WORLD WATER DAY
22 MARCH 2017 - WASTE WATER

Flood Inundation Analysis and Flood Assessment for Nyaungdon Township

Presented by

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Ministry of Transport and Communication

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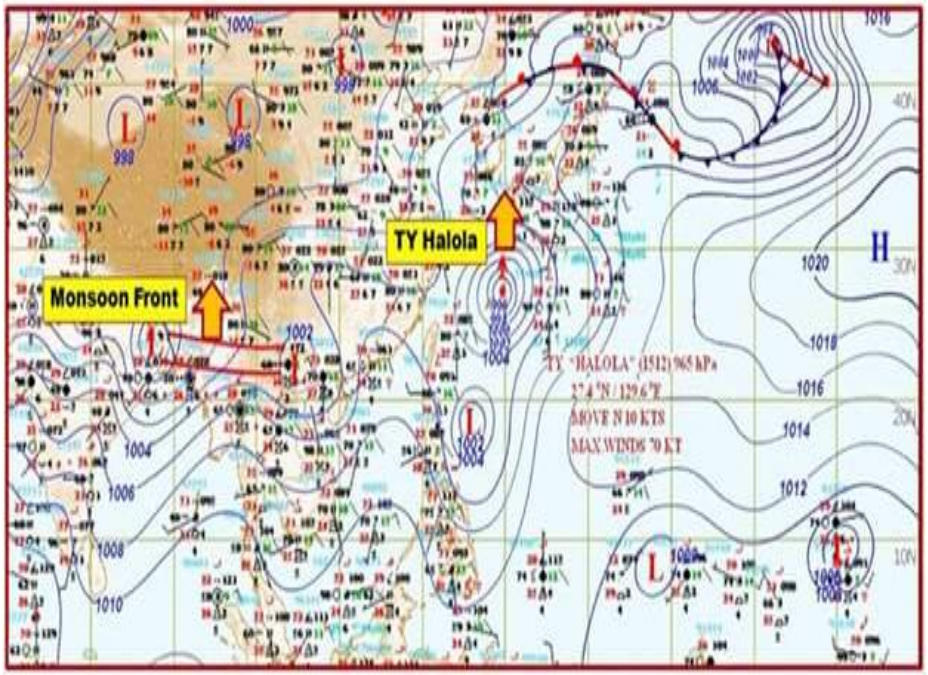
MICC 2, Nay Pyi Taw

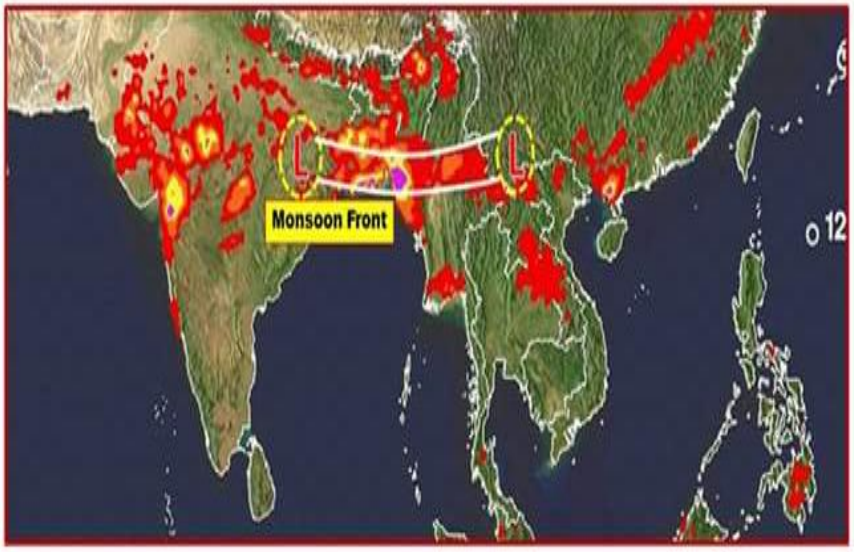
The presentation will cover

- Recent flood condition
- Location and background of study area
- Data sources
- RRI Model structure overview
- Model simulation
- Result and discussion
- Conclusion and recommendation

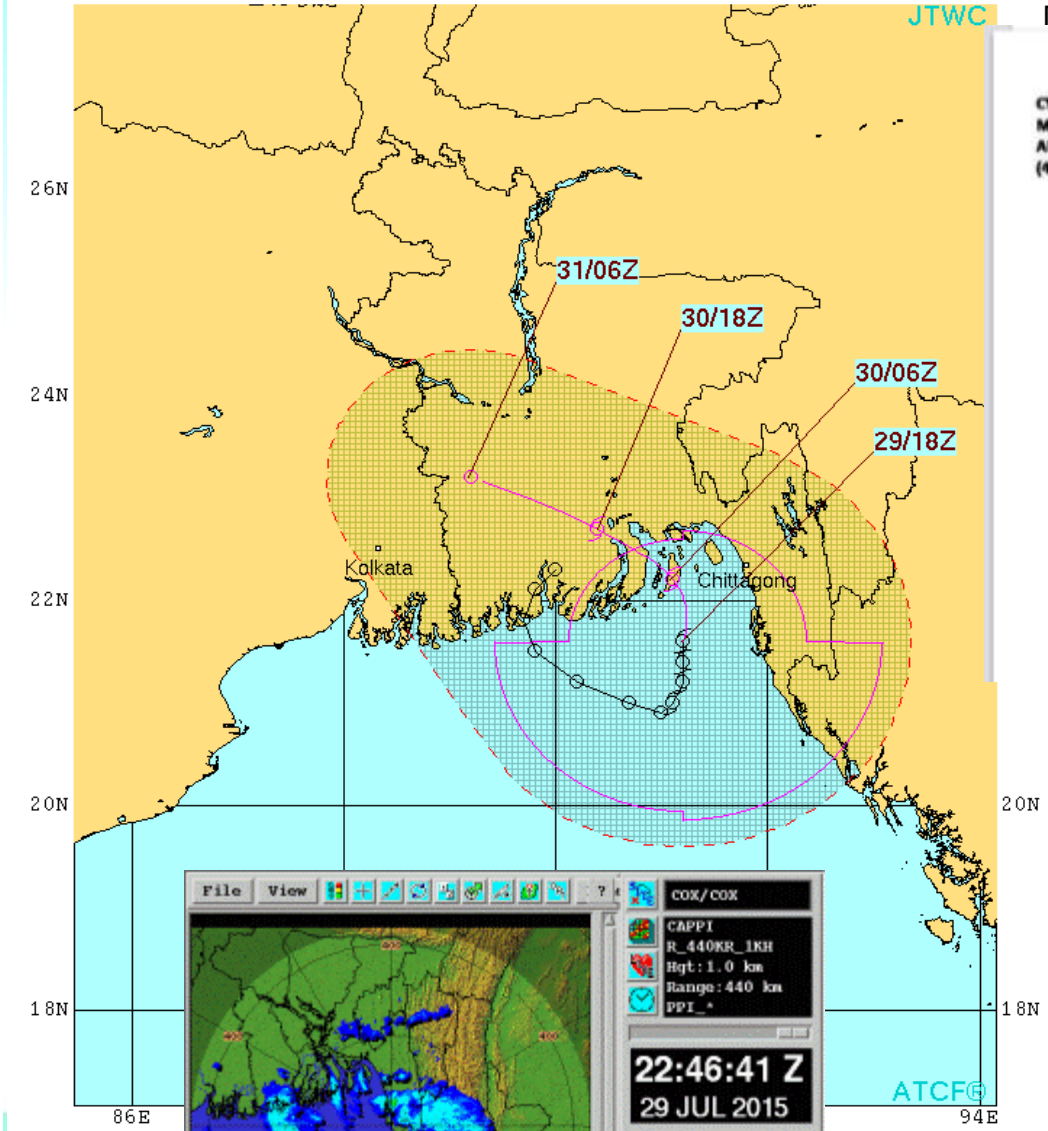
Recent flood condition in Myanmar

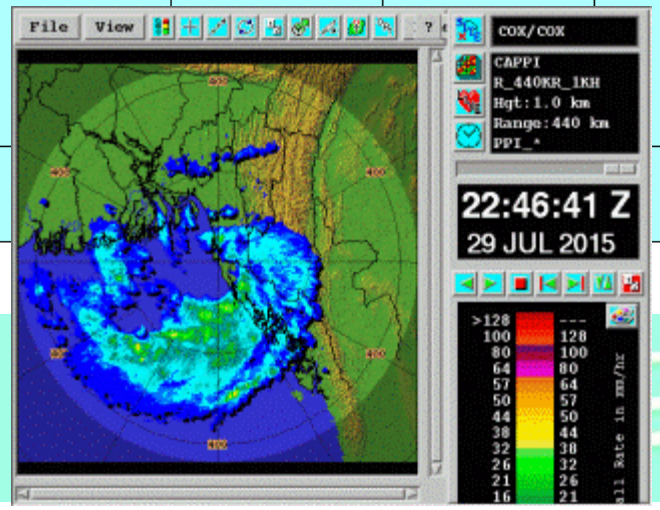
Recently, Myanmar had to face the Meteorological and Hydrological hazards. Flood occurred in 13 region due to the bad weather impact.
The strengthen monsoon and cyclone **KOMEN** caused the water related disaster as landslide, debris flow and flood(riverine flood & flash flood).

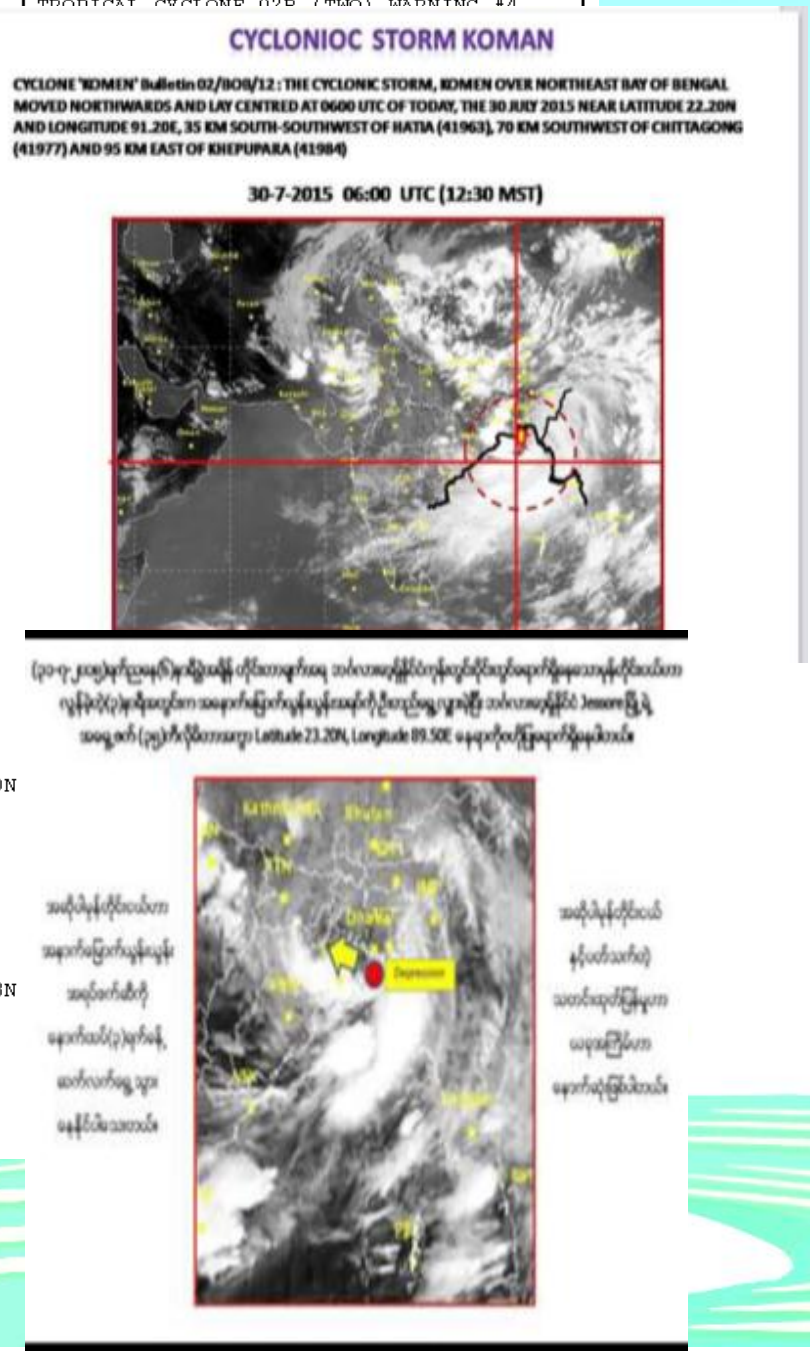




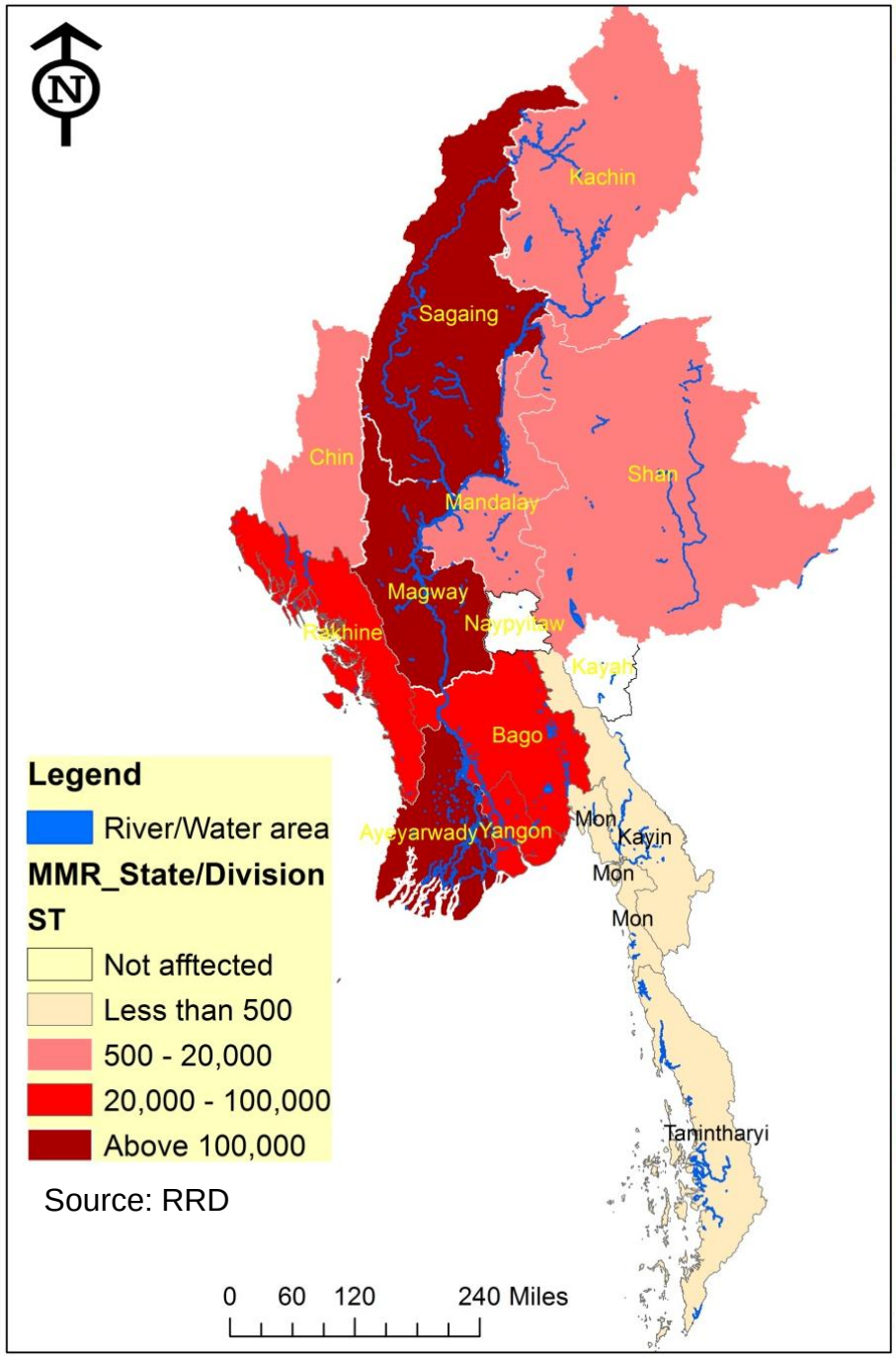
Cloud covered the whole country by Cyclone KOMEN

