


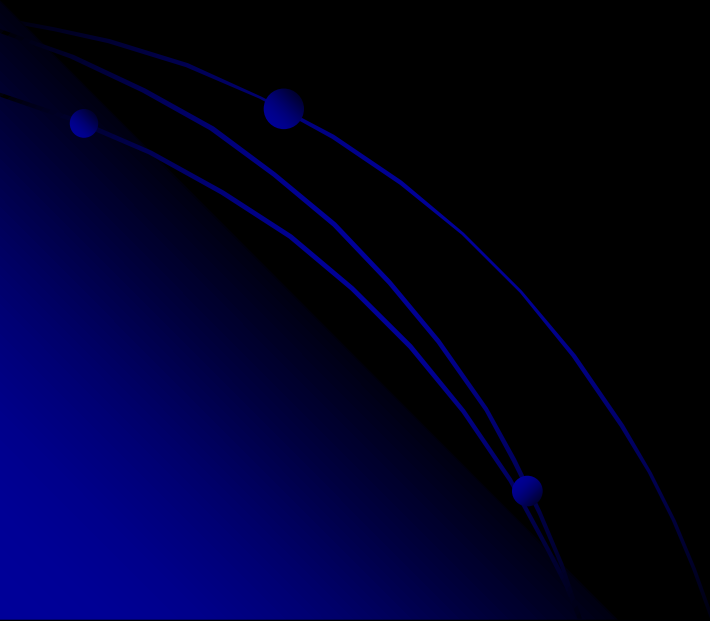
# Flash Flood Risk Information for Local Resilience

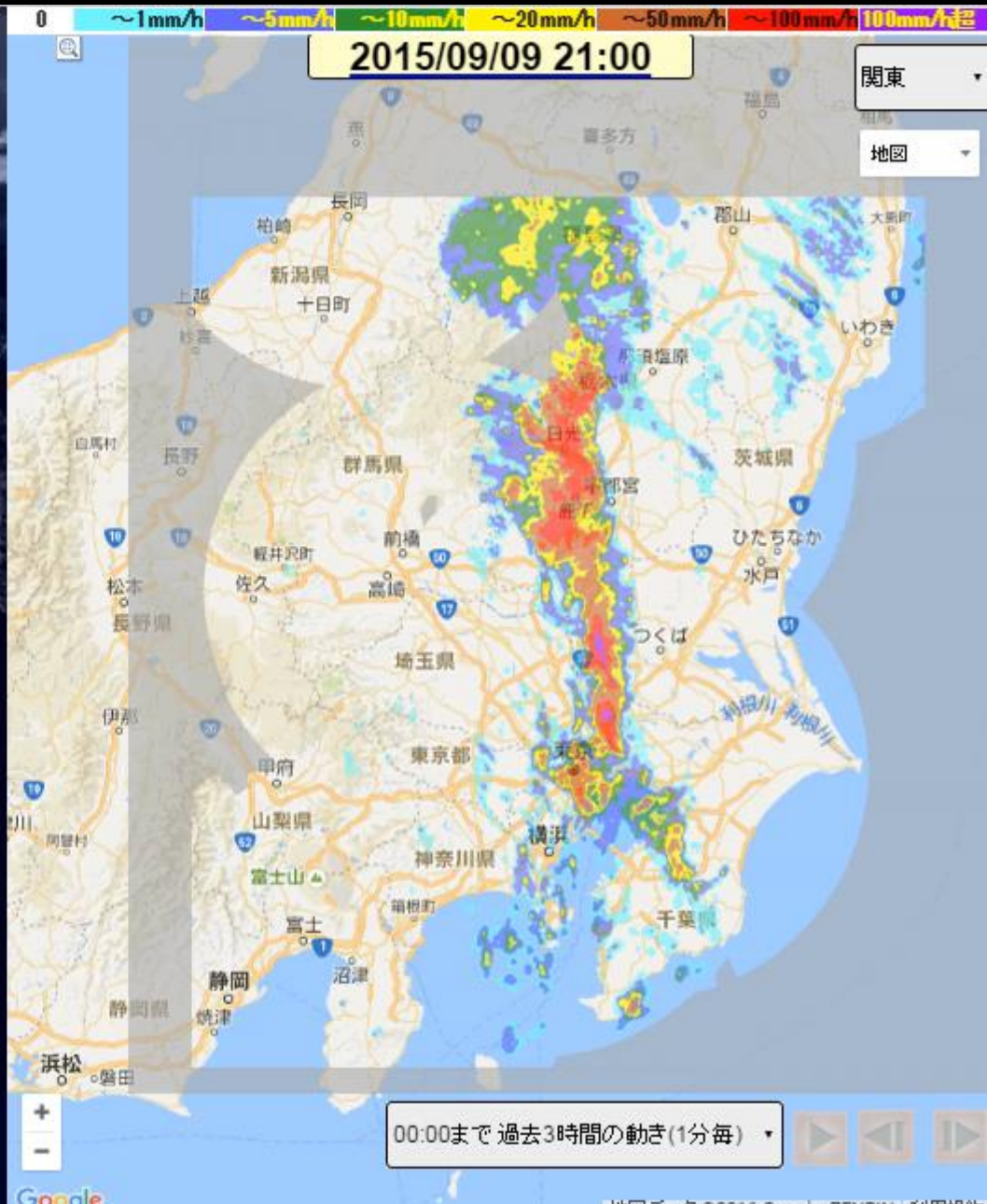
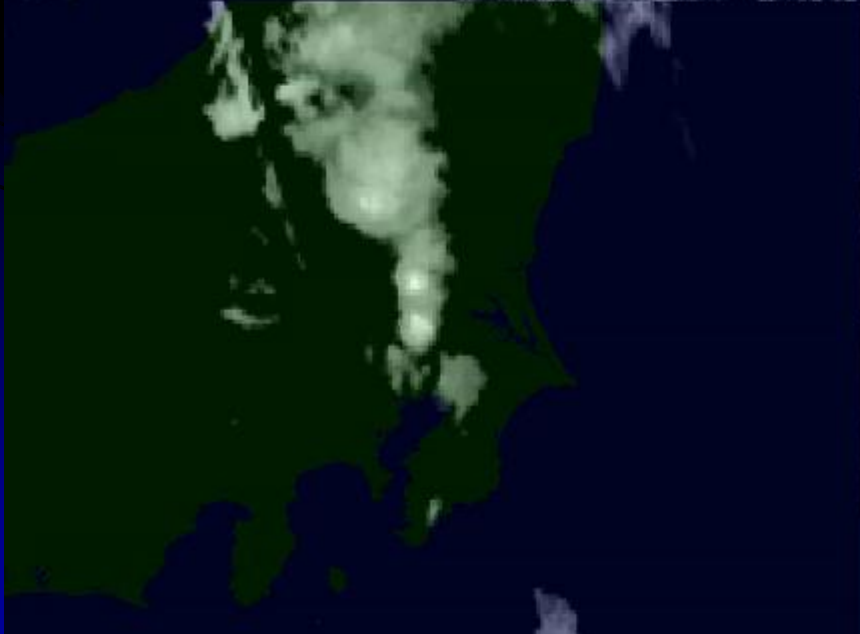
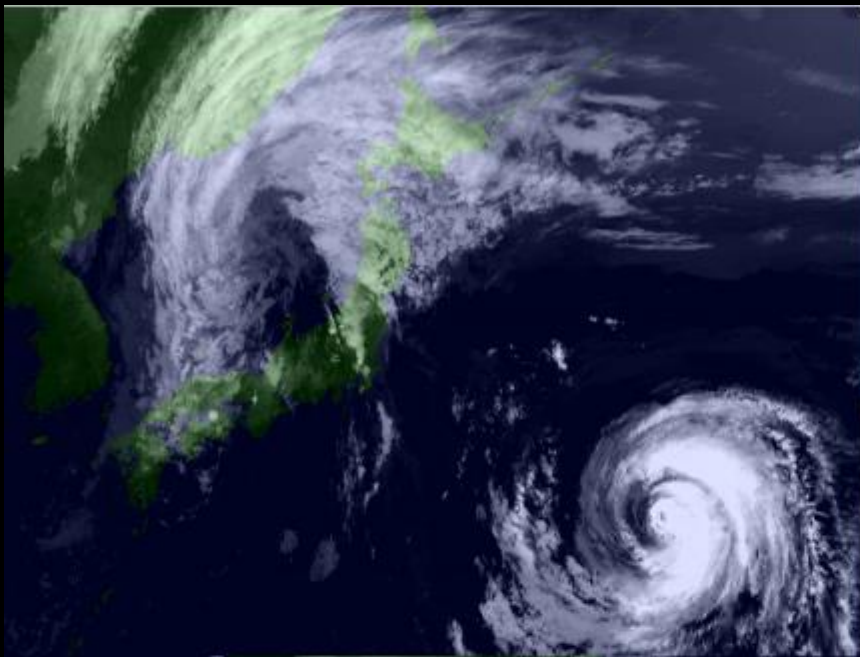
Toshio Koike

