International Symposium on Integrated Actions for Global Water and Environmental Sustainability
-In line with the Commemoration of the 70th Anniversary of UNESCO, October 2015, Medan

Second UN Special Thematic Session on Water and Disasters, 2015, The UN Headquarters, New York

Asia Water Cycle Symposium (AWCS2016), March 2016, Tokyo

IFI Side Event at the UNESCO IHP IC
New Strategy for International Flood Initiative (IFI)
Jun. 2016, Paris

IFI Side Event at the HELP 8th Meeting
Jakarta Statement: Strategic Implementation Plan
Oct. 2016, Jakarta

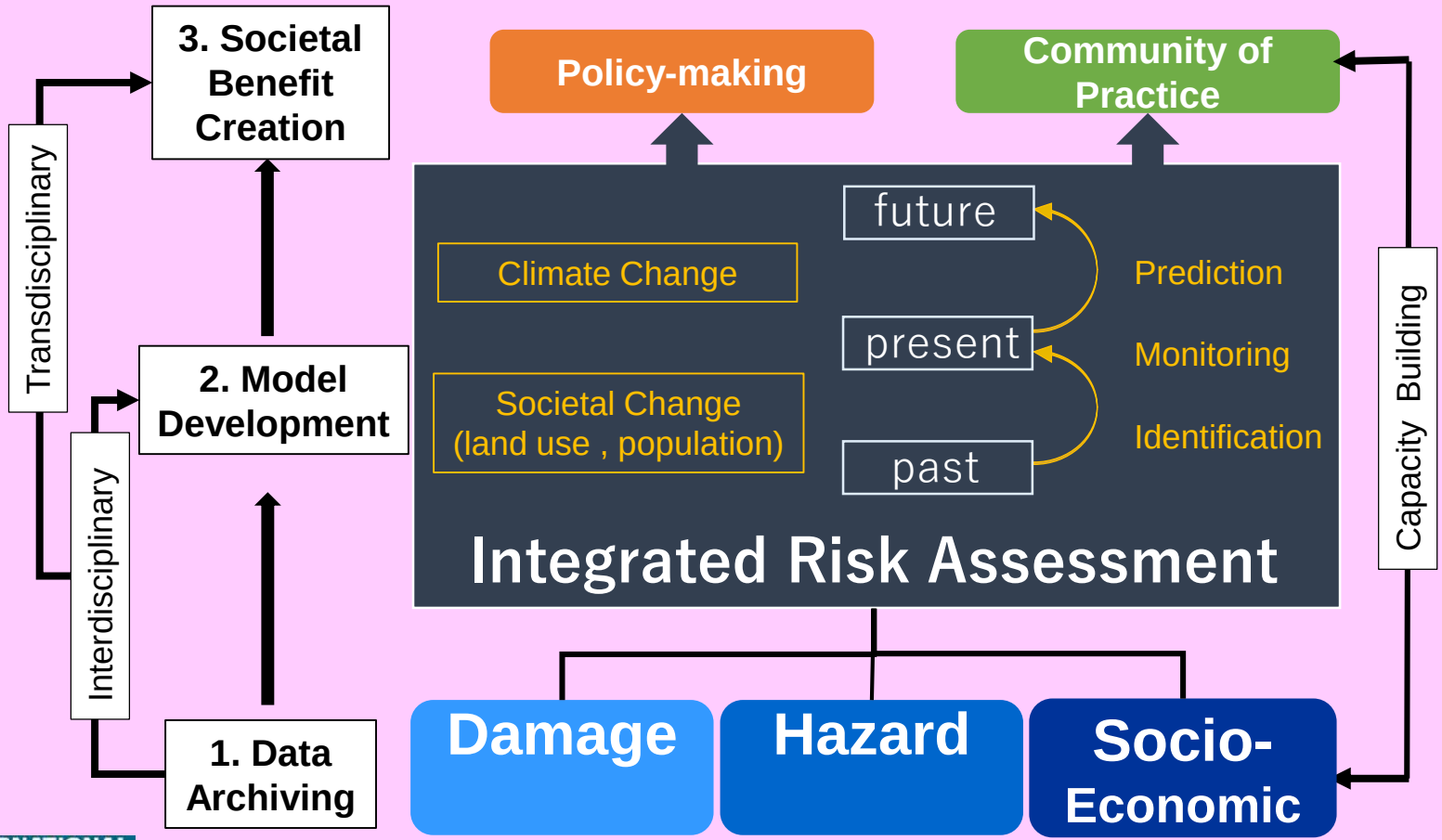
9th GEOSS Asia-Pacific Symposium
Implementation Plans in Asia
Jan. 2017, Tokyo