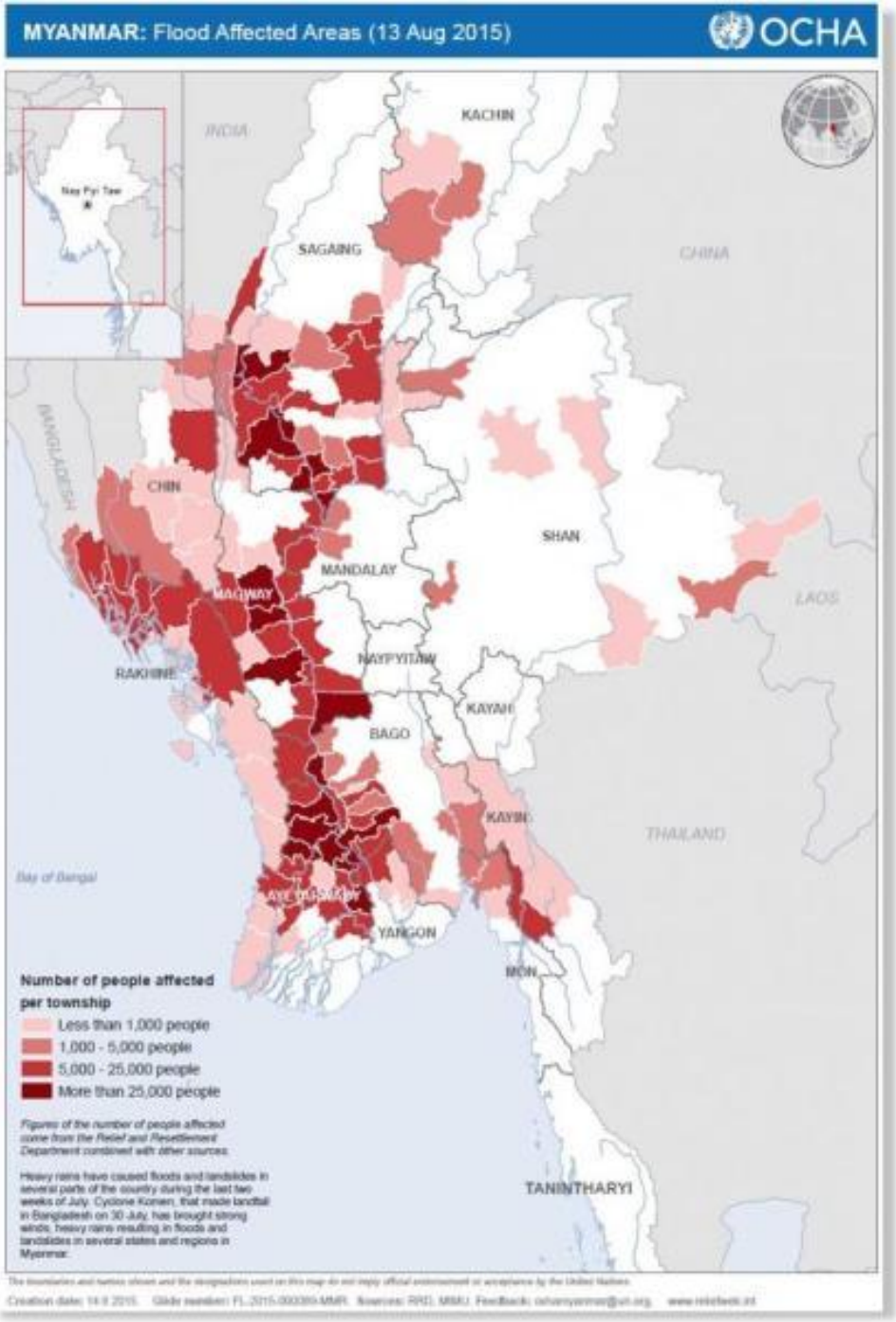




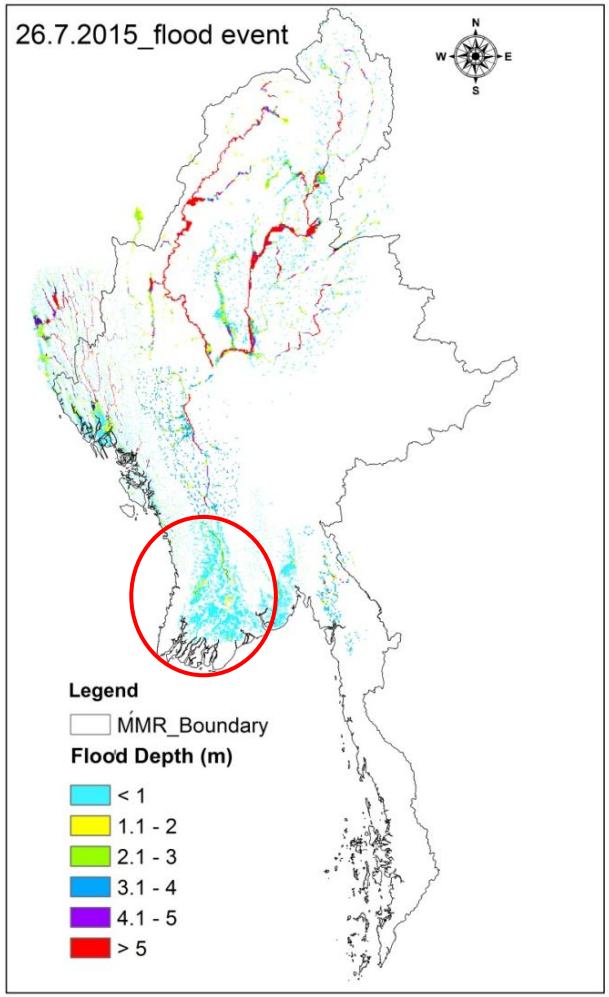


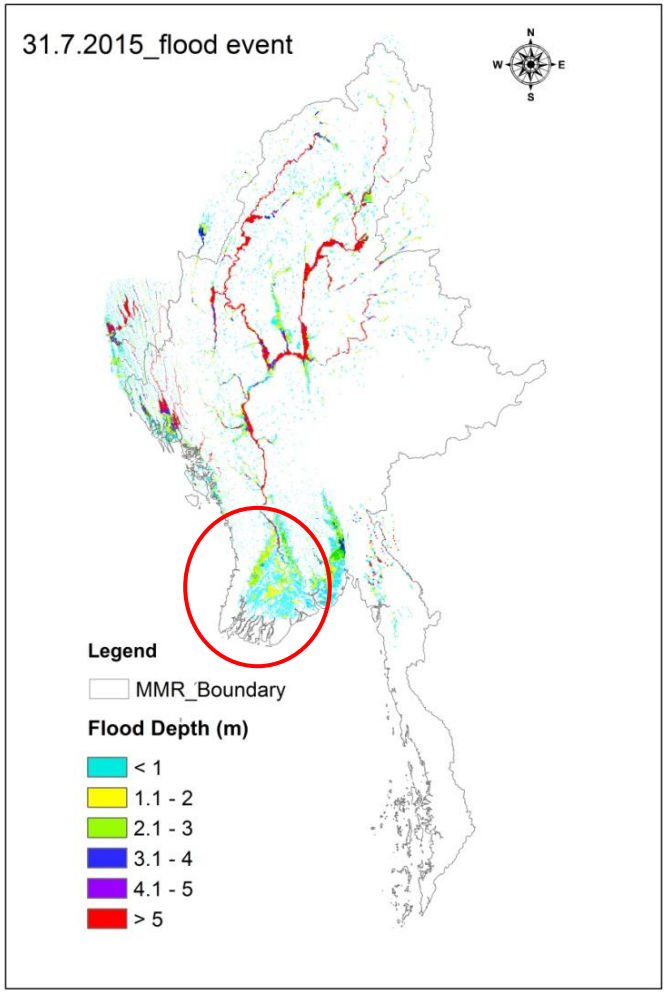
Flood affected areas and affected people

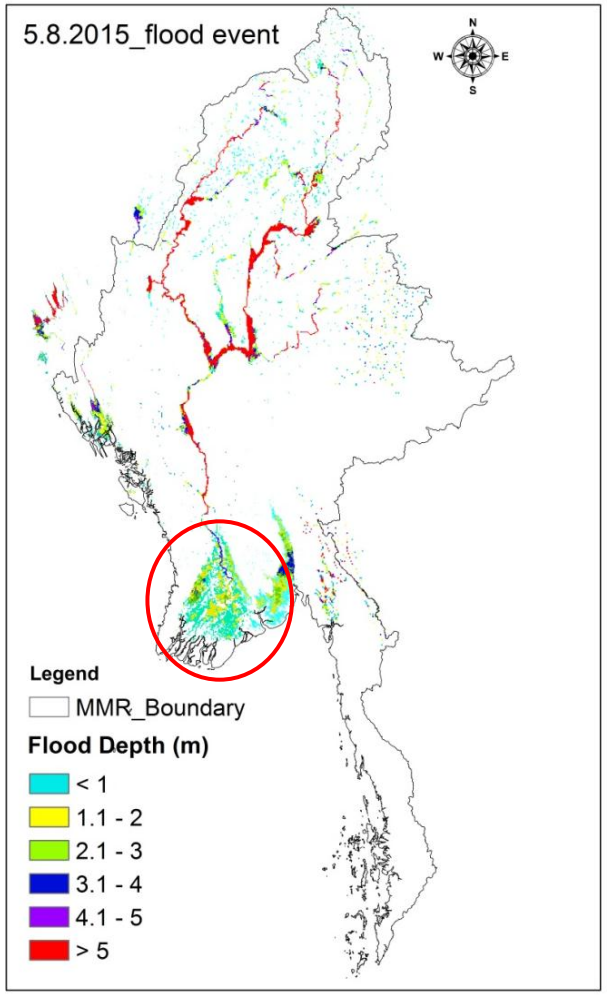




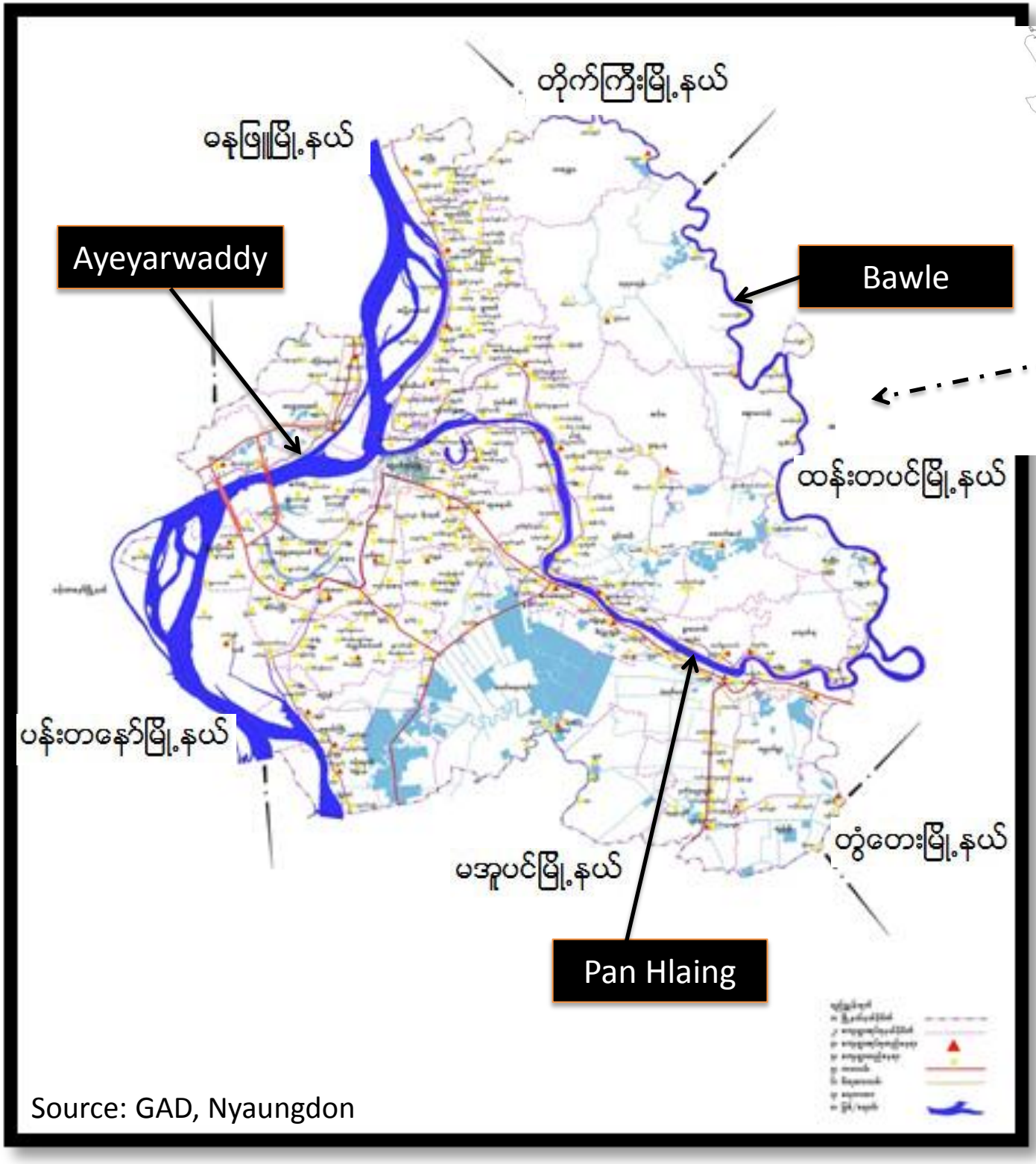
Estimate inundation areas in Myanmar(July-August 2015)

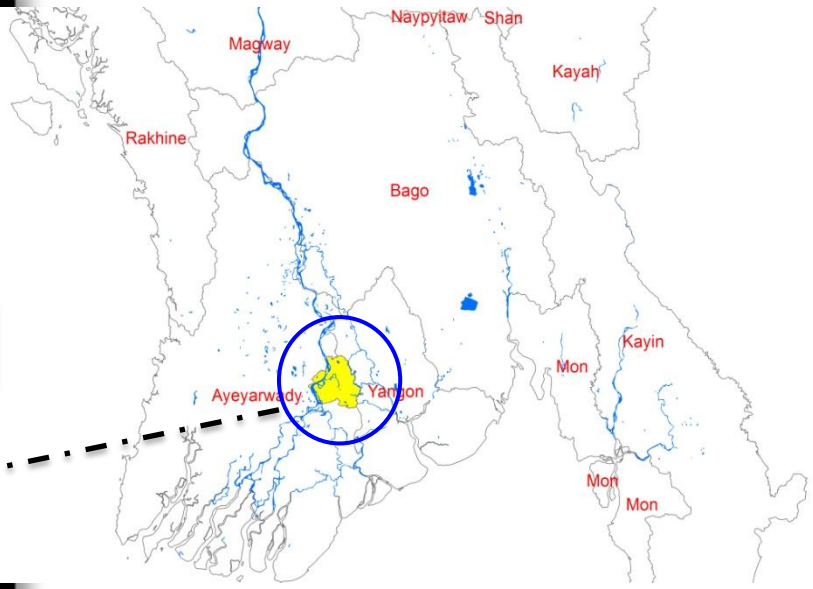






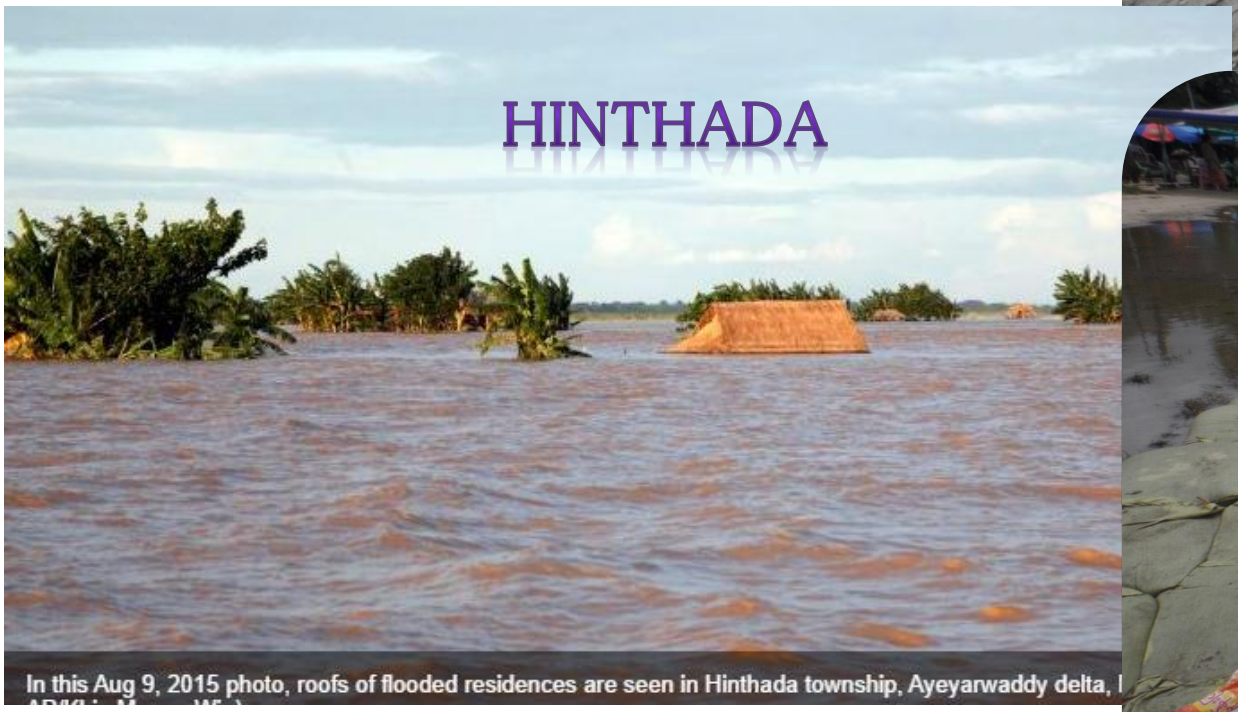
- Software : RRI Model
- DEM : USGS Hydroshed (grid size 2Km)
- Rainfall : 3B42RT (Satellite)
- Model parameter : Standard value





Lat: 16.85 deg to 17.21deg
Long: 95.55 deg to 95.90 deg
Population: 215906
Area: 899.72Km^2
Village: 41


Nyaung Don
A local volunteers group carry supplies over floodwaters in Kyouk Taing village near Nyaung Don township in Myanmar's Irrawaddy region on Aug 7, 2015. (Photo: AFP/Ye Aung Thu)


HINTHADA
In this Aug 9, 2015 photo, roofs of flooded residences are seen in Hinthada township, Ayeyarwaddy delta,

Top 40 Townships, destroyed farmland per capita (destroyed farmland in acres) – Data from MOAI

Rakhine	Ayeyarwaddy	Bago	Magway	Sagaing	Yangon	Kachin
Mrauk-U 75,242	Yegyi 31,054	Monyo 17,756	Pwintbyu 35,084	Kawlin 26,556	Taikkyi 40,022	Mogaung 8,289
Kyauktaw 41281	Myanaung 33,966	Thayarwaddy 20,896	Gangaw 14,259	Kale 39,809	Htantabin 7,930	
Minbya 36,079	Ingapu 30,267	Shwedaung 13,824	Sidoktaya 4,267	Tamu 7,884		
Ann 11,397	Kyaunggon 17,502	Minhla 13,246		Wetlet 8,972		
Ponnagyun 10,094	Ngaungdon 19,076	Letpadan 18,538		Kanbalu 10,968		
Myebon 8,550	Lemyethna 8,481	Gyobingauk 8,829		Mingin 4,356		
Buthidaung 16,664	Zalun 12,160	Thegon 8,763				
Pauktaw 7,424	Danubyu 11,143	Okpho 5,771				
	Thabaung 7,263	Shwegyin 3,583				
		Zigon 2,955				
		Paungde 5,562				

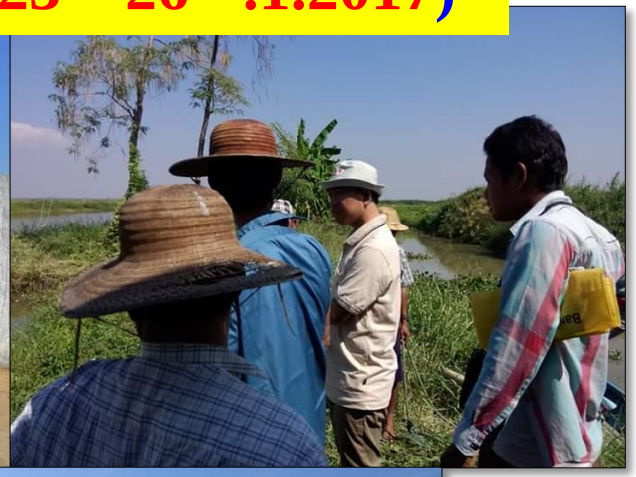
Destroyed farmland in acres (2015-flood event)

Field trip survey to Nyaung Don City area (18.5.2016)