International Centre for Water Hazard and Risk Management (ICHARM)  
Public Works Research Institute (PWRI)  
University of Tokyo



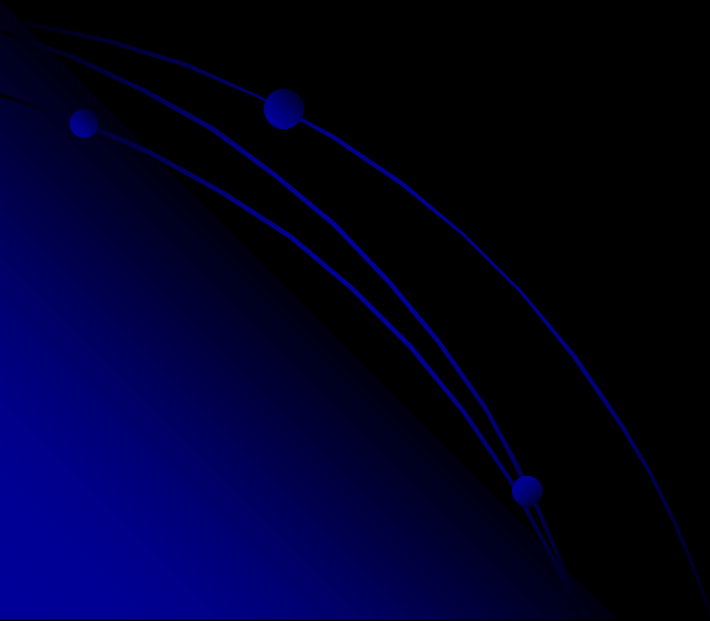
2015







2016







# International Flood Initiative (IFI)

May: XIVth **WMO Congress** welcomed the initiative and suggested to establish a joint UNESCO/WMO Committee on Floods. The proposed ICHARM will constitute a global facility for this programme.

18-22 Jan 2005  
Inauguration of  
IFI at WCDR in  
Kobe  
WMO/UNESCO/  
UNISDR/UNU

2003

2004

- > 12-14 Jul : **Preparatory meeting in Tsukuba**. A joint UNESCO/WMO task team (6 members) produced a **concept paper** "The Joint **UNESCO/WMO** Flood Initiative (JUWFI)"
- > 20-24 Sep : **16<sup>th</sup> IHP-IGC** approved the concept paper and renamed as "The International Flood Initiative (IFI)".
- > 20-29 Oct : **12<sup>th</sup> WMO CHy** discussed the Concept Paper

2002

17-22 Jun : **15<sup>th</sup> UNESO-IHP IGC Resolution** XV-14 on Joint UNESCO/WMO Programme on Floods

In Close Collaboration with:



International Strategy  
**UNISDR**  
for Disaster Reduction



UNITED NATIONS  
UNIVERSITY



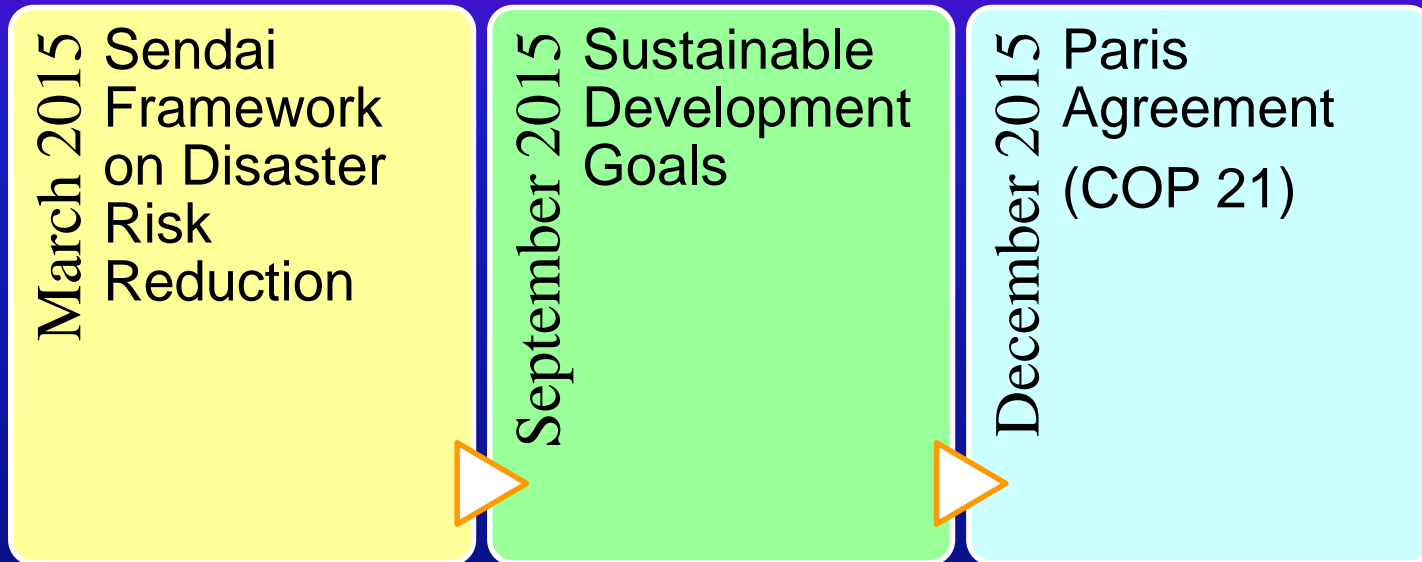
# Three Key Global Agendas in 2015

Understanding

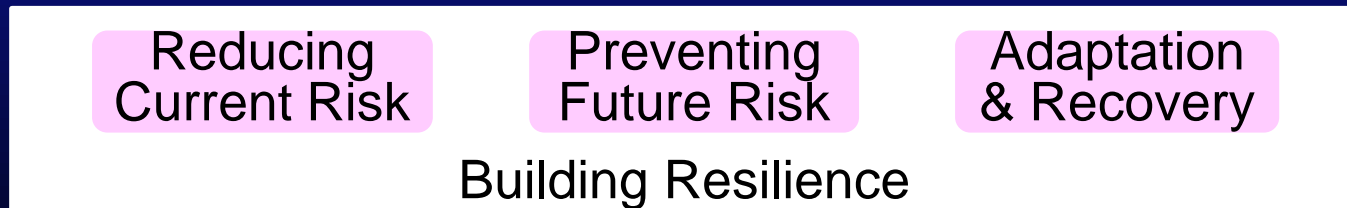
Governance

Investment

EW/BBB



**Concerted Action is Required**

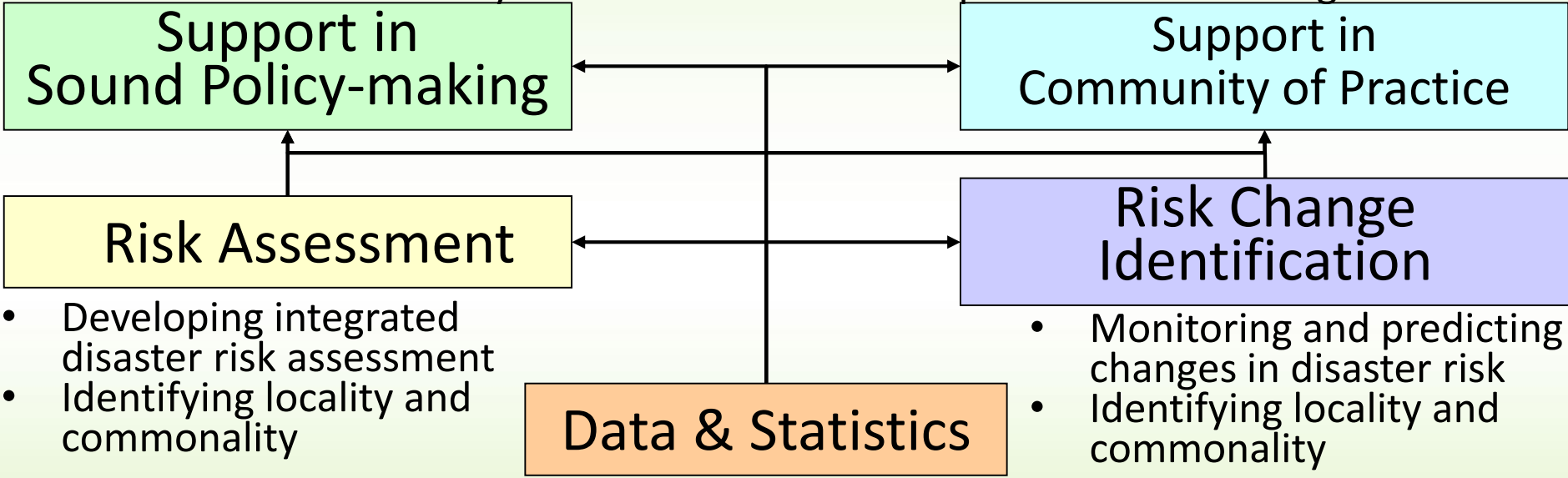


**Sustainable Development**



## IFI Implementation Framework

- Analyzing and formulating policies
- Visualizing values of preparedness and investment efficiency
- Improving disaster literacy
- Promoting co-design and co-implementation among stakeholders



- Developing integrated disaster risk assessment
- Identifying locality and commonality

- Monitoring and predicting changes in disaster risk
- Identifying locality and commonality

- Promoting data collection, storage, sharing, and statistics
- Integrating local data, satellite observations and model outputs

In Close Collaboration with:



# IFI Implementation Framework 2016-2022

## Phase-3 Operation: Strengthen & Expanding



## Phase-2 Prototyping: Install in Specific Areas



## Phase-1 Demonstration: Existing Infrastructure



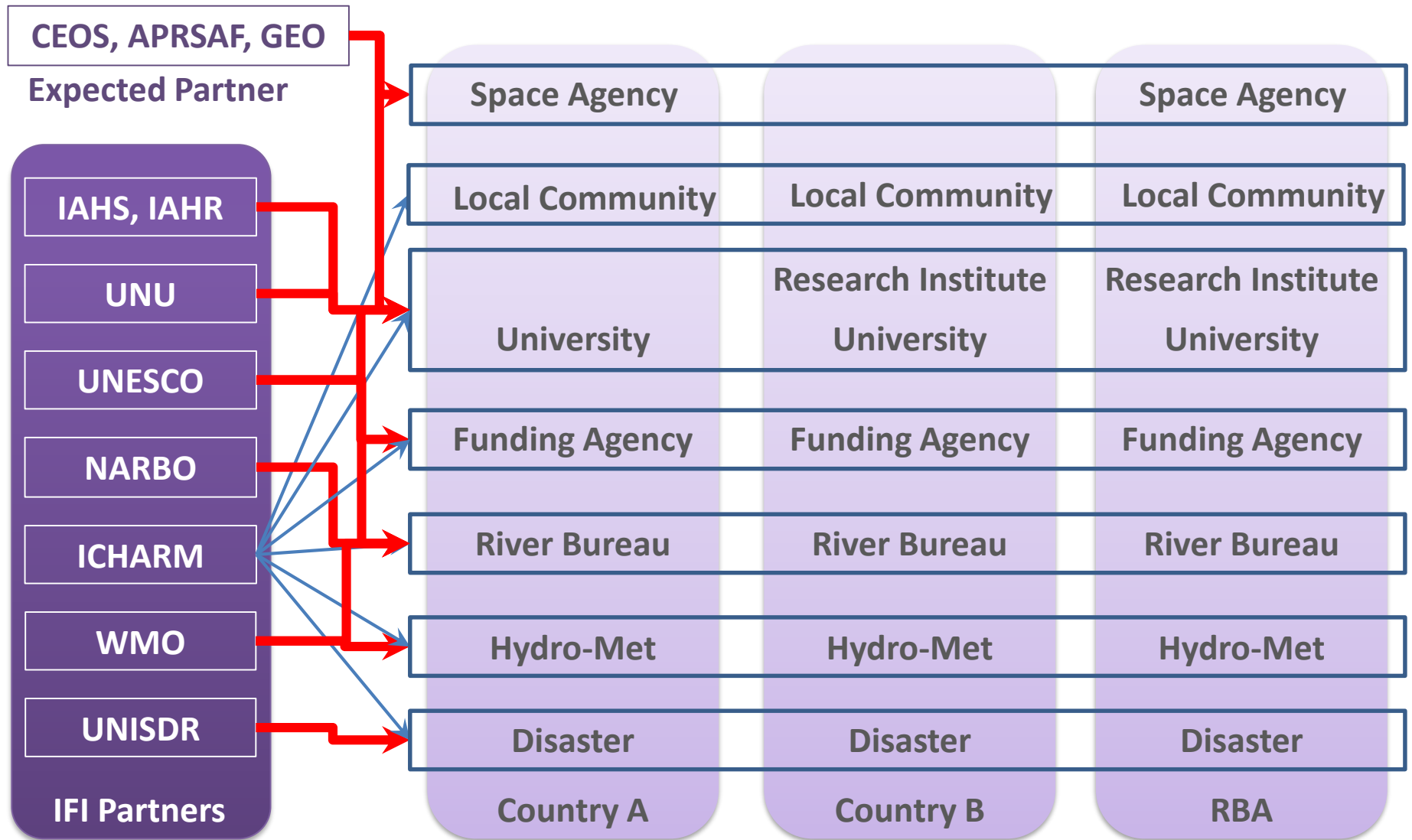
### Regional Coordination Framework

- Commonality & Priority
- Sharing knowledge, best practice
- Strengthening capability
- Establishing a forum for promoting dialogue

### National Coordination Framework

- Locality
- Institutional arrangements
- Observation & data integration
- Natural & Socio-economic
- Communities of practice

# Structure Image of Specific Support

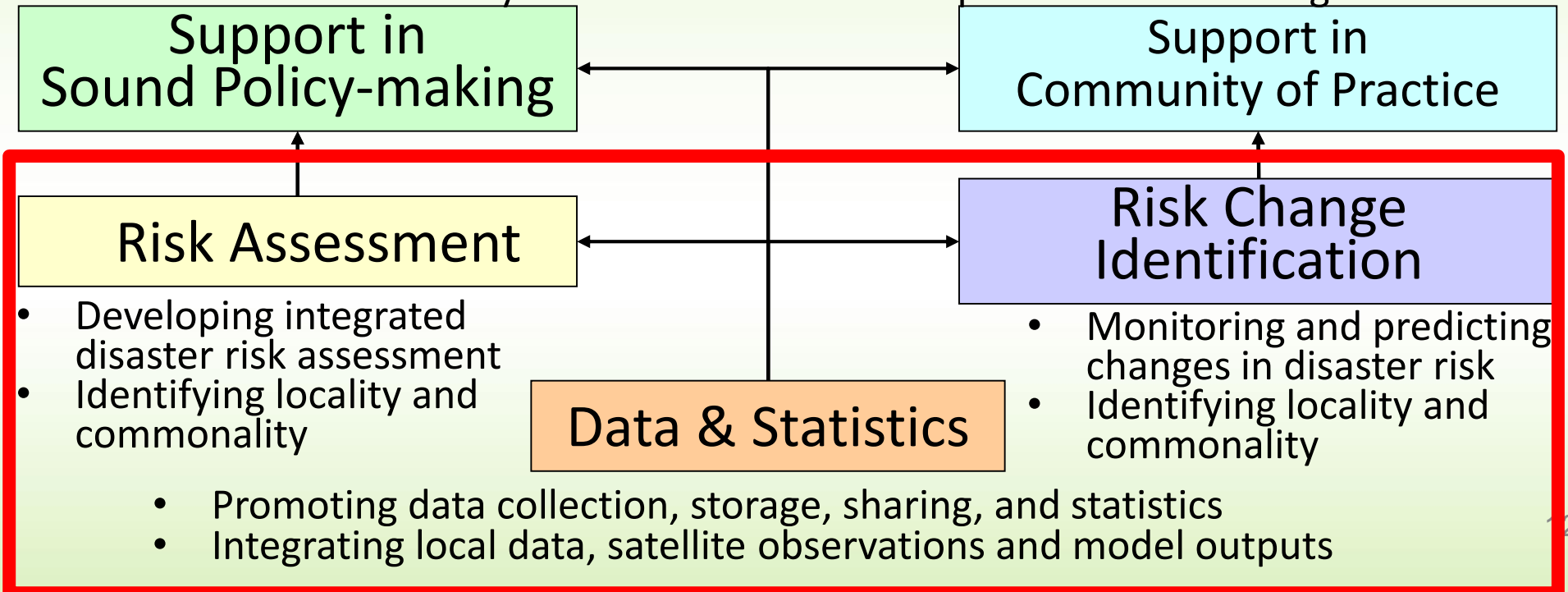


Main support: 

Sub-support: 

## IFI Implementation Framework

- Analyzing and formulating policies
- Visualizing values of preparedness and investment efficiency
- Improving disaster literacy
- Promoting co-design and co-implementation among stakeholders



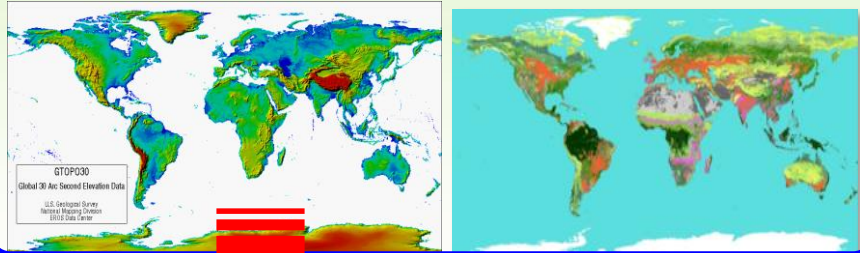
In Close Collaboration with:



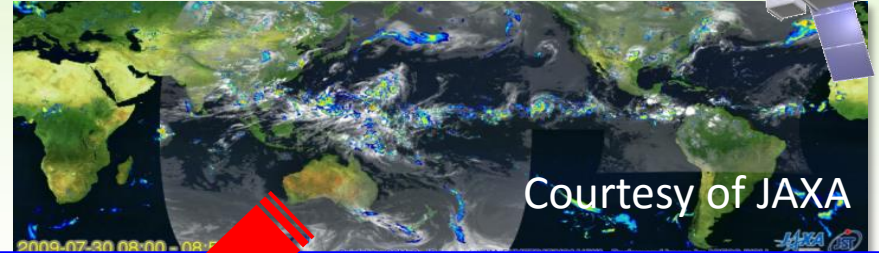


# Early Warning System - IFAS(Integrated Flood Analysis system) for insufficient observed basin

**Global data:** topography, land use, etc.



Import **satellite rainfall** and **ground-gauged data**



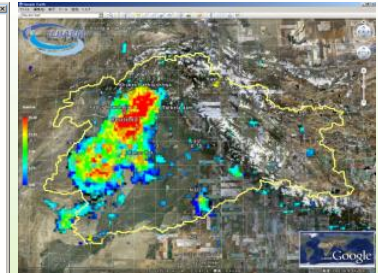
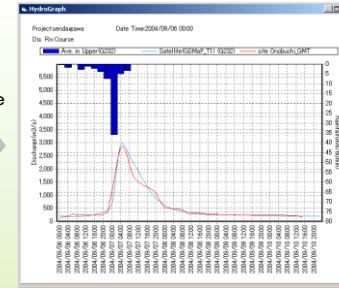
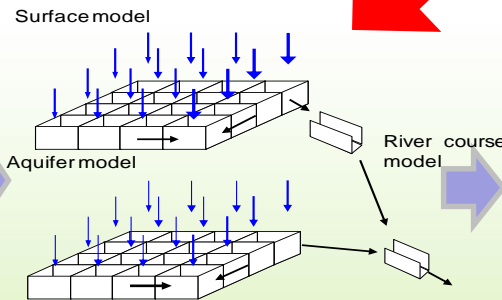
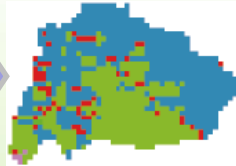
input