Third UN Special Thematic Session on Water and Disasters
Jul. 2017, The UN Headquarters, New York

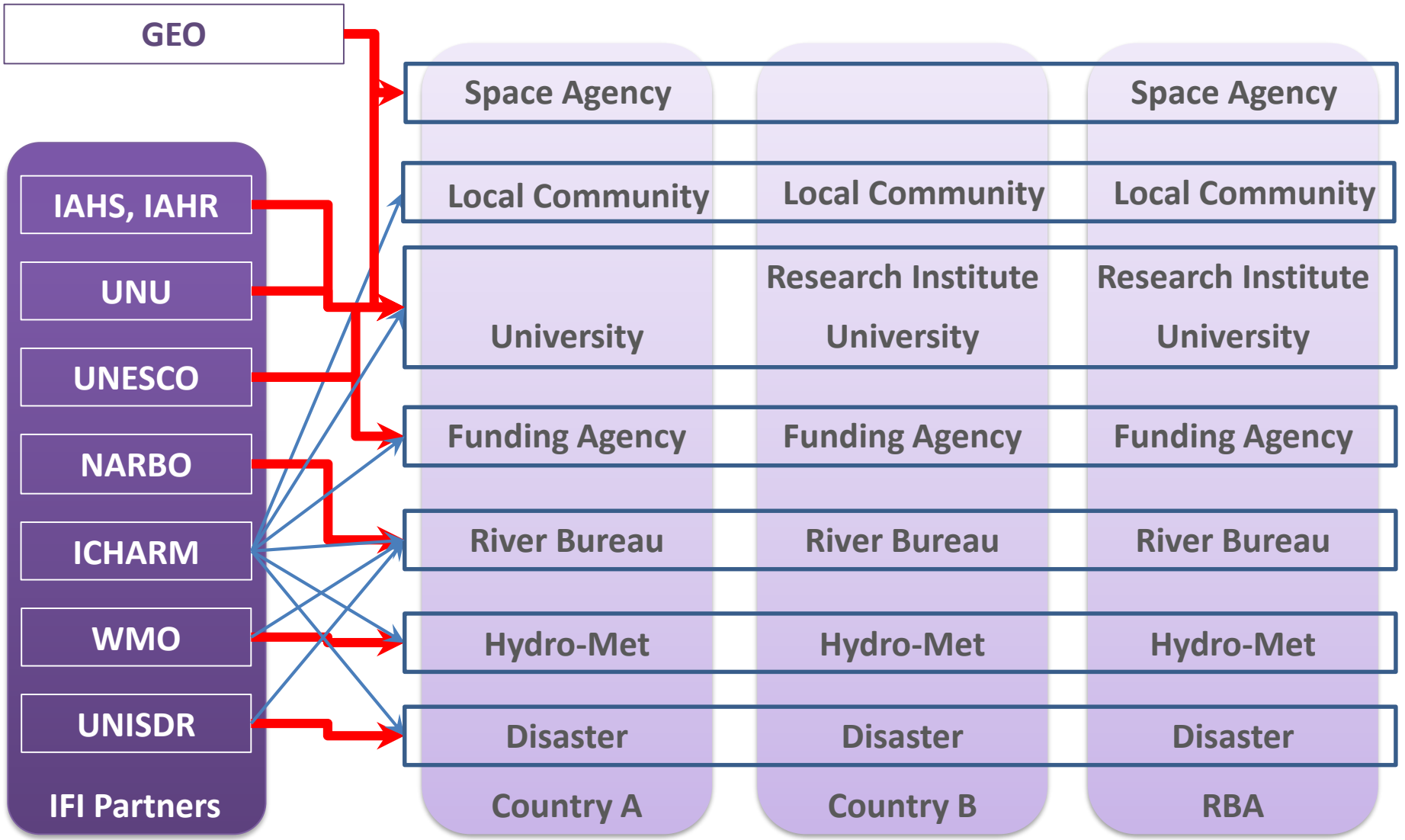
"Water and Disasters in the Context of Climate Change
- from the Mountains to the Islands"
3rd Asia-Pacific Water Summit, Dec. 2017, Yangon