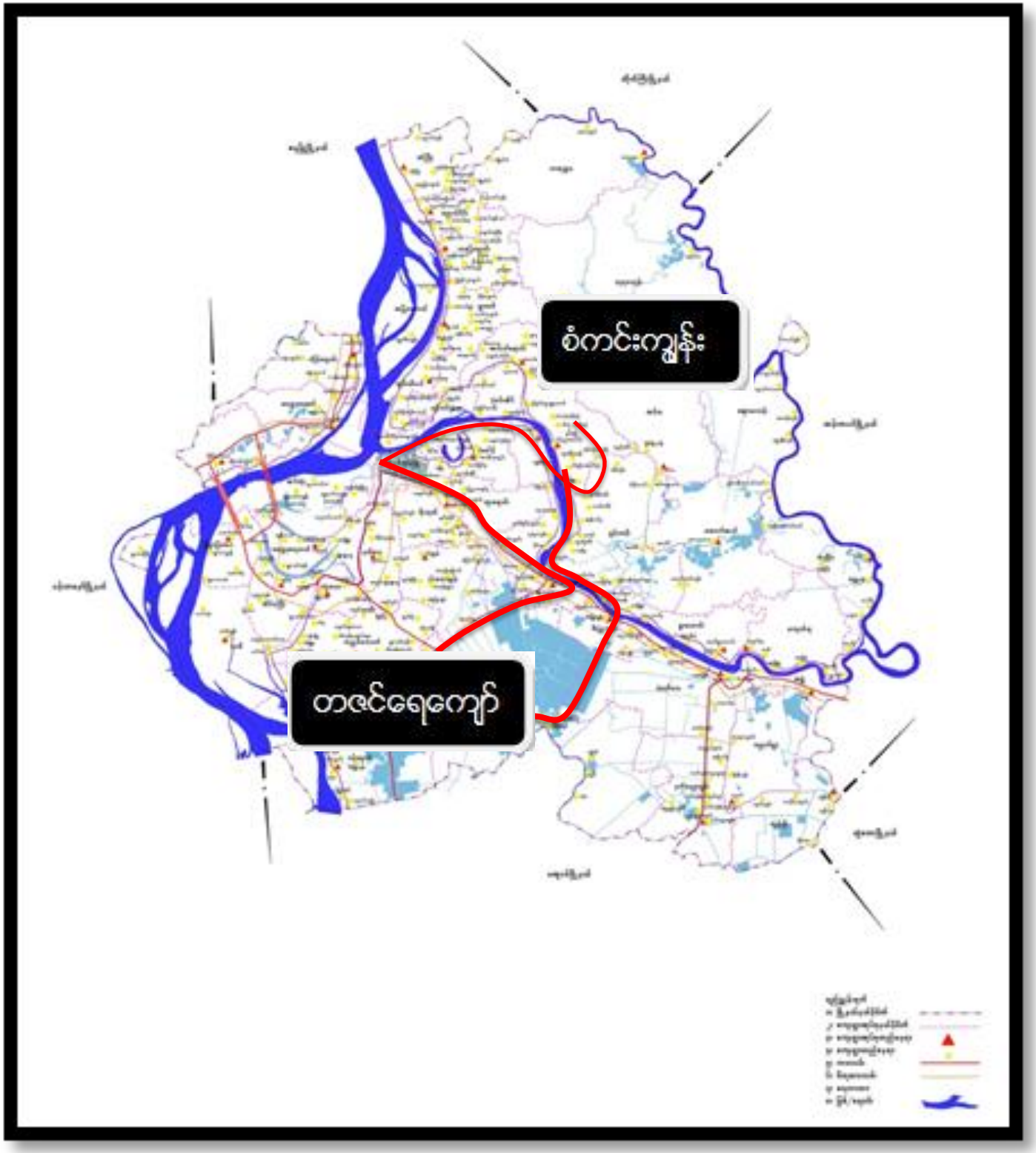
Final meeting of ADB 8456: Part II Flood Management at Royal ACE Hotel, Nay Pyi Taw

Field trip survey to Nyaung Don City area (23rd-26th .1.2017)



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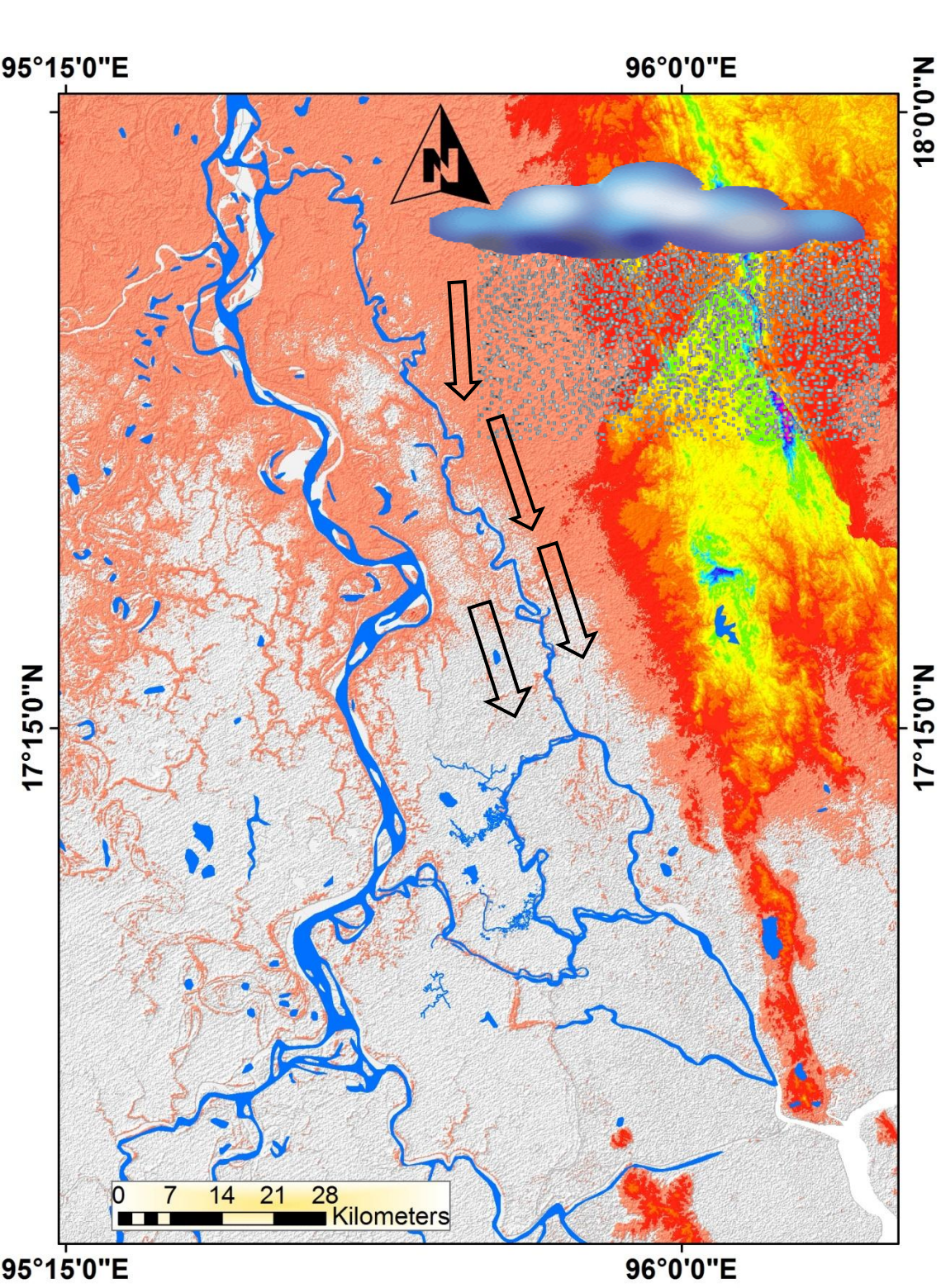
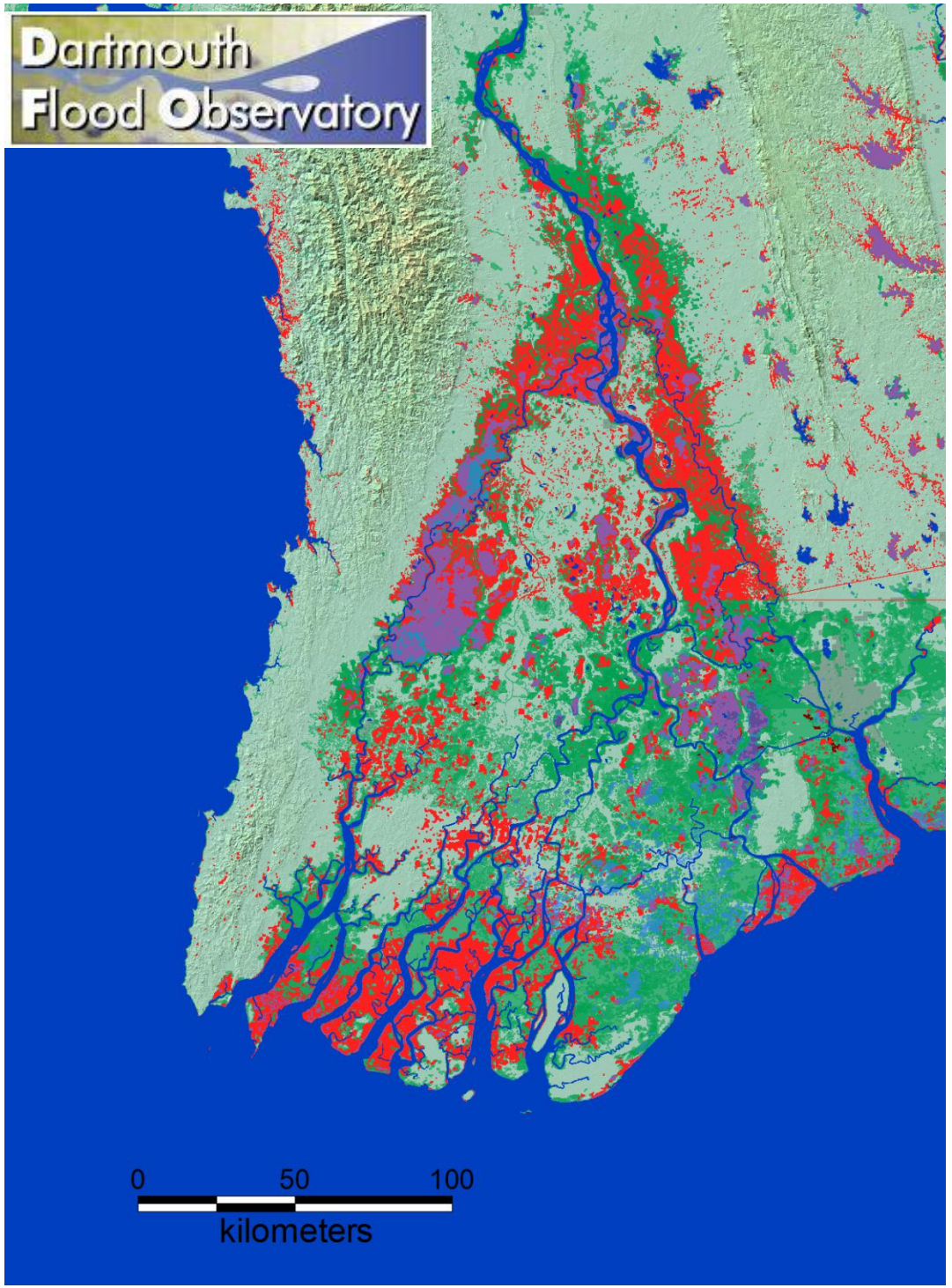
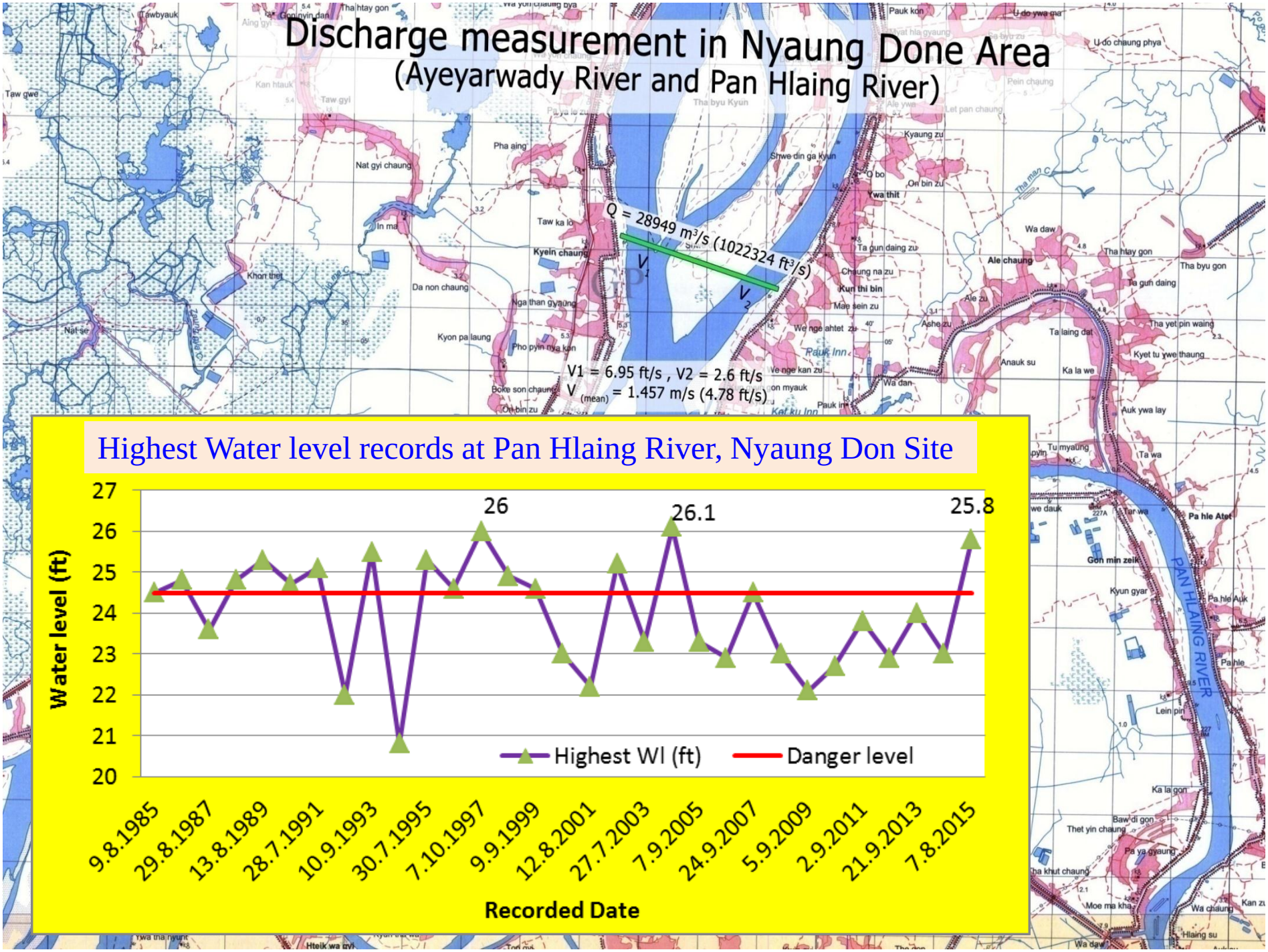




http://floodobservatory.colorado.edu/

Discharge measurement in Nyaung Done Area
(Ayeyarwady River and Pan Hlaing River)

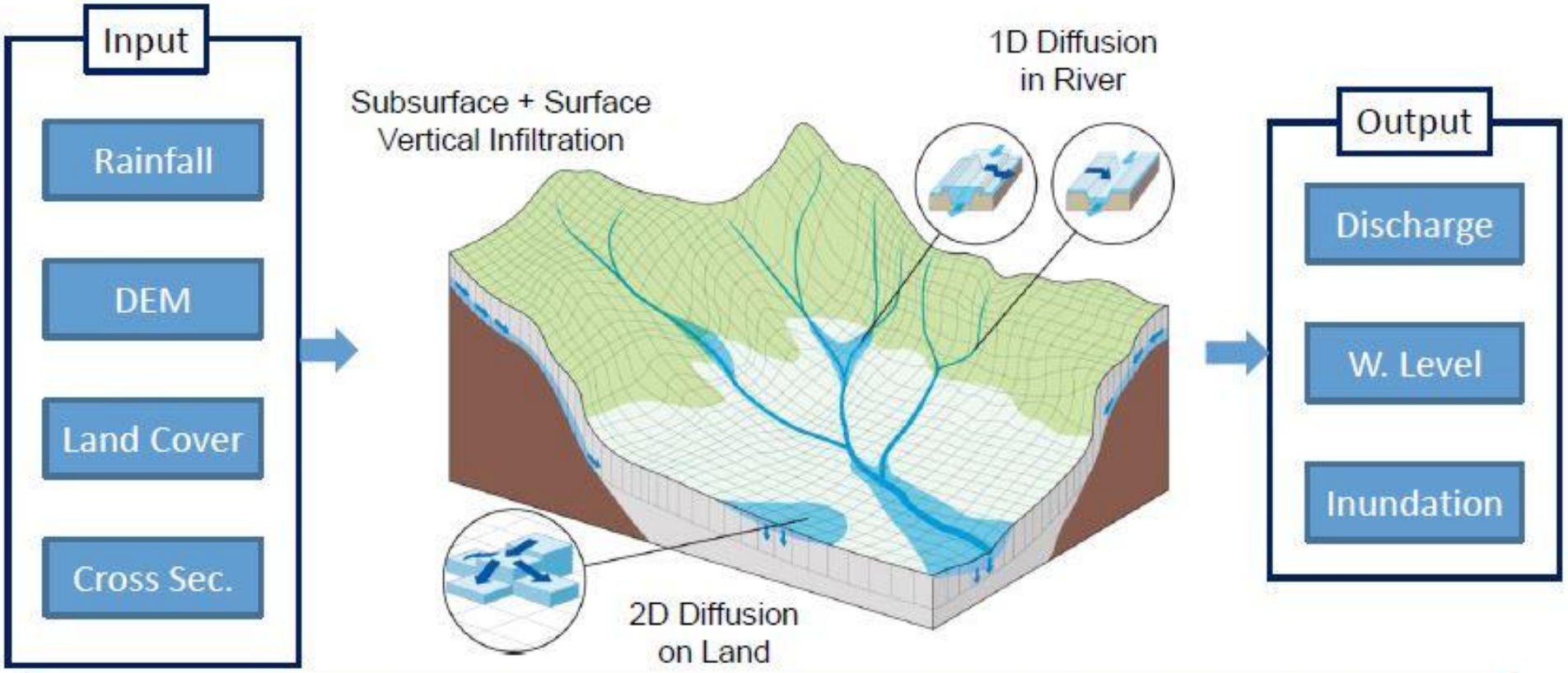


Highest Water level records at Pan Hlaing River, Nyaung Don Site

Data Sources: Department of Irrigation and Water Utilization Management, Nyaung Don