Run-off analysis by PWRI **distributed tank model**

input

Output: River discharge, Water level, Rainfall distribution

Model creation



Evacuate from dangerous areas

Judge by River management authorities

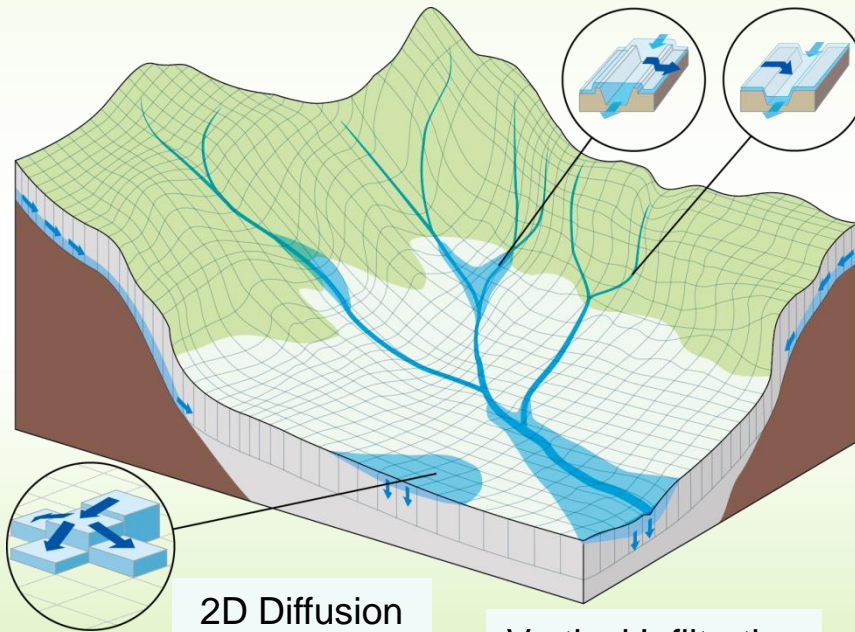
Alert message by E-mail and on the display for river management authorities

Discharge reaches warning level

# Flood Risk: Flooding Simulation by RRI model

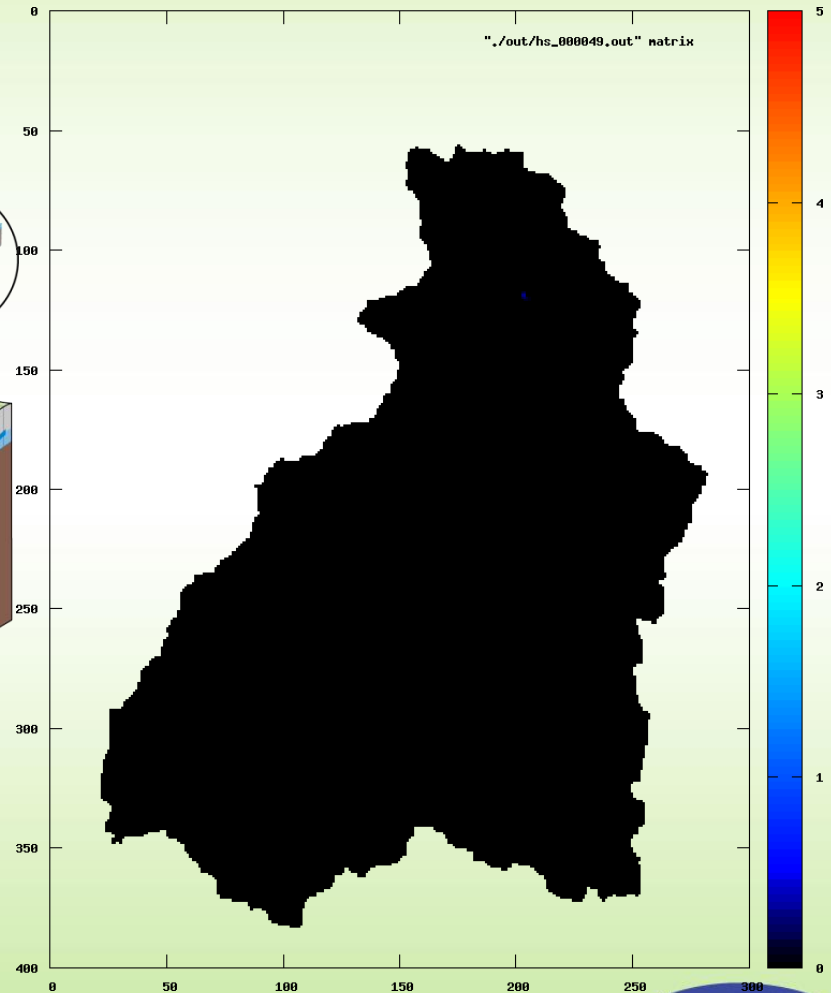
Subsurface + Surface

1D Diffusion in River



2D Diffusion in Catchment

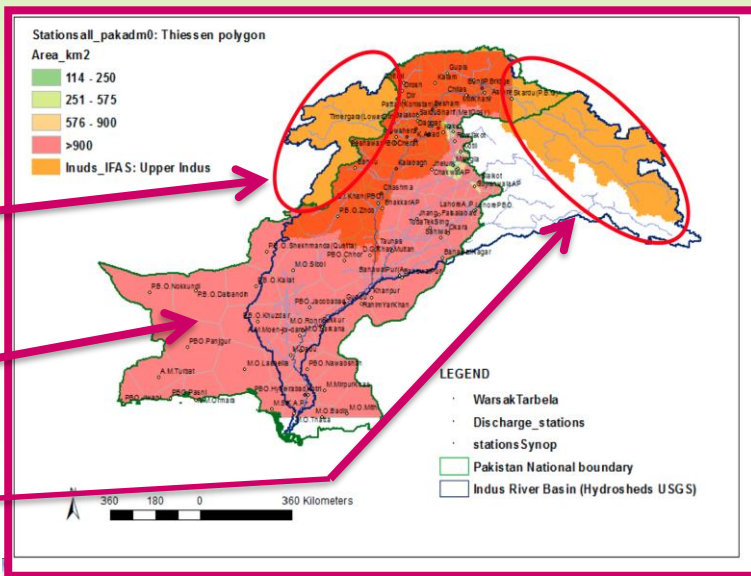
Vertical Infiltration



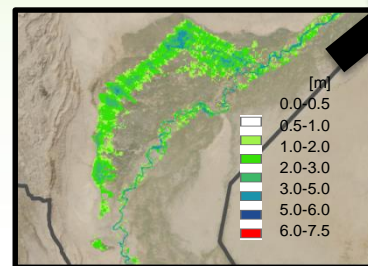
# Indus-IFAS: flood forecasting system based on IFAS / RRI (UNESCO-Pakistan project 2012-14)

