



NARBO 6th General Meeting, February 22-24, 2017, Jakarta

# International Flood Initiative (IFI) and Integrated Water Resources Management (IWRM)

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International Centre for Water Hazard and Risk Management (ICHRM)

Public Works Research Institute (PWRI)

and

University of Tokyo

# 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  
**ISDR**  
for Disaster Reduction



UNITED NATIONS  
UNIVERSITY



# Three Key Global Agendas in 2015

Understanding

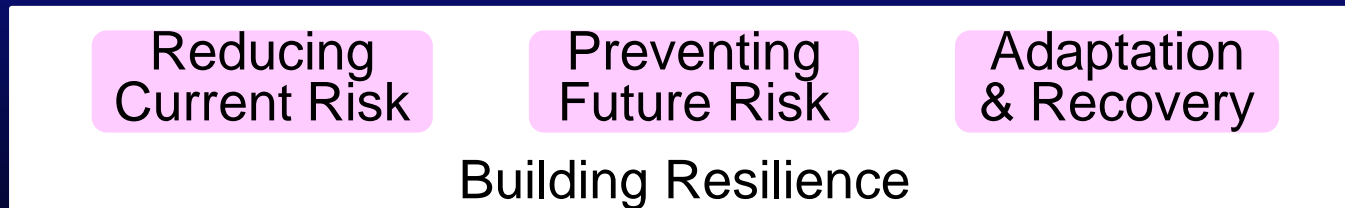
Governance

Investment

EW/BBB



**Concerted Action is Required**



**Sustainable Development**

# Holistic, Evident-based, Quality, Quantity

## Water is Key

### Dialogue

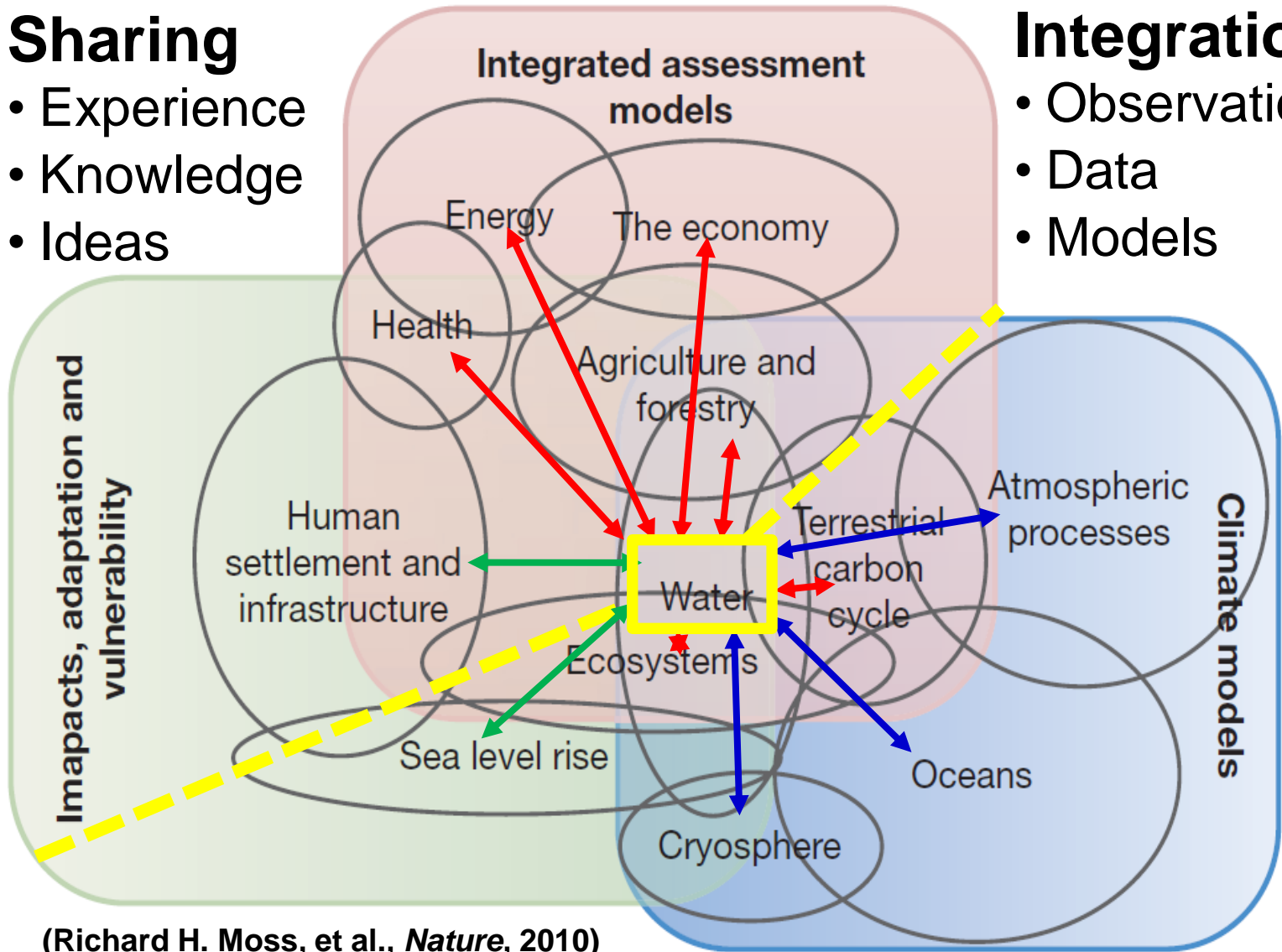
#### Sharing

- Experience
- Knowledge
- Ideas

### Platform

#### Integration

- Observations
- Data
- Models

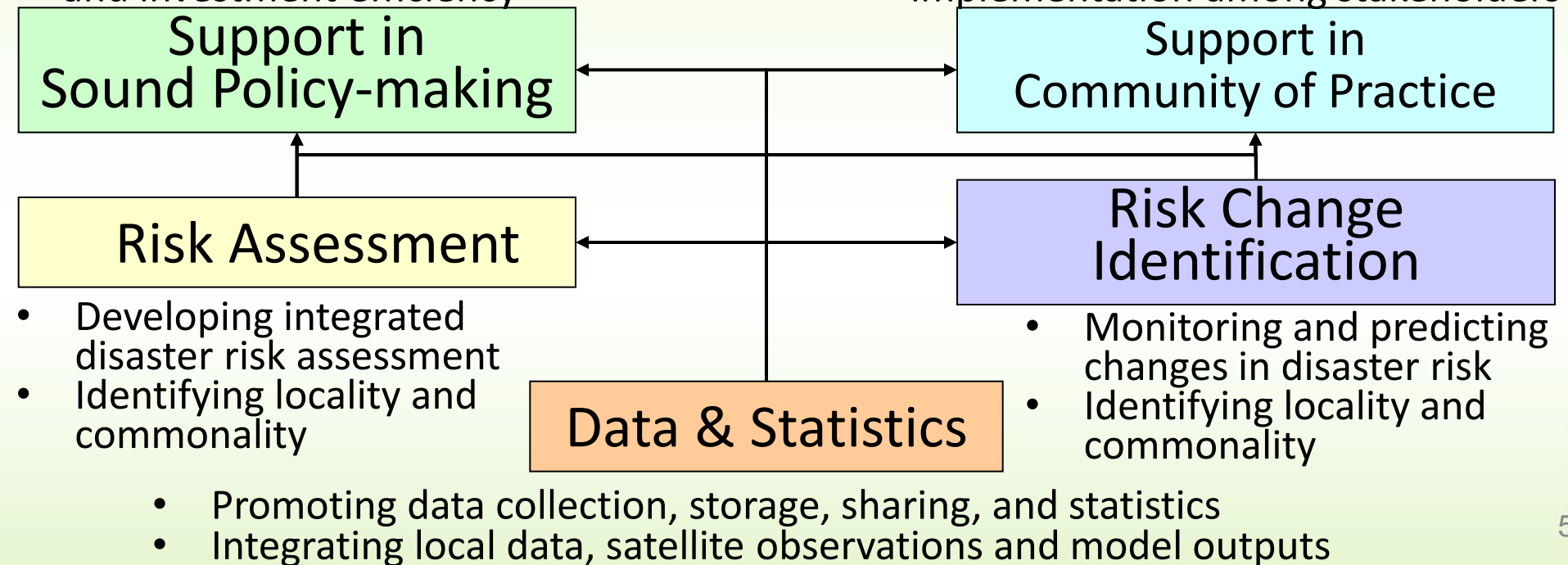


(Richard H. Moss, et al., *Nature*, 2010)

## IFI Key Actions

- 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:



# IFI Spiral-up Implementation Framework 2016-2022

## Phase-3 Operation: Strengthen & Expanding



## Phase-2 Prototyping: Install in Specific Areas



## Phase-1 Demonstration: Existing Infrastructure



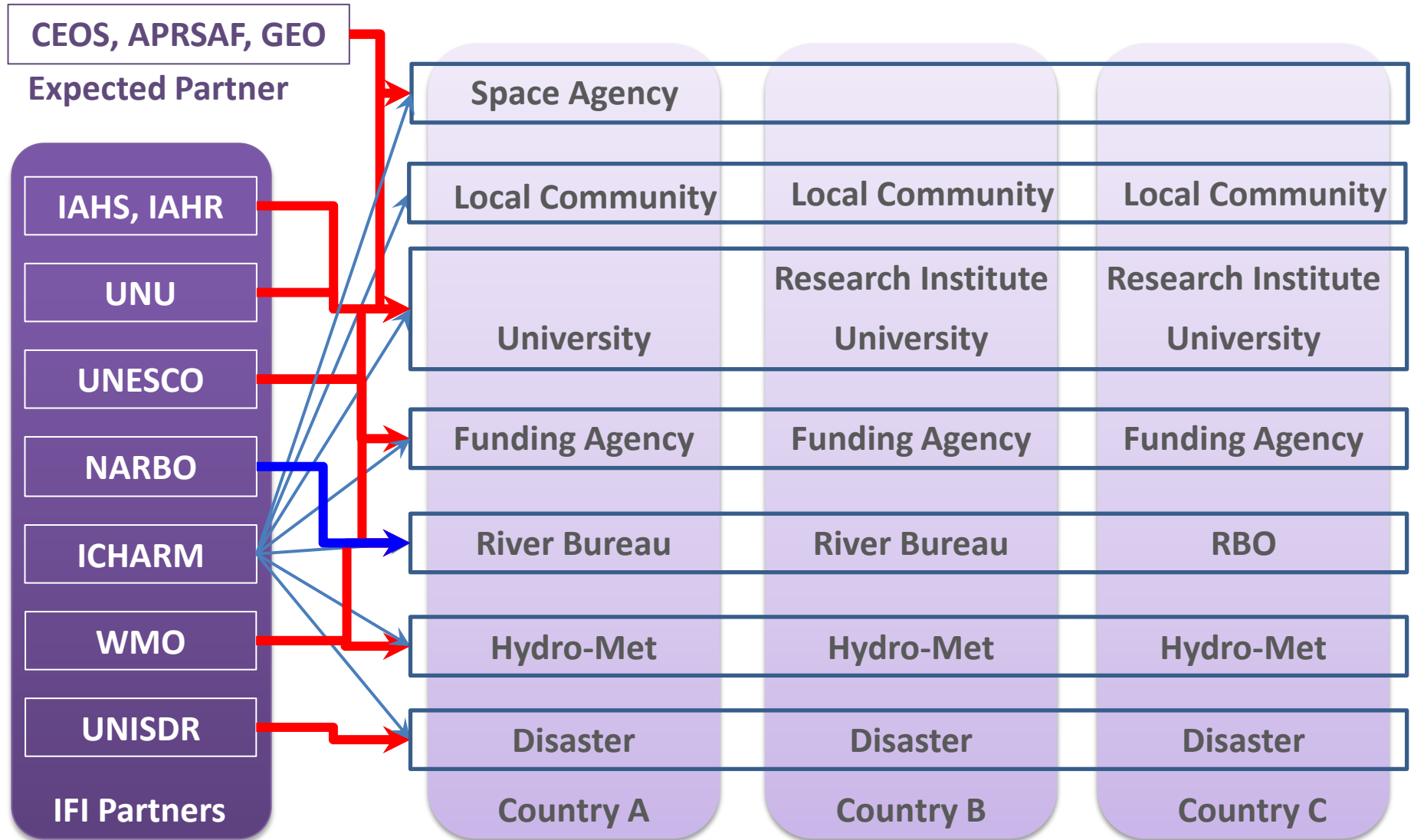
### Regional Coordination Framework

- 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





## 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

Support in Sound Policy-making

Support in Community of Practice

Risk Assessment

Risk Change Identification

Data & Statistics

- 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

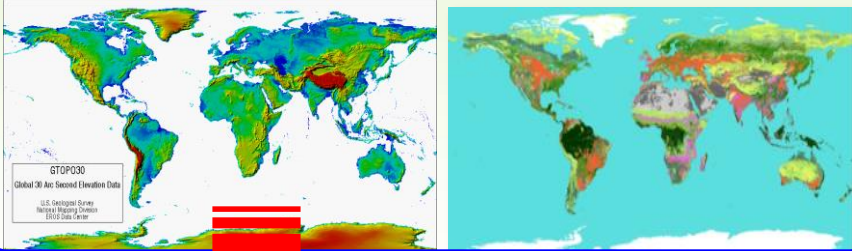
In Close Collaboration with:



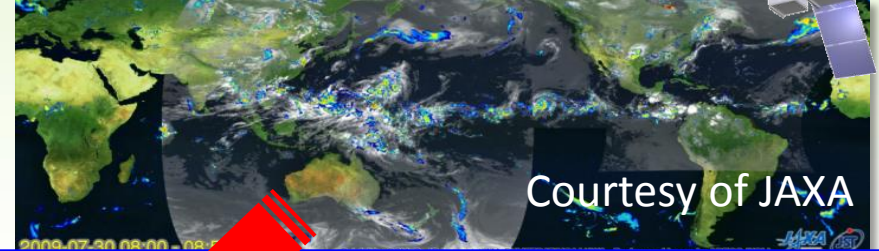


# Early Warning System - IFAS(Integrated Flood Analysis system) for insufficient observed basin

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



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



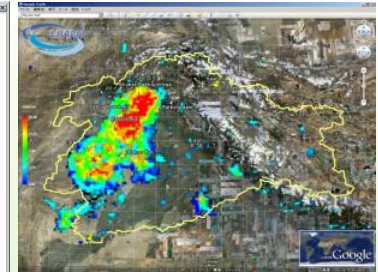
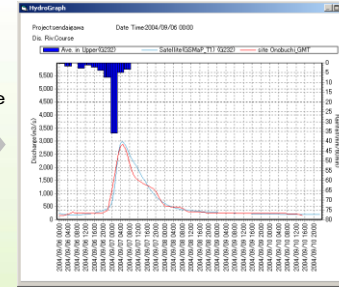
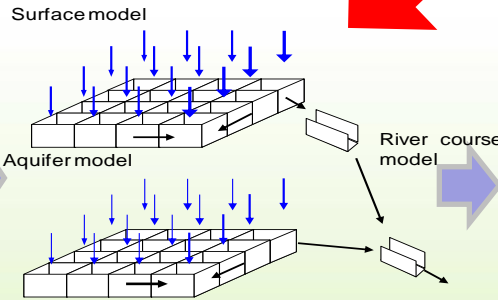
input

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

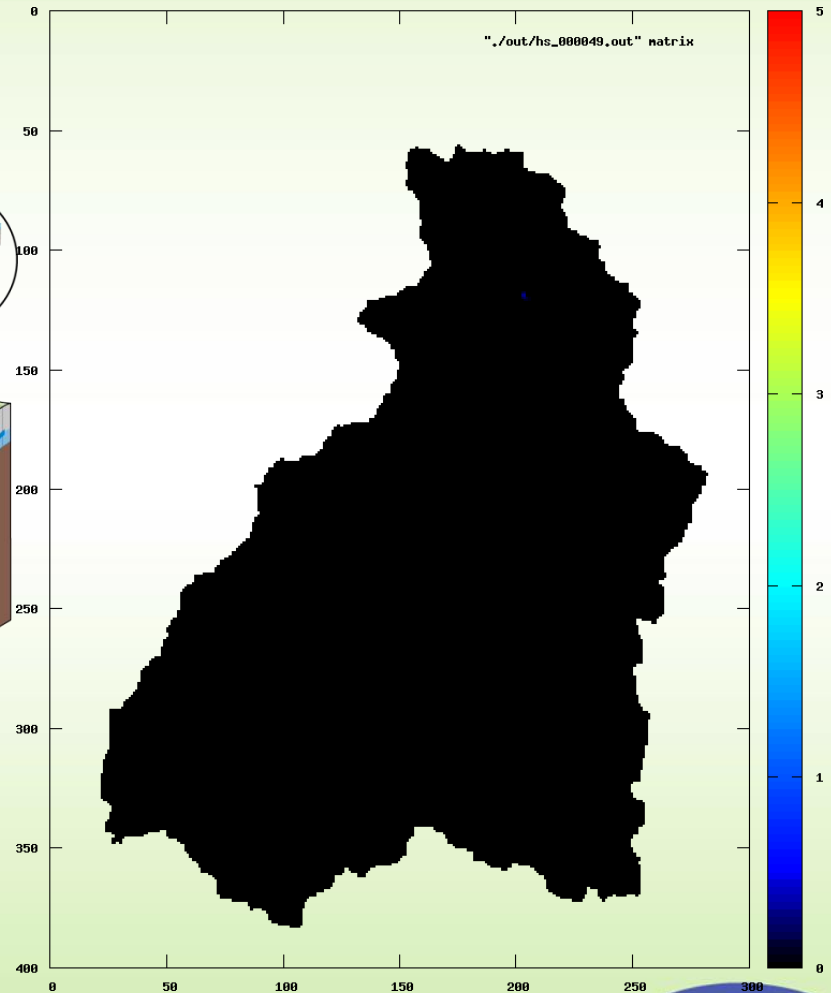
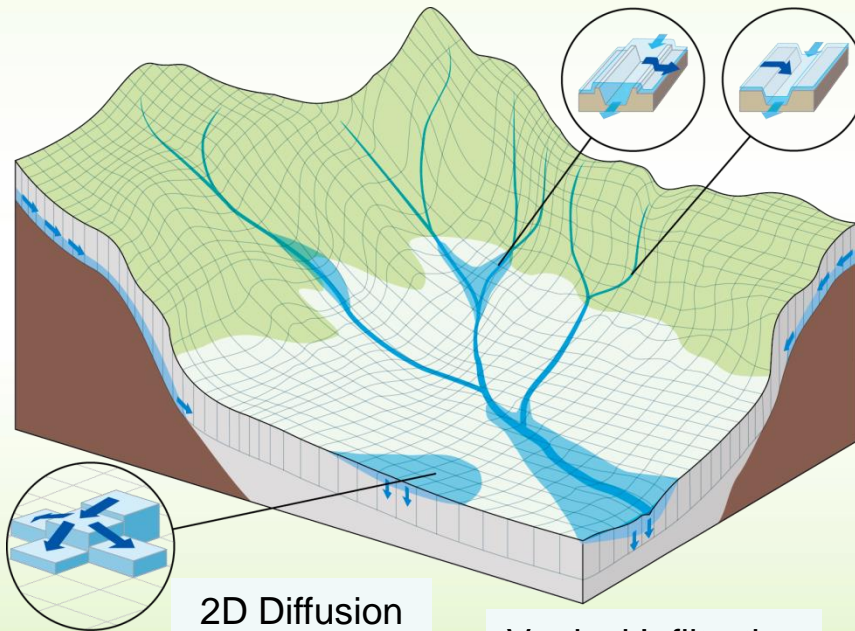
# Flood Risk: Flooding Simulation by RRI model

