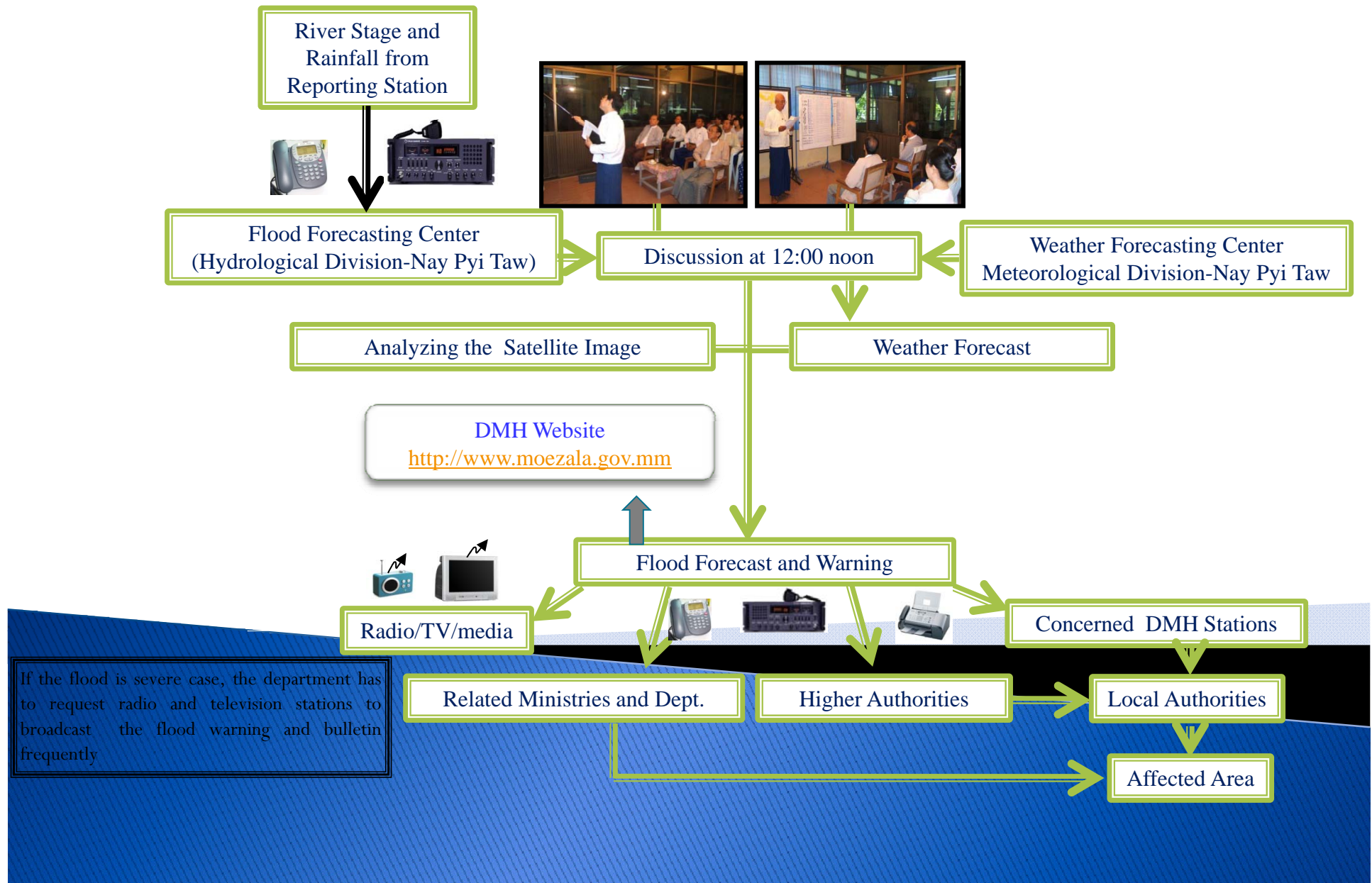
Distribution of Hydrological Stations of DMH in MYANMAR



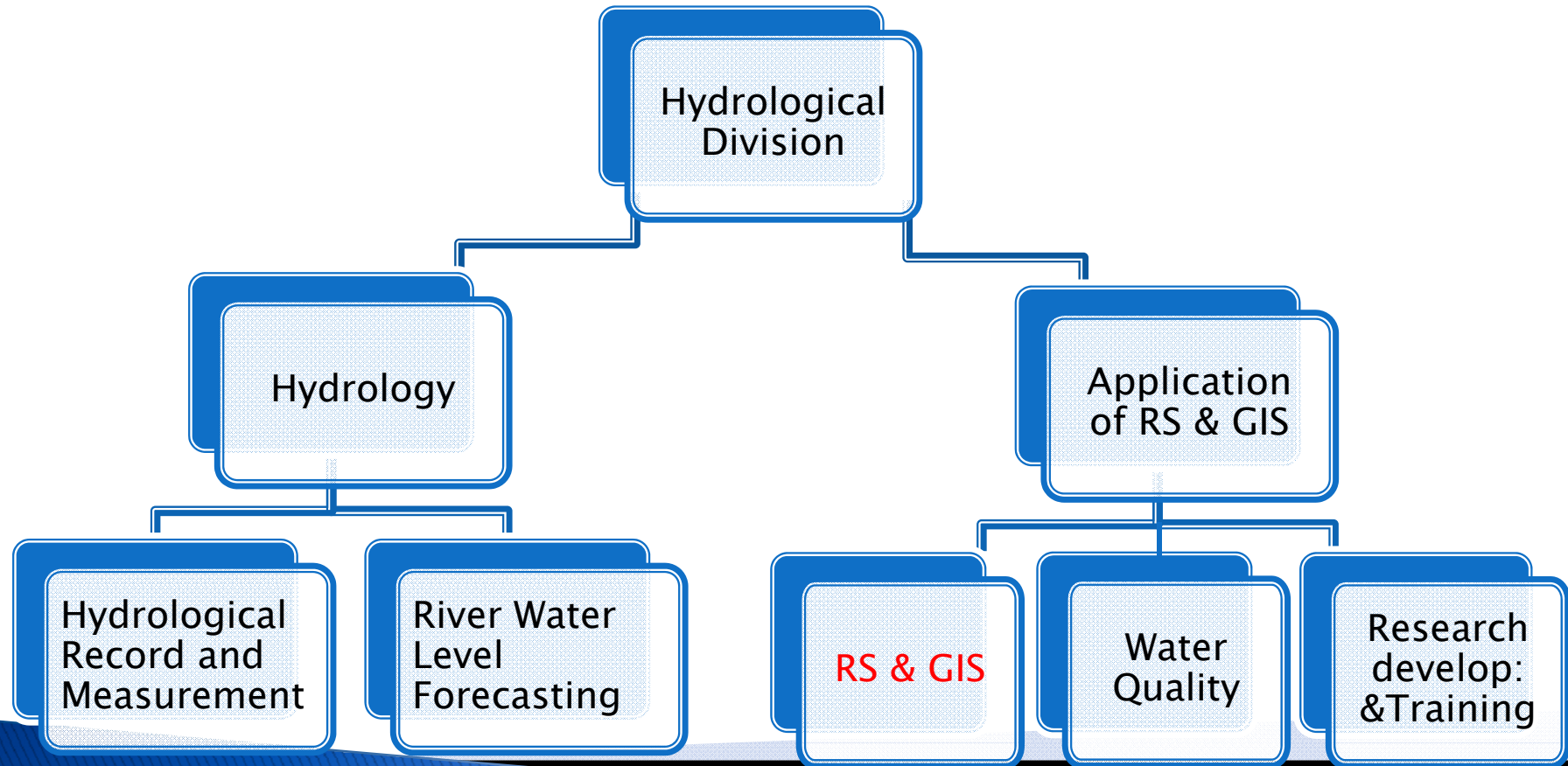
- ✓ Hydrological Services in 1964
- ✓ Acid Deposition Monitoring in 2003
- ✓ Member of EANET (Acid Deposition Monitoring Network in Asia) in 2006

Ayeyarwady	-	15
Stations		
Chindwin	-	5
Stations		
Sittaung	-	2 Stations
Thanlwin	-	1 Station
Dokethawaddy	-	2 Stations
Bago	-	2 Stations
Shwegyin	-	1 Station
Ngawun	-	2 Stations


Current status of Data Collection, Forecasting & Warning



Organization Chart of Hydrological Division



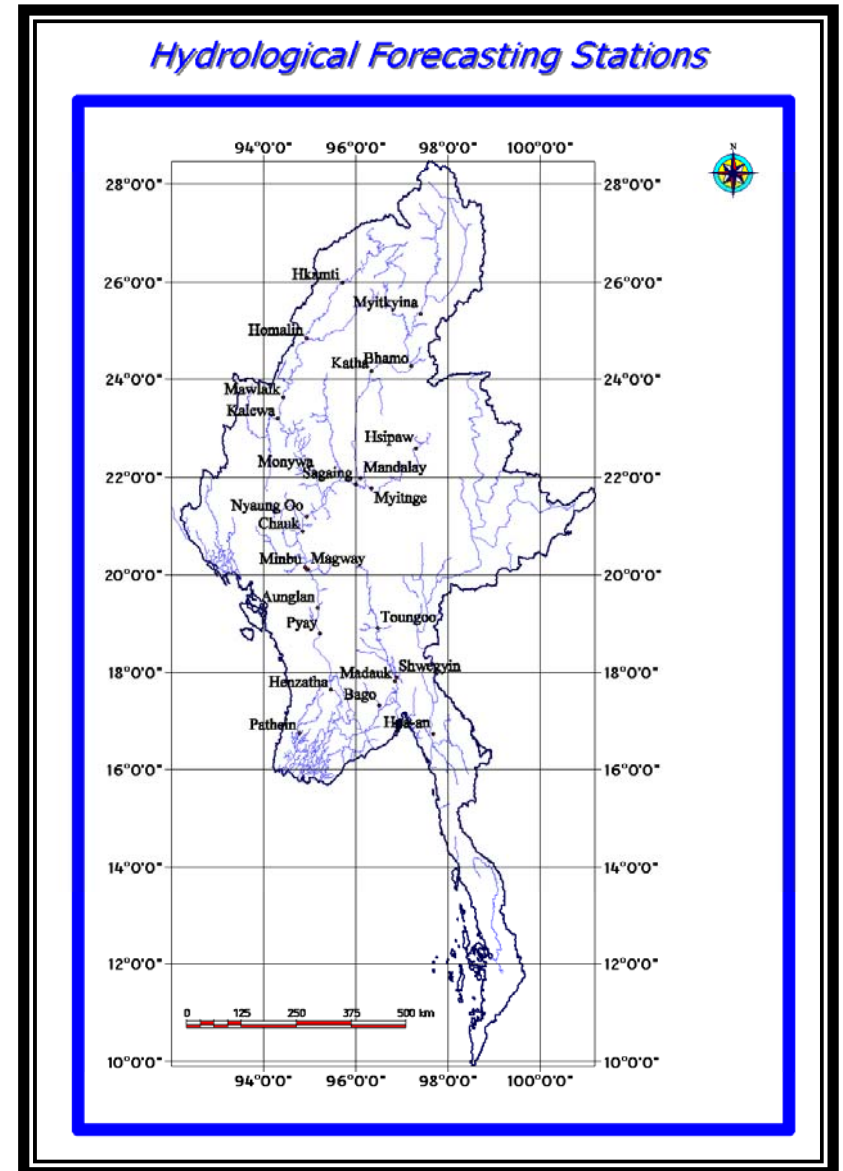
Objectives of Remote Sensing and GIS Section