## INPUT DATA CHALLENGES:

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



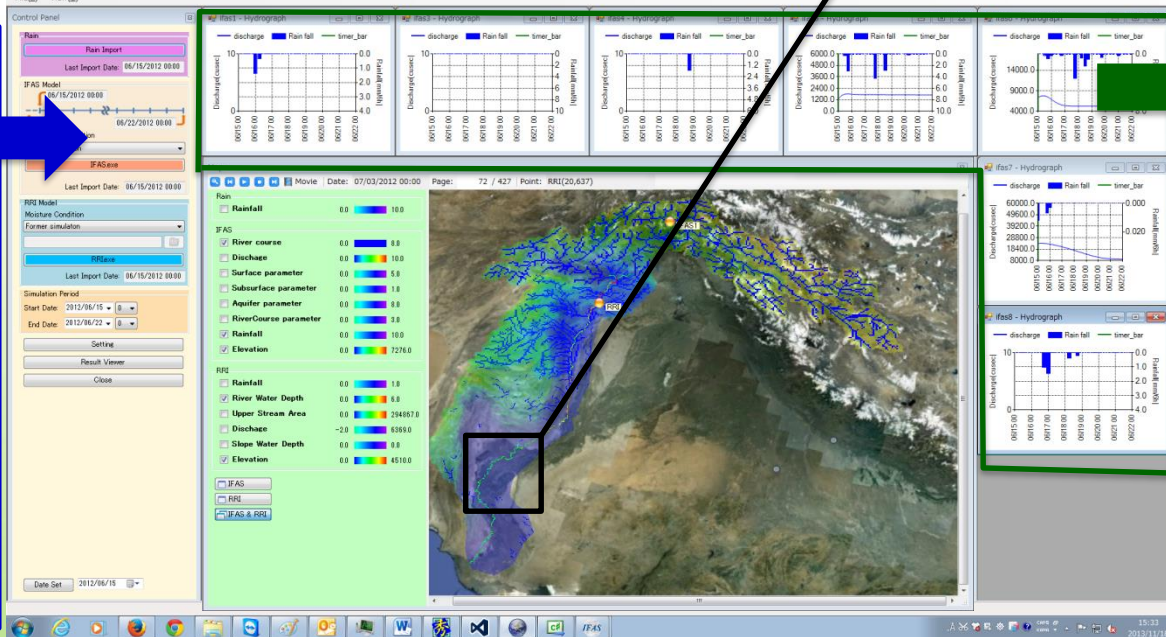
Inundation area by RRI



FLOOD HAZARD MAPPING

## INPUT DATA :

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



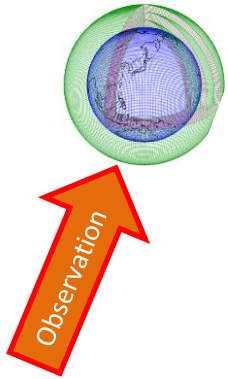
## OUTPUT DATA:

- Rainfall distribution maps
- Hydrographs at specified locations
- Inundation extents in mid-low Indus



# Probabilistic Streamflow Forecasting Utilizing Regional Ensemble Prediction System (EPS)

Japanese type: Downscaling with Mesoscale Data assimilation



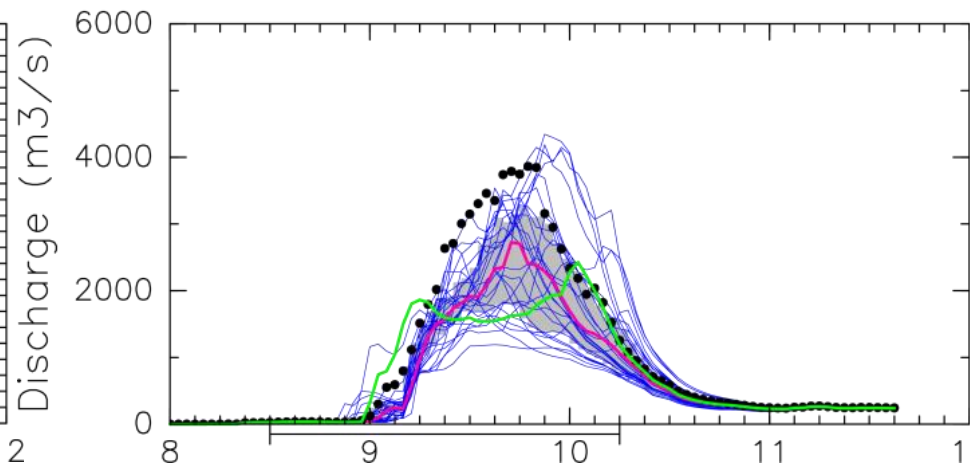
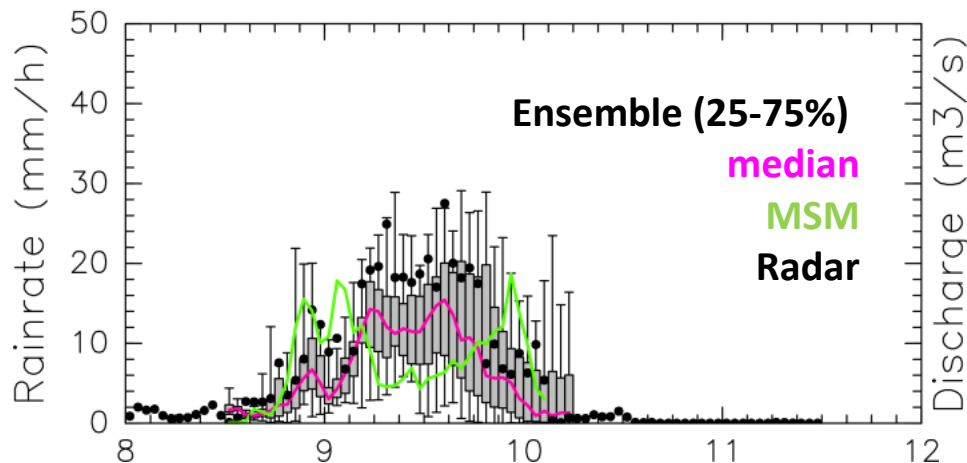
**JMA**