Subsurface + Surface

1D Diffusion in River

2D Diffusion in Catchment

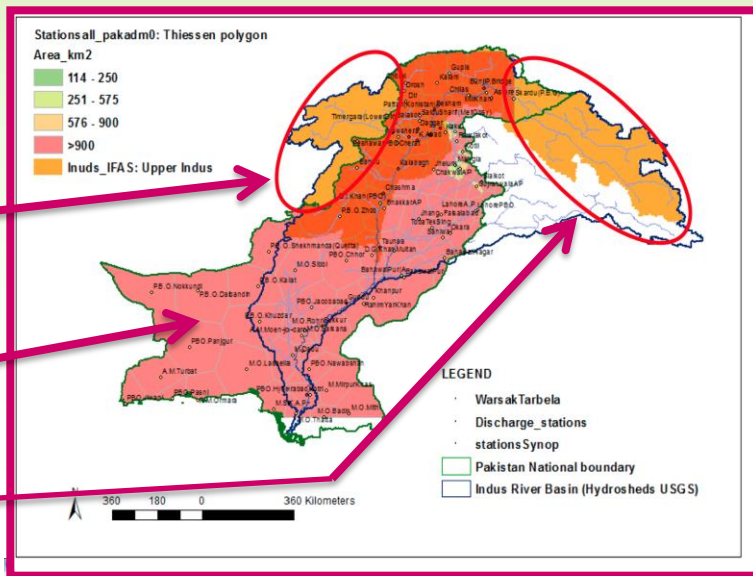
Vertical Infiltration



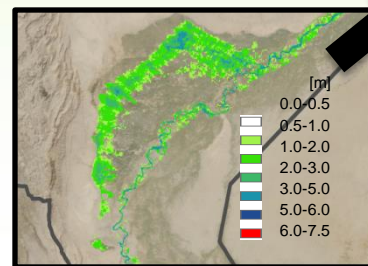
# Indus-IFAS: flood forecasting system based on IFAS / RRI (UNESCO-Pakistan project 2012-14)

## INPUT DATA CHALLENGES:

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



## Inundation area by RRI



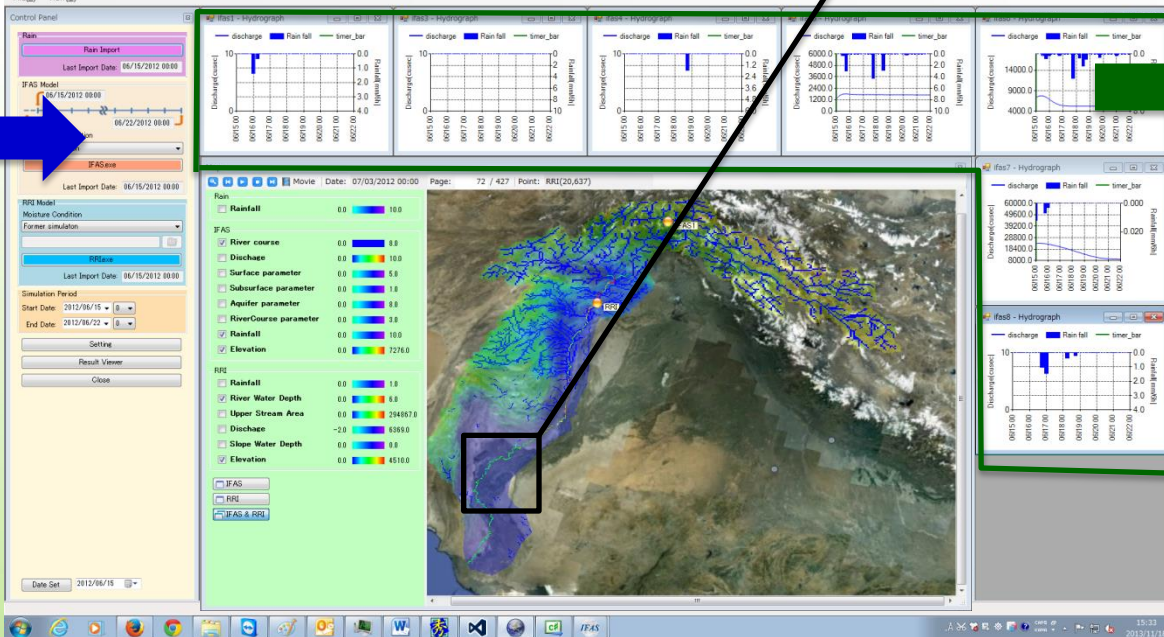
FLOOD HAZARD MAPPING

## OUTPUT DATA:

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

## INPUT DATA :

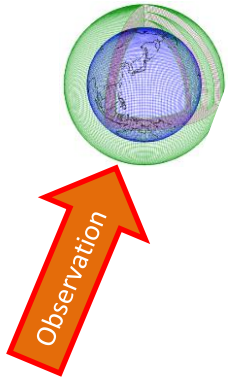
- Rainfall data (PMD ground-gauges, GSMaP and forecasted)
- **Real-time observed**
- **discharges**





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

Japanese type: Downscaling with Mesoscale Data assimilation



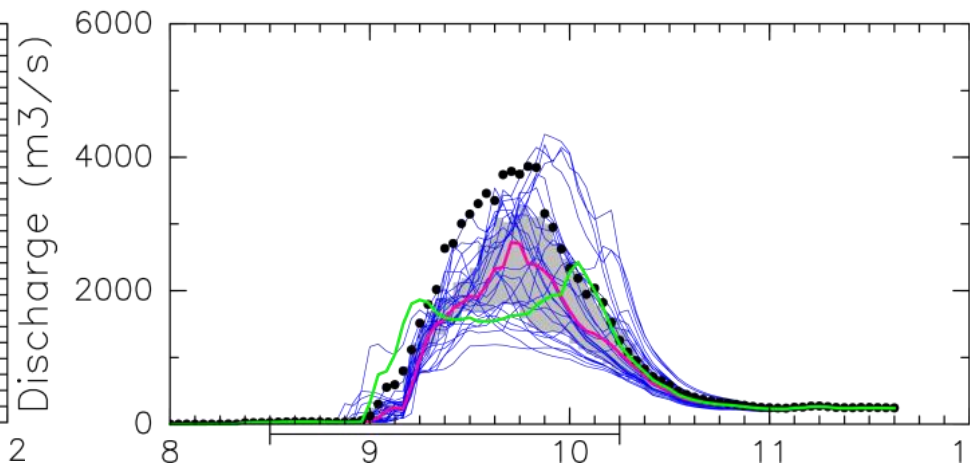
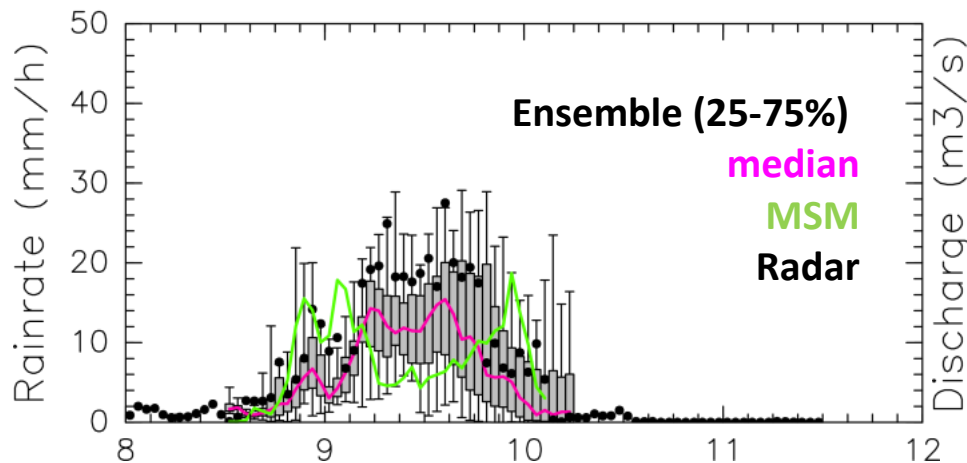
**JMA**