- To develop Web GIS based decision support system for flood prediction and monitoring
 - To apply modern geospatial tools like RS, GIS and GPS in Flood Risk Assessment study ; Landslide Hazard Zonation; Sustainable Water Resources Assessment; Climate Change; Drought; etc.
 - To generate of hydromorphological information system by using Remote Sensing and GIS
 - To provide consultancy for better planning and management using RS & GIS data.
- 

Hydrological Observation Network and Types of Forecast and Warning



- Daily water level forecast
- Dekad Forecast (10 days advance FC)
- Monthly Forecast
- Significant Water level Bulletin
- Flood warning and Bulletin
- Minimum Alert Water Level and Bulletin (for low flow)
- Seasonal water level forecast
- General Long Range flood Forecast
- Flood Forecast at early monsoon
- Flood Forecast at Peak-monsoon
- Flood Forecast at Late-monsoon



Current status of hydrological forecast

For Daily Water Level Forecast

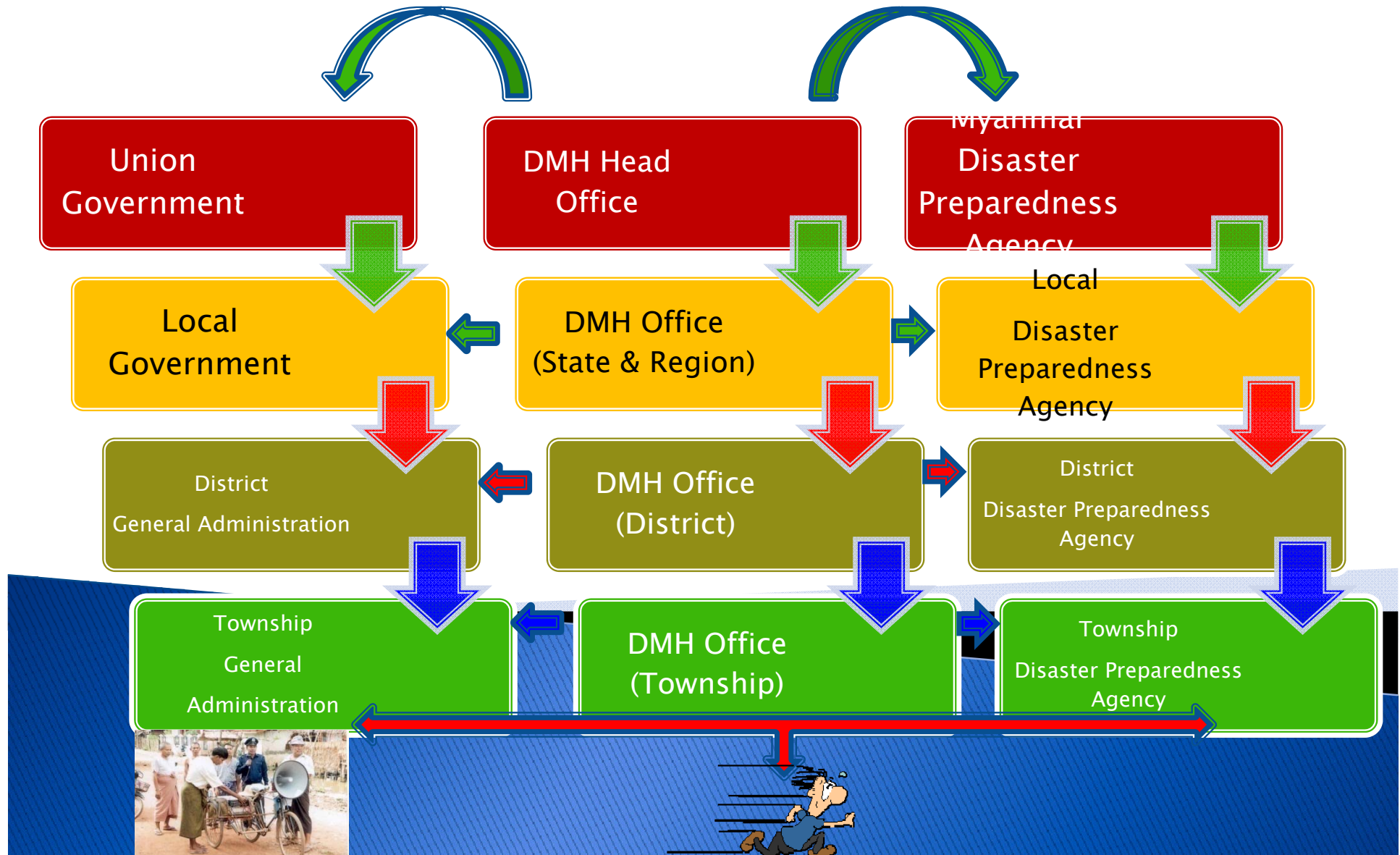
- River Stage Correlation Method
- Empirical Model (based on single and multiple regression analysis)
- Integrated Flood Analysis System (IFAS)

For Seasonal Water Level Forecast

- Based on flood characteristic occurred in Analogue years
- Based on seasonal weather forecast
- Based on comparison of current flow with the individual hydrograph for the last (10) years
- Based on the average flow of the last (10) years
- Based on the Flood frequency analysis

Current status of hydrologic information service

Early Warning Information and Dissemination



Current status of RS & GIS Section

Software Used

- River Tools with license
- TNTmips with license
- ArcGIS 10 (Crack)
- ENVI 4.7 (Crack)

Satellite Image Data Used (free Download Data)

- USGS
- GLCF
- NOAA
- Google Earth
- JAXA (only for the project area in project period)

Current Works

- Analyze Catchment Area
- River network, river slope, drainage density, basin relief, River Order, etc
- Flood Hazard Maps

Causes of River Floods

Ayeyarwady and Chindwin Rivers

- Intense heavy rain due to pronounced monsoon trough persisting for at least **3 days over Northern Myanmar areas**
- **Strong to vigorous monsoon** in Andaman Sea, Bay of Bengal and along the Myanmar coast
- Heavy rainfall **due to cyclonic storm crossing Myanmar and Bangladesh coasts** during pre-monsoon and post-monsoon

Thanlwin, Sittaung, Bago, Shwegyin , Dokehtawady and Ngawun Rivers

- **Strong to vigorous monsoon** in Andaman Sea, Bay of Bengal and along the Myanmar coast
- Mostly due to rainfall associated with **low pressure waves** (the remnants of typhoons and tropical storms of South China Sea) moving from east to west across the country



Utilization of Advanced Land Observing Satellite (ALOS)



Advanced Land Observing Satellite (ALOS, "DAICHI")



✓ **Launch:**

Jan. 24, 2006 by H-2A Rocket #8

✓ **Objectives:**

- Cartography (1/25,000 scale)
- Regional environmental monitoring
- Disaster monitoring, etc

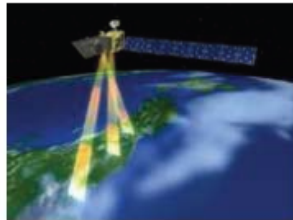
✓ **Three mission instruments:**

- PRISM, AVNIR-2, PALSAR



PRISM

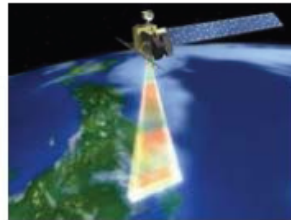
Panchromatic Remote sensing Instrument for Stereo Mapping



PRISM can acquire triplet stereo imageries by nadir-, forward, and backward-radiometers with 2.5m spatial resolution in 35km wide swath.

PALSAR

Advanced Visible and Near-Infrared Radiometer type 2



AVNIR-2 can observe with 10m resolution in 70km swath, and it can be changed the observation area by pointing capability within +/-44 degrees in across track.

PALSAR

Phased Array type L-band Synthetic Aperture Radar



PALSAR can acquire the data in not only daytime but also nighttime as well as cloudy and rainy weather conditions.

- Analysis of Landuse/ Landcover Changes
- Developing Digital Elevation model
- Analysis of Watershed (Slope, Aspect, river networks, river length,
- Developing Flood Inundation Map
- Assessment of drought area

https://sentinel.tksj.jaxa.jp/

Firefox | Satellite Images | Home - Sentinel Asia Web Site

https://sentinel.tksj.jaxa.jp/sentinel2/topControl.action

Wchoppers

Most Visited | Getting Started | Suggested Sites | Web Slice Gallery | OpenDNS

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Games | YouTube | f | Get Media Player Plugin

UserID: gues9999

UserID: password login

SENTINEL Asia Sentinel Asia

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WEB GIS

- Emergency Observation
- Wildfire Monitoring
- Flood Monitoring
- MTSAT Imagery
- Capacity Building
- Library

Welcome To Sentinel Asia Web Site

Sentinel Asia is a voluntary basis initiative led by the APRSAF (Asia-Pacific Regional Space Agency Forum) to support disaster management activity in the Asia-Pacific region by applying the WEB-GIS technology and space based technology, such as earth observation satellites data.

Emergency Observation

- 23/Sep/2012 Flood in India
- 07/Sep/2012 Flood in Vietnam
- 25/Aug/2012 Flash flood in Indonesia
- 22/Aug/2012 Forest fire in Kazakhstan
- 07/Aug/2012 Flood in Philippines
- 21/Jul/2012 Flood in China
- 03/Jul/2012 Flood in Japan
- 25/Jun/2012 Flood in China
- 11/May/2012 Flood in Tajikistan
- 05/May/2012 Flash flood in Nepal

more...

