PWRI

ICHARM

United Nations
tional, Scientific and
Cultural Organization

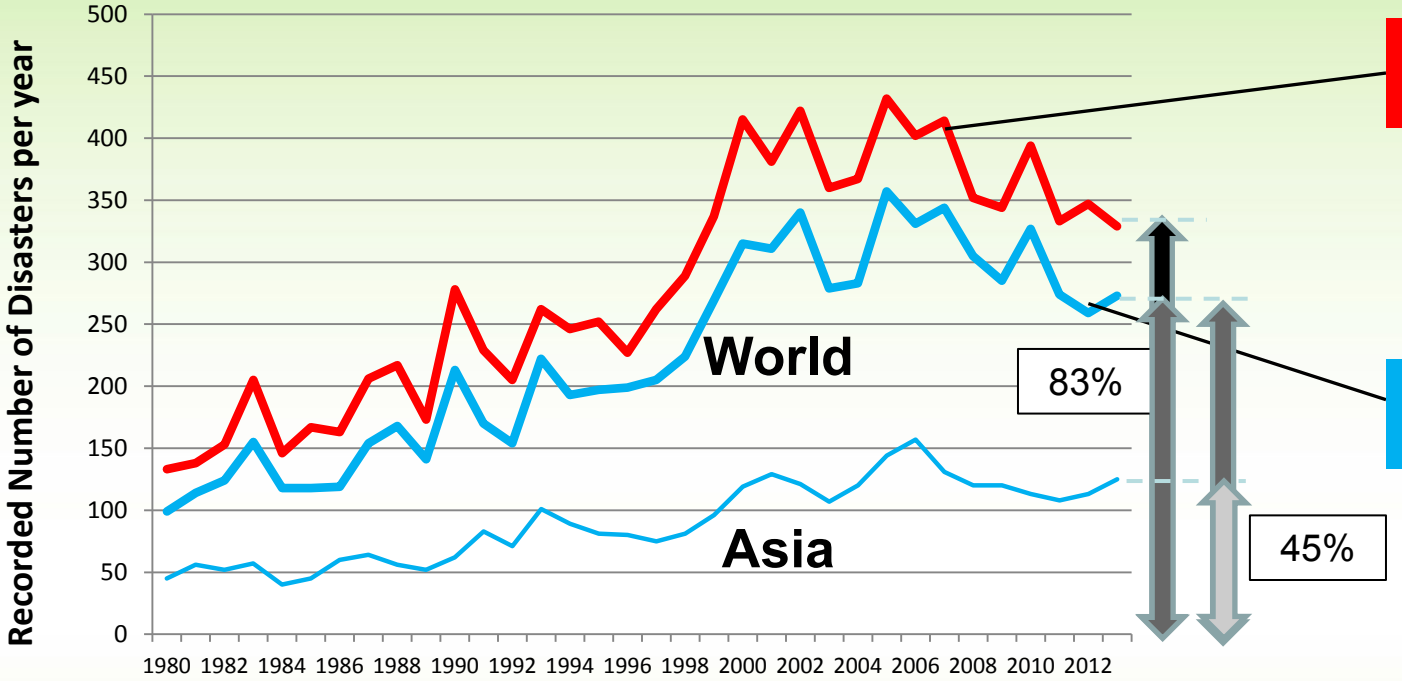
ICHAR

International C
Water Hazard and Risk Management

under the auspices of UNESCO

hosted by PWRI, Tsukuba

Disaster Trend (1980 – 2013)



Natural Hazards (自然災害)

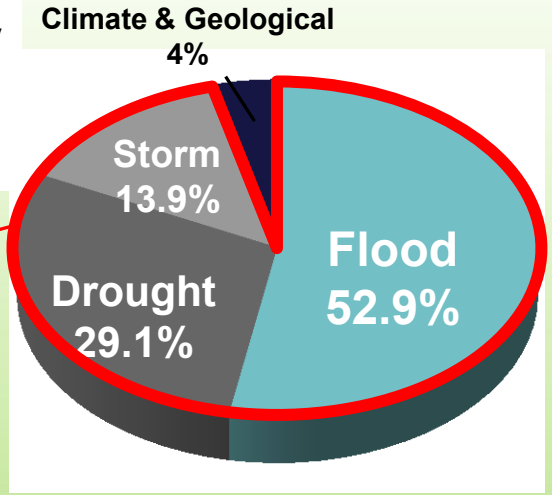
Climate : Extreme temperature, Insect, Wildfire
Geological : Earthquake, Mass Dry, Volcano

Hydro-met Hazards

Hydro-met Hazards (水関連災害)

Drought, Flood, Mass Wet, Storm

Affected People by Natural Hazards (1980 – 2013)



Hydro-met Hazards
96%

CRITERIA of "Disaster"

For a disaster to be entered into the database at least one of the following criteria must be fulfilled:

- Ten (10) or more people reported killed.
- Hundred (100) or more people reported affected.
- Declaration of a state of emergency.
- Call for international assistance.

Data Source : EM-DAT (The OFDA/CRED International Disaster Database, Université Catholique de Louvain, Belgium)
Edited by ICHARM, 2014