20 km GCM → 5 km regional ensemble, 11 member

**ICHARM**

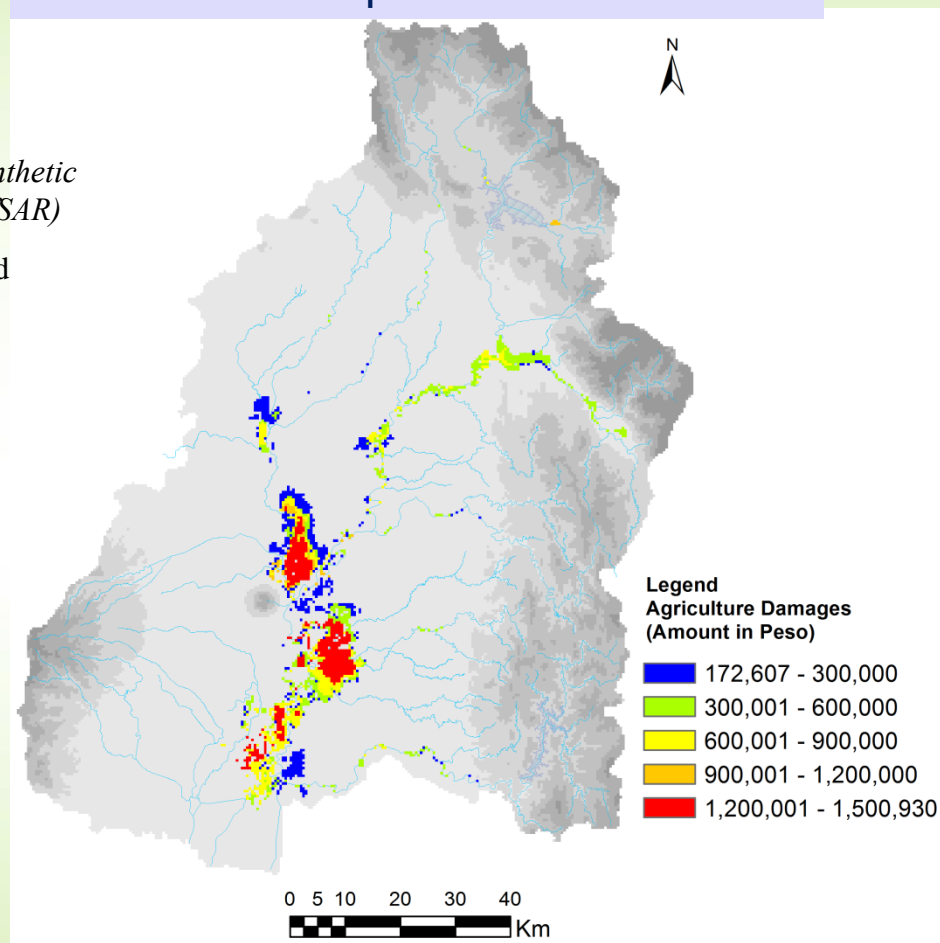
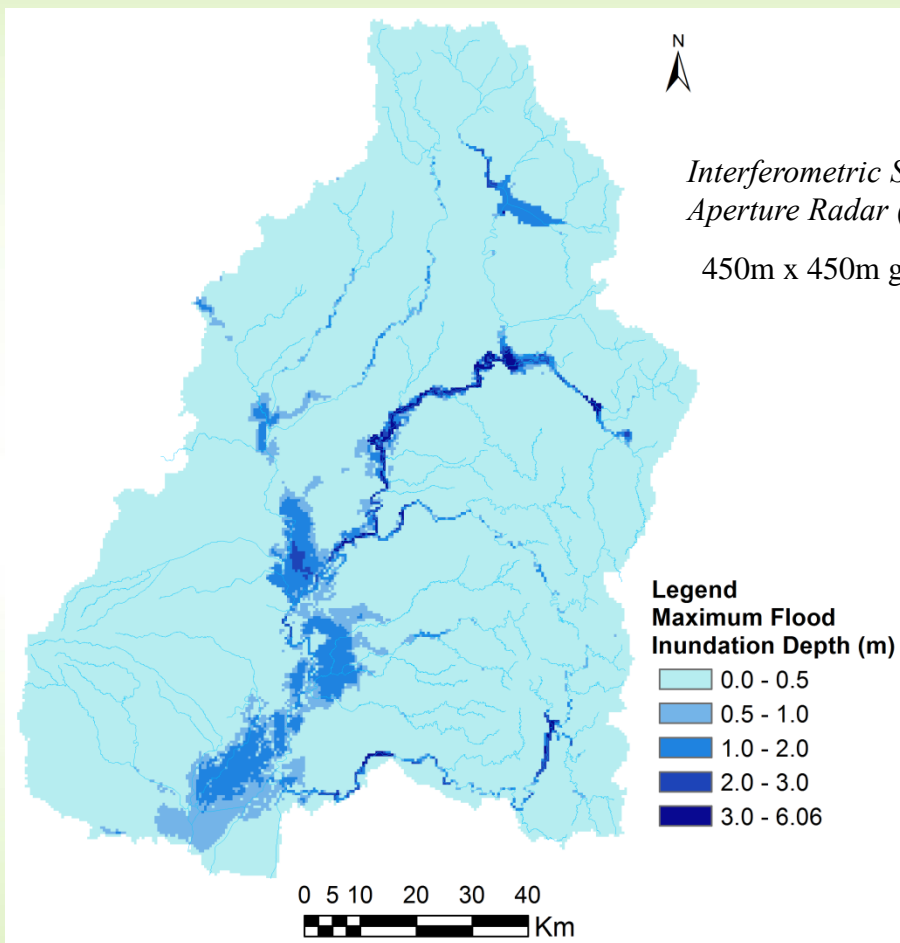
20 km GCM → 3 km regional ensemble, 21~33 member

12z08 ~ FT=18h



# Flood Risk: Damage estimation from depths and others

Flood event: September 2011 Flood



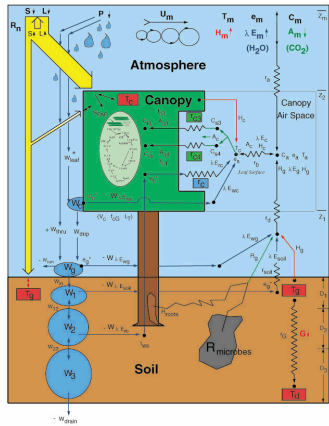
Flooded areas (>0.5m depth) = 45,056.25 ha

**Damages: 1,475.78 million Peso**

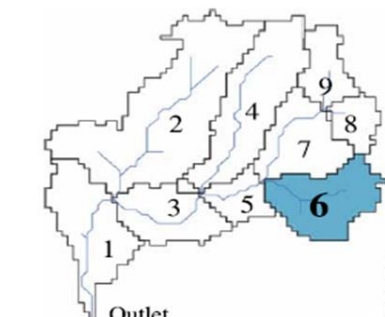
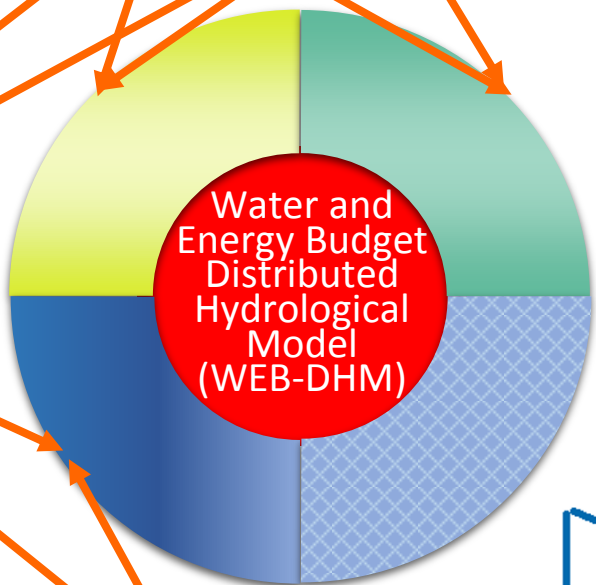
Rice Yield = 4360 kg/ha

Farm gate price of rice = 17 Peso/kg

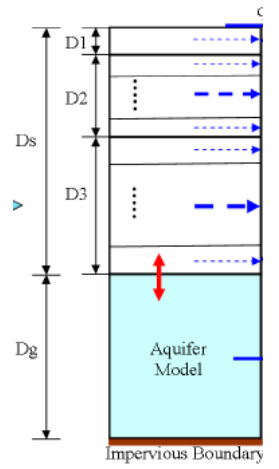
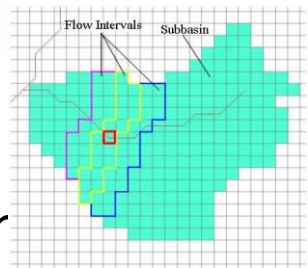
# Energy and Water flux Balance



# Hydrometeorology-Agriculture Coupled Model

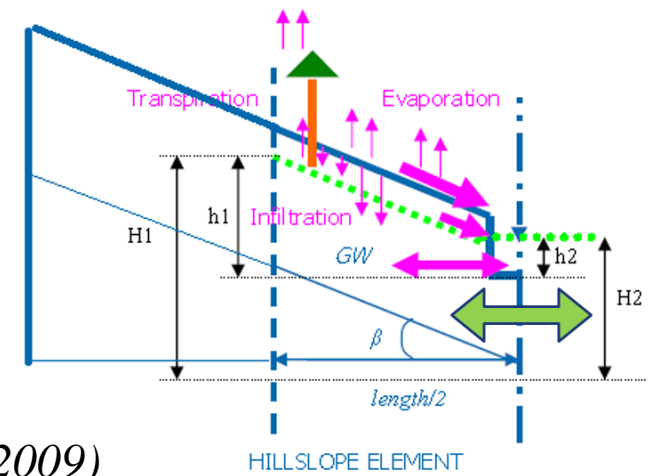


Riverflow  
Via Kinematic  
Wave Equator



Vertical  
Soil moisture  
Profile

Lateral flow,  
Gridded to  
Flow-interval



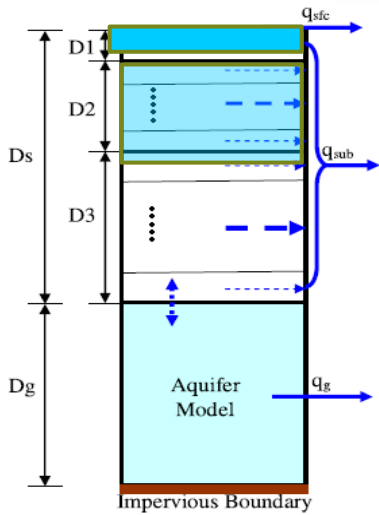
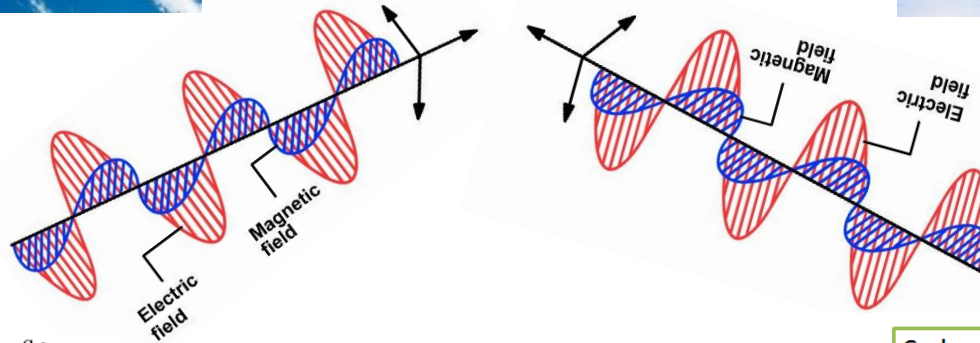
AMSR-E