Overview of model structures

Rainfall-Runoff-Inundation Model

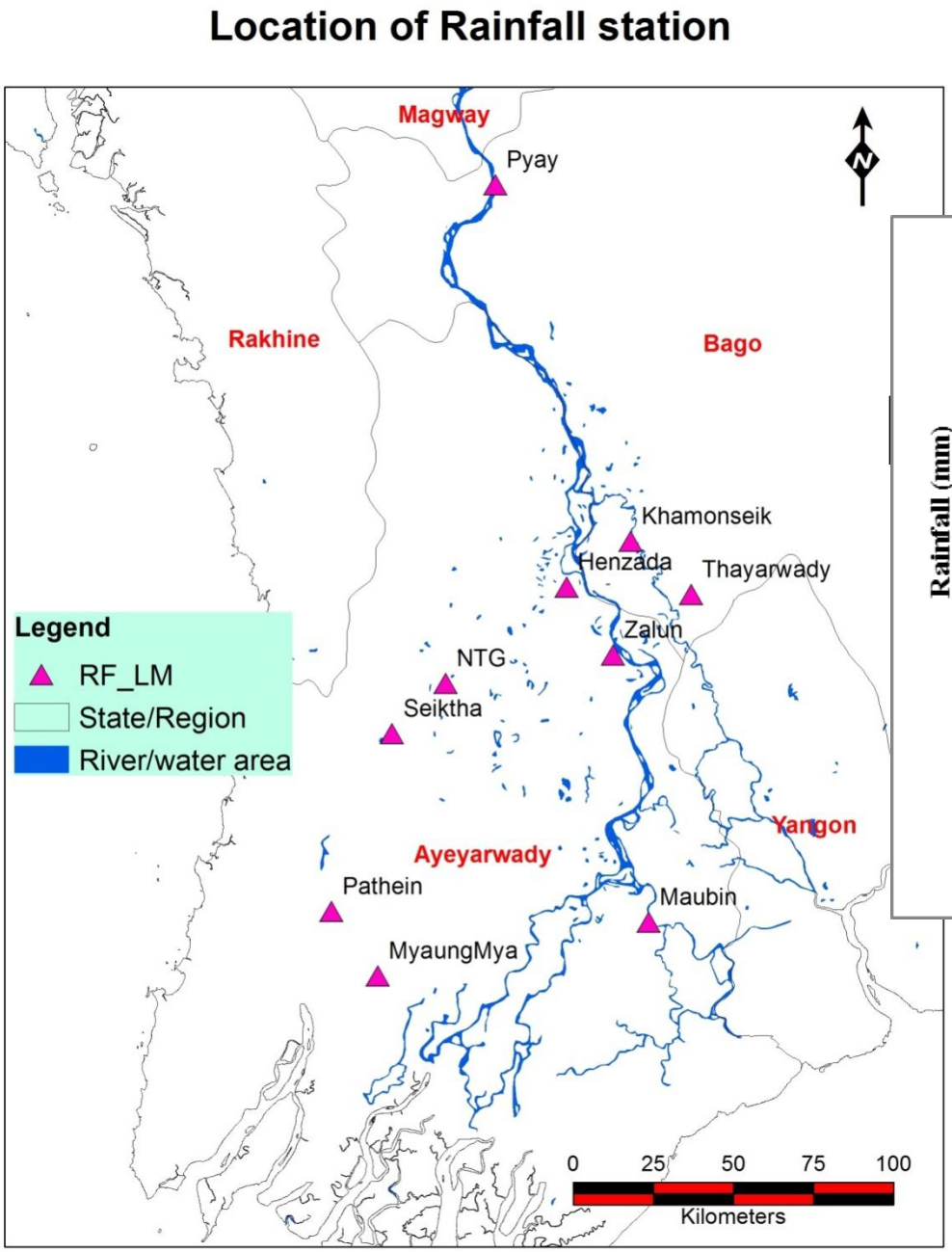


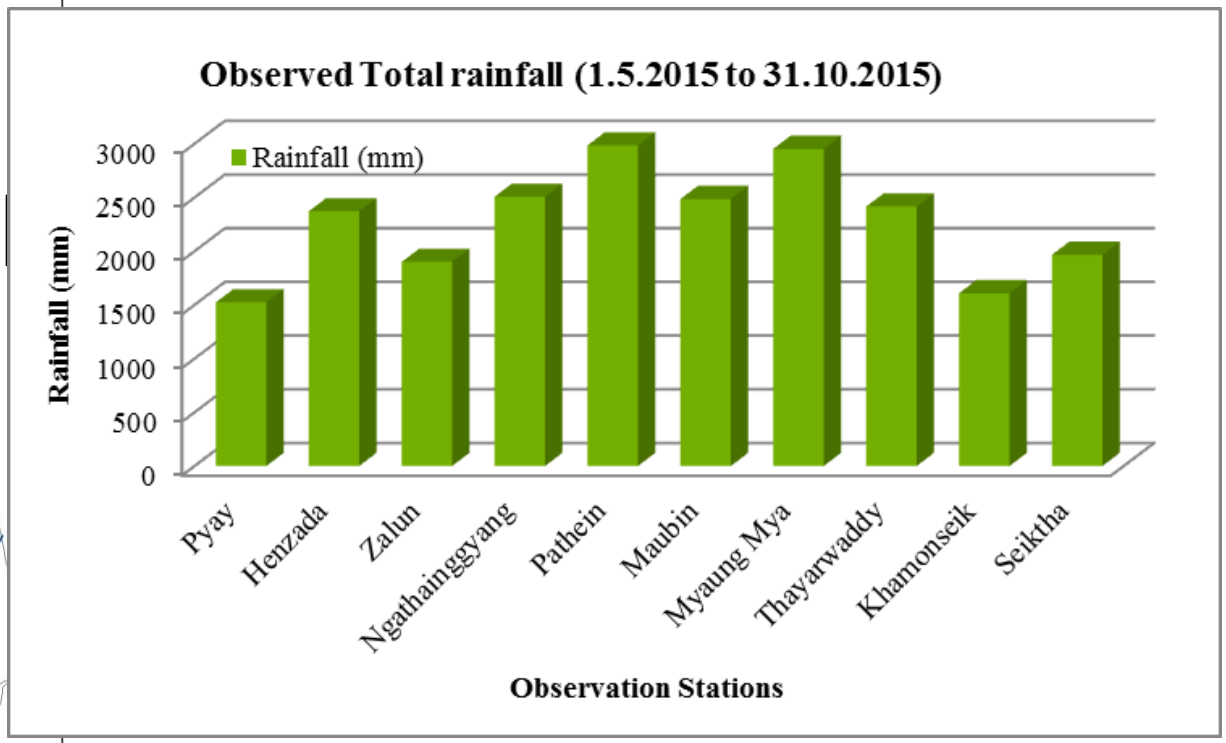
- Two-dimensional model capable of simulating rainfall-runoff and flood inundation simultaneously
- The model deals with slopes and river channels separately
- At a grid cell in which a river channel is located, the model assumes that both slope and river are positioned within the same grid cell

Input data and parameter setting

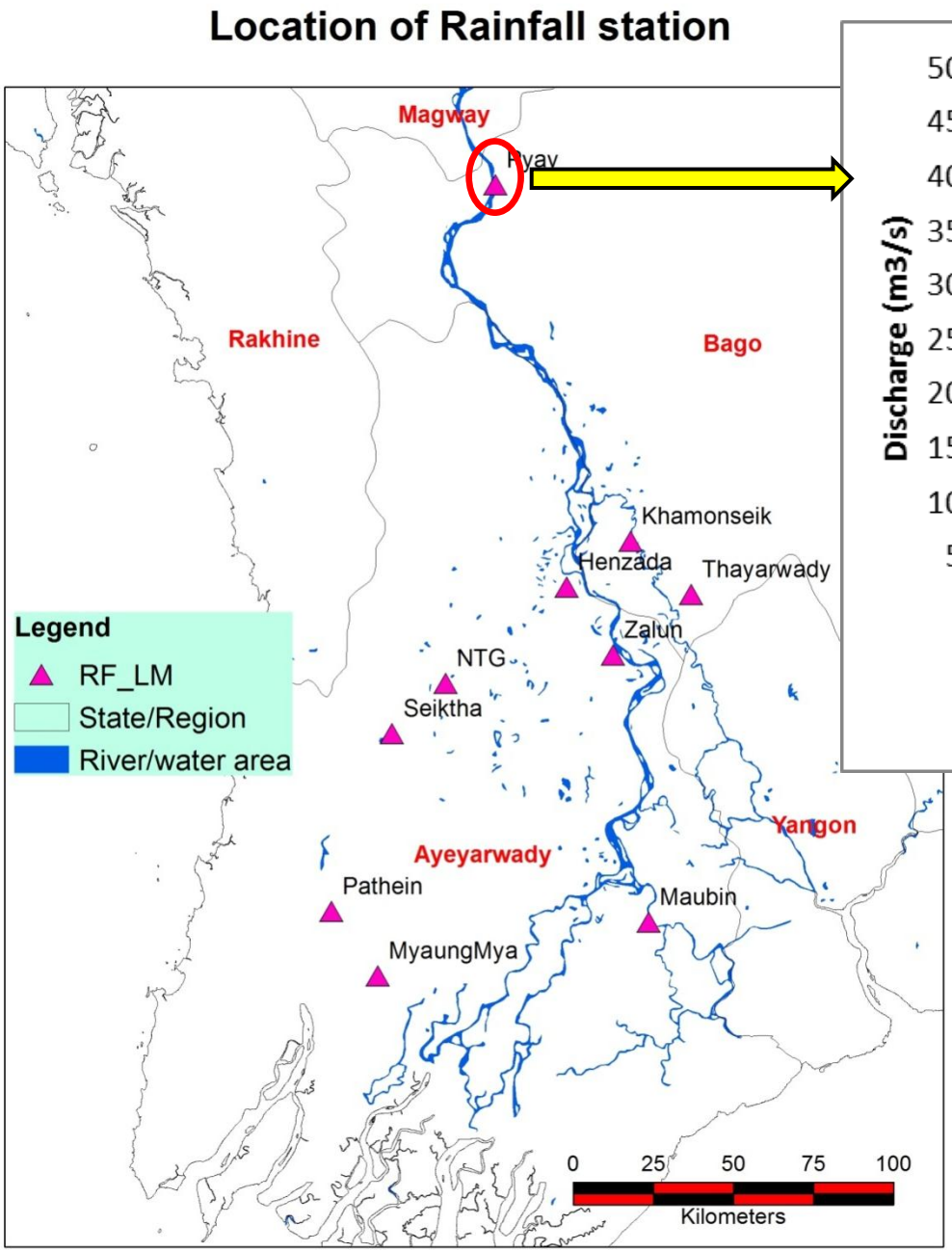
- **The following data are used to run the RRI- Model**
  - **15 sec DEM (HydroSHEDS)**
  - **Approx. 500m square grid (Detail Model)**
  - **Approx. 1km square grid (Large Basin Model)**
  - **Ground rainfall data/GSMap daily**
  - **1 May. 2015 – 31 October 2015**
  - **Changed river width and depth estimation**
  - **Apply default slope roughness and**
  - **Infiltration parameters (Green-Ampt model) are changed according to the soil type as "silt-clay-lone"**
  - **Set "Pyay" as an upper boundary of Ayeyarwady River (inflow from the upper Ayeyarwaddy Basin)**
  - **Cover lower delta area (including nearby basins) as the range of the Large Basin Model**

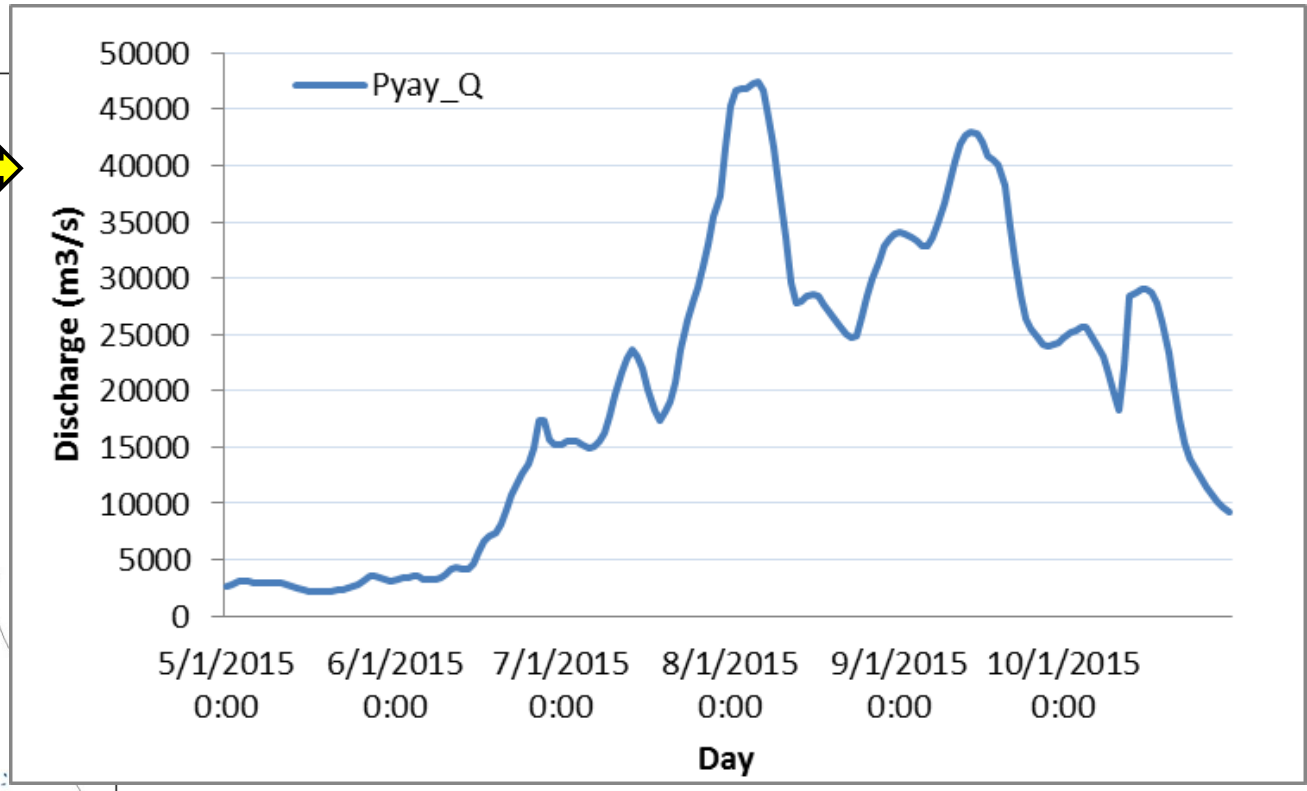
Location of rainfall observation stations in Ayeyarwaddy Basin