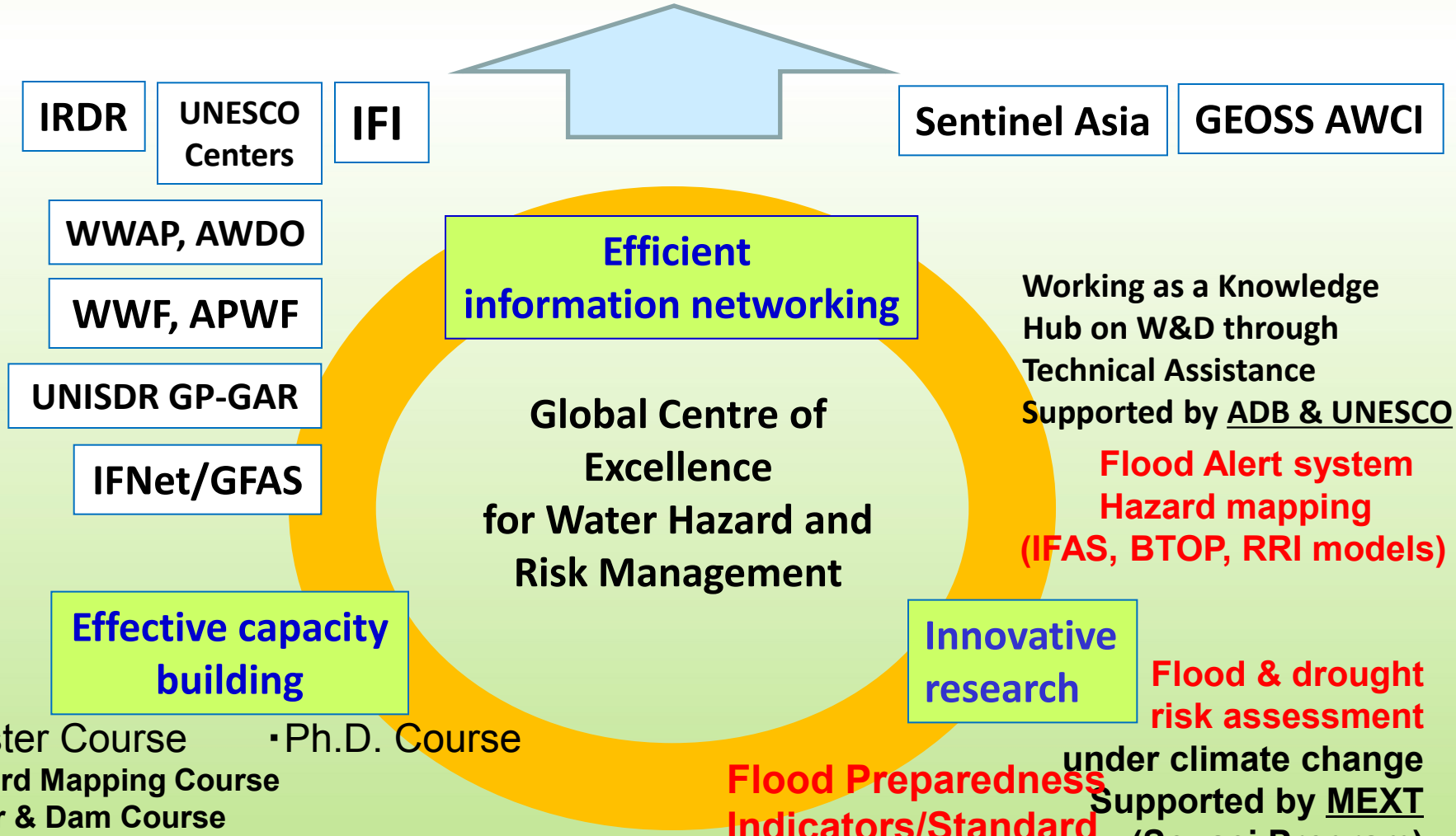
ICHARM Objective

International Centre for Water Hazard and Risk Management

- **To be the Global Center of Excellence to provide and assist implementation of the best practicable strategies to localities, nations, regions and the world to manage the risk of water related hazards including floods, droughts, land slides, debris flows and water contamination.**
  - **At the first phase, the priority is put to flood-related disasters.**

ICHARM's Philosophy: **Localism** (Local Practices)

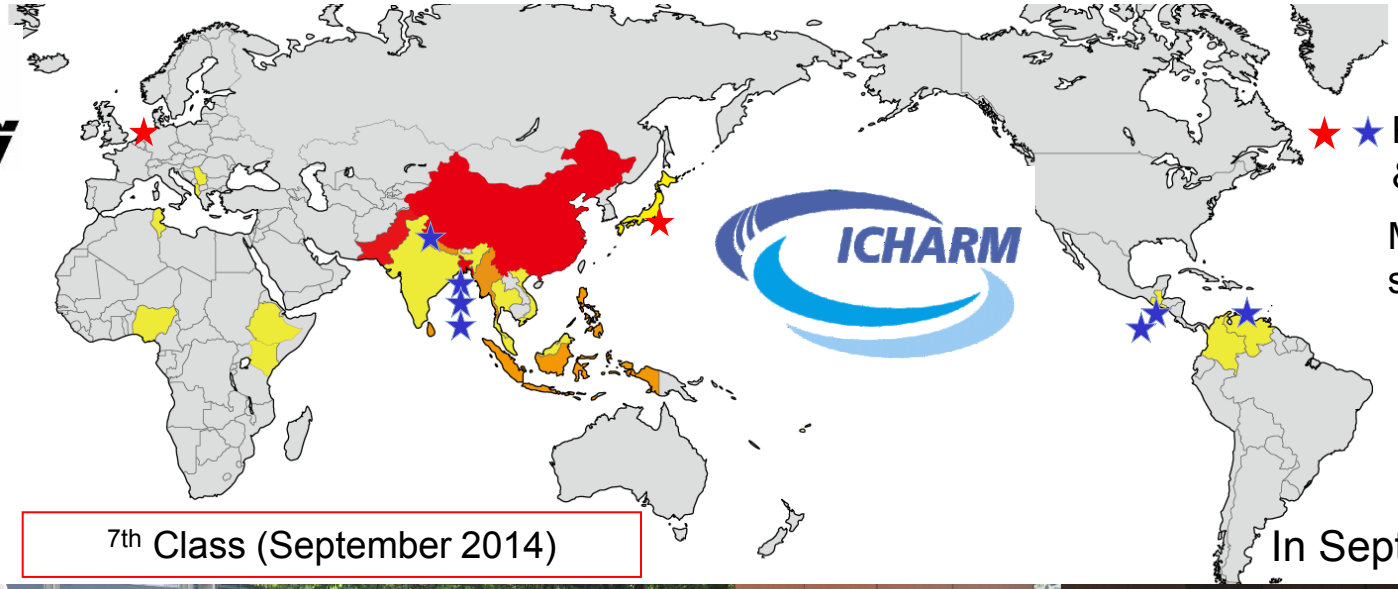
Delivering best available knowledge to local practices



Nationalities of MC and Ph.D. graduates and students

In Oct 2014

84 MS & 2 PhD graduated. 13 MS & 7 Ph.D. students studying.



7th Class (September 2014)