Current Topics

- 27/Jul/2012 Announcement of Opportunity "9th Sentinel Asia System Operation Training" [link...](#)
- 10/Mar/2011 Indonesia Regional Server is opened ! [link...](#)
- 20/Dec/2010 Fiji Regional Server is opened ! [link...](#)
- 26/Nov/2010 Vietnam Regional Server is opened ! [link...](#)
- 10/Nov/2010 Nepal Regional Server is opened ! [link...](#)

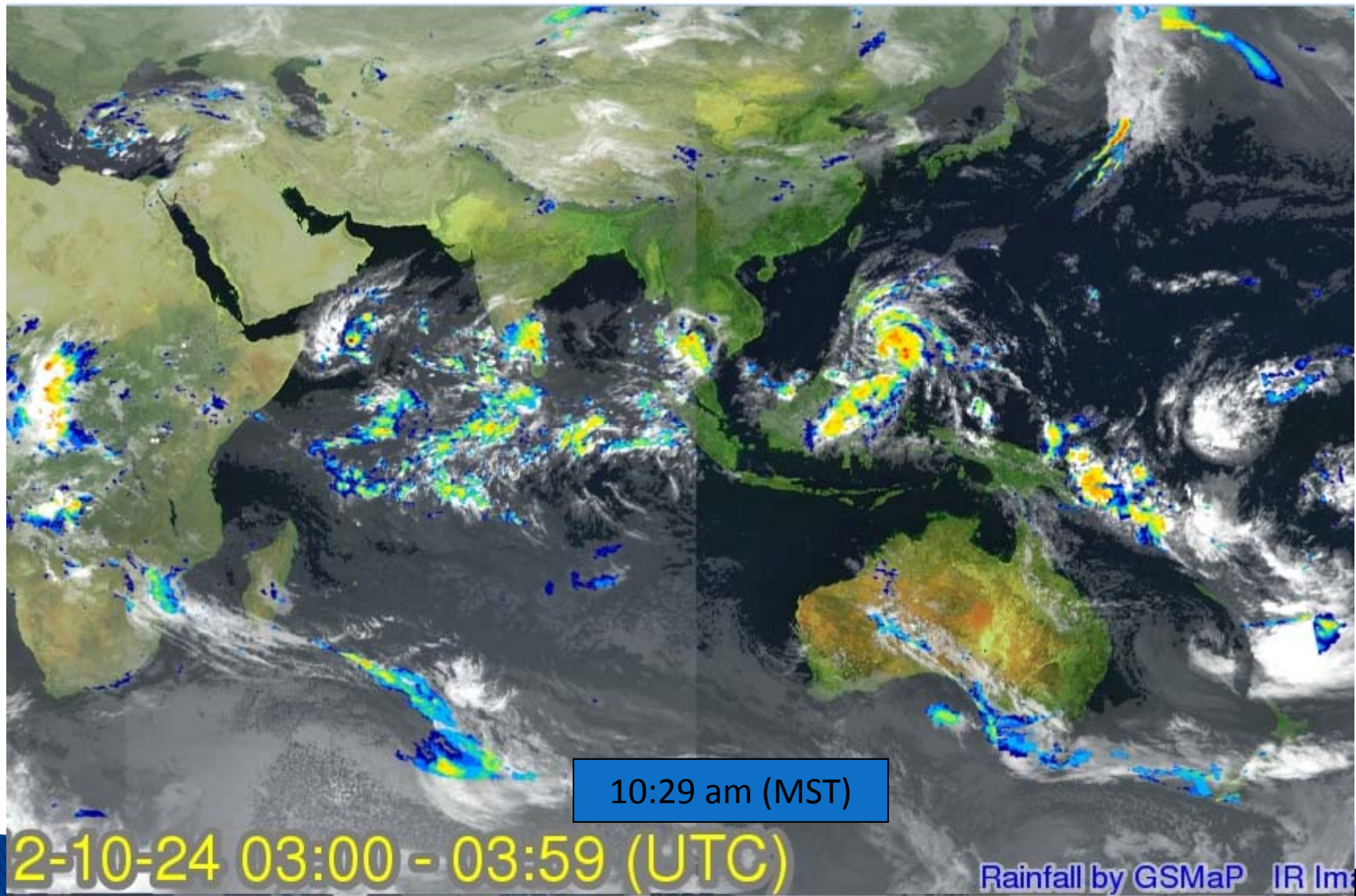
SENTINEL Asia

AXA | Australian Government | AIT | ICHARM | ICIMOD | KARI | 國家實驗研究院

https://sentinel.tksj.jaxa.jp/sentinel2/topControl.action#

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1:17 PM 10/24/2012



At 3:10 pm

References for Flood Monitoring

Firefox | Satellite Images | subset information ... | Thumbnail Cale... x | MyStart by IncrediB... | JAXA Global Rainfal... | gsmmap_html_imag... | WEB-GIS - Sentinel ... | Dartmouth Flood O... +

https://sentinel.tksca.jaxa.jp/sentinel2/thumbnailSelectTab.action?subset_name=Flood+Monitoring#

Most Visited | Getting Started | Suggested Sites | Web Slice Gallery | OpenDNS | Bookmarks

incridibar | Search >> | Daily Deals | YouTube | NEWS | Get Media Player Plugin

Date(UTC):

GSMMap | GFAS(Precipitation and Heavy Rain) | MTSAT(North) | MTSAT(South)

October

S	M	T	W	T	F	S
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

2011 | 2012 | 2013

Hourly(Jpeg)

GSMMap.1h.201210... 24/Oct/2012 03:00

GSMMap.1h.201210... 24/Oct/2012 02:00

GSMMap.1h.201210... 24/Oct/2012 01:00

GSMMap.1h.201210... 24/Oct/2012 00:00

Hourly(Geo-TIFF)

GSMMap.1h.201210... 24/Oct/2012 03:00

GSMMap.1h.201210... 24/Oct/2012 02:00

GSMMap.1h.201210... 24/Oct/2012 01:00

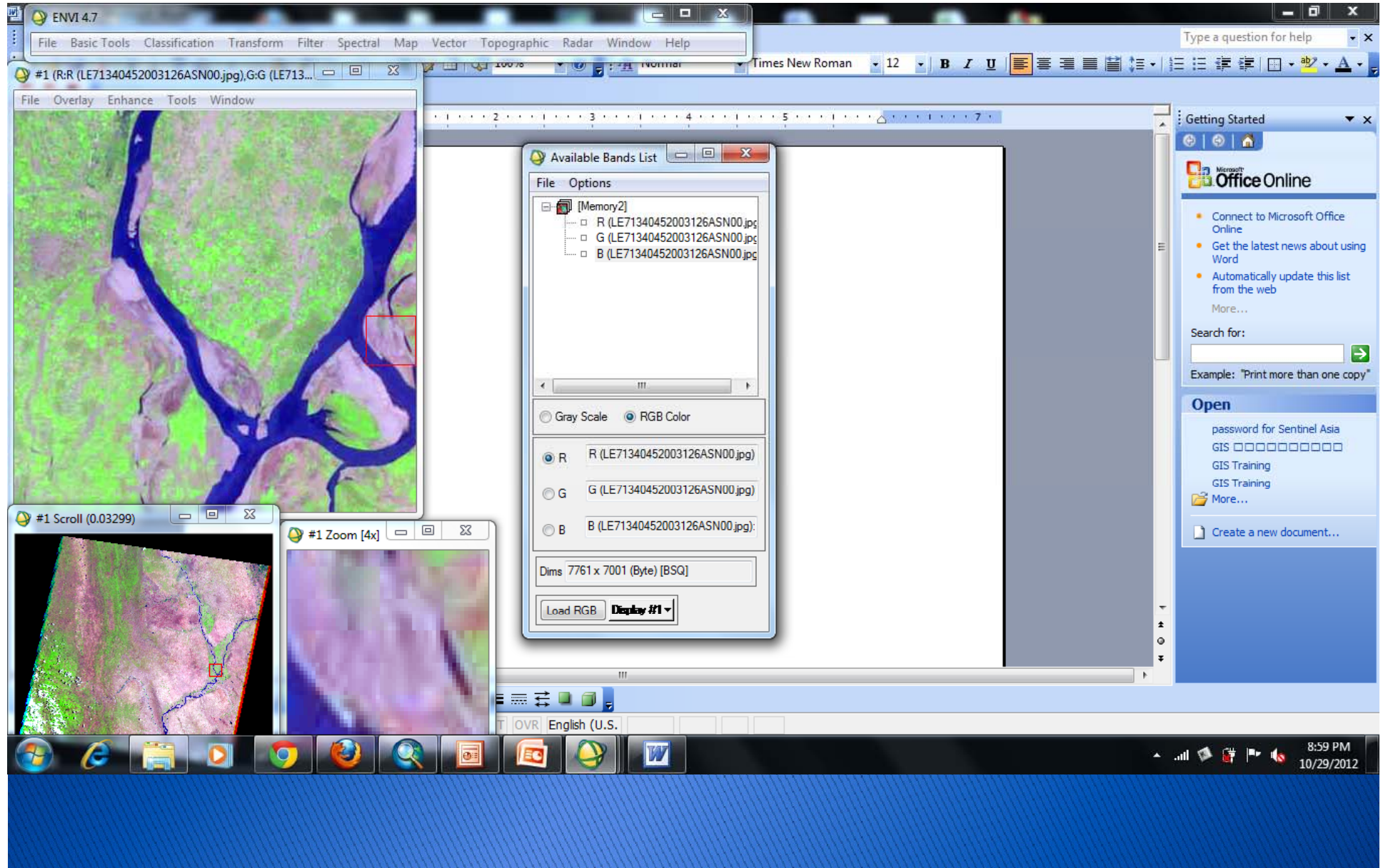
GSMMap.1h.201210... 24/Oct/2012 00:00

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3:24 PM
10/24/2012

References for Flood Monitoring by Hourly

Utilization of Landsat Images



“Flood simulation Using HEC RAS, Remote Sensing GIS”