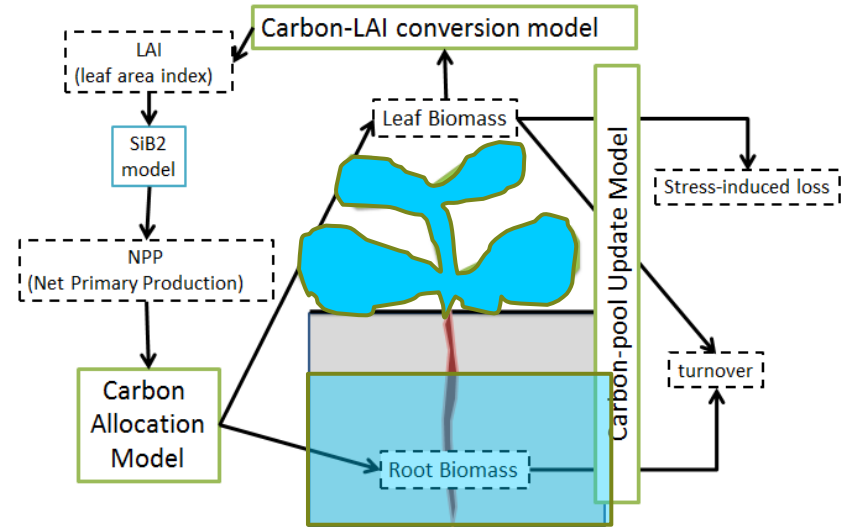
# Coupled Data Assimilation



AMSR2



Electronic-Magnetic  
Wave  
+



Land surface model

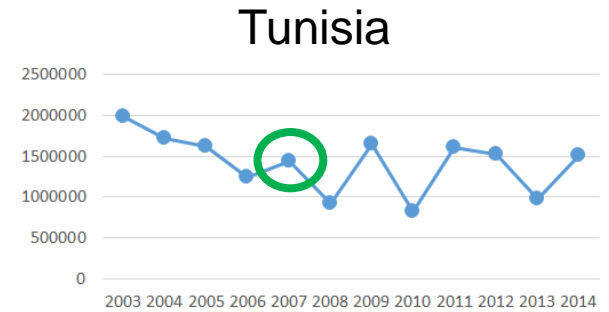
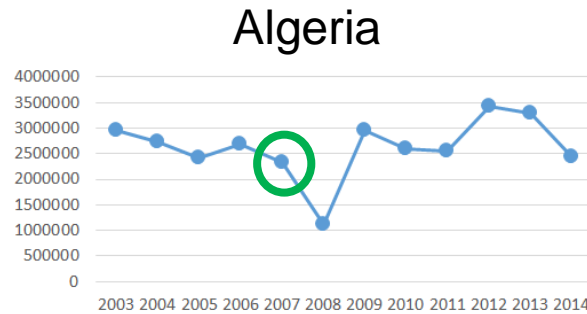
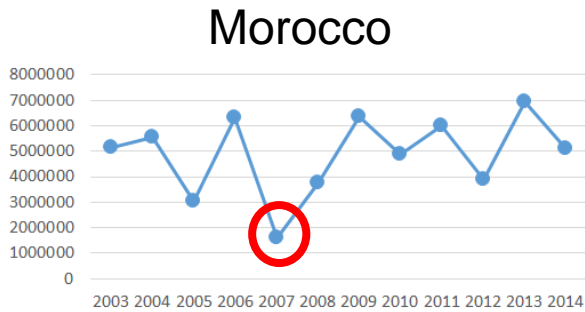
Dynamic Vegetation Model