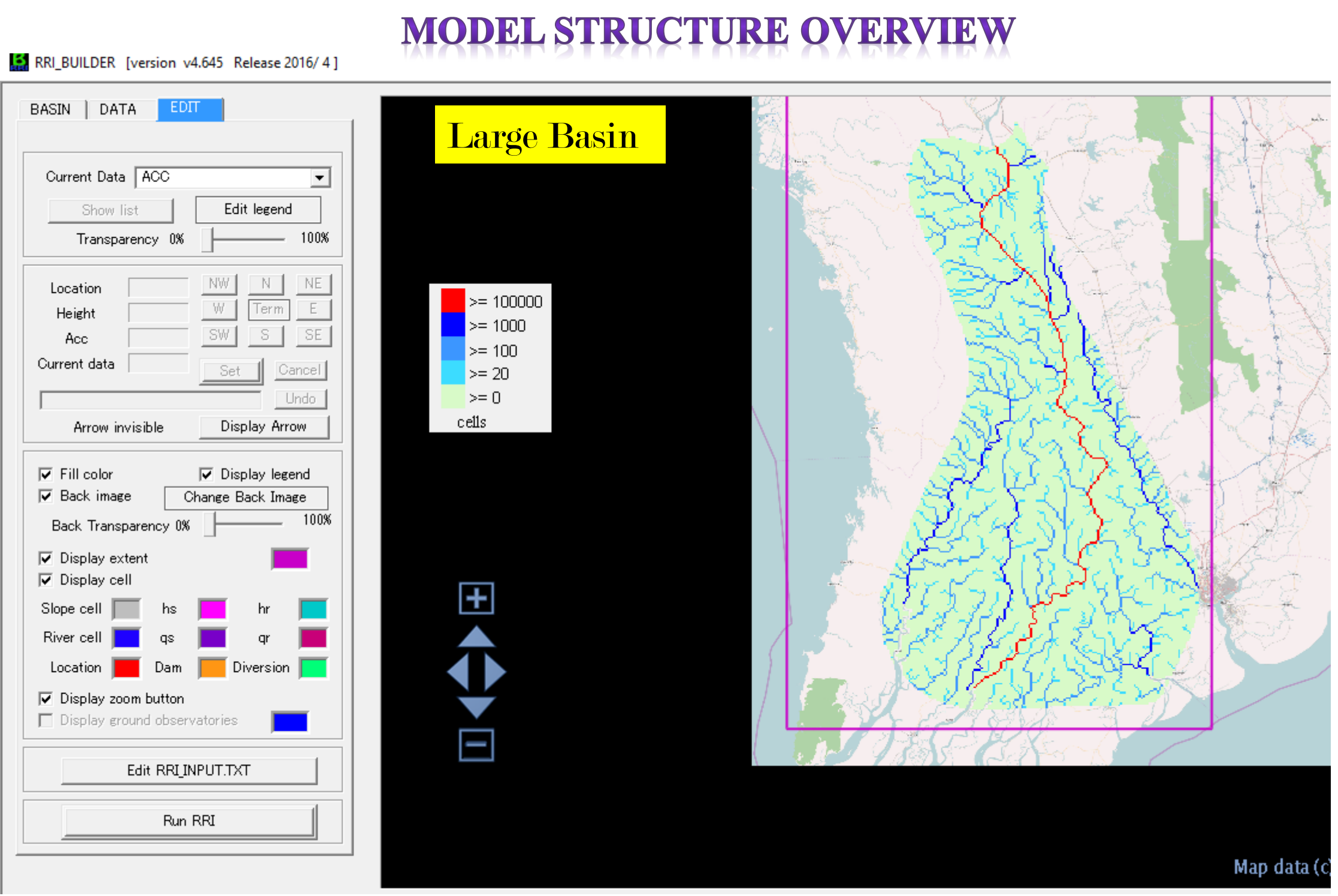


Outlet Discharge from upstream basin at Pyay gauging station

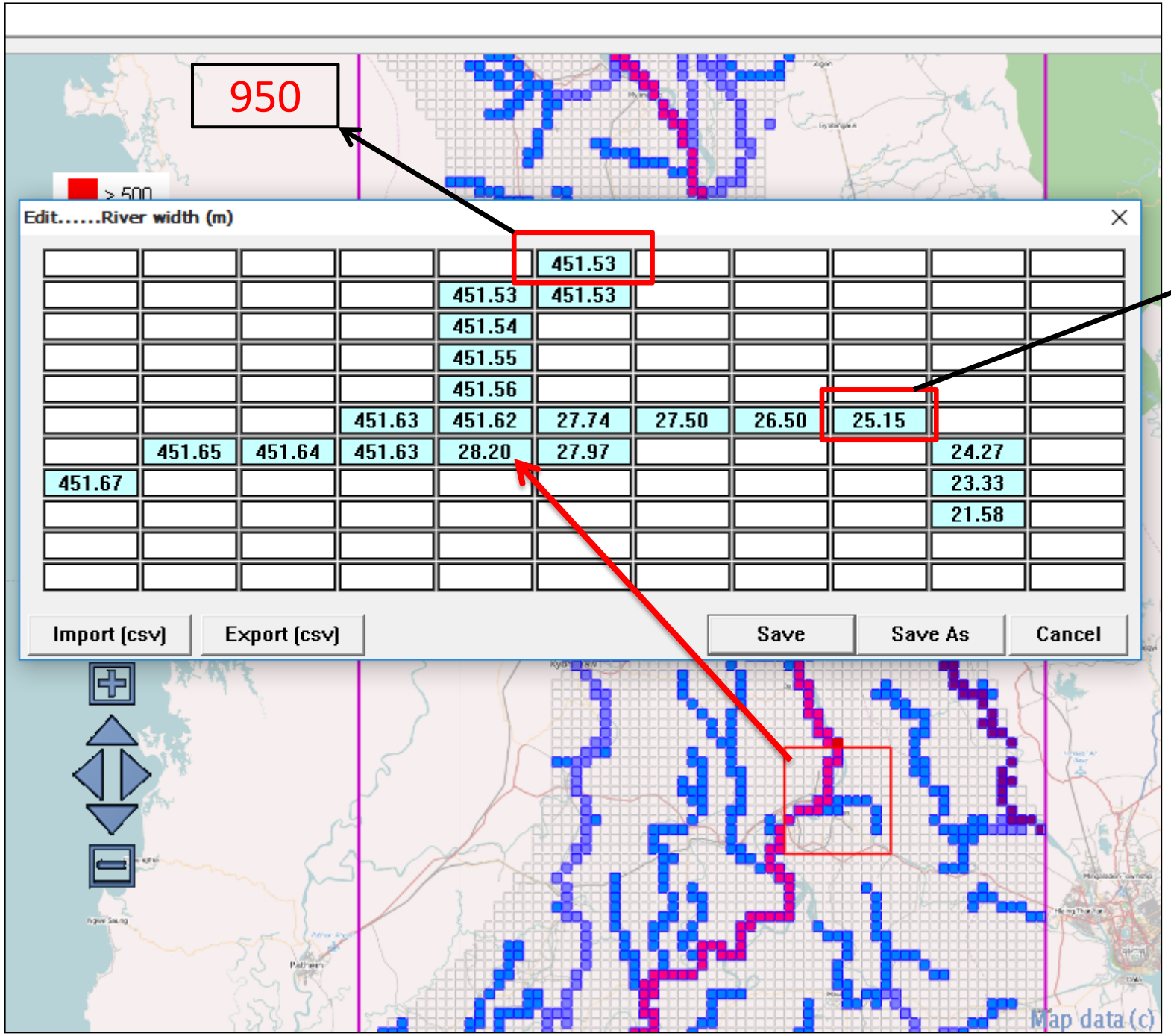




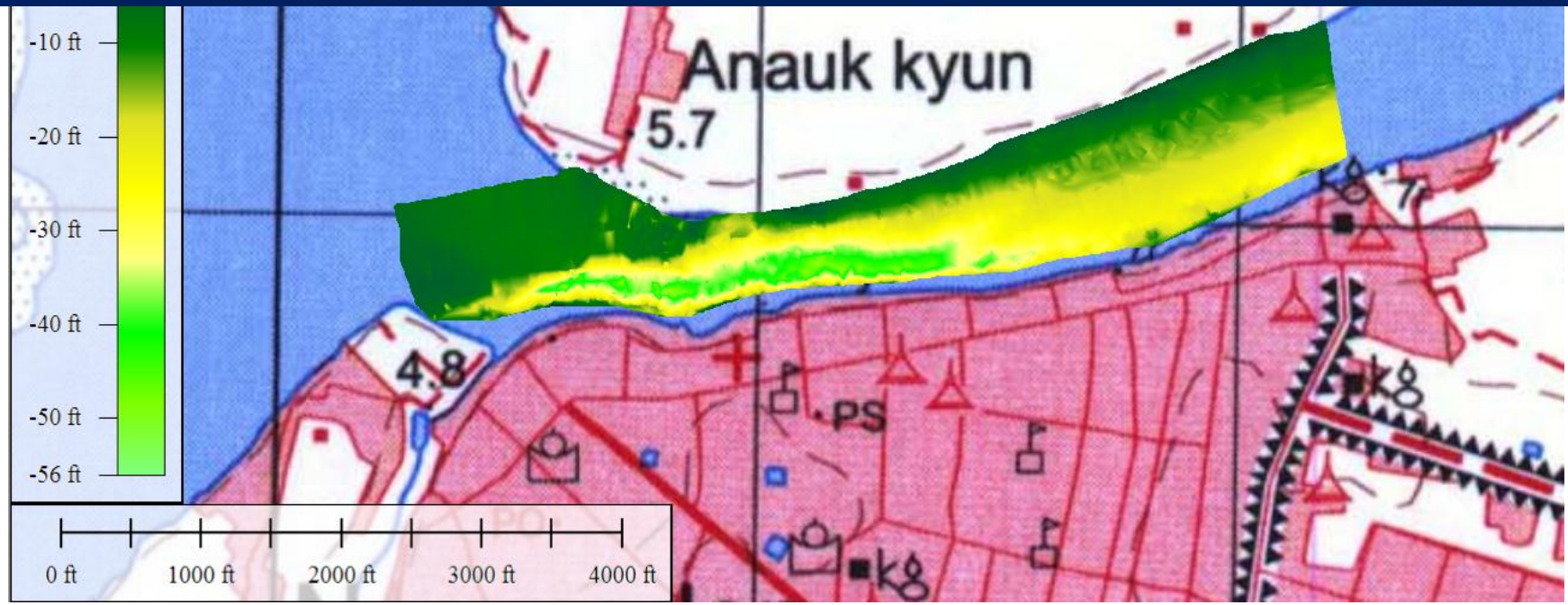
MODEL STRUCTURE OVERVIEW



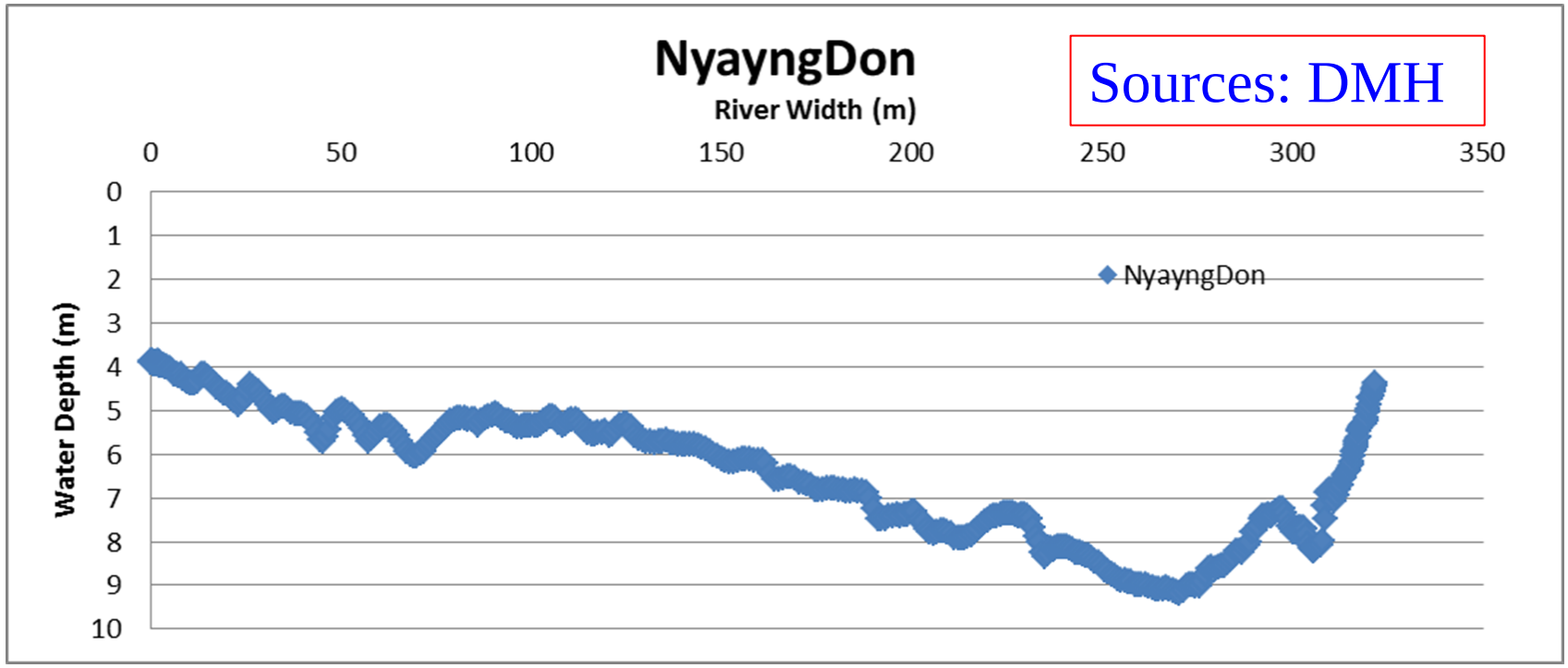
Modified river width and depth



River width and depth of the Pan Hlaing River

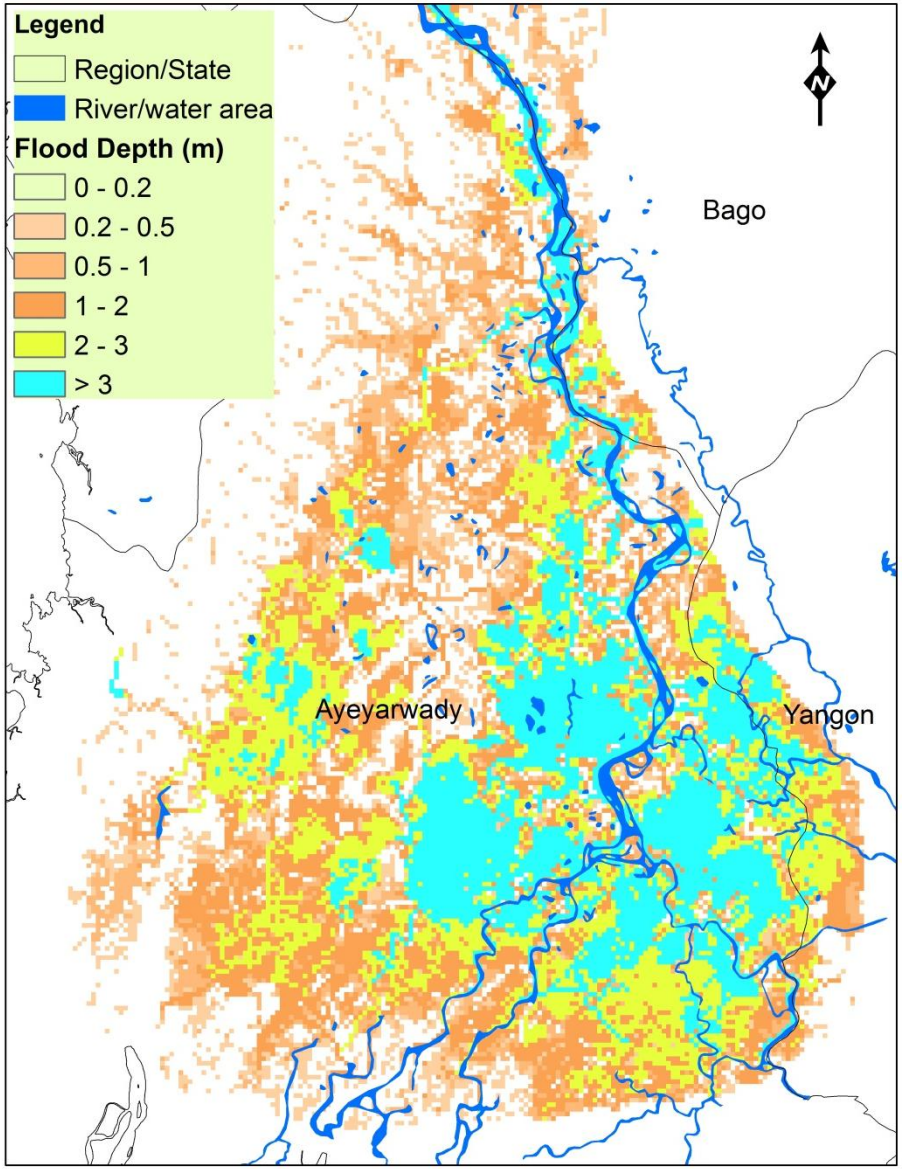


Data Sources: Department of Irrigation and Water Utilization Management, Nyaung Don Site

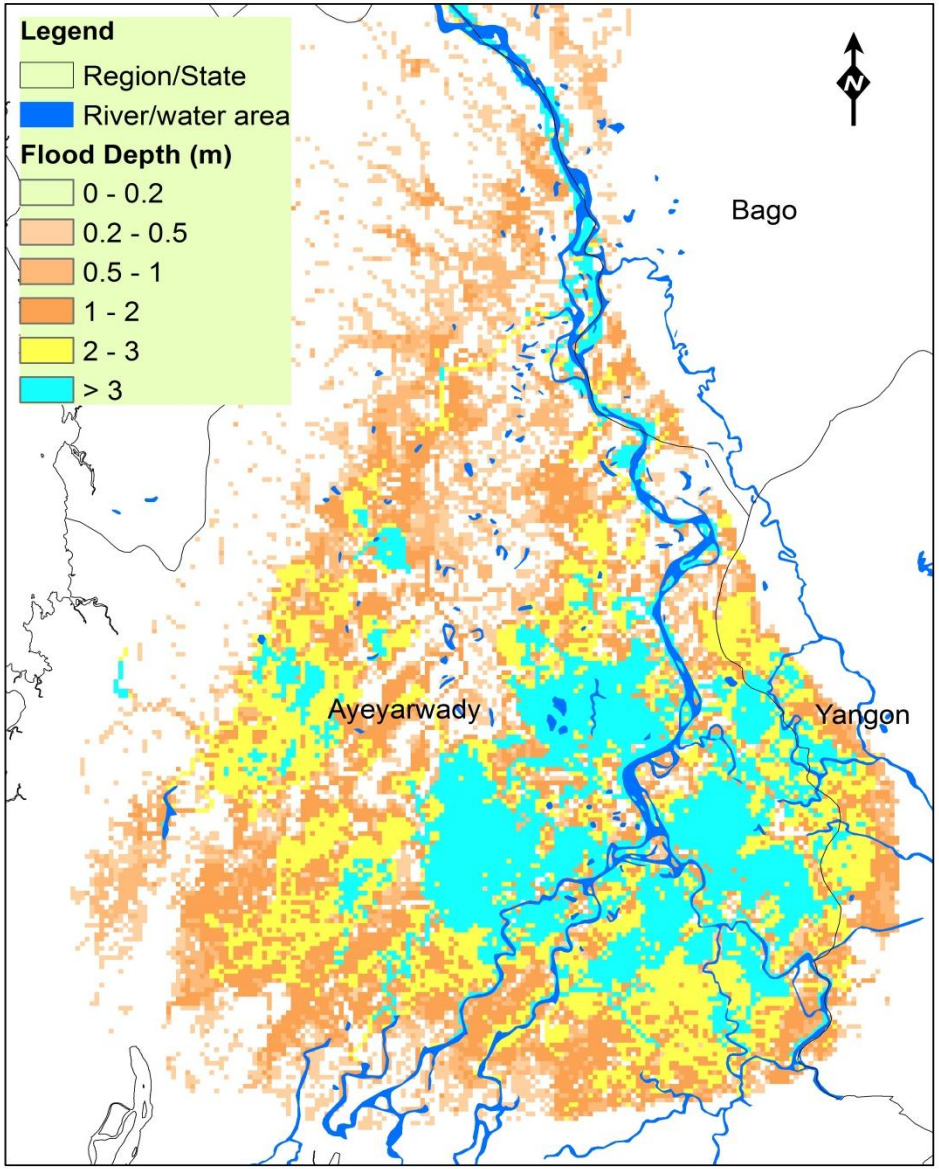


Result and Discussion

Max_Potential flood inundated aea of Ayeyarwaddy Regio 2015 (GRF_default)