Special Session “High-level panel: Water and Disasters”
8th World Water Forum, Mar. 2018, Brazilia

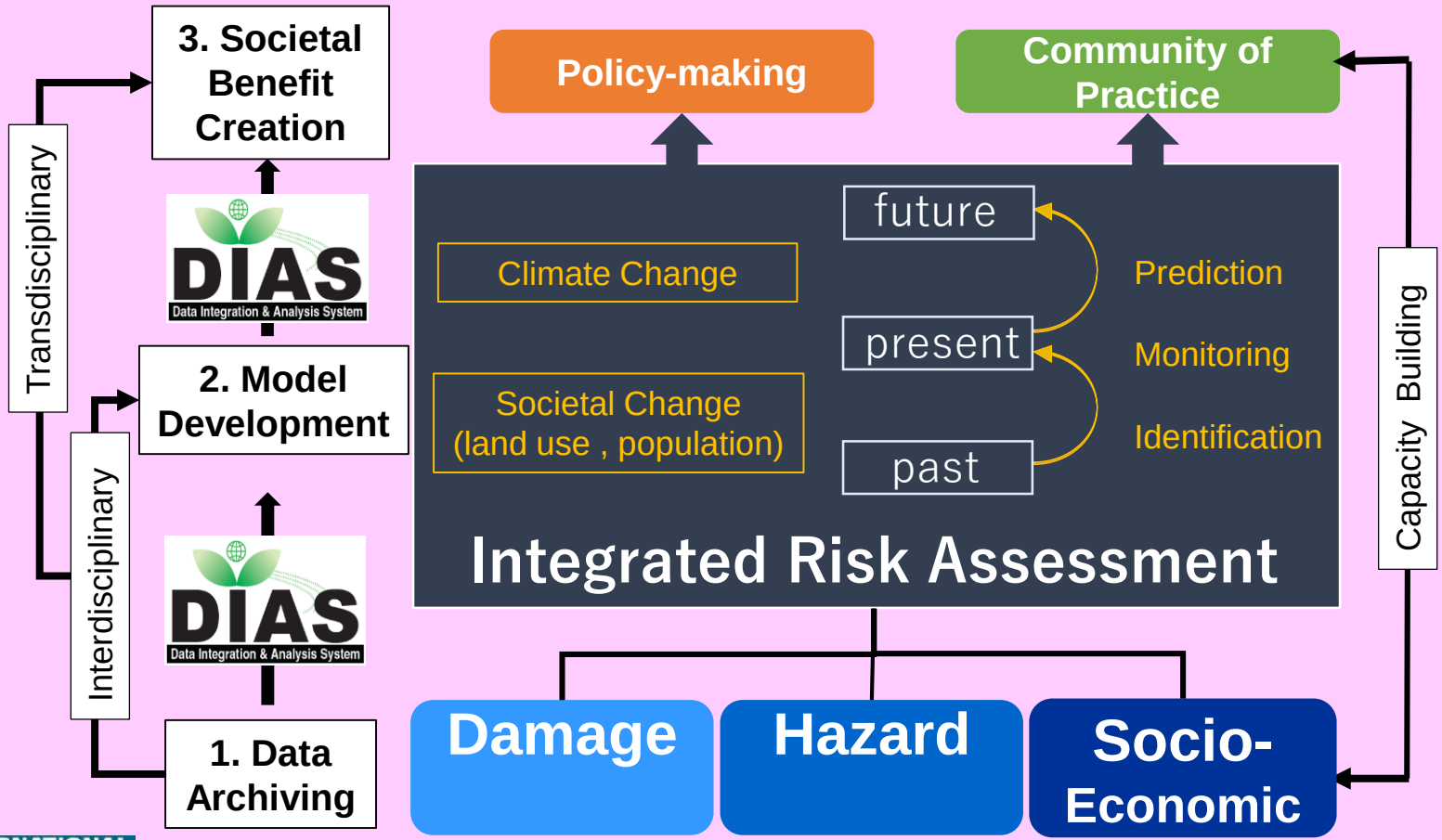
Platform on Water Resilience and Disasters