Ms. Hrin Nei Thiam

Ms. Tin Yi

Mr. Hla Tun

Mr. Sein Lin

Mr. Arnob Bormudoi

} DMH, Myanmar

GIC, AIT

2007-2008

GeoInformatics Center

Asian Institute of Technology



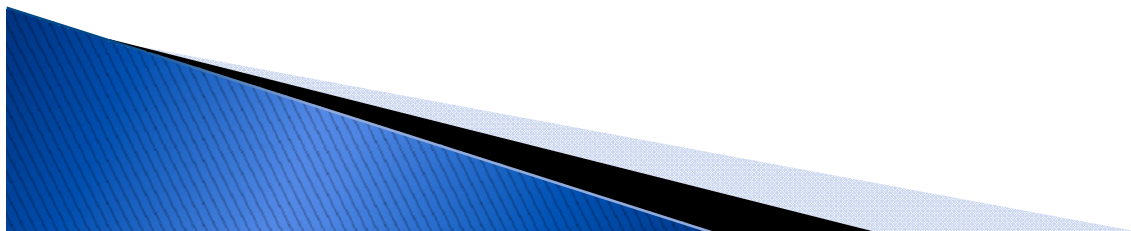
Objectives

Main objective:

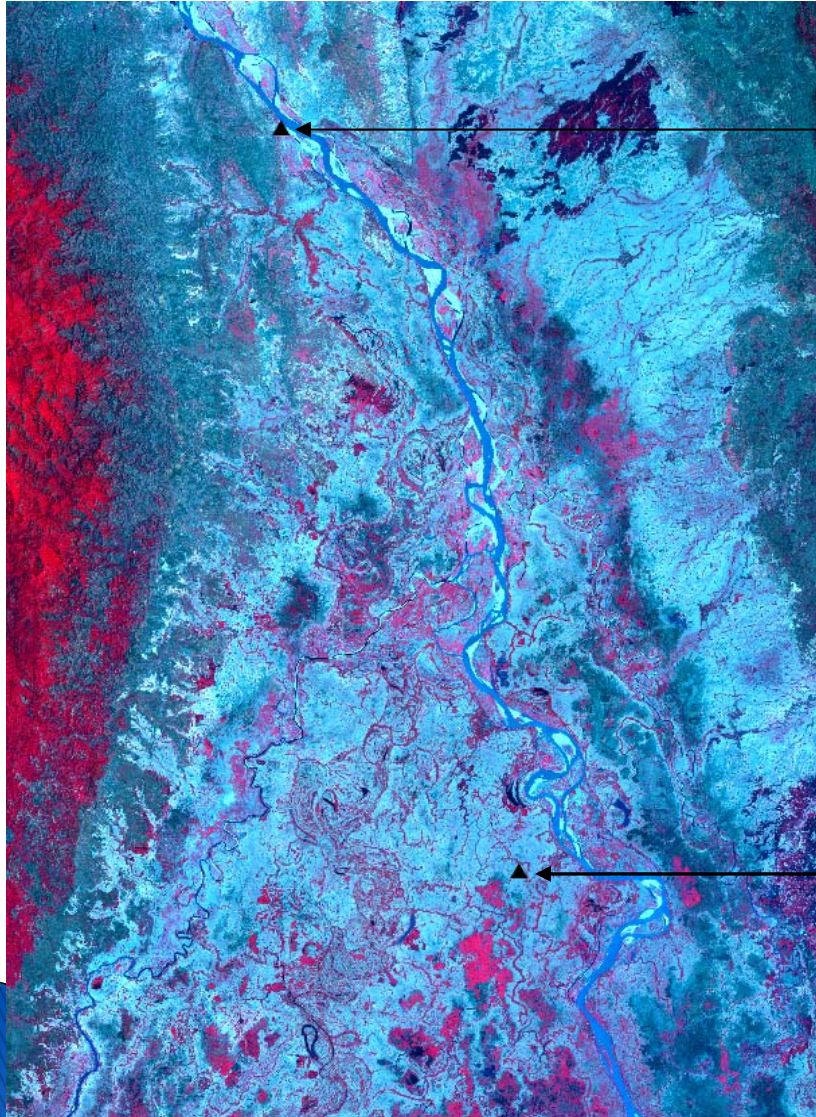
- ▶ To develop flood hazard map using Satellite data, Flow data, Ancillary data and Hydraulic model HEC-RAS for Ayeyarwady River, Myanmar

Sub objective(s):

- ▶ To develop a detailed landuse map from recent satellite data of the study area.



Location of Study Area



Seiktha (u/s)

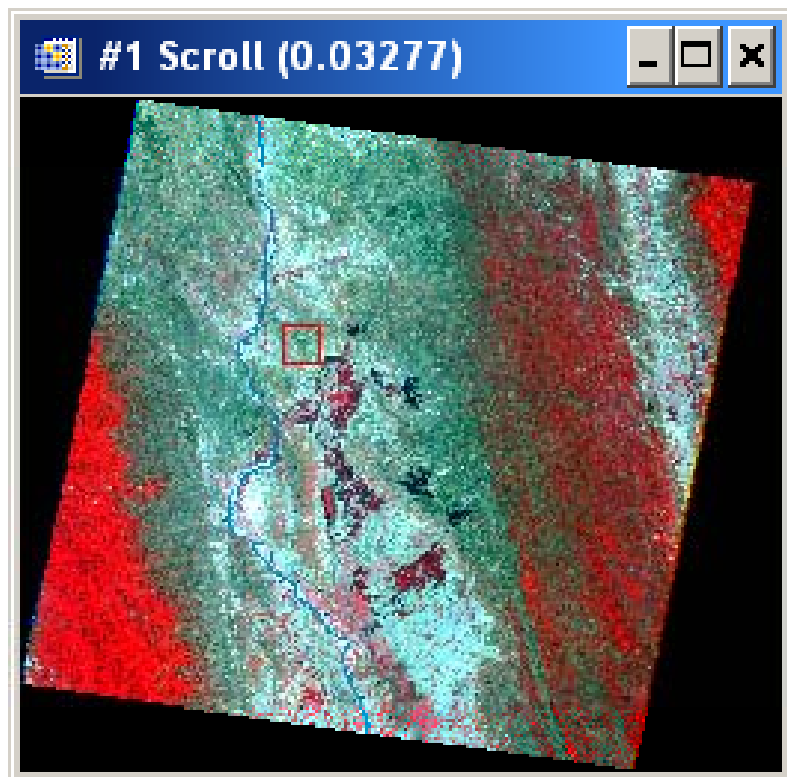
Lat. $18^{\circ}24'N$ and Lon.
 $95^{\circ}12'E$

Approximate length of the
river under study 143 Kms

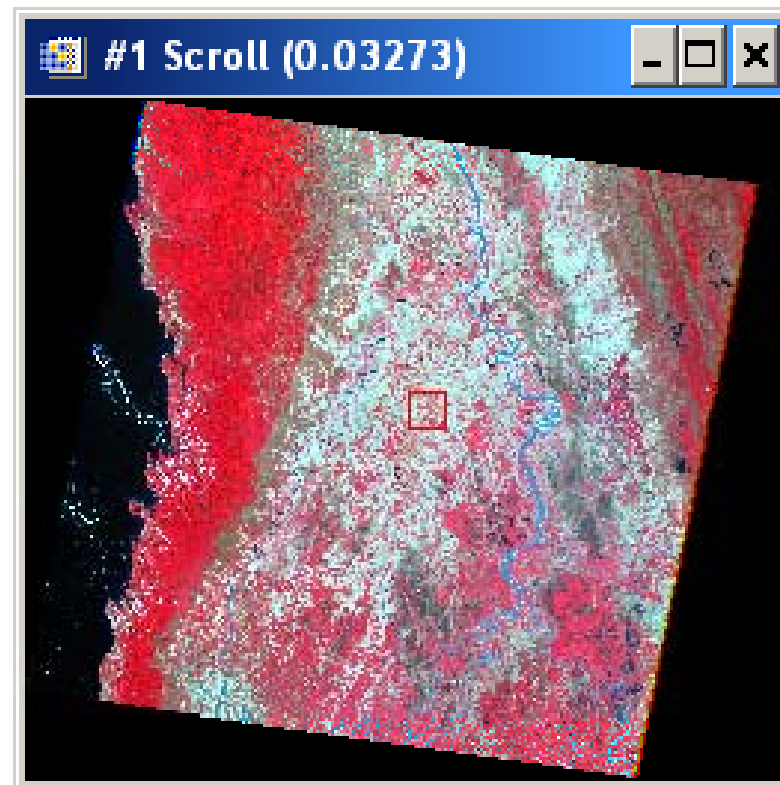
Zalun (d/s)

Lat. $17^{\circ}30'N$ and Lon.
 $95^{\circ}30'E$

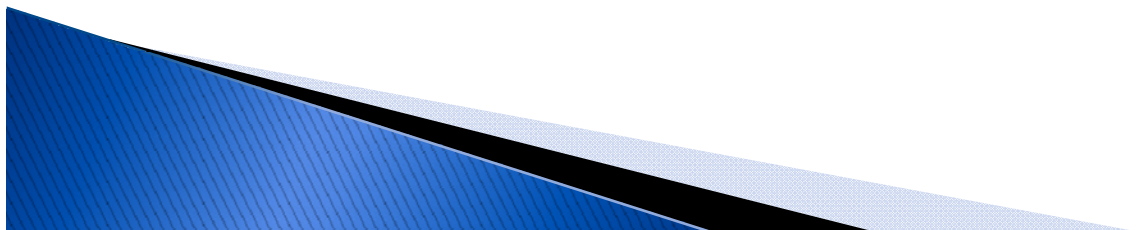
Satellite Images..