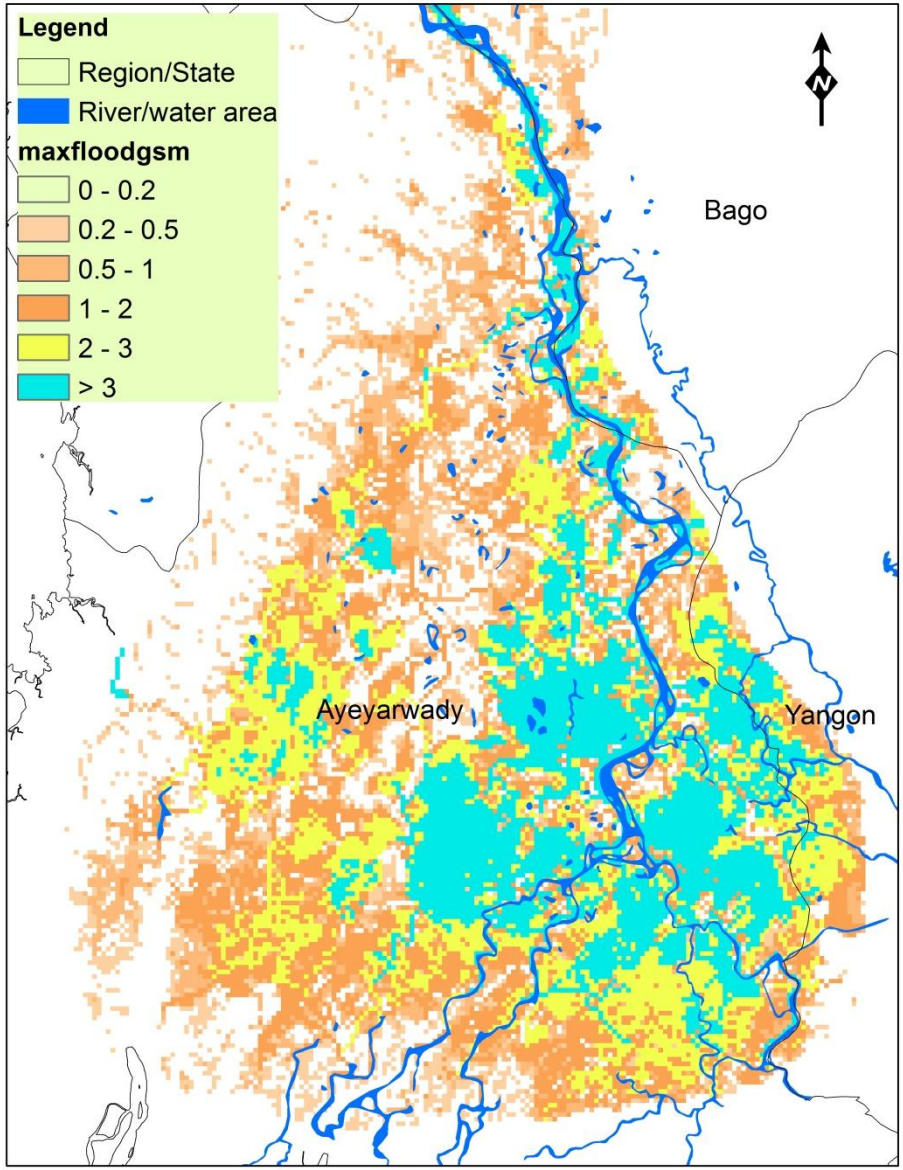


Max_Potential flood inundated aea of Ayeyarwaddy Regio 2015 (GRF_Cali)

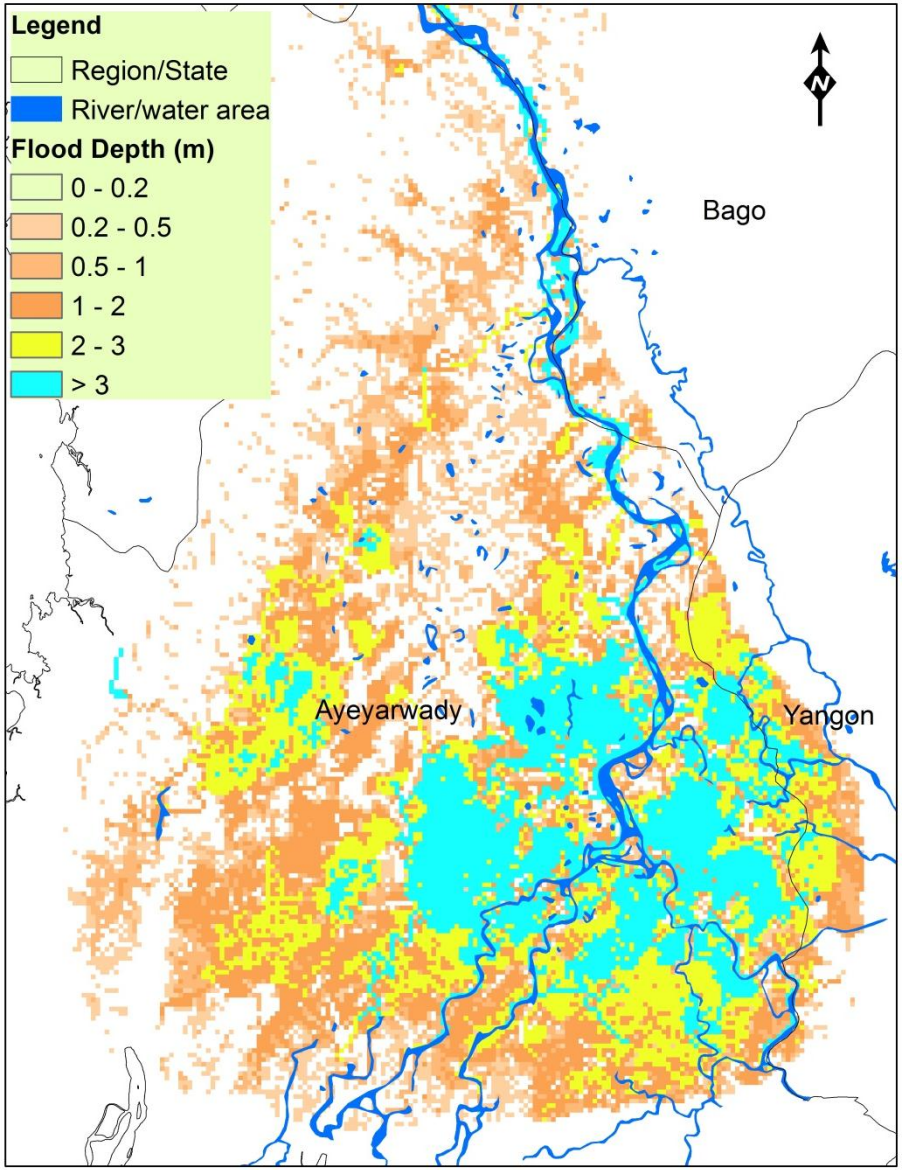


Result and Discussion

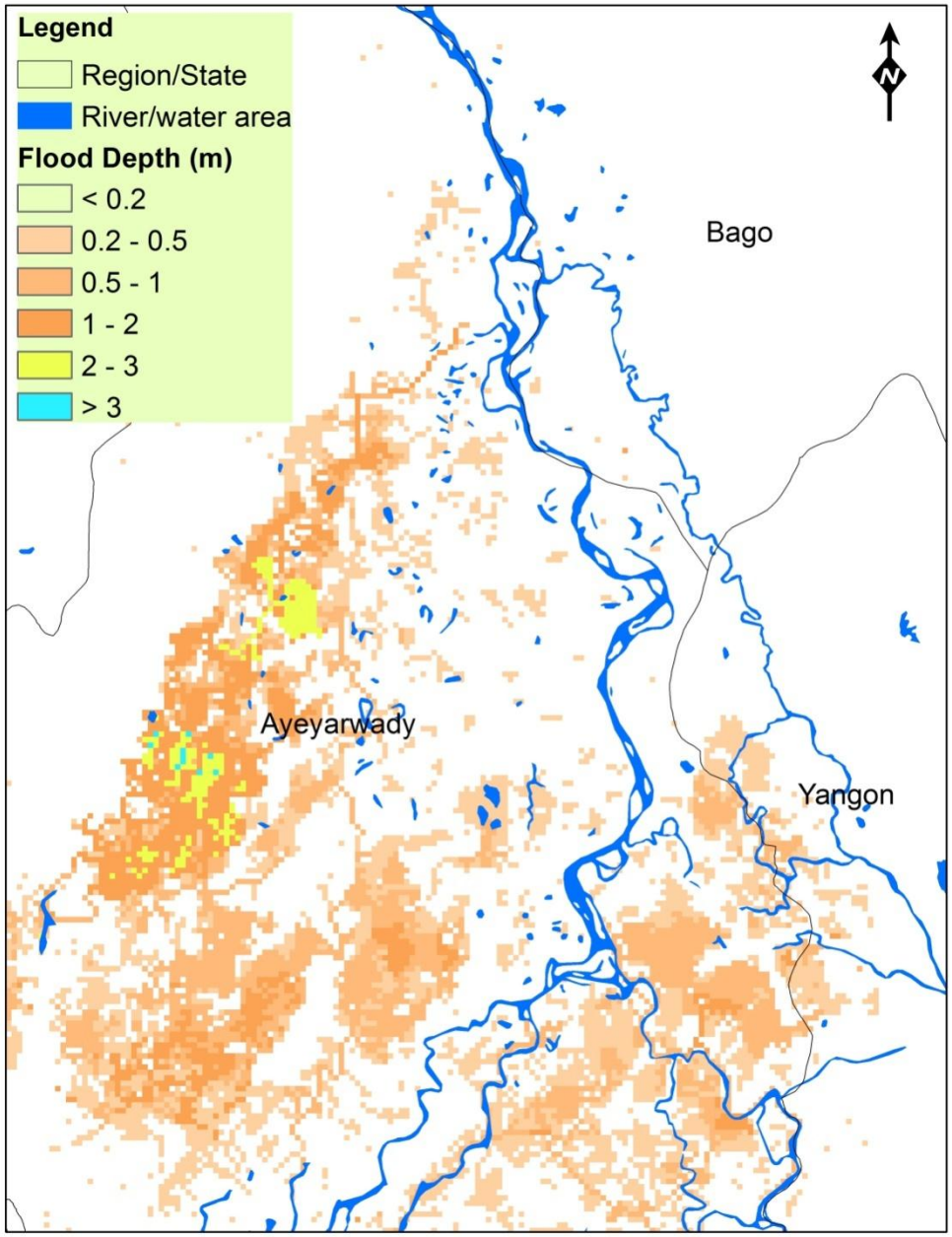
Max_Potential flood inundated aea of Ayeyarwaddy Regio 2015 (GSMap_defaulti)



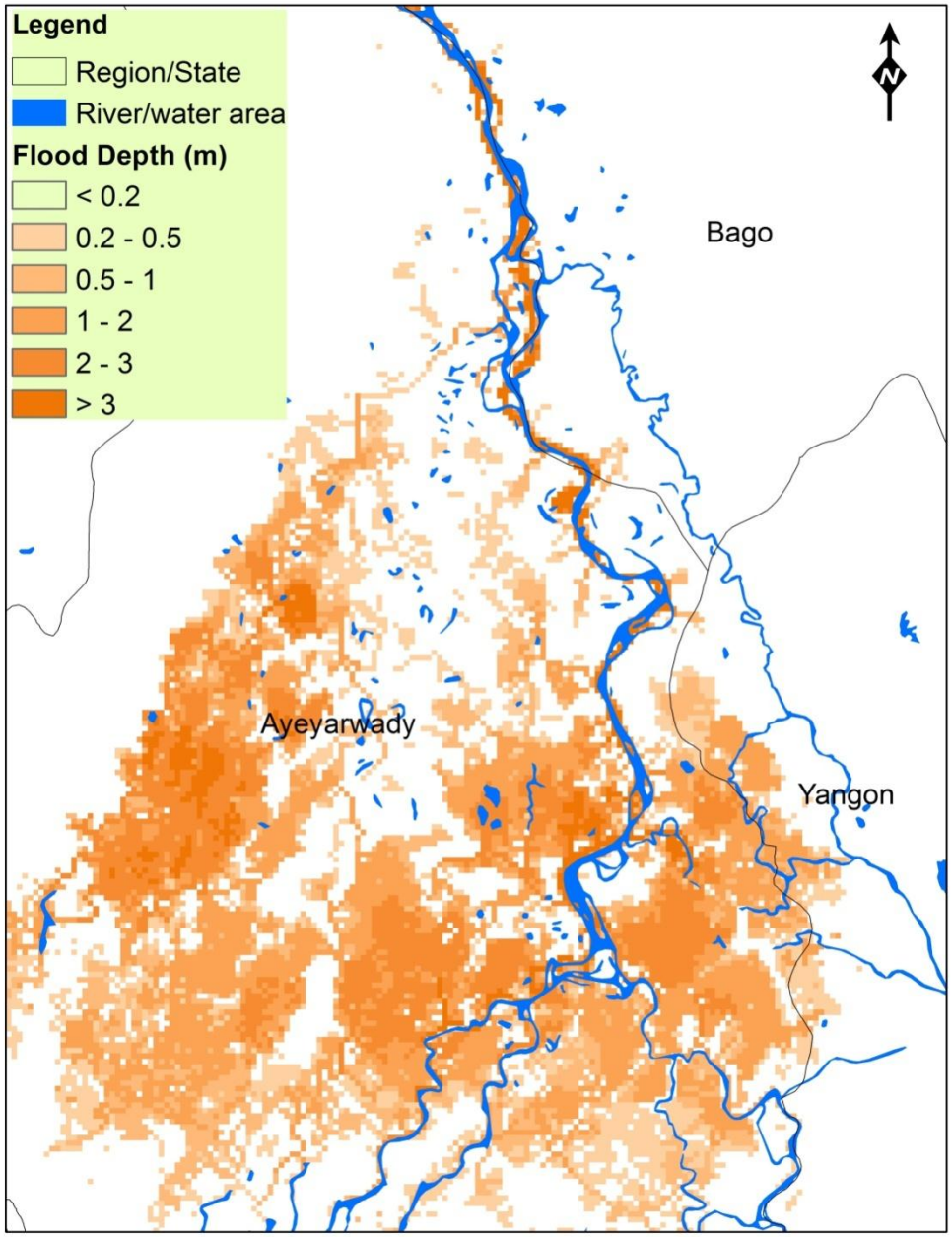
Max_Potential flood inundated aea of Ayeyarwaddy Regio 2015 (GSMap_Calii)



Potential flood inundated aea of Ayeyarwaddy Region, 7.7.2015 (GRF_Cali)

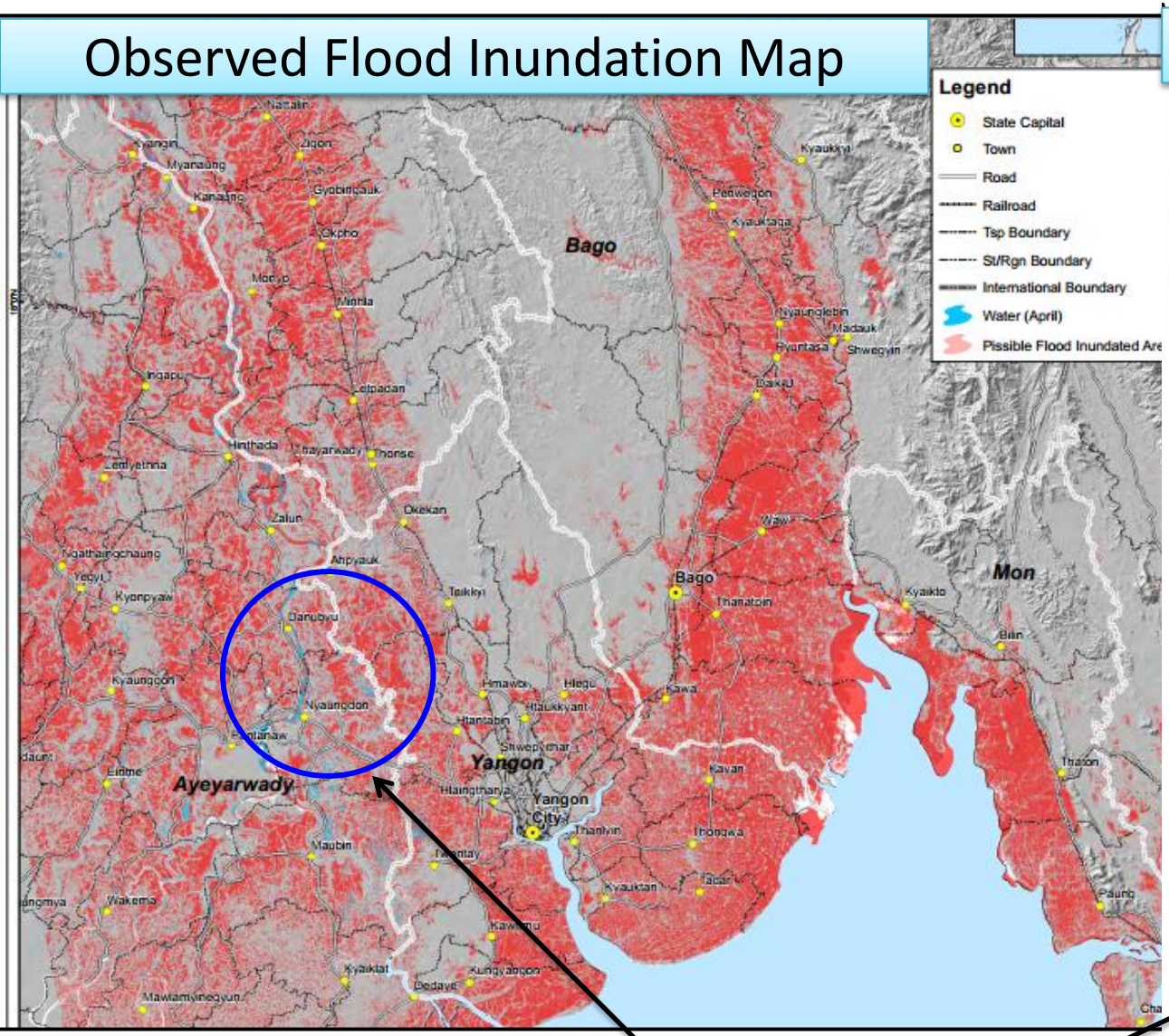


Potential flood inundated aea of Ayeyarwaddy Region, 7.8.2015 (GRF_Cali)