Water-related Disasters

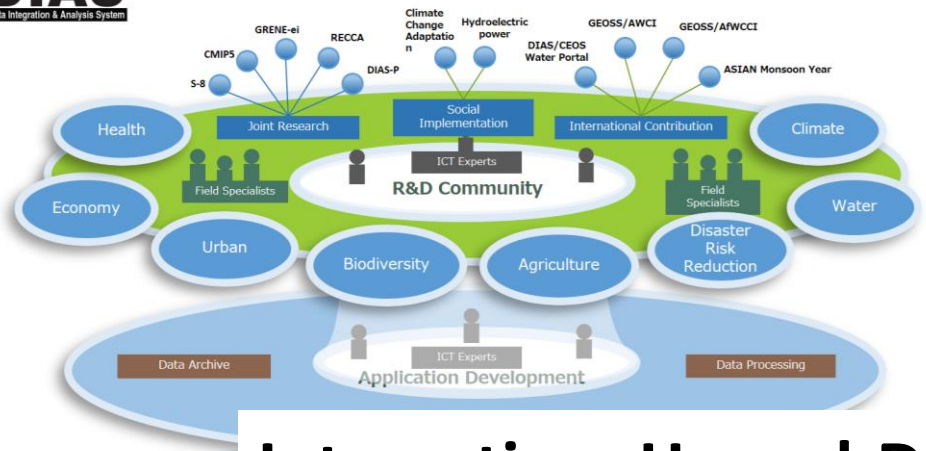


Platform on Water Resilience and Disasters



DIAS Data Integration & Analysis System

Challenges to variety, volume, velocity and veracity.