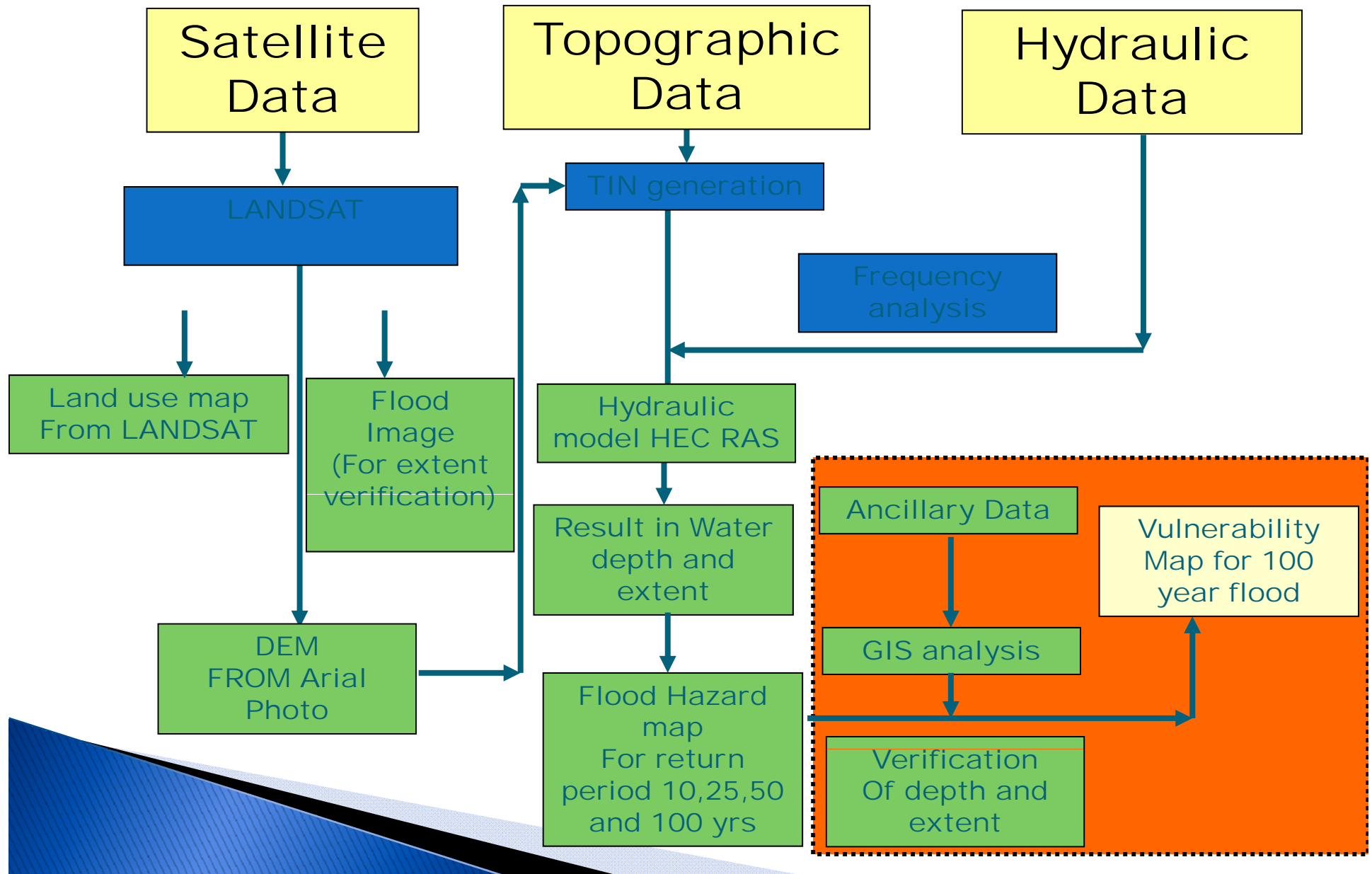
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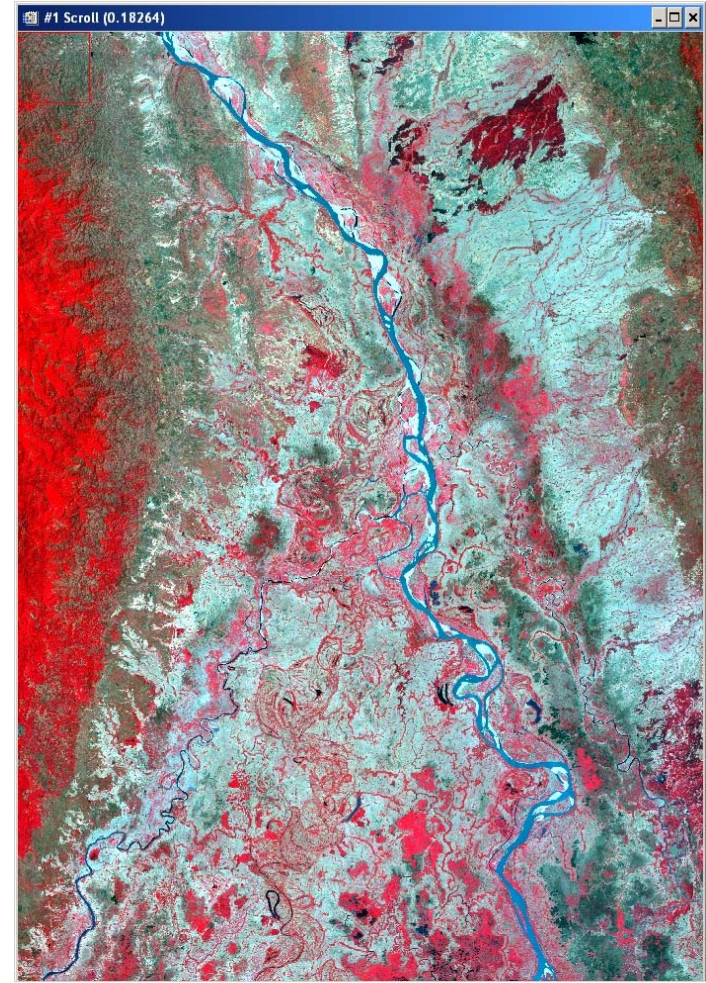
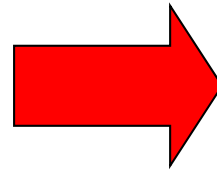
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YEAR2000
Path133, Row 48

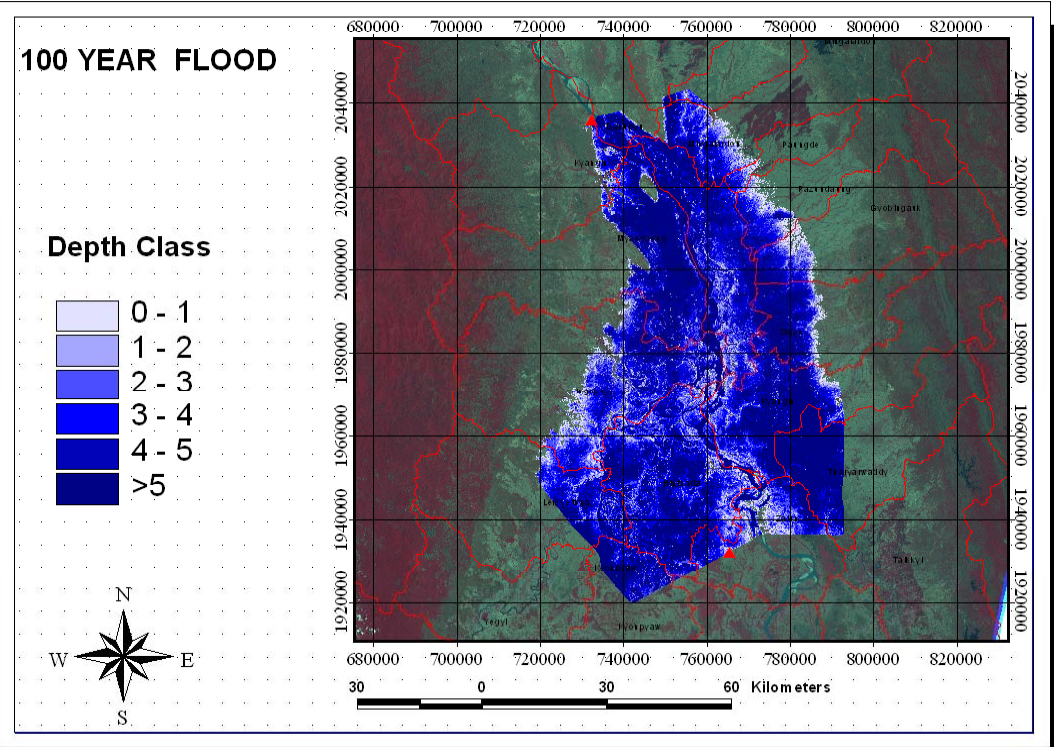
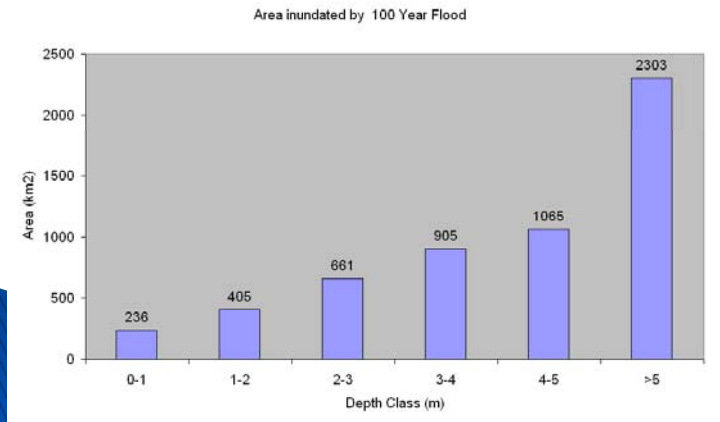
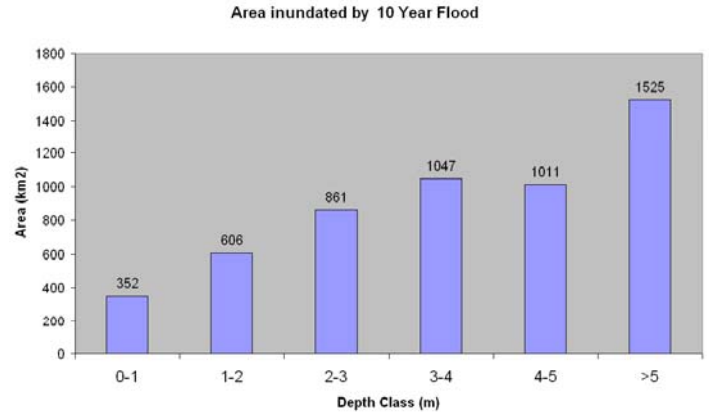
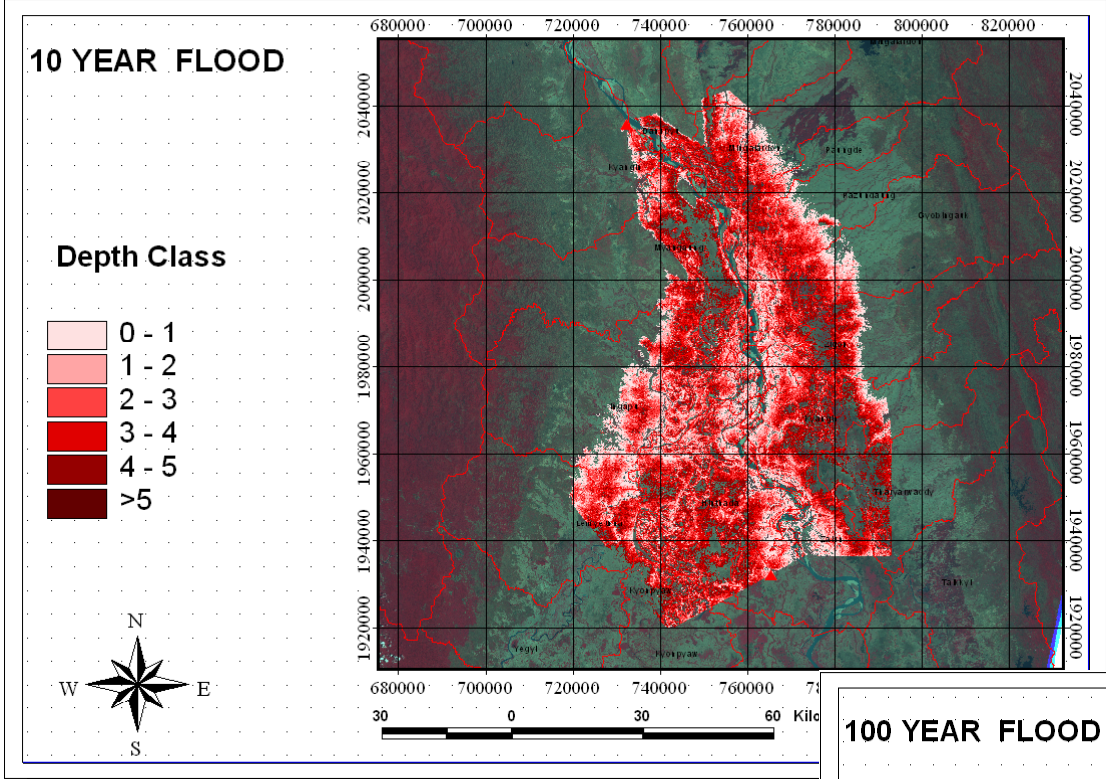