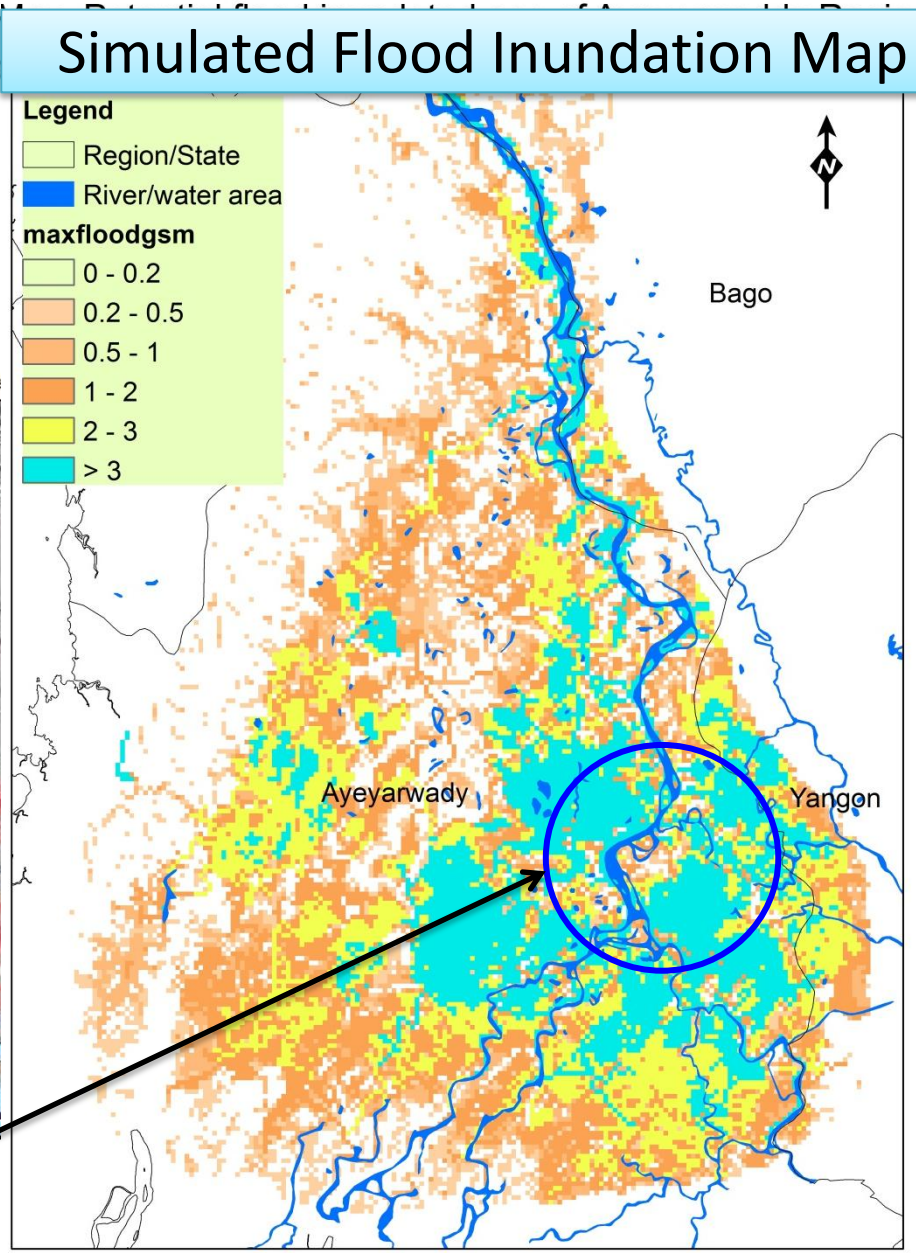


Verification of flood extent area

Observed Flood Inundation Map

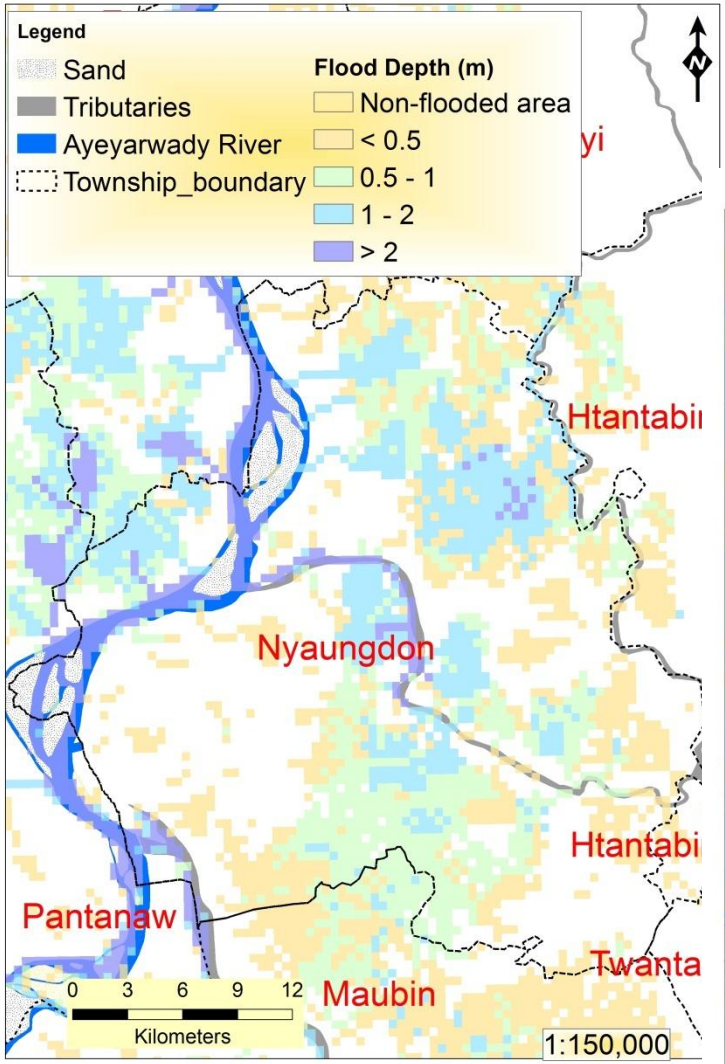


Simulated Flood Inundation Map

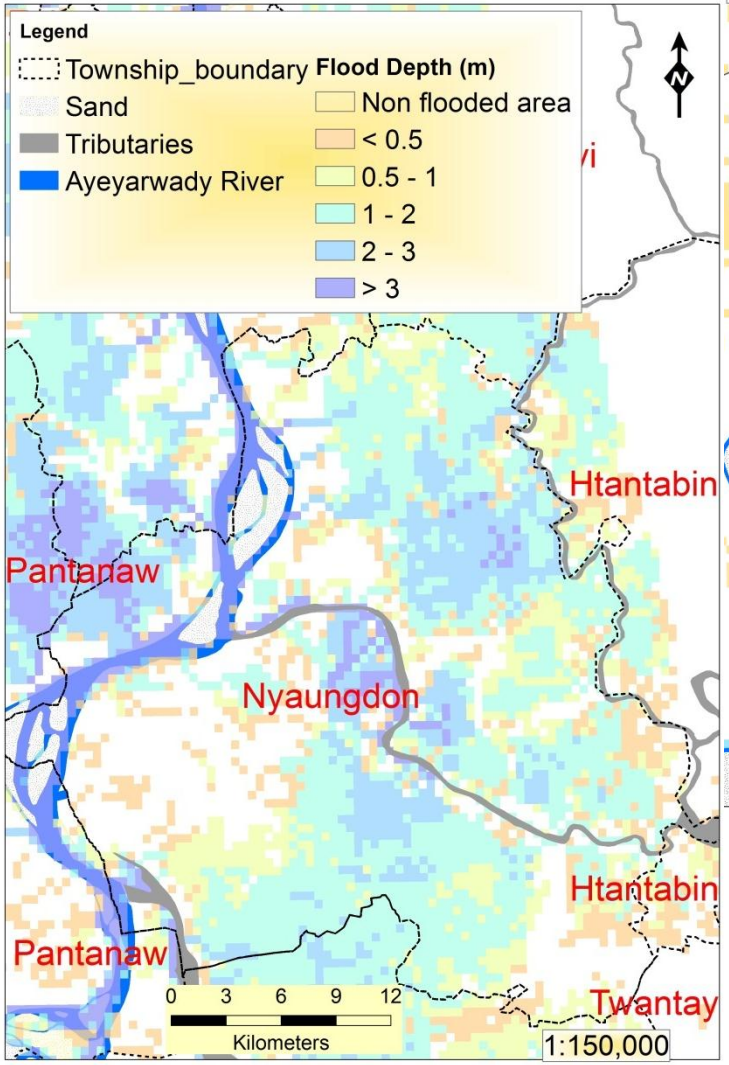


Nyaung Don

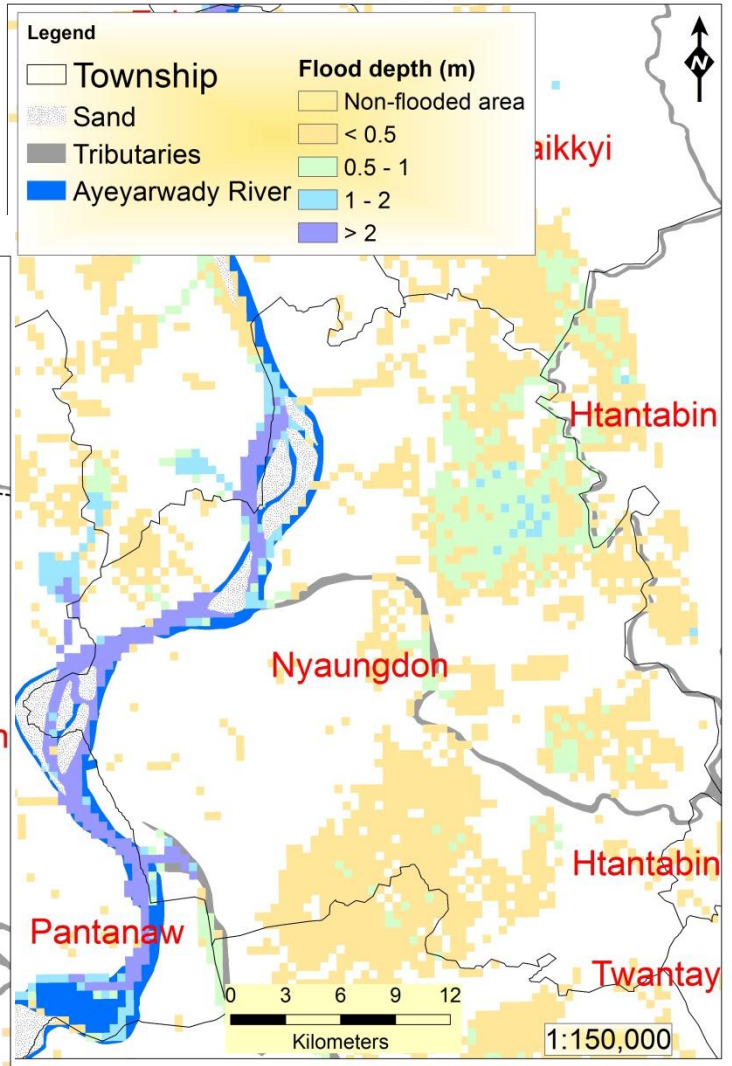
2011



2015

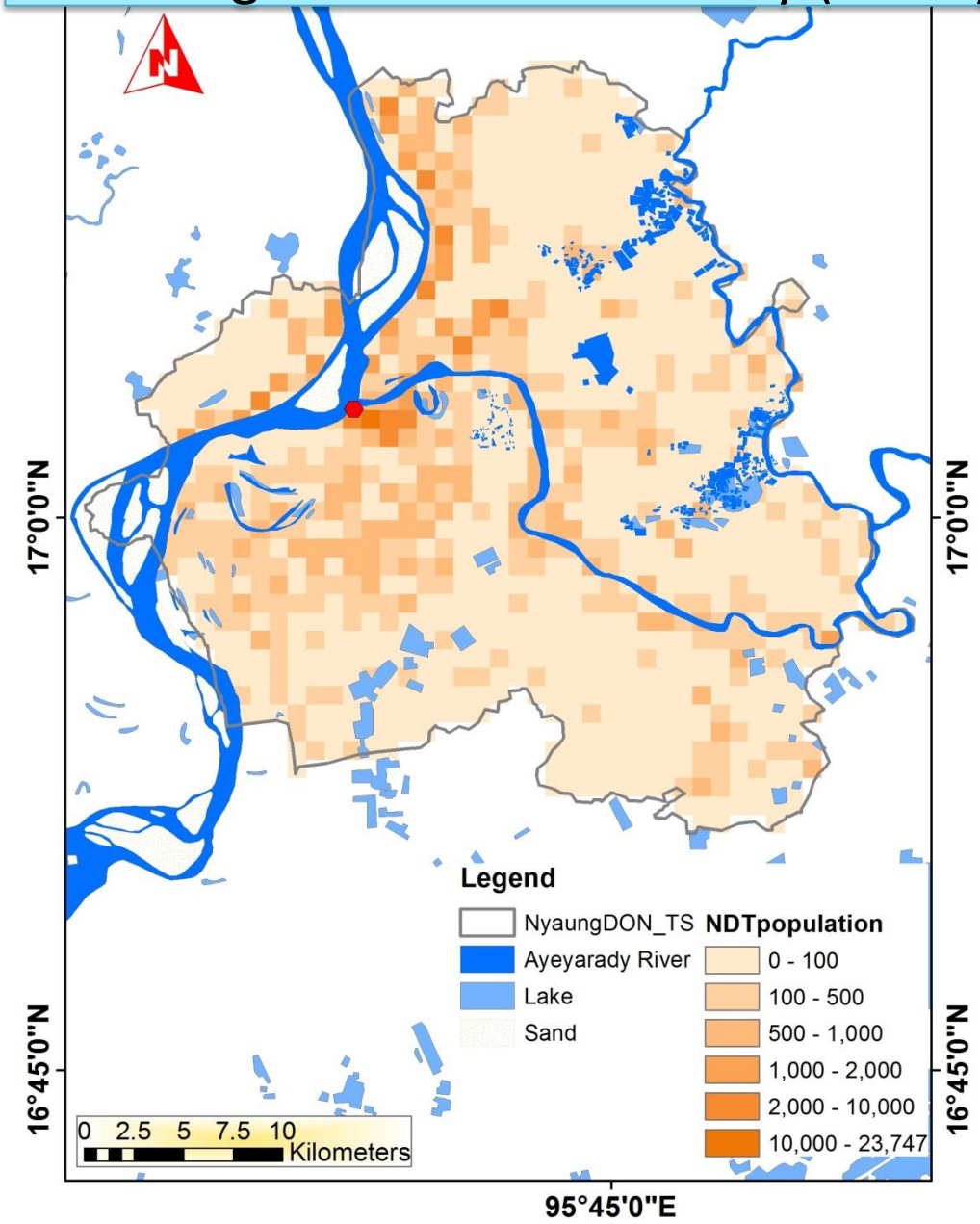


2016

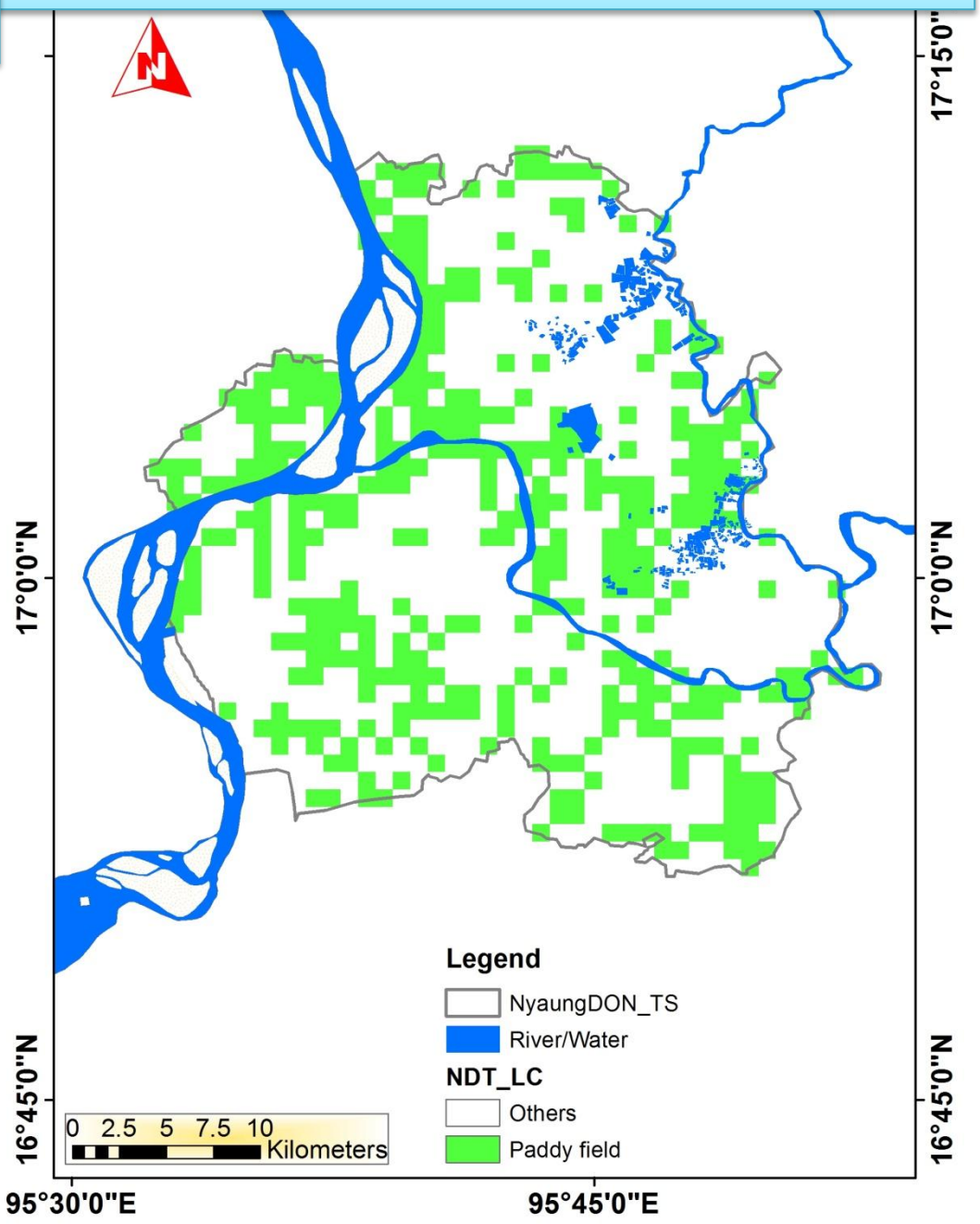


Flood Risk Assessment

Land Scan Global Population 2014
Oak Ridge National Laboratory (ORNL)



Land cover data GLCNMO2008



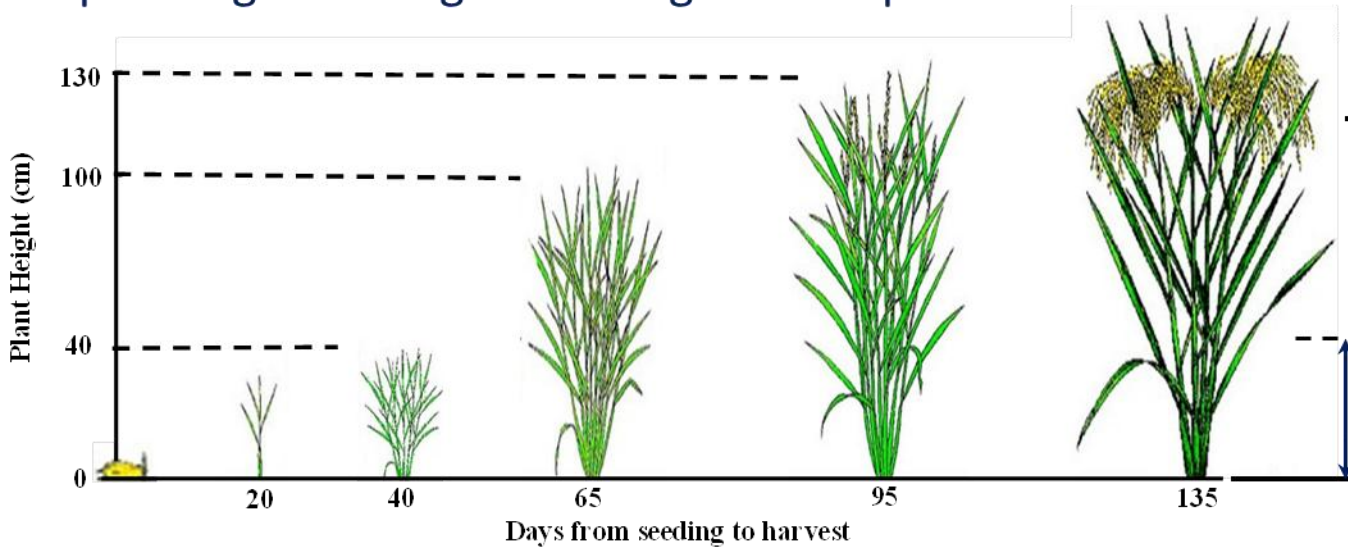
Case study in Pampamga River Basin

SOUSEI Program for Risk Information on Climate Change
気候変動リスク情報創生プログラム

Flood Risk Assessment: Agricultural Damage

Development of damage function:

Flood damage curves as a function of flood depth and duration are proposed based on linear interpolation of flood damage matrix data by introducing minimum damageable flood depth and by considering partial or complete submergence water surface levels corresponding to each growth stage of rice plants.