Extra-large volume data storage (25PB

SDGs & DIAS Challenges

Searching
Possible Future Contributions
To match SDGs and DIAS

8

Integration: Hazard-Damage-Socio-economy

Early Waring: Flood, Land Slide, Drought

Climate Change Impact Assessment: Dynamical-Statistical Down-scaling

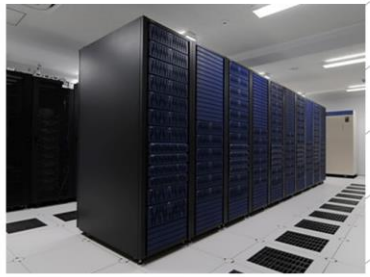
DIAS Data Integration & Analysis System

Data Integ *a legacy*

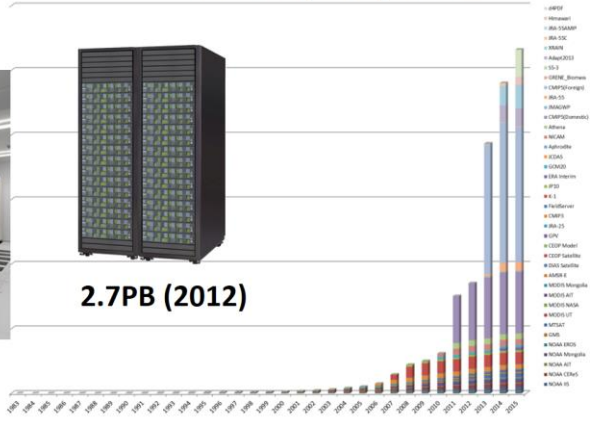
Analysis System *ibutions to GEOSS*

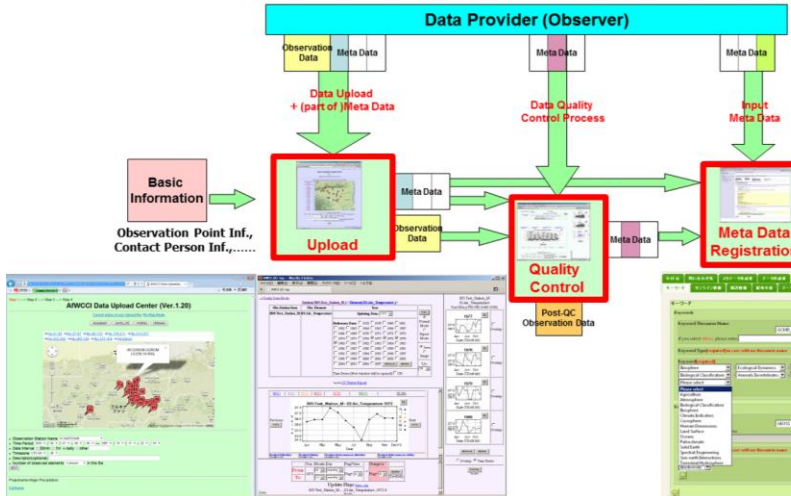
tackling a large **, including data**
Earth observation data. **loading, QC and metadata registration**

IPCC AR4 (2007): 40TB → IPCC AR5 (2012): 2.6PB



600TB (2007)





Activities in Asia-Pacific Region

- **Philippines**
  - **Platform on Water Resilience and Disasters**
  - Activity: Meeting among related stakeholders in **Mar.** and **Jun.** 2017, **Mar.** and **May** 2018
  - Initial Target(s): Pampanga River & Davao River
- **Pakistan**
  - **Platform on Water Resilience and Disasters**
  - Activity: Meeting among related stakeholders in **Apr.** and **Dec.** 2017
  - Initial Target(s): Indus River
- **Myanmar**
  - **Platform on Water Resilience and Disasters**
  - Activity: Meeting among related stakeholders in **May, Nov.** 2017 and **Sep.** 2018
  - Initial Target(s) Bago River & Sittaung River
- **Sri Lanka**
  - **Platform on Water Resilience and Disasters**
  - Activity: Meeting among related stakeholders in **Aug.** 2017 and **Mar.** 2018
  - Initial Target(s): Kalu River, Kelani River, Malvaththu River

ICHARM

Philippines

Activities for "Platform on Water Resilience and Disasters"

Meetings on "Platform on Water Resilience and Disaster";

- 13 March, 2017 at Metro Manila
- 15 June, 2017 at Metro Manila
- 18 September, 2017 at Hanoi

Participated Stakeholders

	•	**DOST**	: **D**epartment **o**f **S**cience and **T**echnology
Hydro-Met	•	**PAGASA**	: **P**hilippine **A**tmospheric, **G**eophysical and **A**stronomical **S**ervices **A**dministration
River Bureau	•	**DPWH**	: **D**epartment of **P**ublic **W**orks and **H**ighways
Disaster	•	**OCD**	: **O**ffice of **C**ivil **D**efense
Economy	•	**NEDA**	: **N**ational **E**conomic and **D**evelopment **A**uthority
Statistics	•	**PSA**	: **P**hilippine **S**tatistics **A**uthority
Geology	•	**NAMRIA**	: **Na**tional **M**apping and **R**esource **I**nformation **A**uthority
Academia	•	**UP (3)**	: **U**niversity of **P**hilippines (3)

ICHARM

Damage

Data	Source of information
Casualties & missing person	
Num. of affected people	
Agricultural damage	
Housing damage	
Damage to critical infrastructure	
Direct economic loss other than agricultural loss	

Hazard

Data	Source of information
DEM (LiDAR)	
DEM (ifSAR)	
Hydromet data	
Inundation depth (LiDAR)	
Inundation depth (interview)	
Rainfall	
River flow	
River cross section	
Tidal level	

Socio-economic

Data	Source of information
Land use	
Agriculture	
Population	
Infrastructure	
Industry	
Commerce	
Drainage facility	
Information	
Regional GDP	
Tax revenue	
Land price	

ICHARM

Damage

Data	Source of information
Casualties & missing person	OCD
Num. of affected people	OCD
Agricultural damage	DA
Housing damage	OCD
Damage to critical infrastructure	DPWH, LGU
Direct economic loss other than agricultural loss	LGU NEDA

Hazard

Data	Source of information
DEM (LiDAR)	UP Mindanao
DEM (ifSAR)	NAMRIA
Hydromet data	PAGASA, ASTI, DREAM
Inundation depth (LiDAR)	UP Diliman, UP Mindanao
Inundation depth (interview)	PAGASA
Rainfall	PAGASA
River flow	DPWH, UP Mindanao
River cross section	DPWH, UP Mindanao
Tidal level	NAMRIA