Methodology



Results





Training Workshop on Installation of Integrated Flood Analysis System (IFAS)

Supported by JAXA

22 -24 June 2010

Nay Pyi Taw, Myanmar

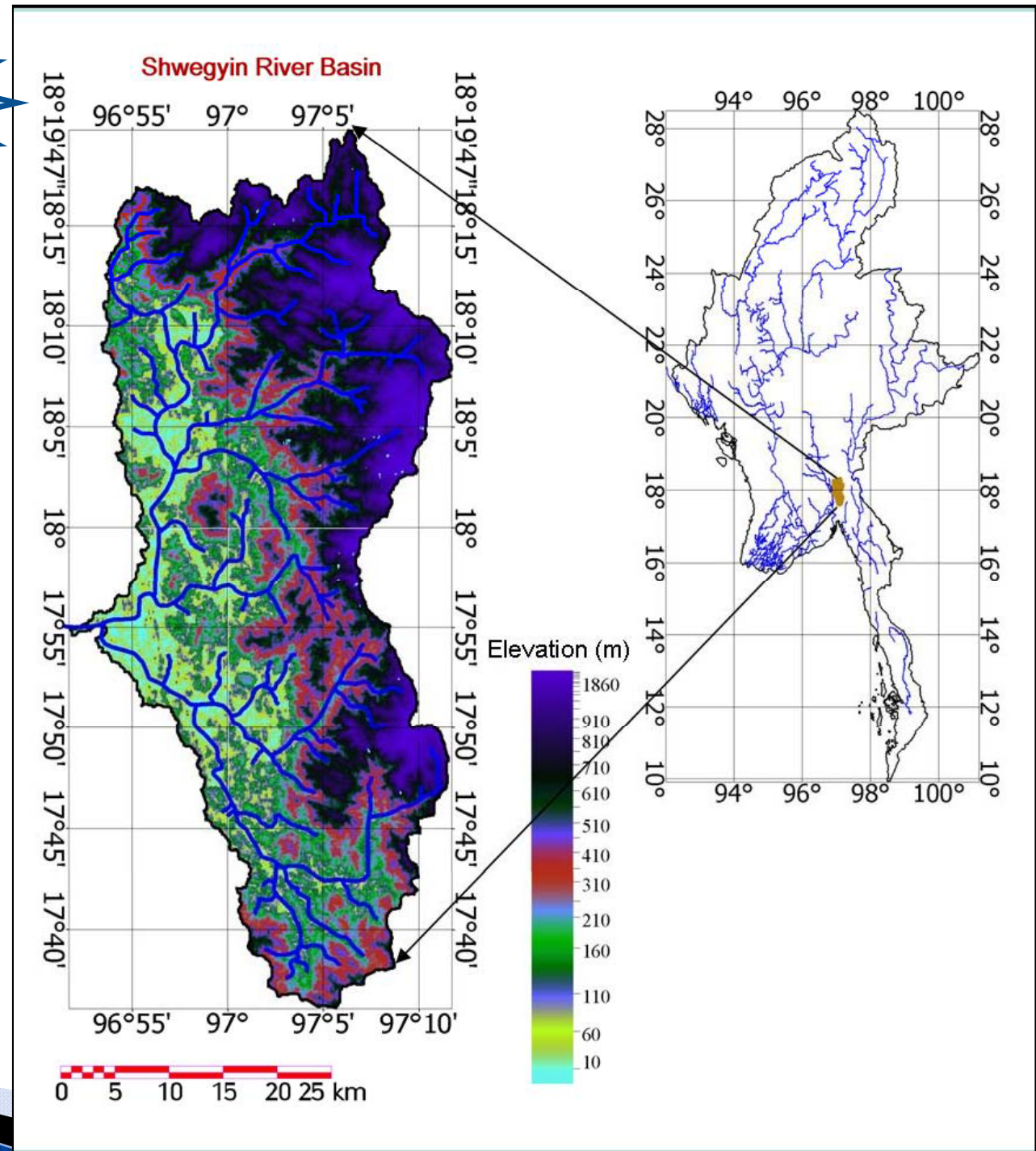


Objectives

- ❑ To build capacities to be able to undertake hydrological prediction/ forecasting in poorly-gauged basins through practicing IFAS (Integrated Flood Analysis System)
- ❑ To enhance quick and effective implementations of flood forecasting and analyzing system for flood risk management and disaster mitigation

Study Area

- It stretches for about 42 miles from north to south and 19 miles from east to west,
- It is situated on the mouth of Shwegyin River
- Shwegyin River catchment is about 1747 km²
- Topography of the basin is varying from 40 ft to 6200 ft above Mean Sea Level



**Utilization of satellite-based
rainfall as an input data**

Product Name	3B42RT	CMORPH	QMORPH	GSMaP
Builder	NASA/GSFC	NOAA/CPC	NOAA/CPC	JAXA/EORC
Coverage	60° N – 60° S			
Spatial Resolution	0.25° (25 km)	0.25° (25 km)	0.25° (25 km)	0.1° (10 km)
Temporal Resolution	3 hr	3 hr	30 min	1 hr
Delivery delay	10 hr	15 hr	2.5 hr	4 hr
Data Archive	Since Dec. 1997	Since Dec. 2002	-	Since Dec 2007

***.bin**

***.dat**

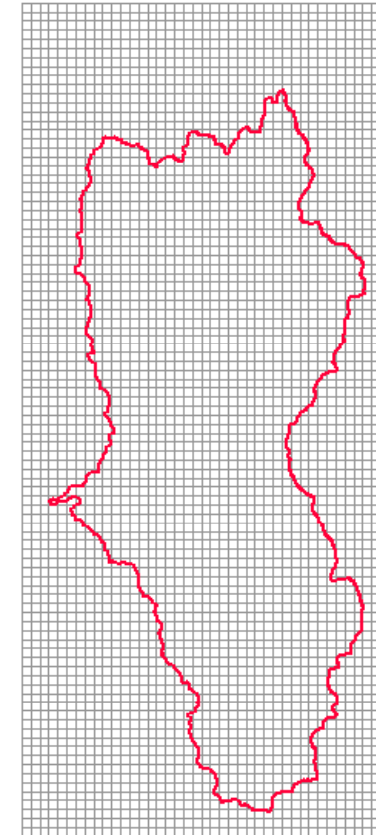
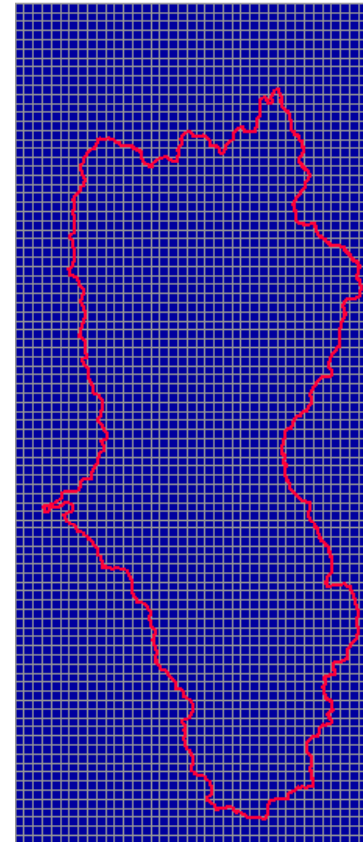
Satellite-based RF