20 km GCM → 5 km regional ensemble, 11 member

**ICHARM**

20 km GCM → 3 km regional ensemble, 21~33 member

12z08 ~ FT=18h



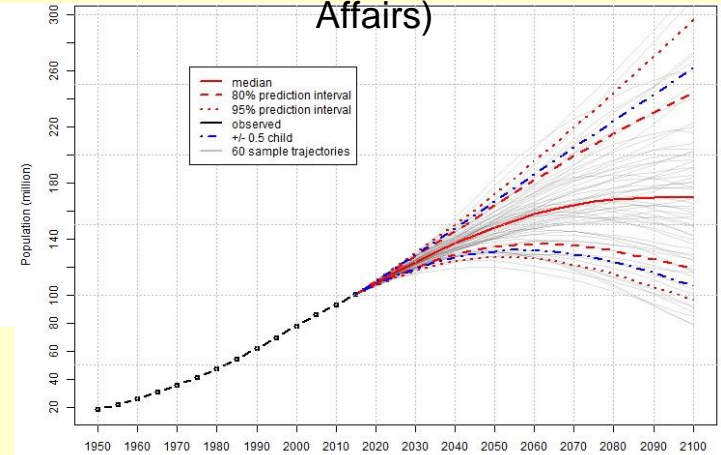


# Estimated affected people by a 100-year return period flood in future

## Calculation condition:

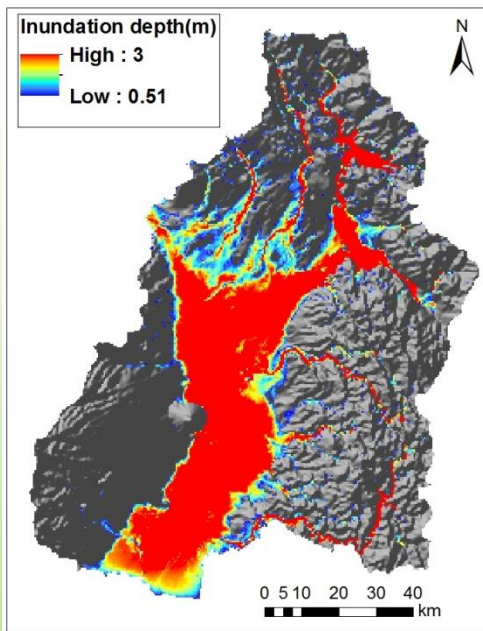
GCM: MRI-AGCM3.2S (20km, SST: MME)  
Downscaling (5km): WRF (Grell 3D ensemble scheme)  
Runoff and Inundation model: RRI 450m grid  
Input data: 48-hour precipitation, maximum pattern  
(100-year probability)  
Population distribution: LANDSCAN 1km grid data (2013)  
Future population projection:  
(UN Department of Economic and Social Affairs)

## Future population projection (Philippines) (UN Department of Economic and Social Affairs)

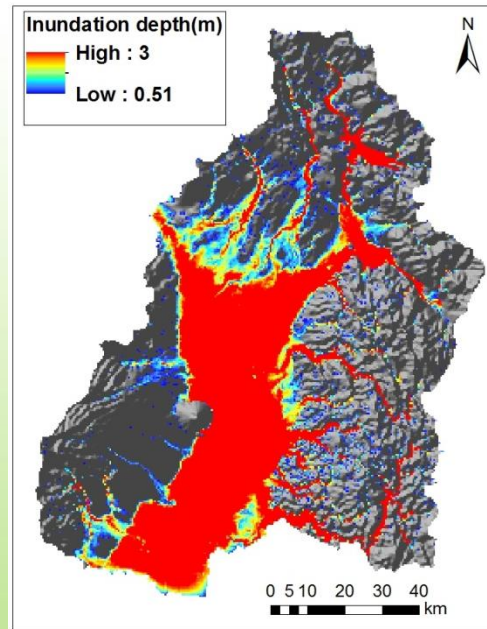


Source: United Nations, Department of Economic and Social Affairs, Population Division (2015).  
World Population Prospects: The 2015 Revision. <http://esa.un.org/unpd/wpp/>

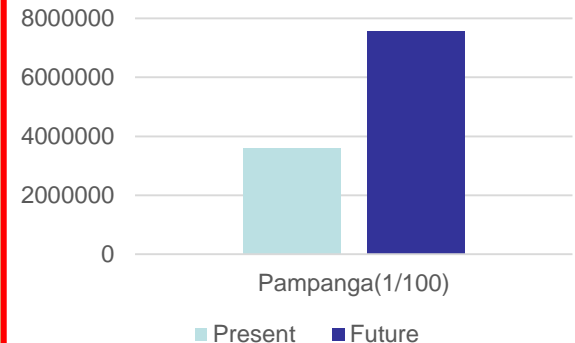
## Flood inundation (1/100) in present climate