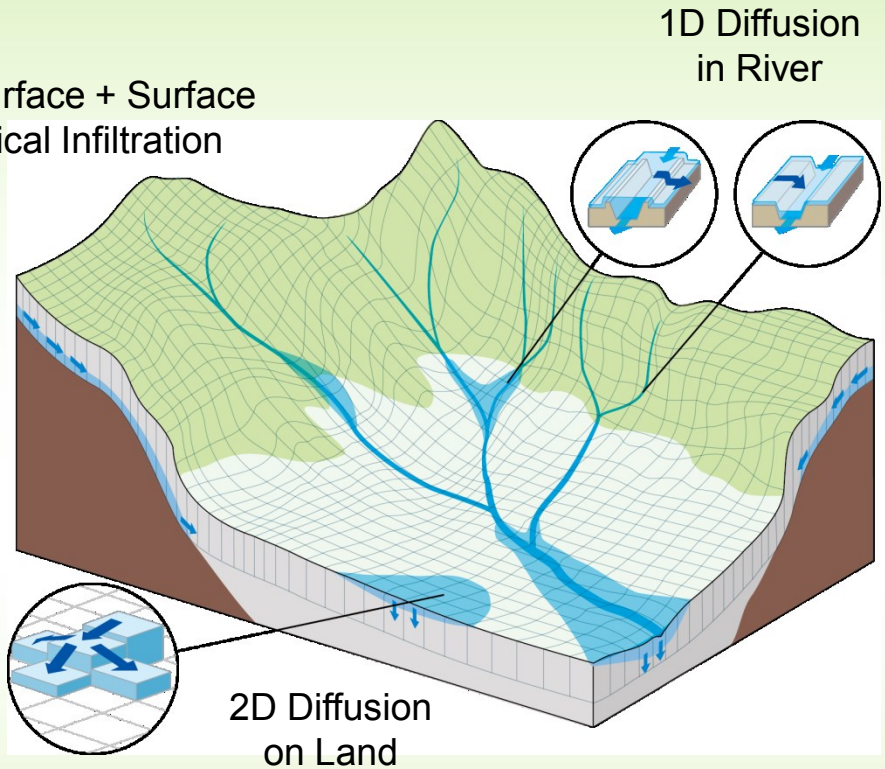
In Sept 2014

Second PhD (2014)

Rainfall-Runoff-Inundation Model

Input

- Rainfall
- DEM
- Land Cover
- Cross Sec.



Output

- Discharge
- W. Level
- Inundation

- RRI Model is a 2D model simulating for rainfall-runoff and flood inundation simultaneously
- It simulates flows on land and in river and their interactions at a river basin scale
- It simulates lateral subsurface flow in mountainous areas and infiltration in flat areas

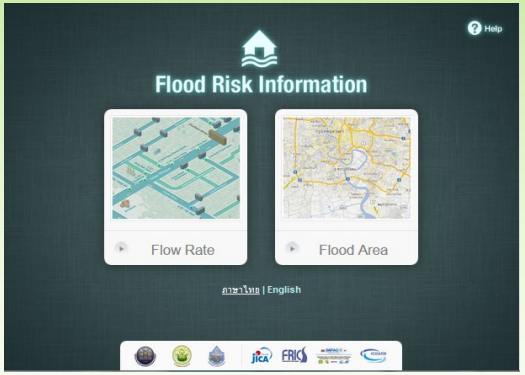
Sayama, T. et al.: Rainfall-Runoff-Inundation Analysis of Pakistan Flood 2010 at the Kabul River Basin, *Hydrological Sciences Journal*, 57(2), pp. 298-312, 2012.