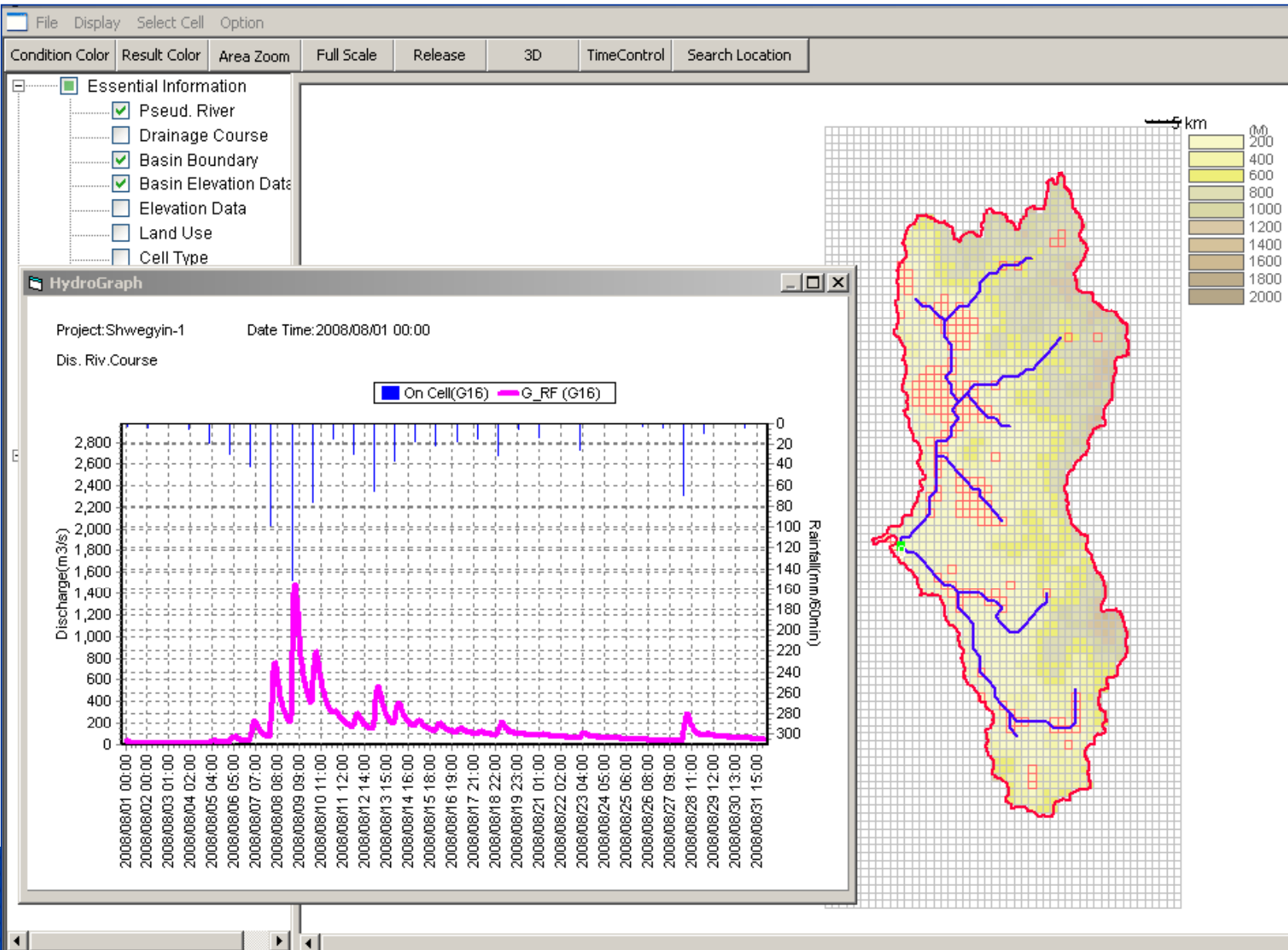
View	Data	Trans
1	<input checked="" type="checkbox"/> Rainfall	0%
2	<input checked="" type="checkbox"/> Land Use	0%
3	<input checked="" type="checkbox"/> Elevation Data	0%

Row	Col	Rainfall
-----	-----	----------

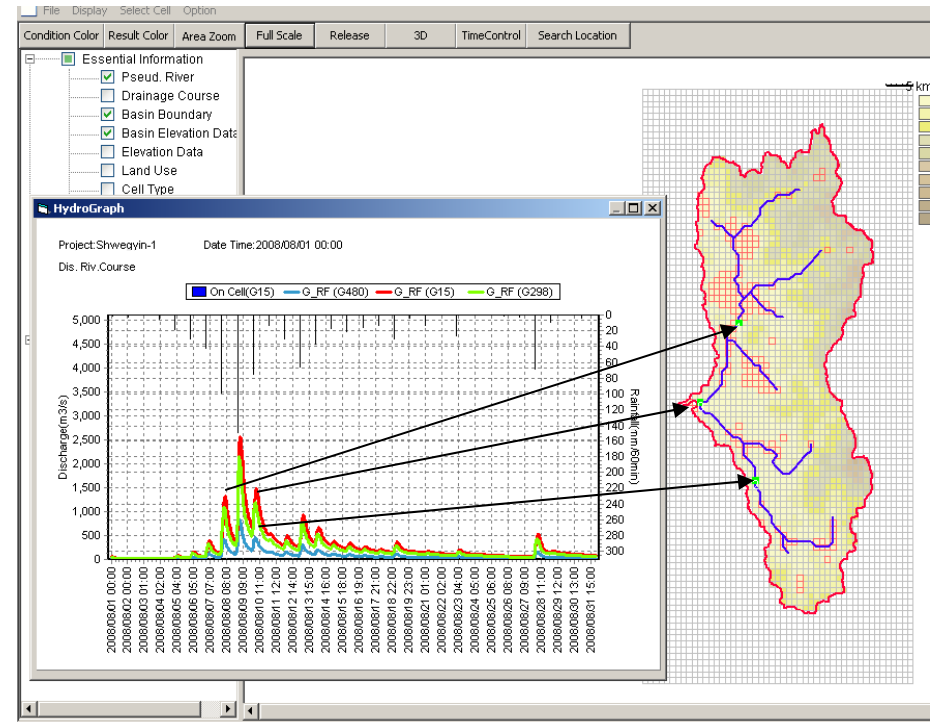
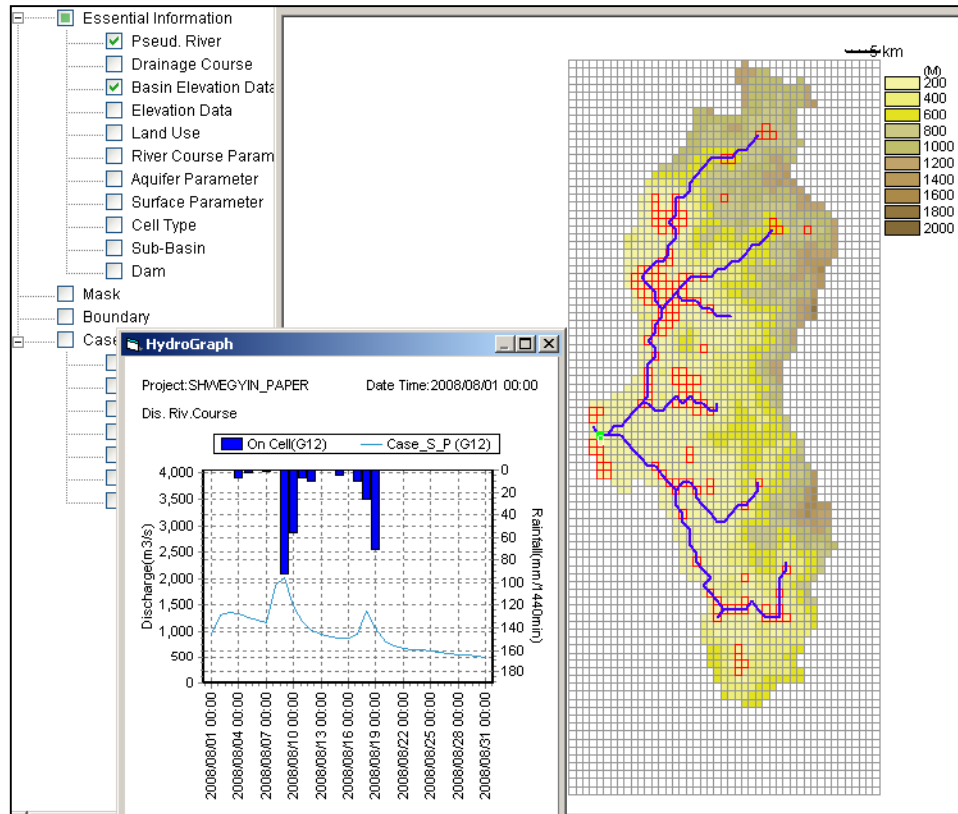
Rainfall Data [RF-Sat]			
Data Period:			
8/1/2008 - 8/20/2008 11:00:00 PM			
	Date of Data	UM	UE
1	2008/08/01 00:00		
2	2008/08/02 00:00		
3	2008/08/03 00:00		
4	2008/08/04 00:00		
5	2008/08/05 00:00		
6	2008/08/06 00:00		