## Flood inundation (1/100) in future climate

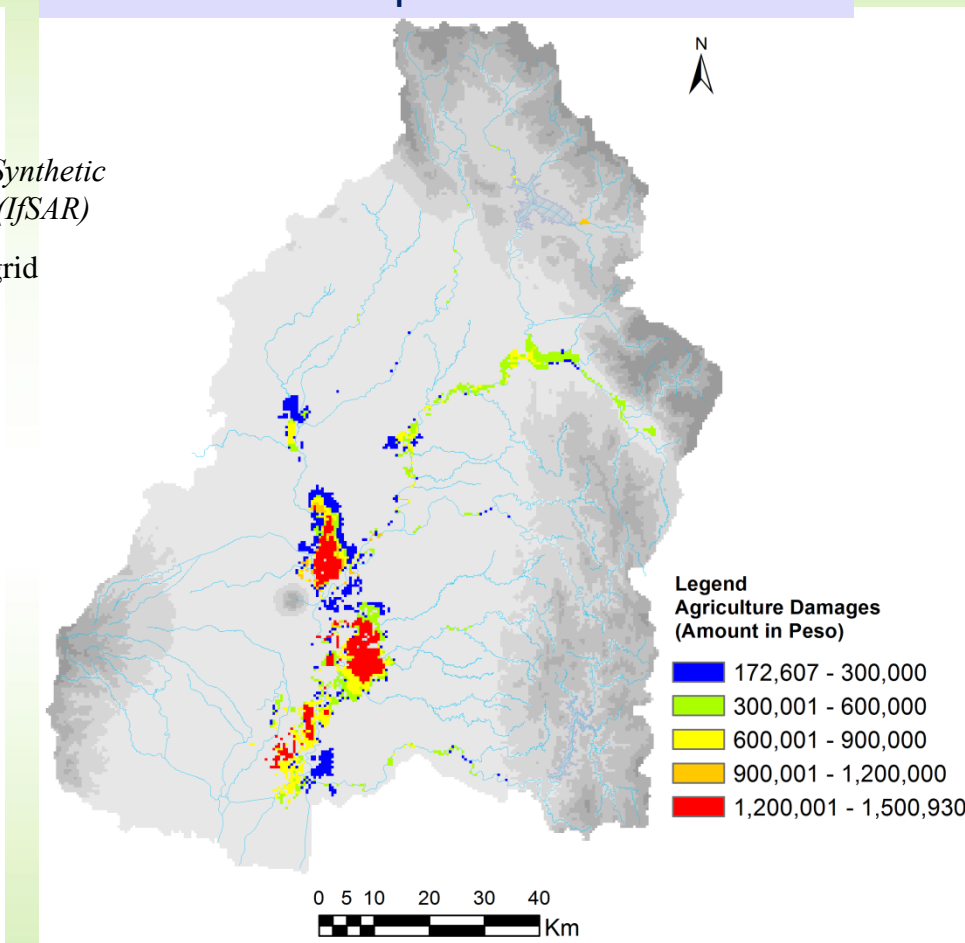
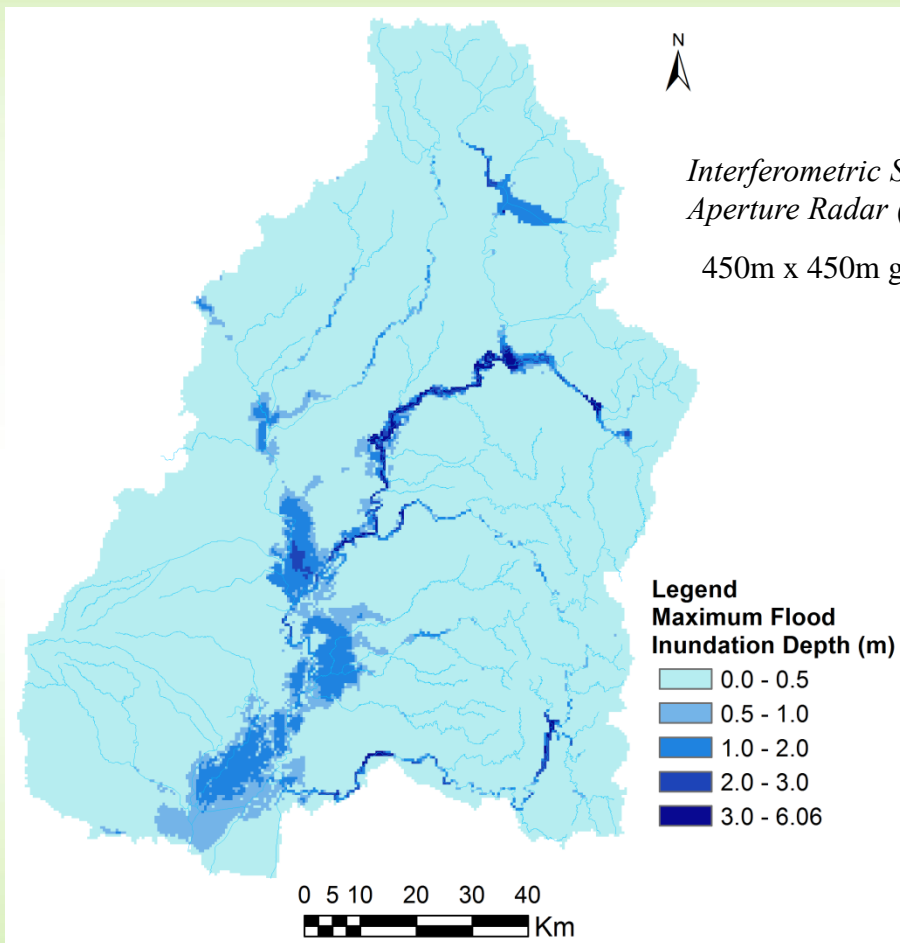


## Change of affected people in the maximum inundation area



# Flood Risk: Damage estimation from depths and others

Flood event: September 2011 Flood



Flooded areas (>0.5m depth) = 45,056.25 ha

**Damages: 1,475.78 million Peso**

Rice Yield = 4360 kg/ha

Farm gate price of rice = 17 Peso/kg



# Capacity Building

Short-training funded by JICA



MSc/PhD Course by ICHARM/GRIPS/JICA



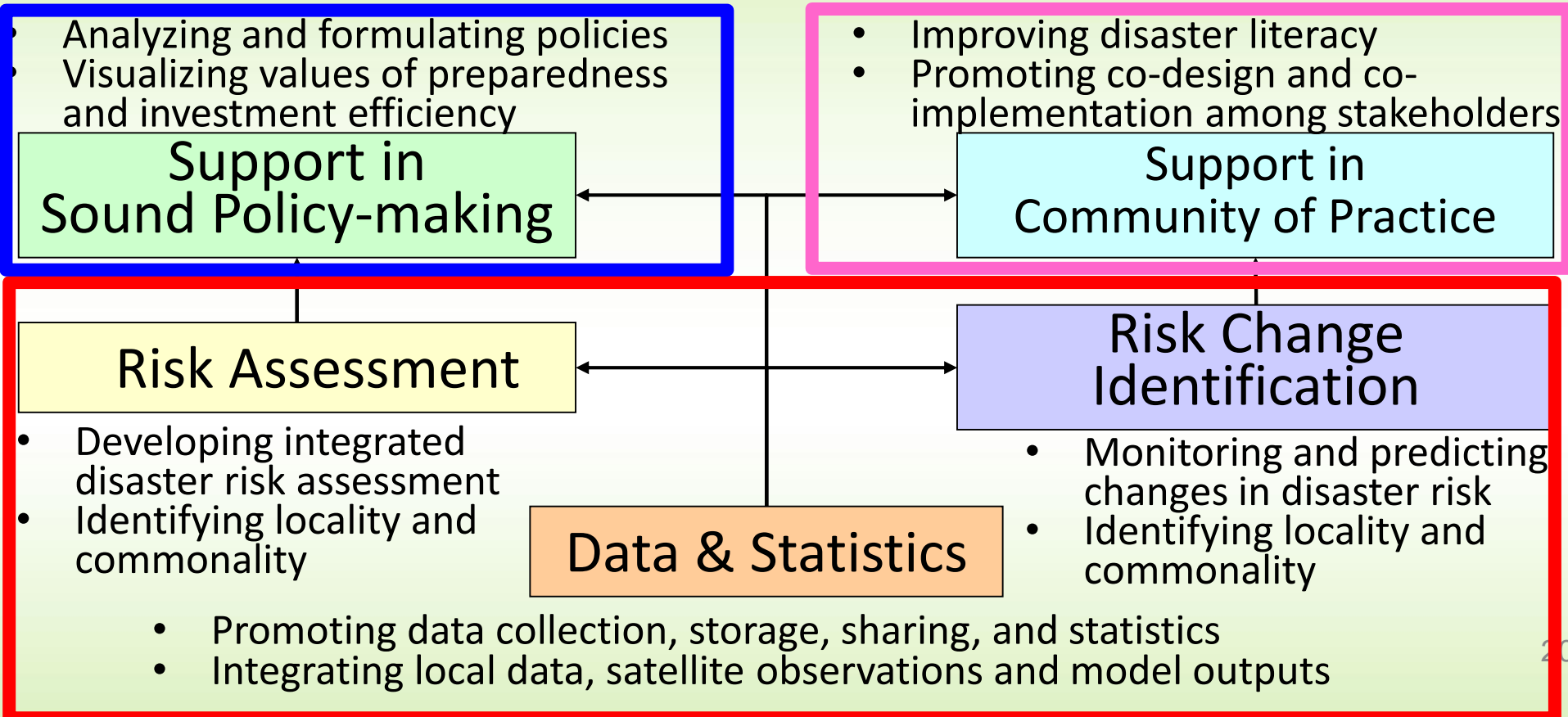
Short- training for Senior Manager

Training Workshop at AHA Center



Local Training





*In Close Collaboration with:*