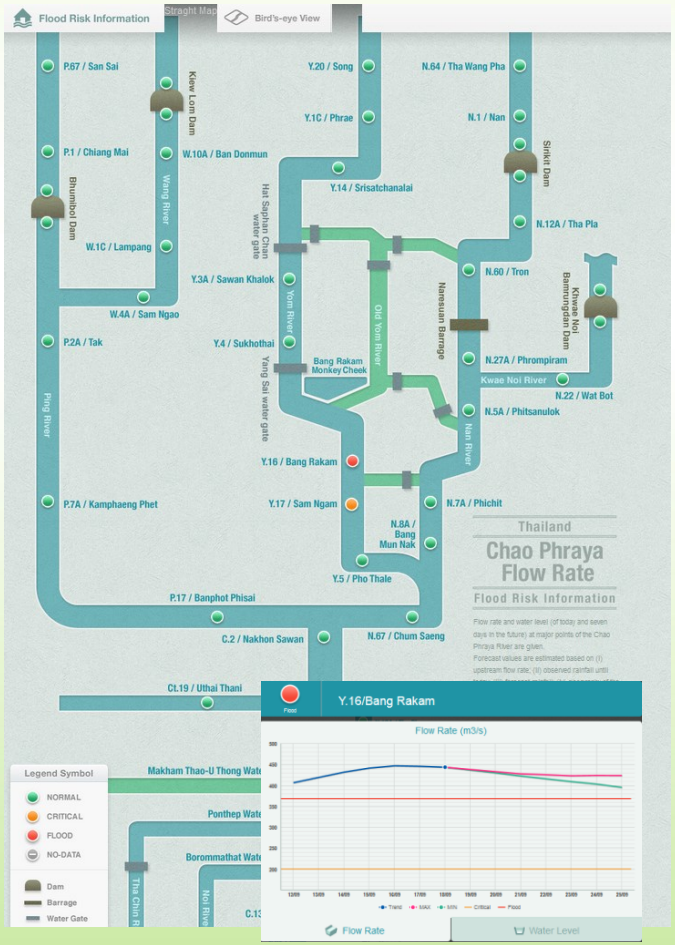
ICHARM

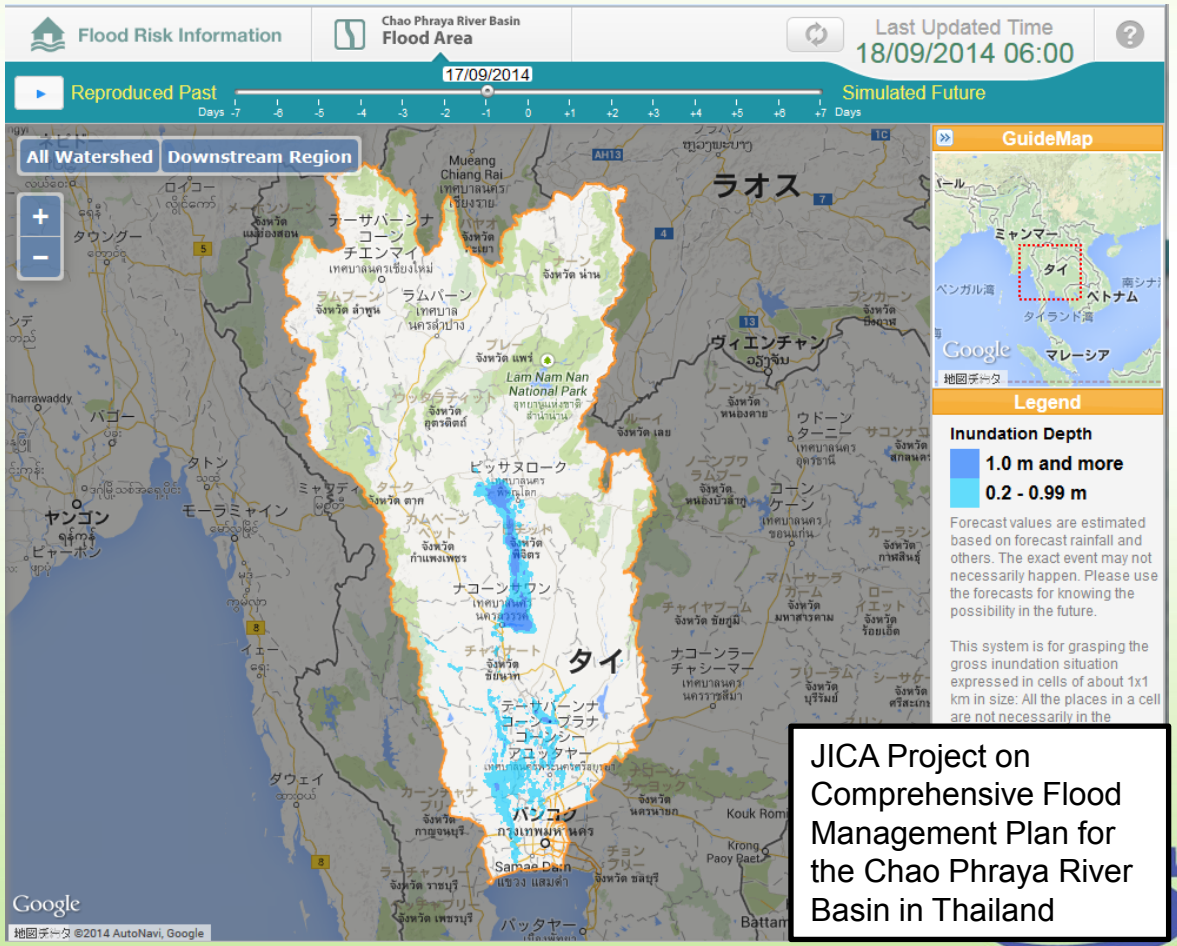
Flood Risk Information System

for the Chao Phraya River Basin based on RRI Model (developed by JICA/FRICS and operated under RID, Thailand)

http://floodinfo.rid.go.th/index_en.html





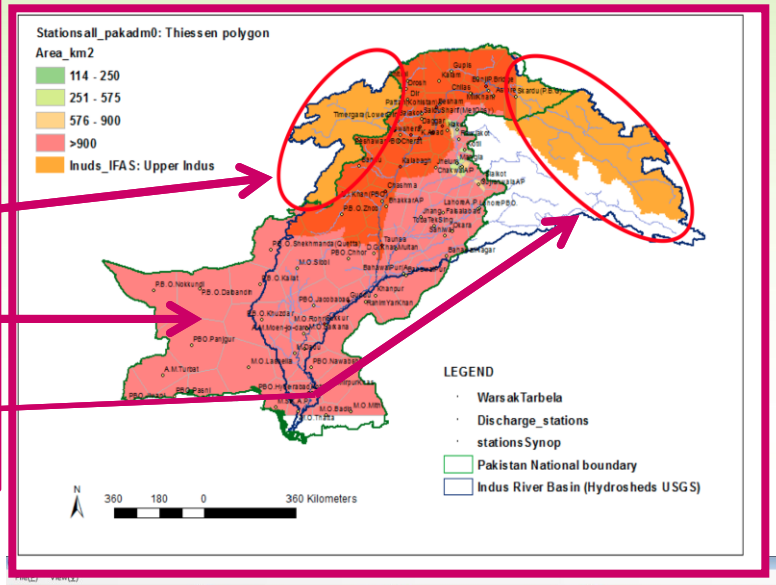


JICA Project on Comprehensive Flood Management Plan for the Chao Phraya River Basin in Thailand

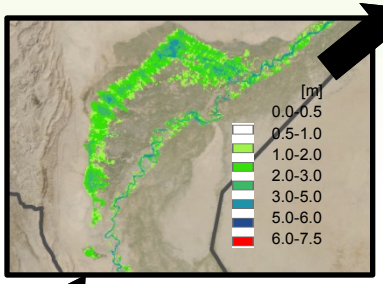
Indus-IFAS: flood forecasting system based on IFAS / RRI (UNESCO-Pakistan project 2012-13)

INPUT DATA CHALLENGES:

- *Lack of trans—boundary data*
- *Null-Low rain gauges network density*
- *Uncertainty on snowmelt*