Ground-based RF

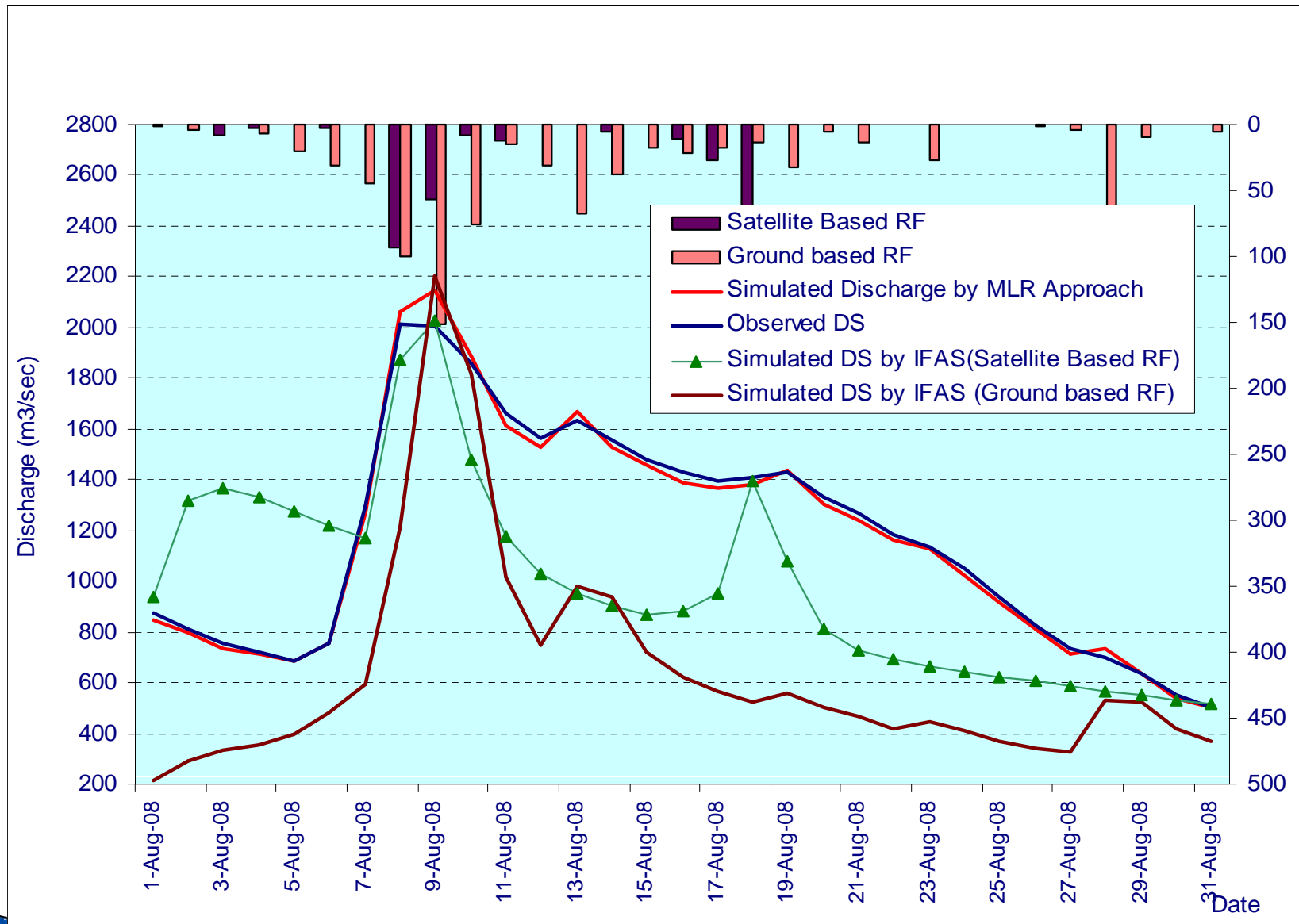




Simulated process by using IFAS Model



Comparison of Simulated flood and observed flood



Need to Calibrate for good accuracy

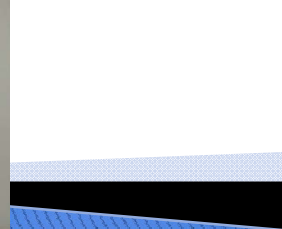


Geoinformatics Center
Asian Institute of Technology

Flood Hazard Mapping in Homalin City in the Chindwin River Basin

(10-28 September 2012)

1st Phase



Field Visit

5-9 Nov, 2012

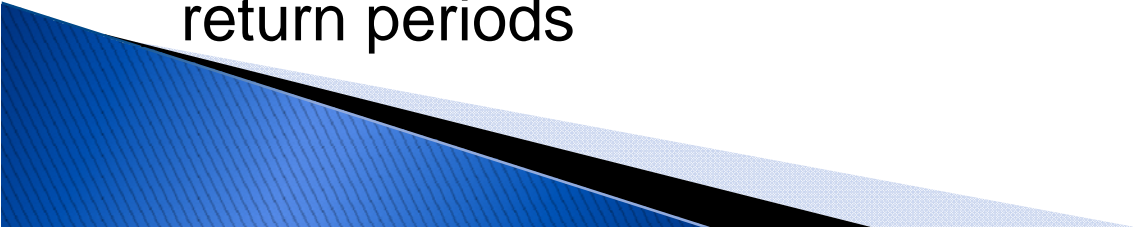




2nd Phase

3-21 December 2012

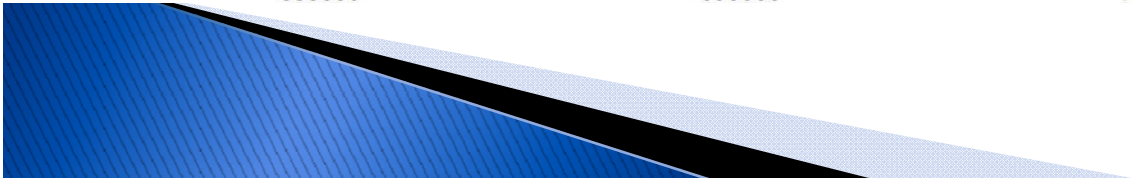
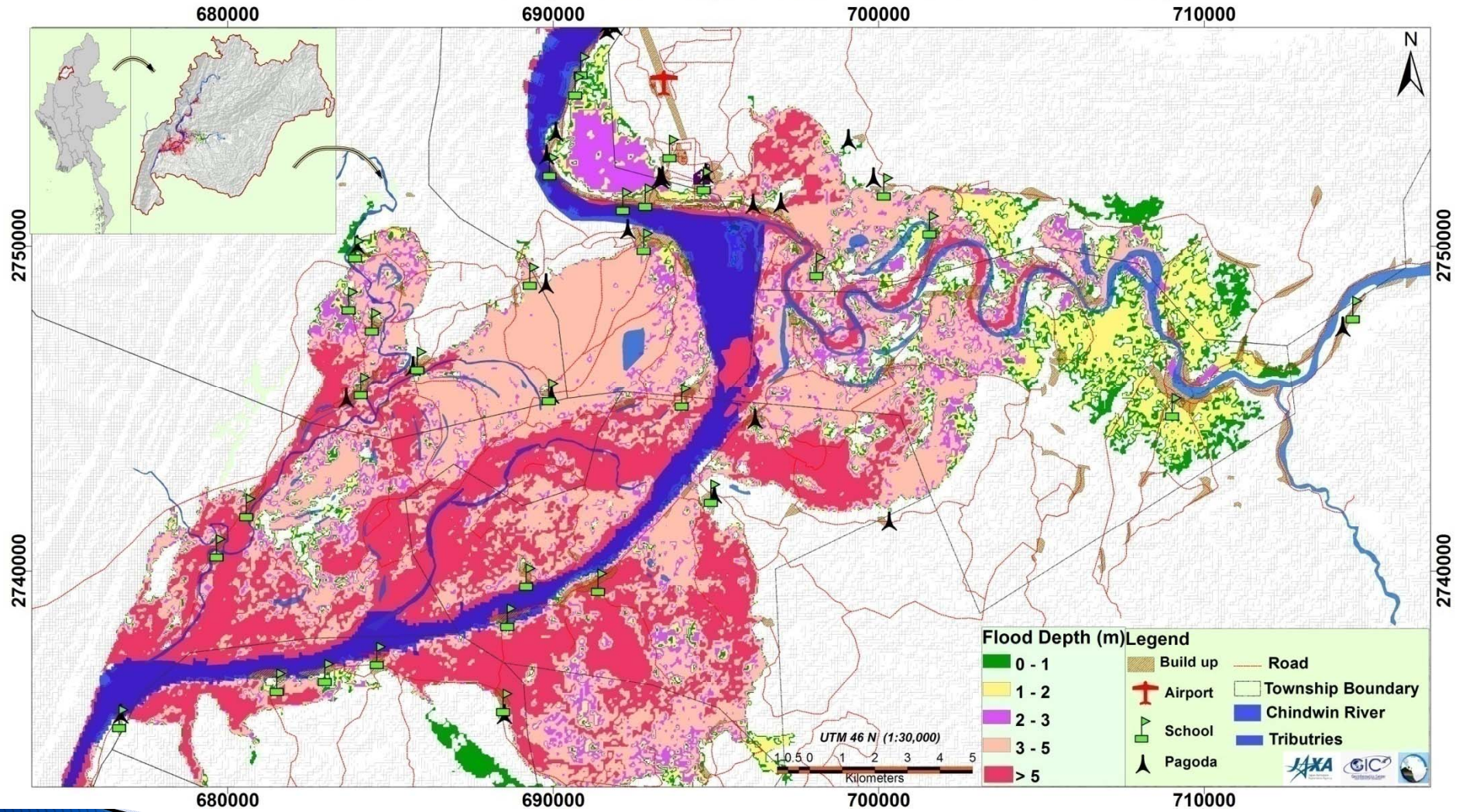
Objectives

- 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, PRISM)
 - MODIS
- Population Data
 - Total population district level in the study area (2004)
- Ancillary Data
 - GIS shape files of rivers, banks, roads, schools, monastery, market etc.

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

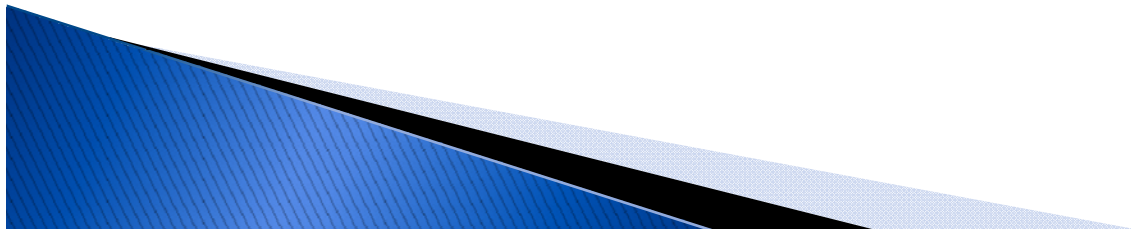


Project Phase I (2013)

Sponsored by Japan Aerospace Exploration Agency (JAXA)
Technical Assistance by Geoinformatics Center, Asian Institute of Technology

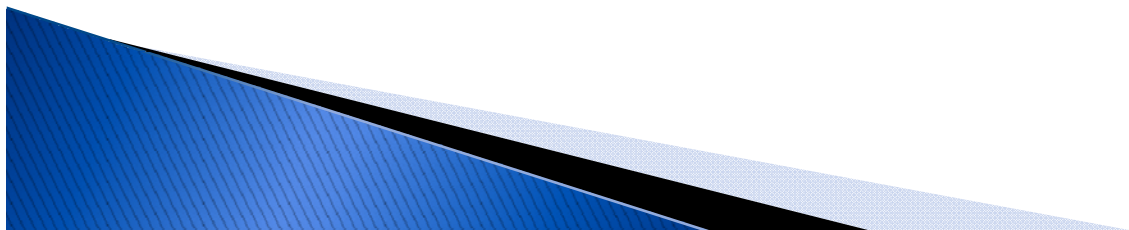
Workshop and Training on Applications of Remote Sensing and GIS For Disaster Management

18-22 Nov, 2013



Future Plan

- ✓ Landslide Susceptibility Mapping Using Remote Sensing and Modelling Techniques
- ✓ Assessment Glaciers in Northern Myanmar area by using Remote Sensing Data and GIS Technology
- ✓ Analysis of Landuse/Landcover Changes by using Remote Sensing Data and GIS Technology
- ✓ Developing the agro-ecological zoning Changes by using Remote Sensing Data and GIS Technology
- ✓ Assessment of Drought Area by using Remote Sensing data
- ✓ Improving the efficient implementation of flood forecasting and warning system by using Satellite Rainfall Data





THANK YOU