# Drought analysis

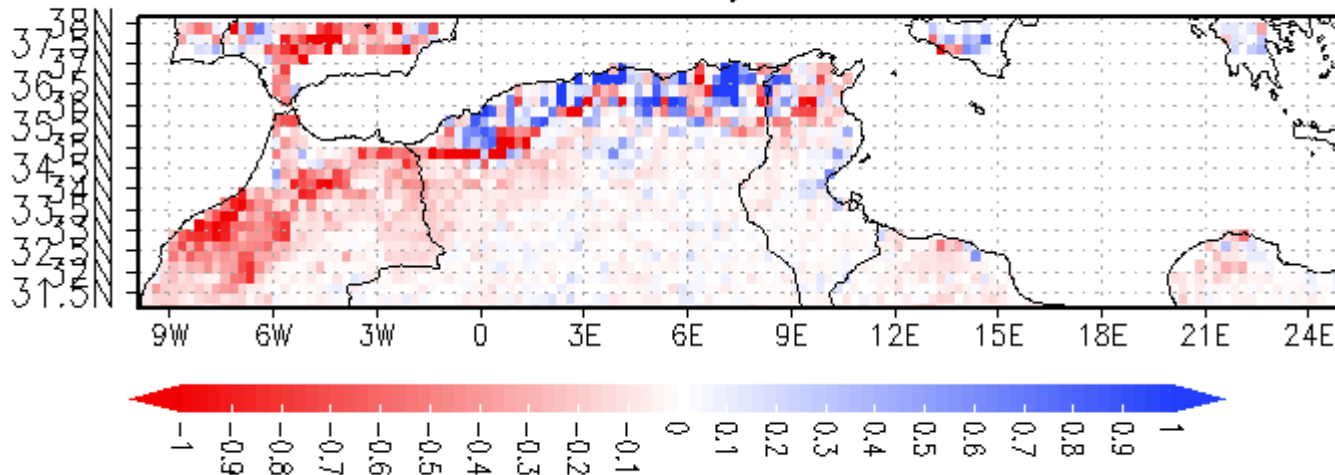
## Wheat production

### 2007 Morocco Drought



## LAI anomaly from CLVDAS

### LAI anomaly 20070401

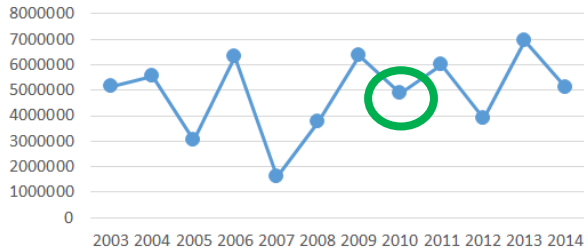


# Drought analysis

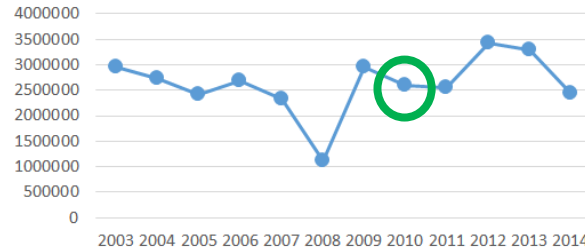
## Wheat production

### 2010 Tunisia Drought

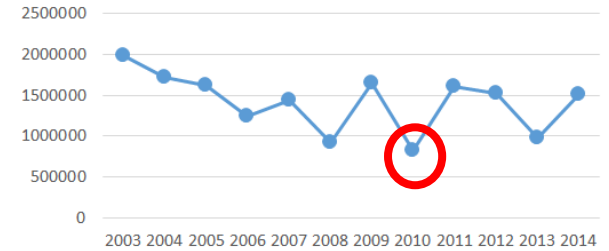
#### Morocco



#### Algeria

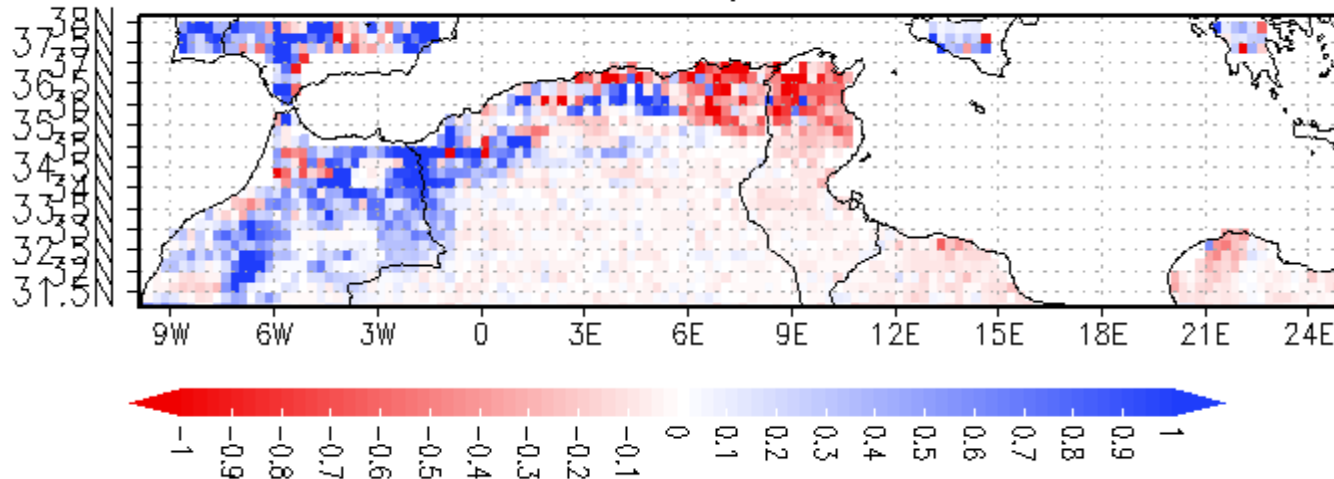


#### Tunisia



## LAI anomaly from CLVDAS

### LAI anomaly 20100401



200701

200801

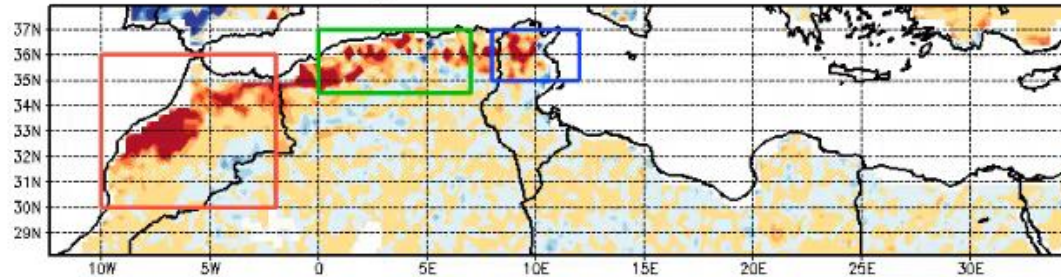
200802

200803

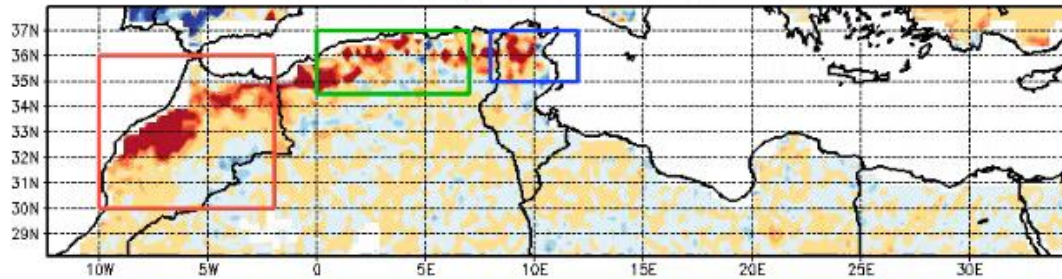
Loop:  Int.: 100 (ms) #. 1 /90



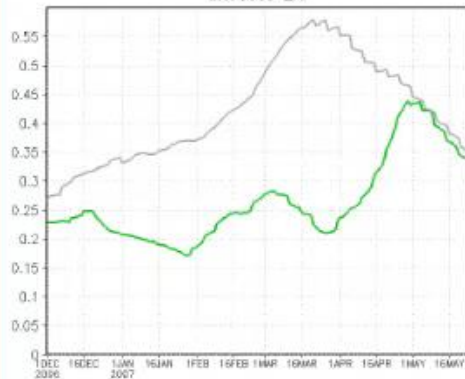
### Reanalysis LAI anomaly 20070101



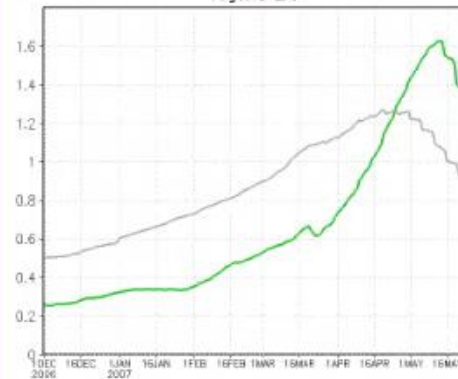
### Forecast LAI anomaly ave 20070101 from 200701



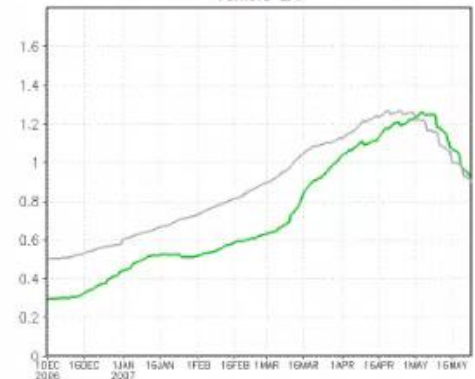
Morocco LAI



Algeria LAI



Tunisia LAI

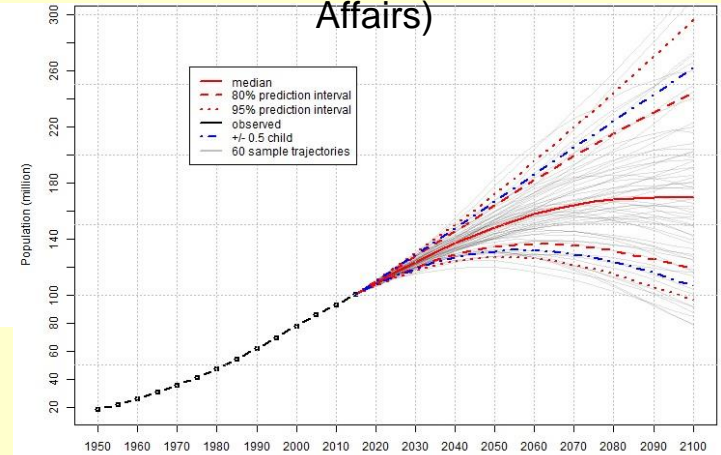


# Estimated affected people by a 100-year return period flood in future

## 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)

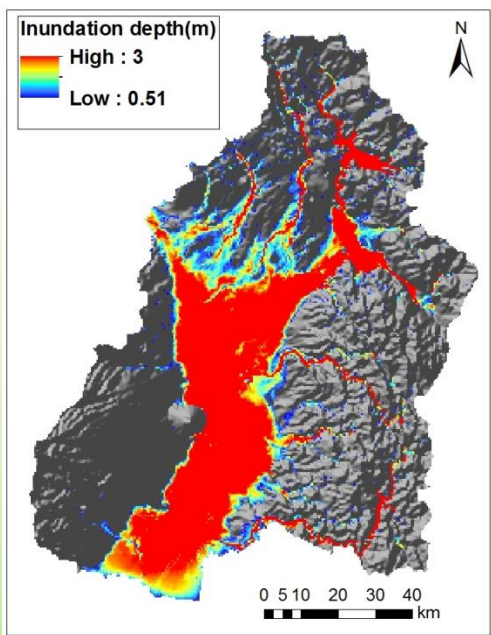
## Future population projection (Philippines) (UN Department of Economic and Social Affairs)



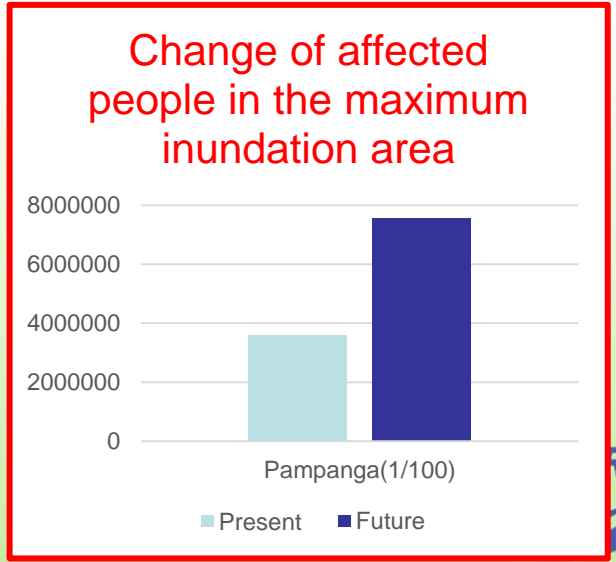
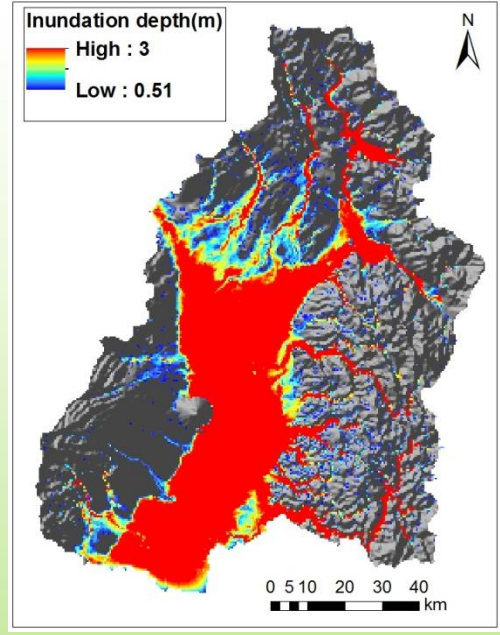
Source: United Nations, Department of Economic and Social Affairs, Population Division (2015).  
 World Population Prospects: The 2015 Revision. <http://esa.un.org/unpd/wpp/>



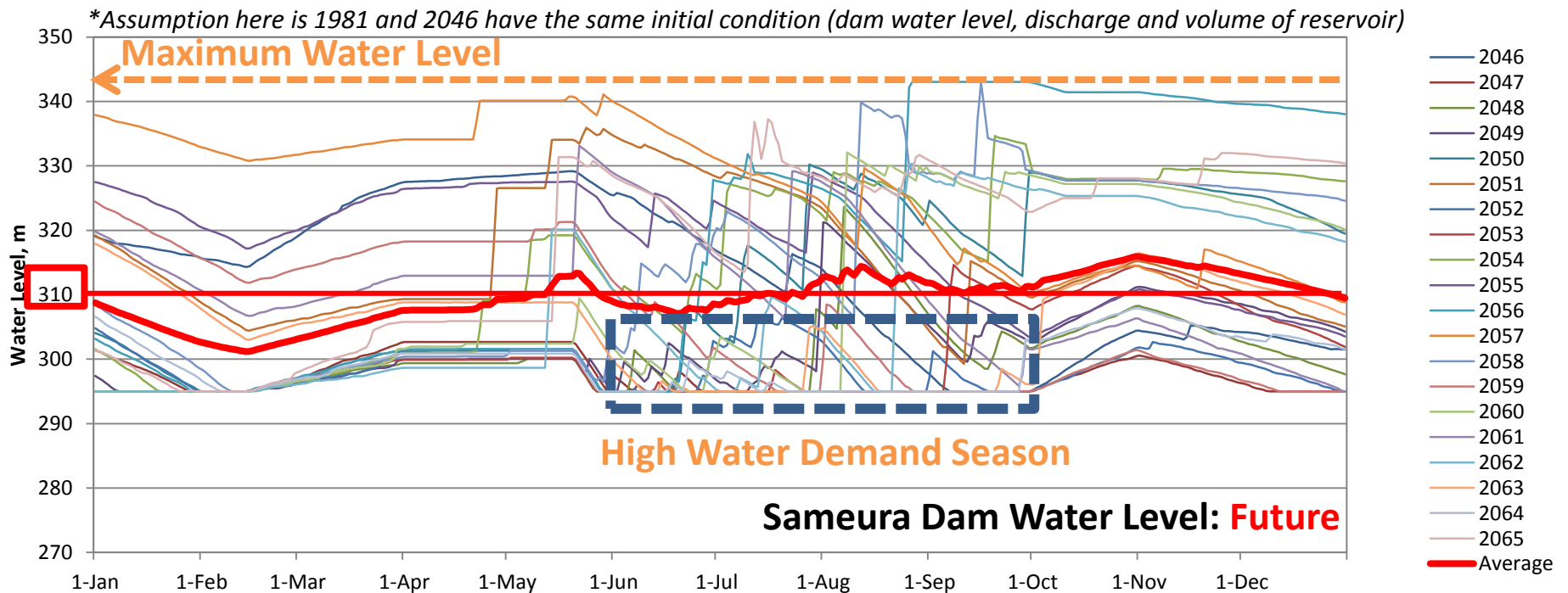
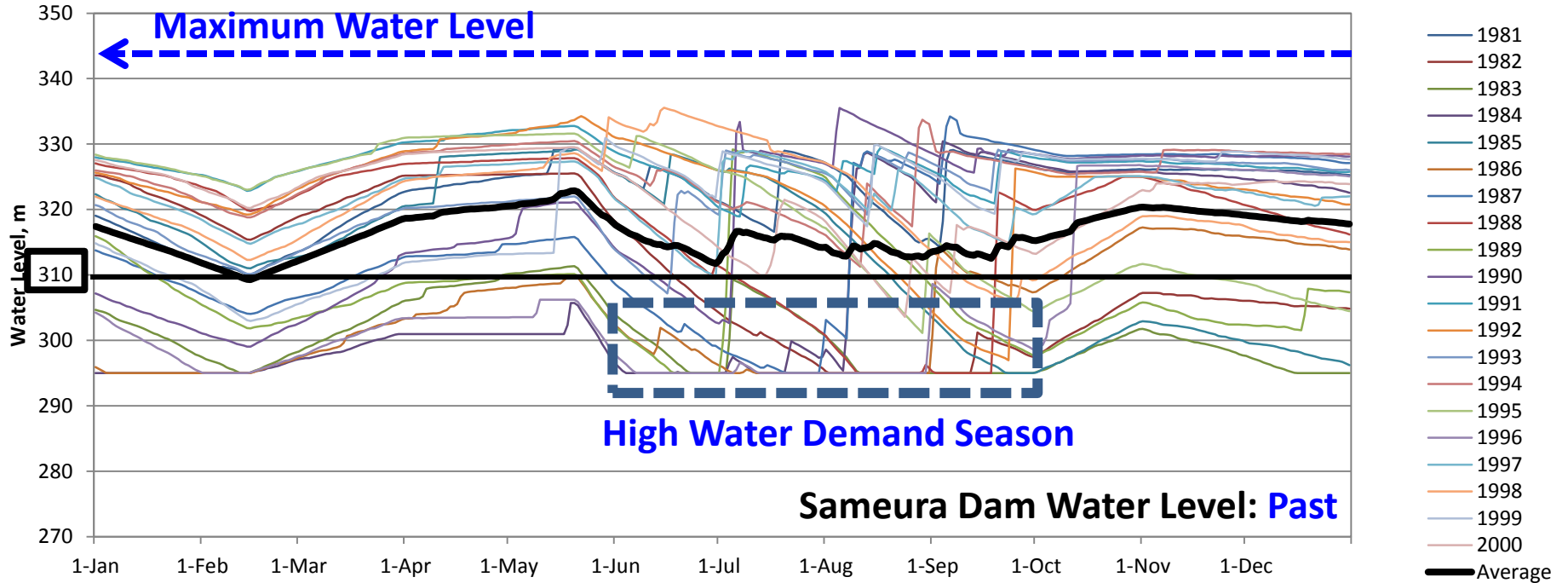
## Flood inundation (1/100) in present climate