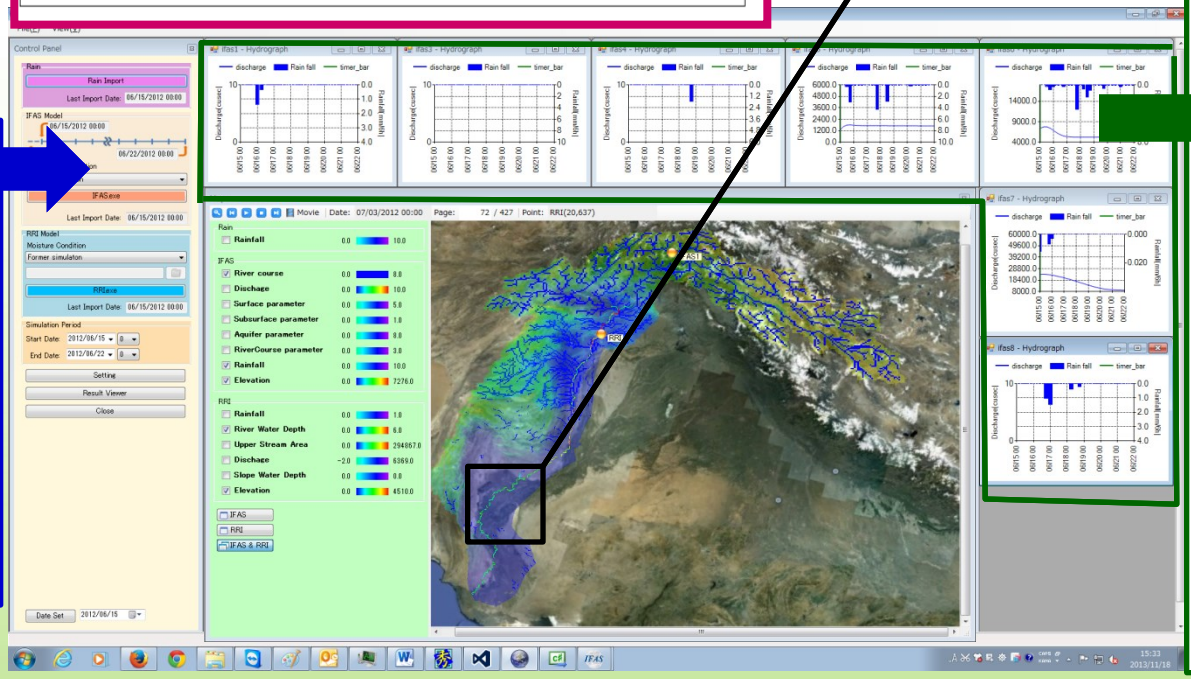
Inundation area by RRI



FLOOD HAZARD MAPPING

INPUT DATA :

- Rainfall data (PMD ground-gauges, GSMaP and forecasted)
- **Real-time observed discharges**



OUTPUT DATA:

- Rainfall distribu-tion maps
- Hydro-graphs at specified locations
- Inundatio n extents in mid-low Indus

Capacity Building for Pakistan (2012-13)

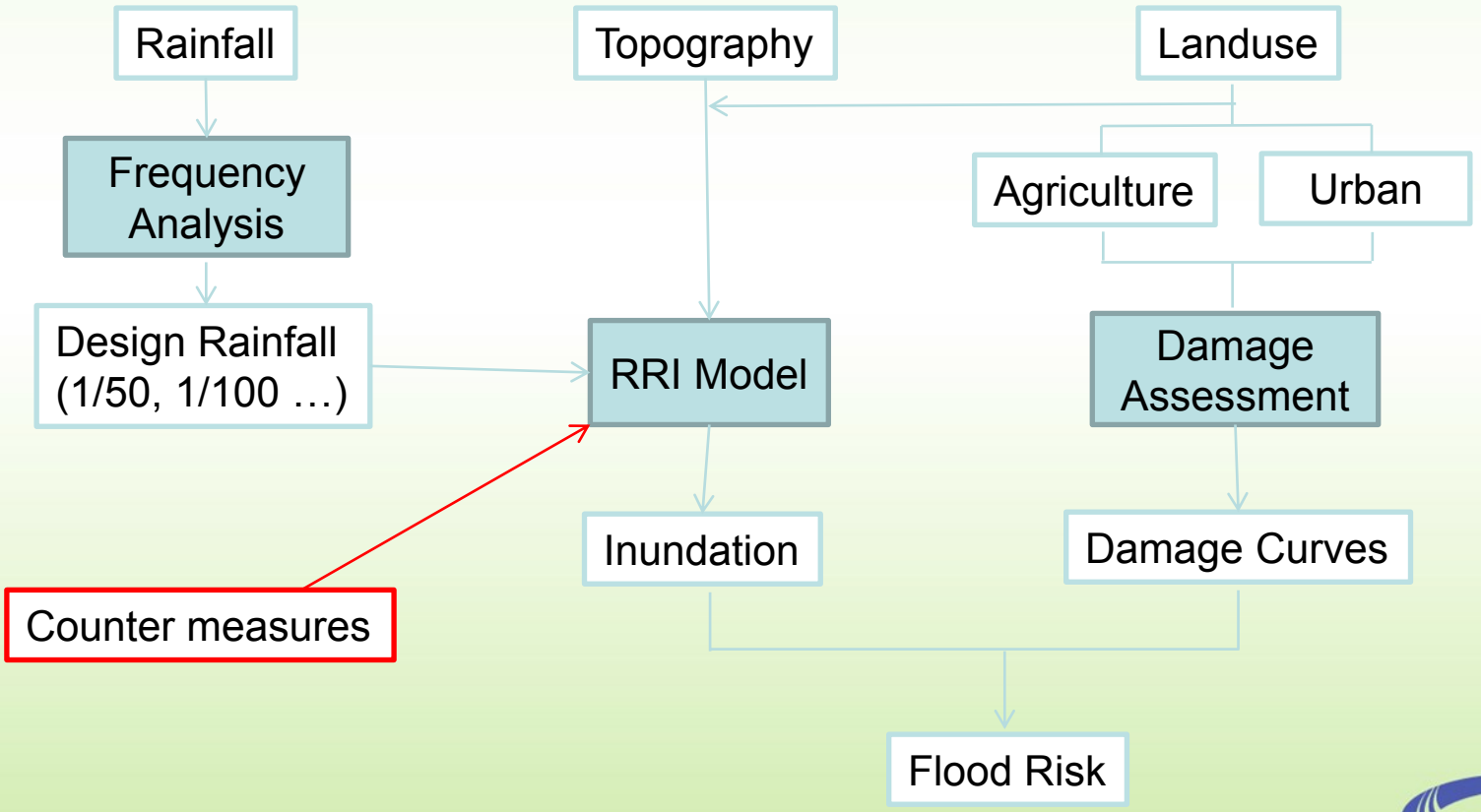
6 Pakistani officers (PMD, SPARCO & IPD) graduating from ICHARM/GRIPS MSc