9 – 15 cm (BAS, 2013)

Completely submergence level

Minimum damageable level

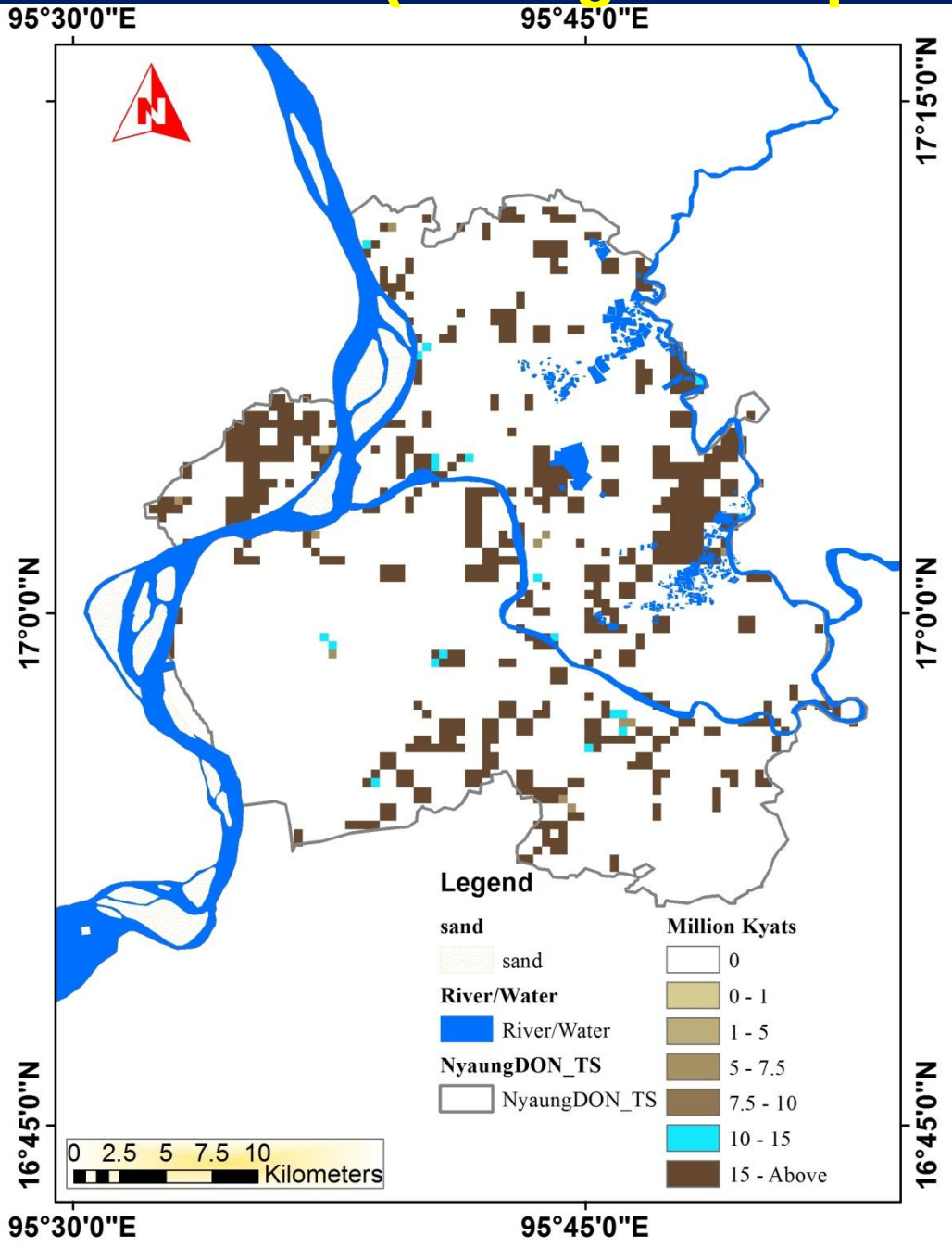
No damage

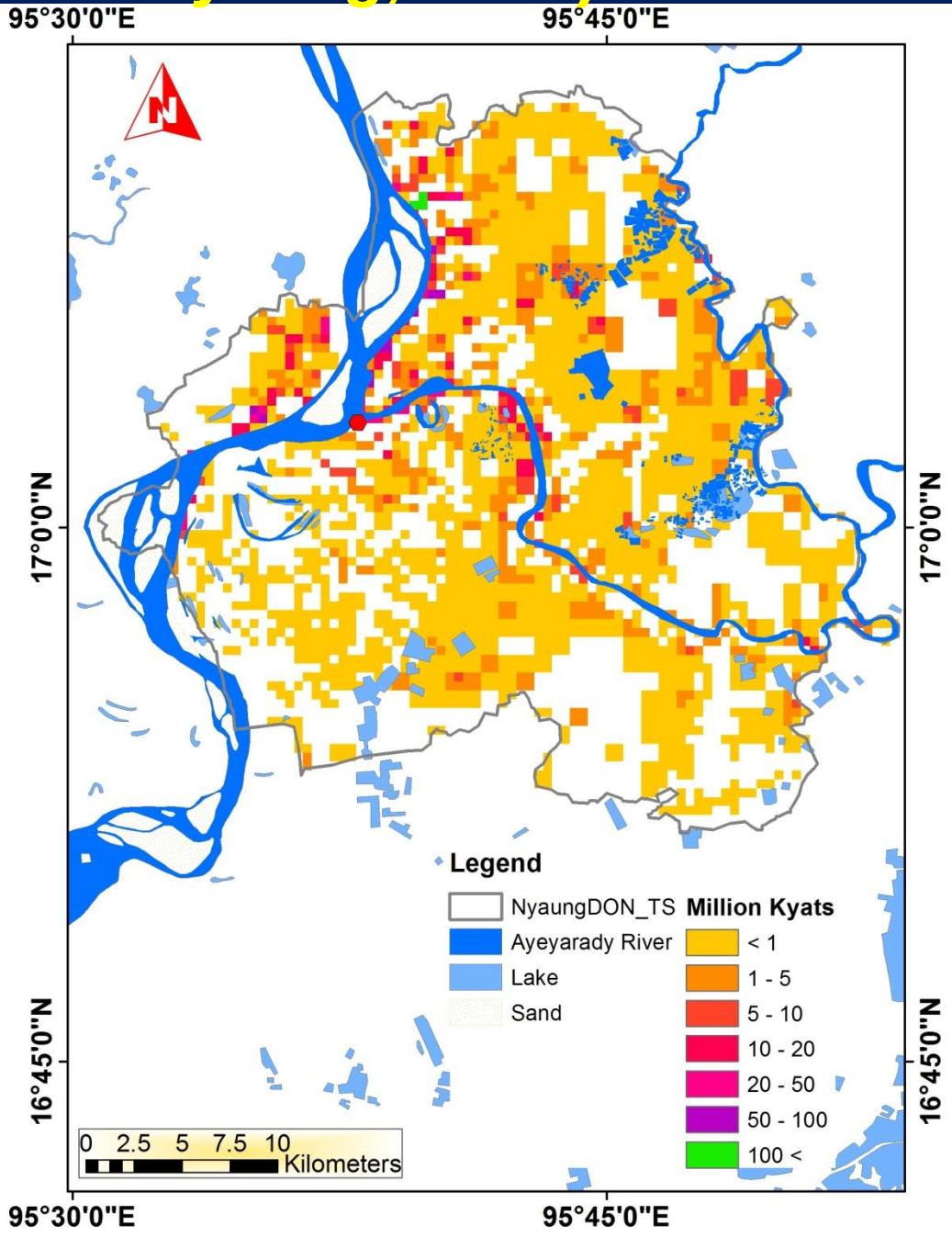
	Seeding		Maximum tillering and panicle formation	Flowering	Harvest
Duration (days)	20	20	25	30	40
Growth Stage	Seedbed / Seedling	Newly Planted	Vegetative Stage	Reproductive Stage	Maturity Stage

For vegetative stage: 20 cm

For reproductive, maturity and ripening stages: 50 cm

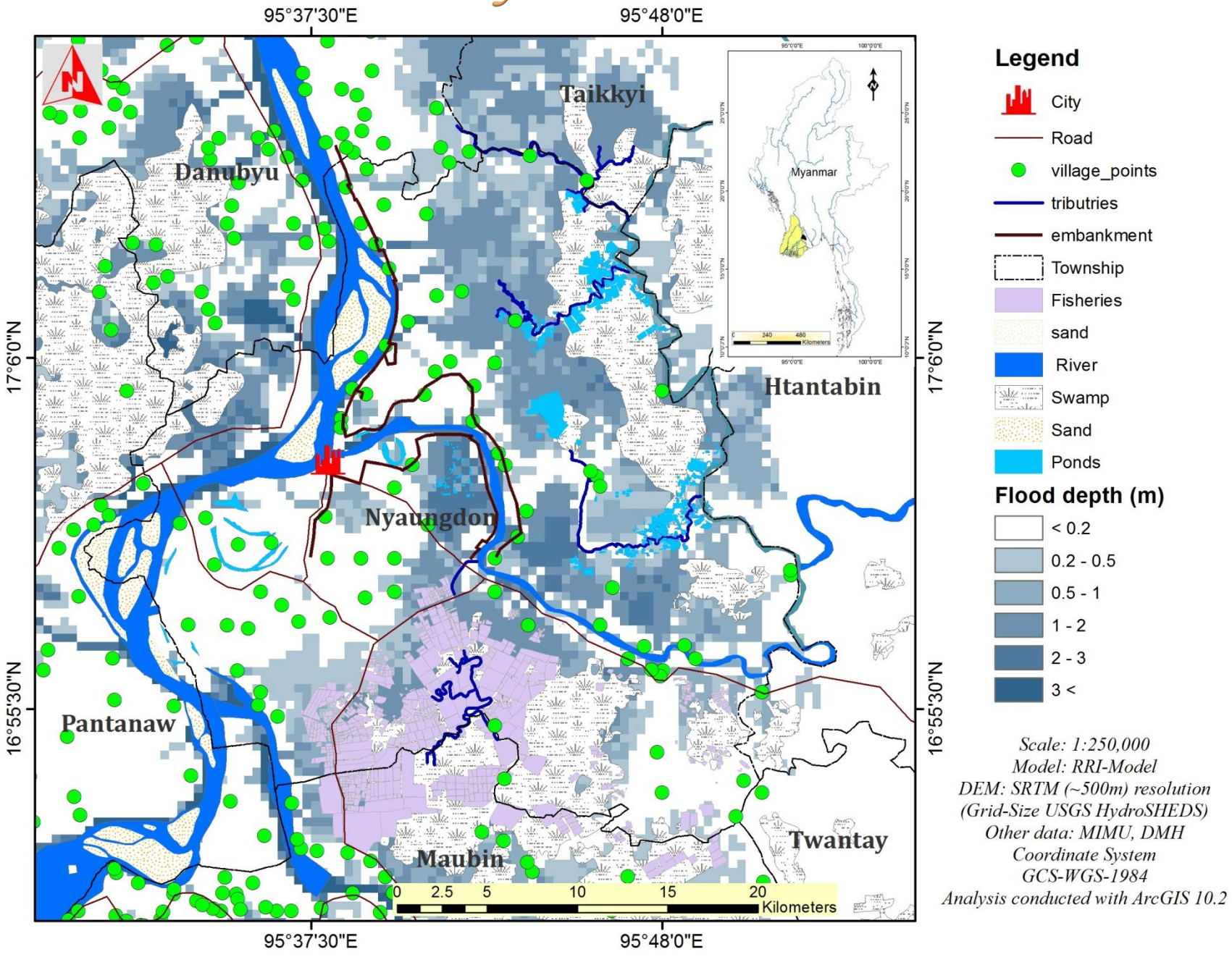
Potential Agricultural Damage and Houses Damage (during flood period July-Aug, 2015)





FLOOD HAZARD MAP OF *Nyaung Don Township* BASED ON

2015 flood event



Recommendation

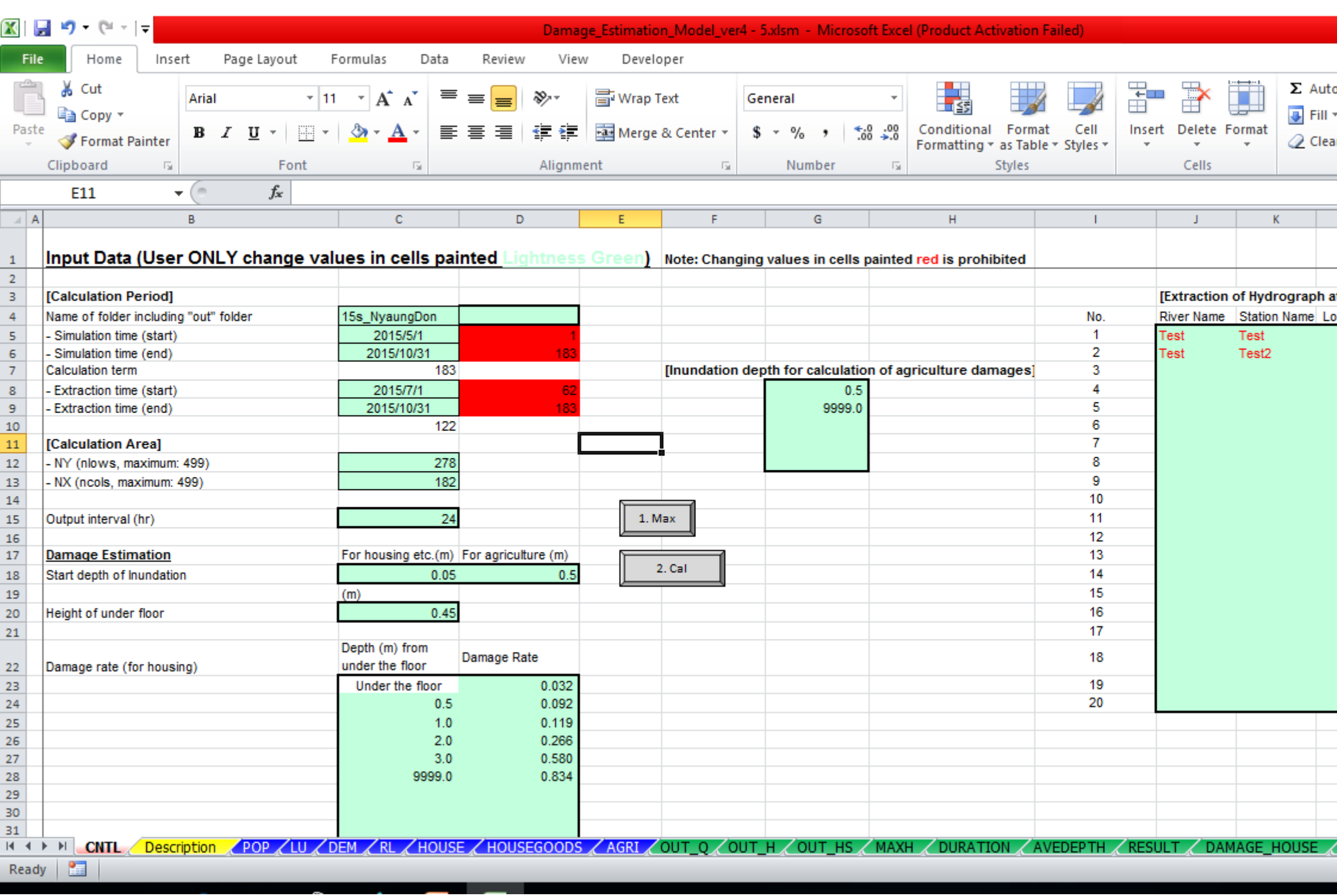
- Needed to install Meteorological and Hydrological observation stations near Ayeyarwaddy River and Pan Hlaing River in Nyaung Don Township
- Update DEM data, High resolution satellite images, River profile data (river width and depth), hydrological data (water level and discharge) and soil data are required to improve the model simulation result.
- Additional field trip survey should be conducted to flood affected area to achieve the flood risk assessment.
- Improve the cooperation network with relevant organizations.

Conclusions and Way Forward

Flood Assessment is required to provide a national scale mapping of the indicative flood hazard from all rivers across the entire country.

- To analyze the flood inundation, flood mapping and to access the flood risk assessment of the study area by RRI Model Simulation.
- To analyze the flood inundation pattern of the area for actual flood and predicted flood as design flood for 50yrs or 100 yrs return period.
- To study the flood countermeasure that is to reduce the flood risk due to significant weather event.


Thank you!


Damage_Estimation_Model_ver4 - 5.xlsm - Microsoft Excel (Product Activation Failed)
File
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Clipboard
Arial
11
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Cell Styles
Styles
Insert
Delete
Format
Cells
E11
Input Data (User ONLY change values in cells painted Lightness Green)
Note: Changing values in cells painted red is prohibited
[Calculation Period]
Name of folder including "out" folder
15s_NyaungDon
- Simulation time (start)
2015/5/1
1
- Simulation time (end)
2015/10/31
183
Calculation term
183
- Extraction time (start)
2015/7/1
62
- Extraction time (end)
2015/10/31
183
122
[Calculation Area]
- NY (nlows, maximum: 499)
278
- NX (ncols, maximum: 499)
182
Output interval (hr)
24
1. Max
2. Cal
Damage Estimation
For housing etc.(m)
For agriculture (m)
Start depth of Inundation
0.05
0.5
(m)
Height of under floor
0.45
Damage rate (for housing)
Depth (m) from under the floor
Damage Rate
Under the floor
0.032
0.5
0.092
1.0
0.119
2.0
0.266
3.0
0.580
9999.0
0.834
[Inundation depth for calculation of agriculture damages]
0.5
9999.0
No.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
[Extraction of Hydrograph a
River Name
Station Name
Lo
Test
Test
Test
Test2
CNTL
Description
POP
LU
DEM
RL
HOUSE
HOUSEGOODS
AGRI
OUT_Q
OUT_H
OUT_HS
MAXH
DURATION
AVEDEPTH
RESULT
DAMAGE_HOUSE
Ready