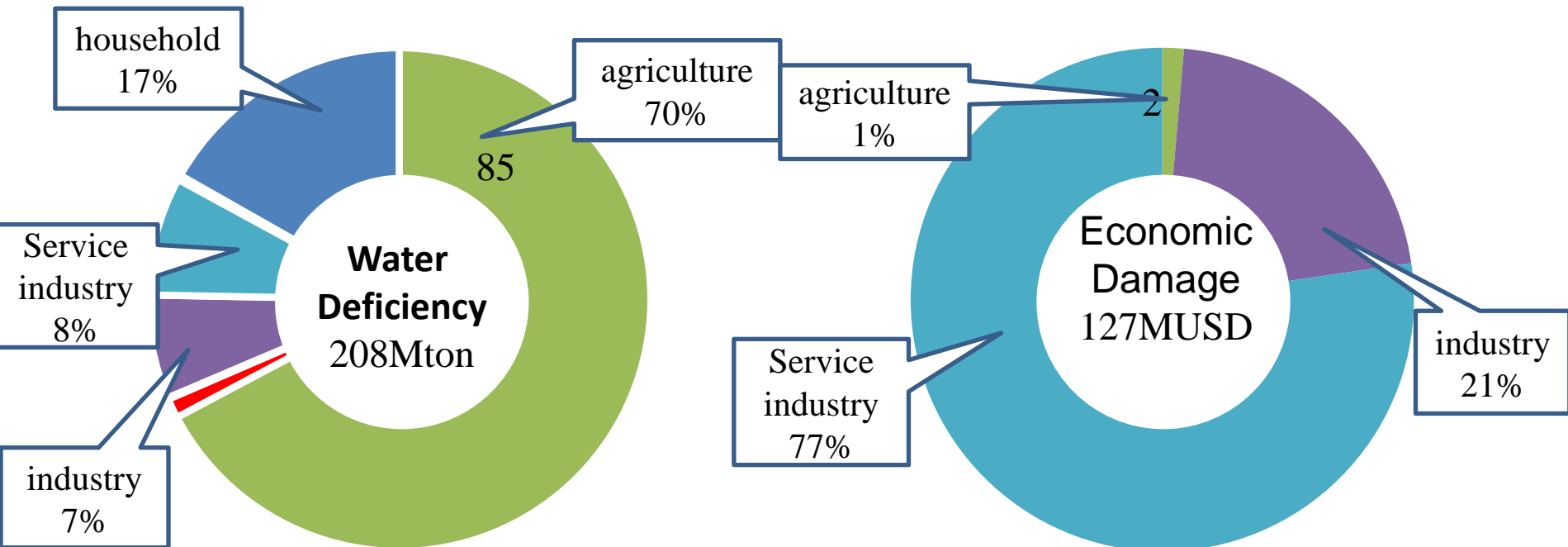
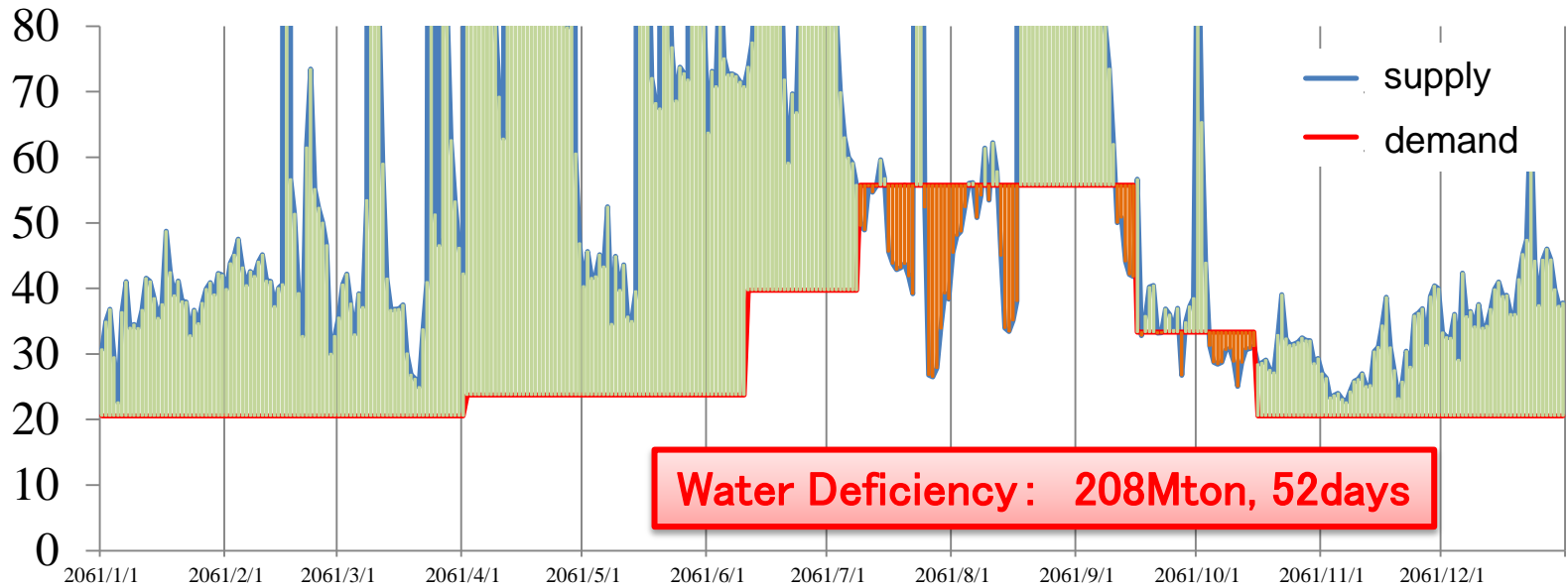
## Flood inundation (1/100) in future climate