Short- training in Japan of 11 Senior Managers from Pakistan

ICHARM participation to international Workshop and Training in Pakistan

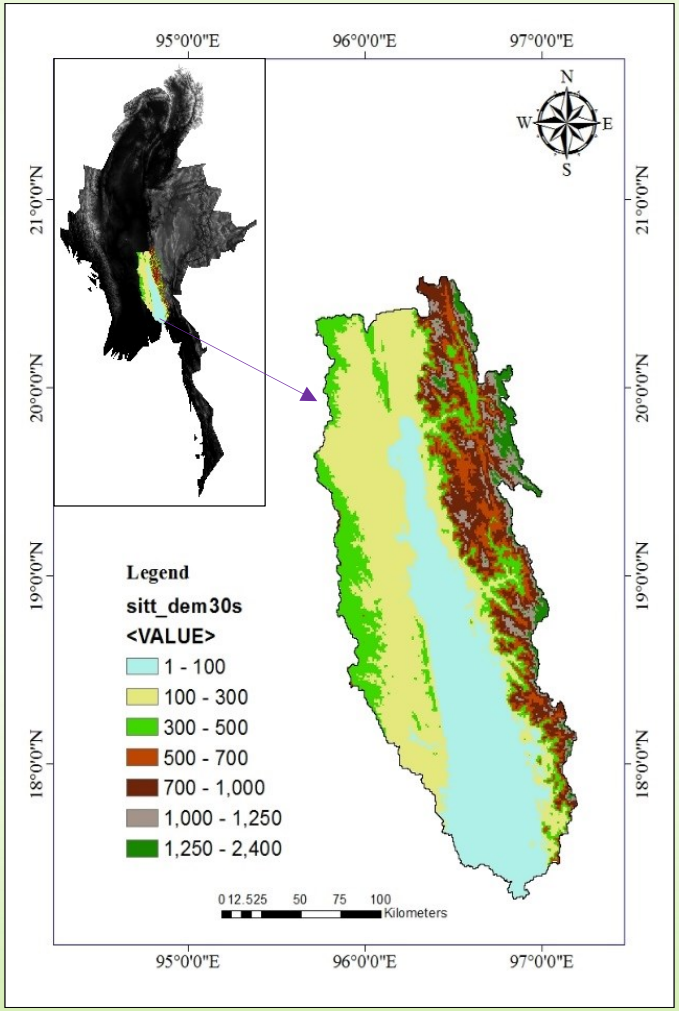
Indus-IFAS training at FFD Lahore

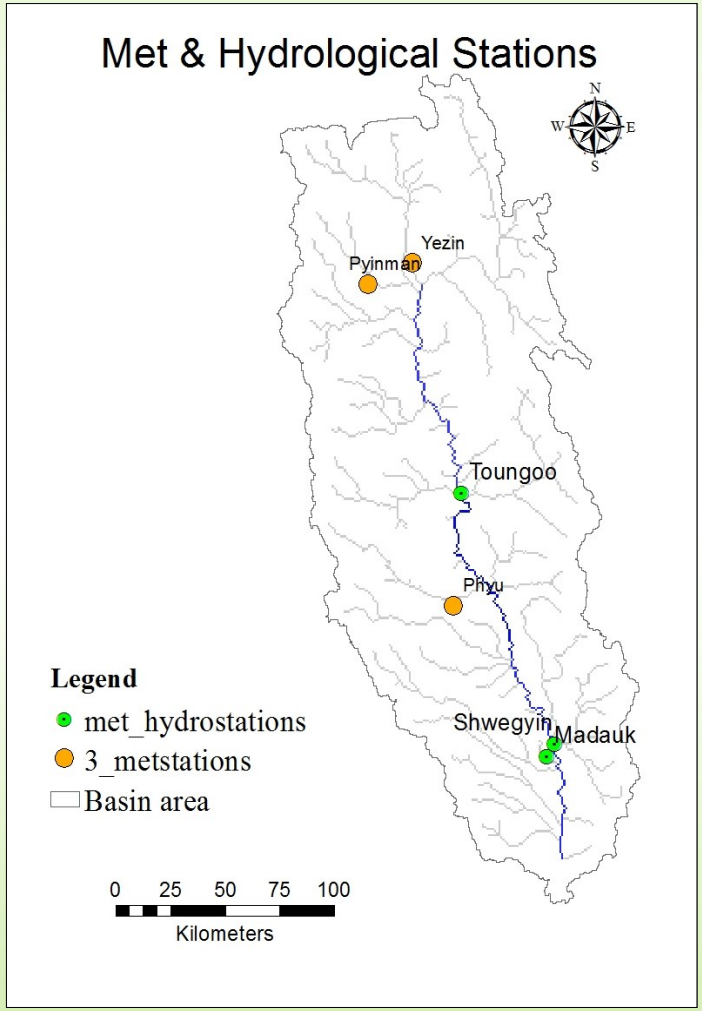
Flood Risk Assessment with RRI



Flood Inundation Analysis and Risk Assessment in the Sittoung River Basin in Myanmar

Zaw Myo Khaing, MSc Thesis, ICHARM-GRIPS, 2014

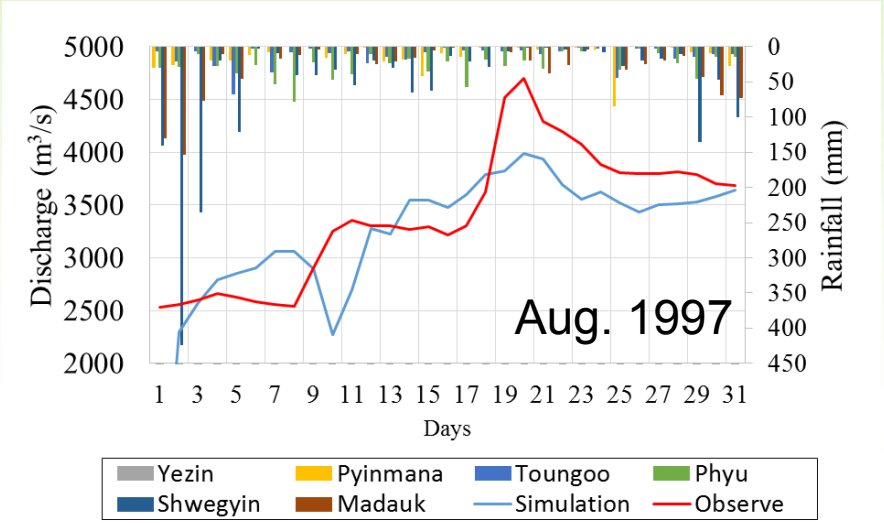




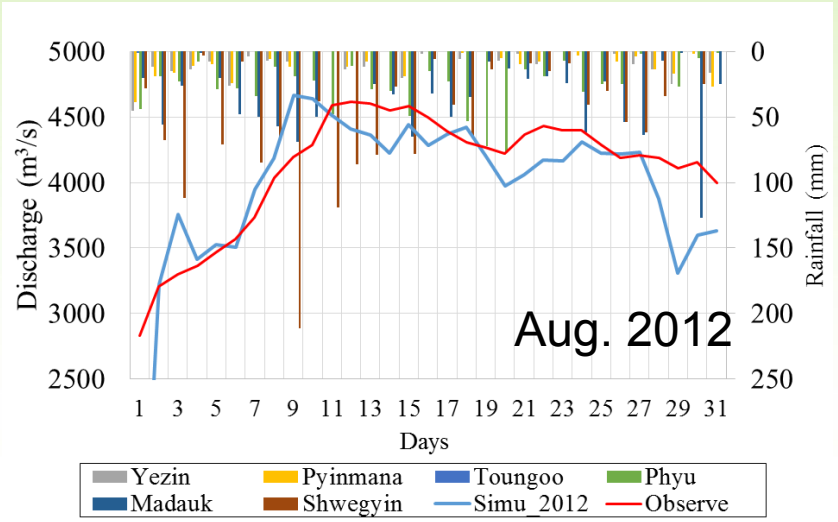
Sittoung River Basin: 33,600 km^2 (4th largest in Myanmar)
Important for agricultural production (paddy) and food exportation (crop plants)

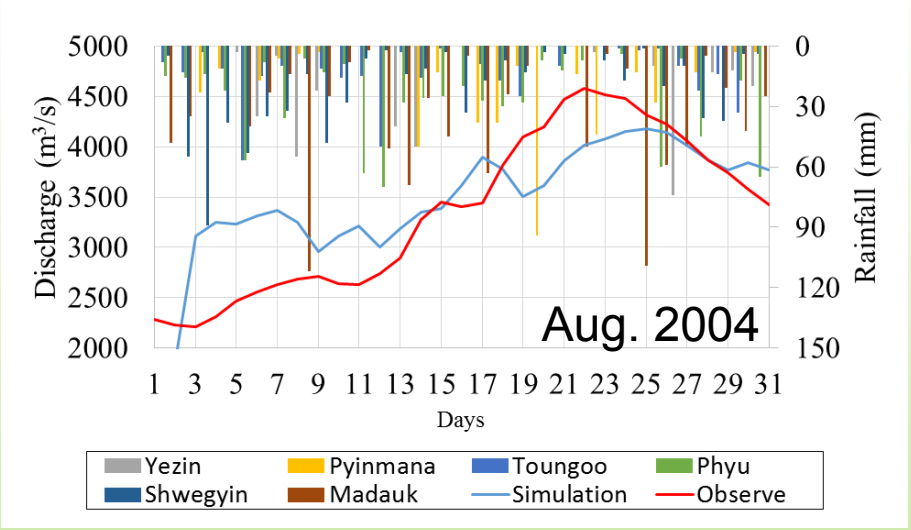
Model Calibration and Validation

Calibration

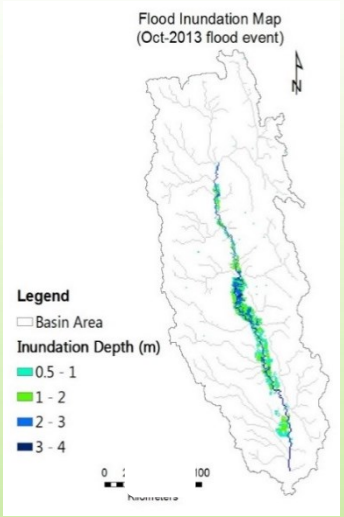


Validation

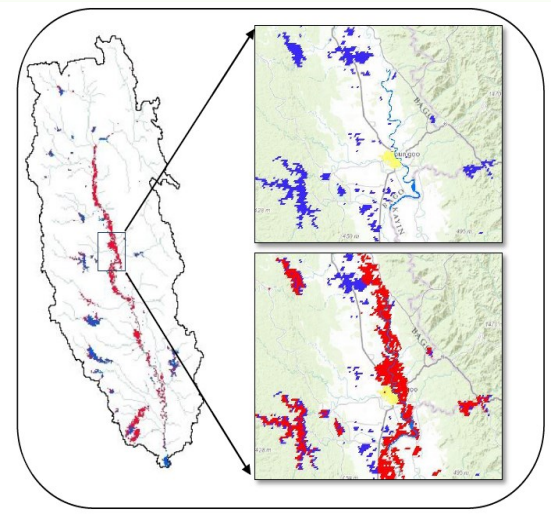




RRI



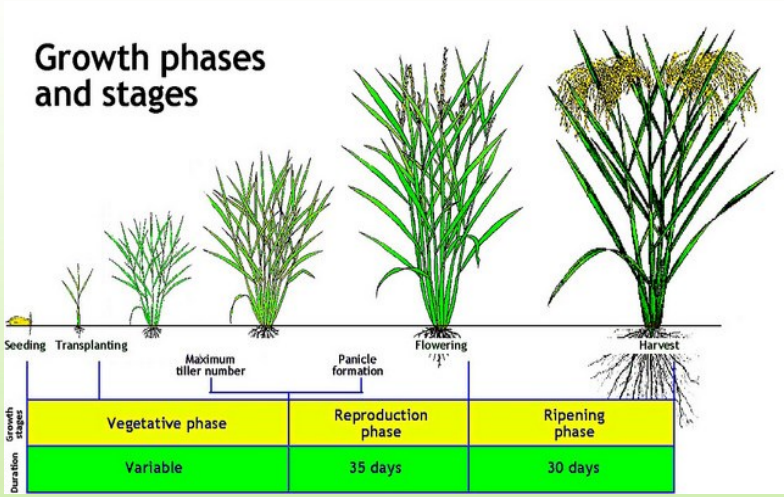
MODIS (MLSWI)