# Takamatsu City: Projected Most Severe Drought



# Capacity Building

Short-training funded by JICA



MSc/PhD Course by ICHARM/GRIPS/JICA



Short- training for Senior Manager

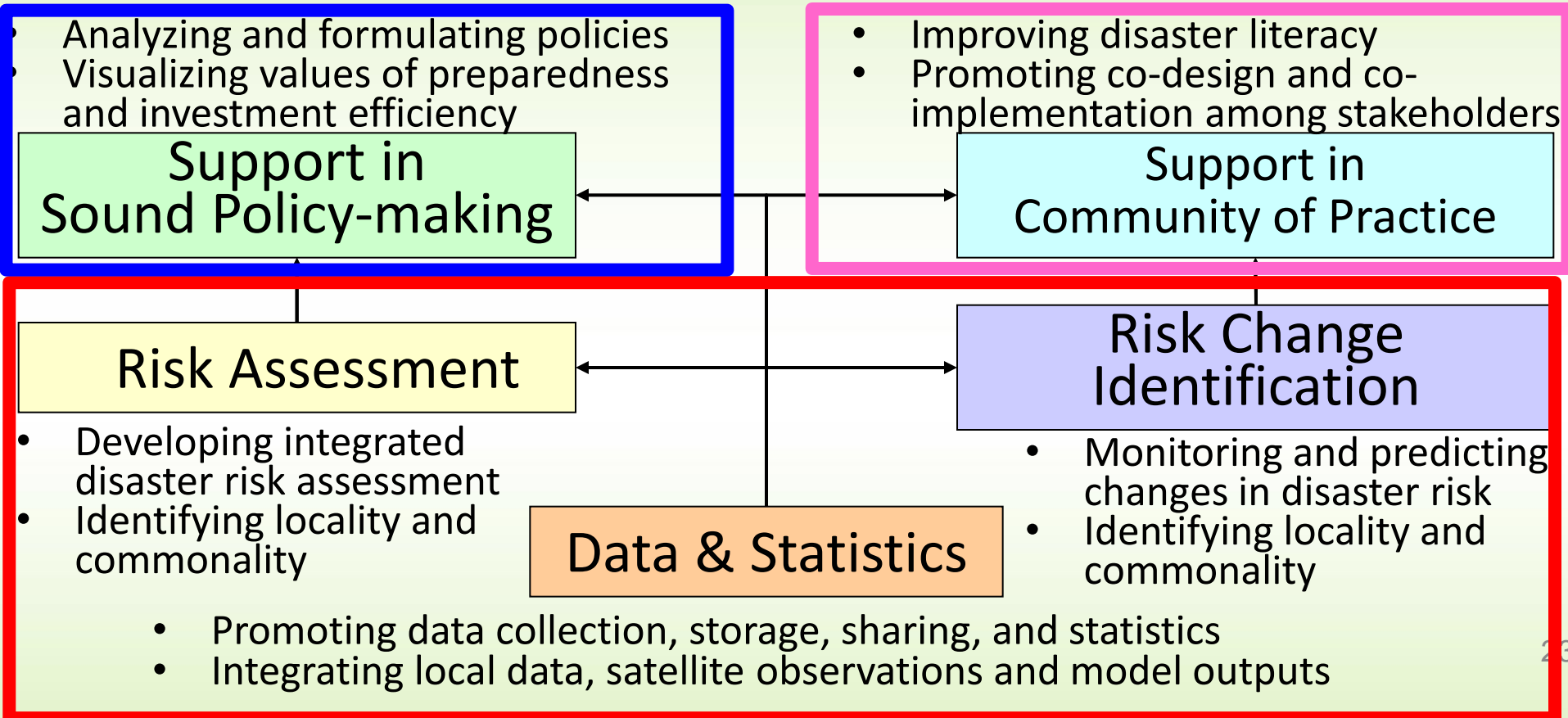
Training Workshop at AHA Center



Local Training







# HELP-IFI Jakarta Statement (draft Oct.31, 2016)

-Towards an interdisciplinary and transdisciplinary partnership to consolidate flood risk reduction and sustainable development -

## 1. Present Status

- increasing losses
- human factors + climate change
- globalized and interconnected 21C
- gap between science and society
- lack of effective inter-agency coordination

## 2. Key Directions

- Sendai+SDGs+Paris
- budgetary imitations and capabilities
- spiral-up approach
- interdisciplinary and transdisciplinary
- quantifying and minimizing the uncertainty
  - data
  - assessment
  - change identification
  - awareness
  - preventive investment
  - response-recovery

## 3. Actions

### Each country:

- platform on water and disaster (<national platform)

### IFI Partners:

- assist the platform

### Donors:

- incremental support

Asia and Pacific → World

# HLPW Panel members (as of 3/21/2016)



Kevin Rutte  
*Prime Minister, Netherlands*



János Áder  
*President, Hungary*



Emomalii Rahmonov  
*President, Tajikistan*

*Special Advisors to the Panel*



Dr. Han Seung-soo  
*Former prime Minister, South Korea*



Manuel Pulgar-Vidal  
*Minister, Peru*



Macky Sall  
*President, Senegal*



Enrique Peña Nieto  
*President, Mexico*



Ameenah Gurib-Fakim  
*President, Mauritius*



Jacob Zuma  
*President, South Africa*

*Co-chairs*



Abdullah Ensour  
*Prime Minister, Jordan*



Sheikh Hasina  
*Prime Minister, Bangladesh*



Malcolm Turnbull  
*Prime Minister, Australia*

*Co-convended by:*



Ban Ki-moon  
*Secretary General, United Nations*



UNITED NATIONS



WORLD BANK GROUP



Jim Yong Kim  
*President, World Bank Group*

# HLPW Action Plan “9 Areas of Action”

1. Catalyzing Changes, Building Partnerships and International Cooperation
2. Resilient Economies, Societies, and Disaster Risk Reduction
3. Universal Access to Safe Water and Sanitation
4. Sustainable Cities and Human Settlements
5. Water and the Environment
6. Infrastructure and Investments
7. Water Governance
8. Water Data
9. Valuing Water



WATER DATA



VALUING WATER



WATER GOVERNANC

# HLPW's Expectations to IFI

- Countries, **in collaboration with IFI Members**, should establish a flood platform as a part of national platform with help of international networks.
- Countries, **with assistance by IFI Members**, should collect and archive data, assess current and future risks, demonstrate that flood risk reduction pays off, define locally applicable methodology, and monitor and predict changes.
- Stakeholders, **with support by IFI Members**, should make well-informed decisions and improve their practices of Integrated Flood Management.
- Donors should support **collaboration among IFI Members, countries, stakeholders and partners** in progressive manners so that good practices are widely learned, applied, and operated in other communities, countries and regions.

# Holistic, Evident-based, Quality, Quantity

## Water is Key

### Dialogue

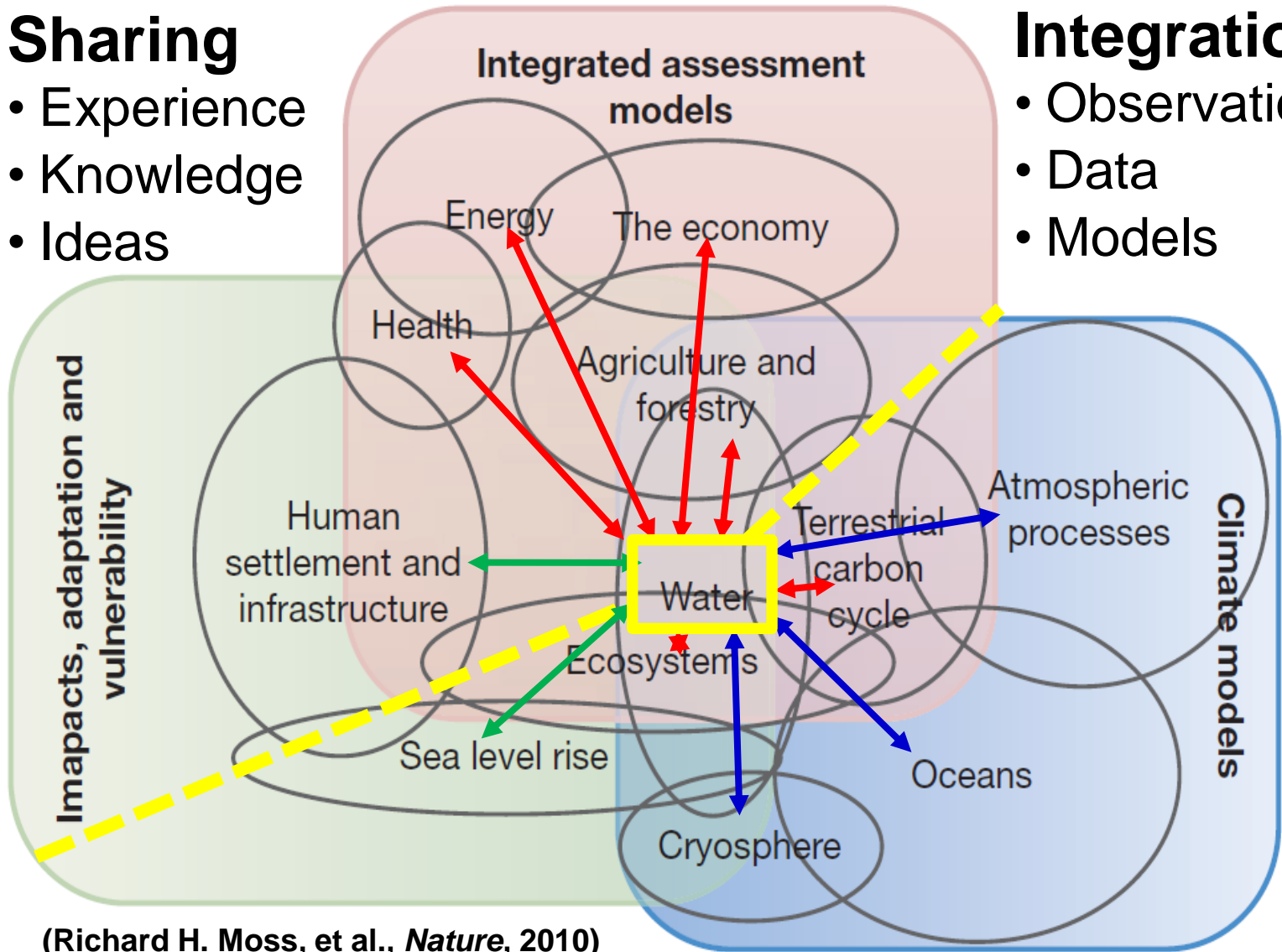
#### Sharing

- Experience
- Knowledge
- Ideas

### Platform

#### Integration

- Observations
- Data
- Models



(Richard H. Moss, et al., *Nature*, 2010)

# Three Key Global Agendas in 2015

Understanding

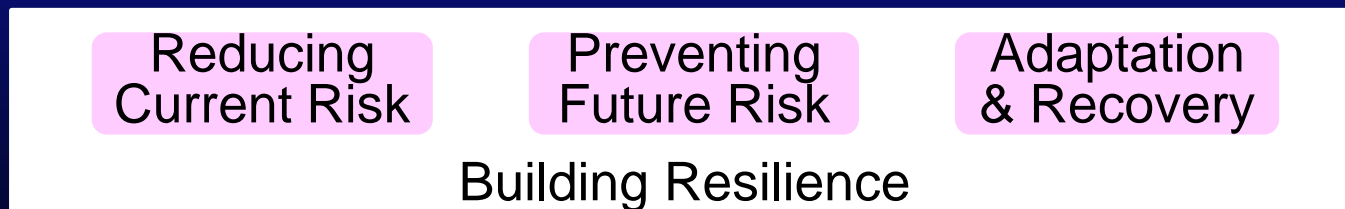
Governance

Investment

EW/BBB



**Concerted Action is Required**



**Sustainable Development**