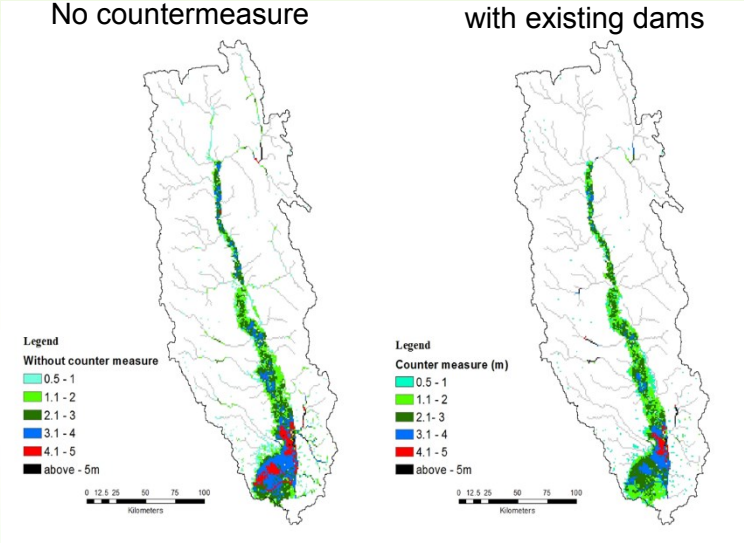
Agricultural Damage Estimation

Rice Production cost US $ 373 / ha
Pulse Crop Production cost US $ 416 / ha

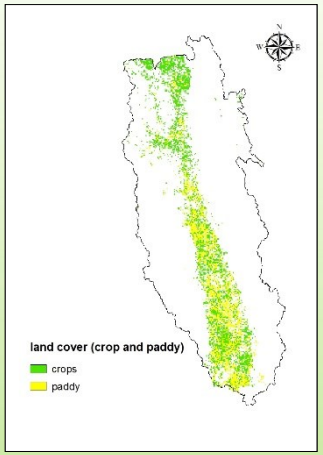
Flood Damage Ration in Paddy (Base on 1997 Monsoon Season Flood Inundation)			
Duration	Depth (0-1m)	Depth (1-2m)	Depth (above 2m)
1st week	0 to 10%	20 to 45%	45 to 75%
2nd week	15 to 30%	40 to 70%	70 to 85%
3rd week	25 to 55%	65 to 90%	100%
4th week	50 to 75%	100%	100%



Simulated Flood for 50-year Return Period



Land use data



Estimated Paddy Damage:
38-40 Mill. USD
(34-35 Mill. USD with dams)

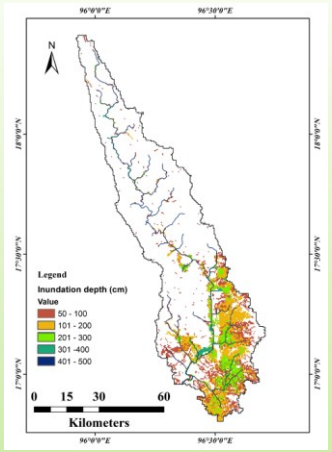
Pulse Crop Damage:
7.3-7.8 Mill. USD
(4.3-4.6 Mill. USD with dams)

Reference
2013.7. Nigata, Fukushima
Affected: 164 km^2, 53 Mill USD

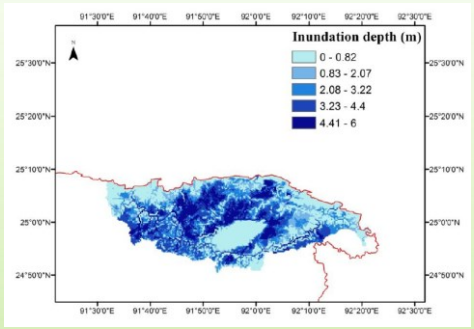
Comparison with other MSc studies

Country	Basin	Area (km^2)	Affected Paddy (km^2)	**Estimated Damage (Mill. USD)**	Source (MSc Thesis)
Myanmar	Sittung	33600	1385	**38-40**	Khaing, 2014
Myanmar	Bago	5000	1030	**25**	Tin, 2013
Bangladesh	Surma	6800	1938	**55**	Noman, 2013
Nepal	Bagmati	2800	146	**4.4**	Akhlaque, 2013
Sri Lanka	Kelani	2000	38	**1.6**	Kumar, 2013

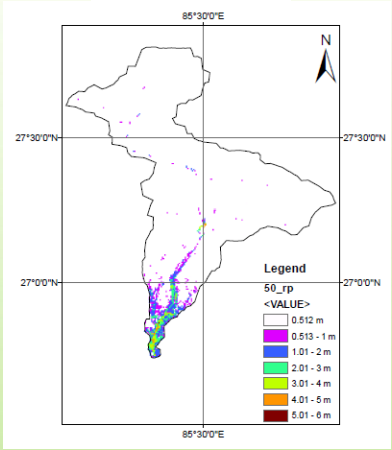
Bago



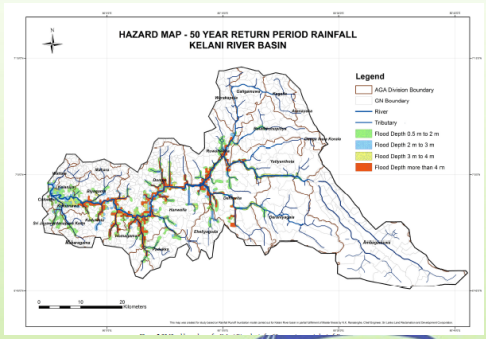
Suruma



Bagmati



Kelani



ICHARM