Socio-economic

Data	Source of information
Land use	LGU DOST
Agriculture	PSA, DA
Population	PSA
Infrastructure	DPWH/LGU
Industry	DTI
Commerce	DTI
Drainage facility	DPWH/LGU
Information	PSA NEDA
Regional GDP	PSA
Tax revenue	BIR
Land price	City Assessors Office

Commitments by responsible agencies

Pakistan

Activities for "Platform on Water Resilience and Disaster"

A meeting for establishment of "Platform on Water Resilience and Disaster";

- March 2-3, 2017 at PMD Headquarter, Islamabad

Participated Stakeholders

Meteorology	• **PMD**	: **P**akistan **M**eteorological **D**epartment
Water Resources	• **PCRWR**	: **P**akistan **C**ouncil of **R**esearch in **W**ater **R**esources
Climate Change	• **GCISC**	: **G**lobal **C**hange **I**mpact **S**tudies **C**enter
Agriculture	• **NARC**	: **N**ational **A**griculture **R**esearch **C**entre
Disaster	• **NDMA**	: **N**ational **D**isaster **M**anagement **A**uthority
Academia	• **UET**	: **U**niversity of **E**ngineering and **T**echnology
Academia	• **NUST**	: **N**ational **U**niversity of **S**cience and **T**echnology

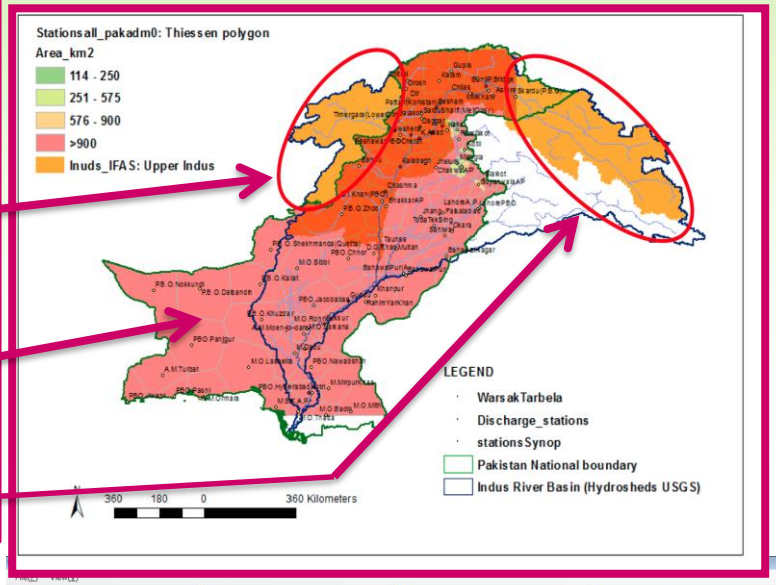
ICHARM

Activities (UNESCO Pakistan Project)

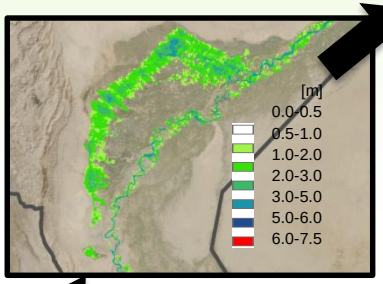
Indus-IFAS: flood forecasting system based on IFAS/RRI

INPUT DATA CHALLENGES:

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



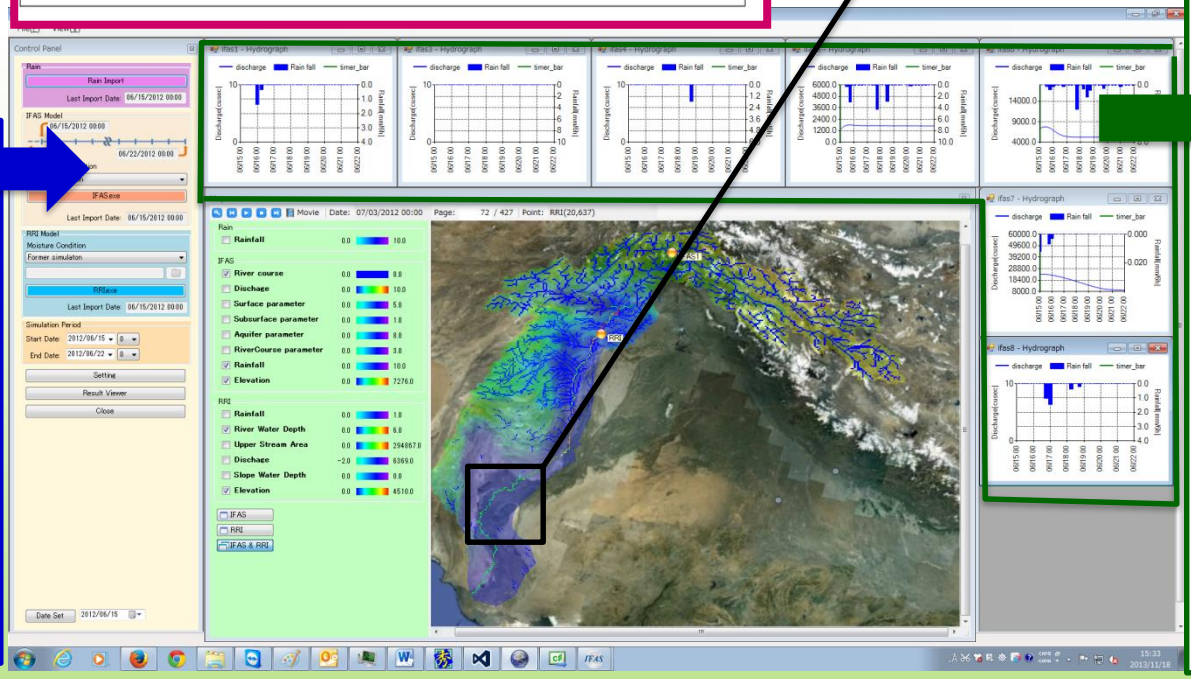
Inundation area by RRI



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
- Inundation extents in mid-low Indus

Myanmar

Activities on "Platform on Water Resilience and Disaster"

Meetings on "Platform on Water Resilience and Disaster";

- May 9, 2017 at Nay Pyi Taw
- November 1, 2017 at Nay Pyi Taw

Participated Stakeholders

River Management	• **DWIR**	: **D**irectorate of **W**ater Resources and **I**mprovement of **R**iver System
Irrigation	• **IWUMD**	: **I**rrigation and **W**ater **U**tilization **M**anagement **D**epartment
Hydro-Meteorology	• **DMH**	: **D**epartment of **M**eteorology and **H**ydrology
Disaster	• **RRD**	: **R**elief and **R**esettlement **D**epartment
Academia	• **YTU**	: **Y**angon **T**echnology **U**niversity

ICHARM

Near real-time flood forecast system for the Bago River

Climate and hydro in-situ data

Rainfall | Temperature | Pressure | Wind | Relative Humidity — ~10 mins

Water-level | Tide — ~10 mins

SATREPS,DMH, (IWUMD, DHP)

SATREPS,DMH

Archived data (JRA55)

Pressure | Wind | Temperature | Solar Radiation

Satellite products

GSMAP, AMSAR2 ALOS/PALSAR | Cloud Cover | Shortwave — ~10-15 mins

Dam operation

Outflow | Capacity | Water level

IWUMD, DHPI

High-reso DEM *SATREPS*

Cross-section

SATREPS, DWIR

Drainage structure *IWUMD*

LAI-FPAR

Geoprocessing forcing

Real Time System

Statistical model

Longwave — ~1 min

DIAS Data Integration & Analysis System

Real Time Processes

RRI Model

Discharge | Water level | Inundation — ~ 5 mins

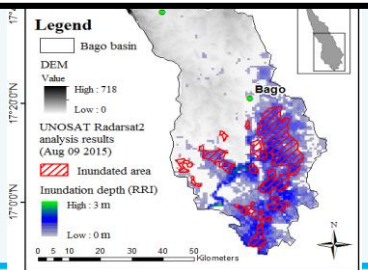
WEB-DHM Model

Soil moisture | Discharge — ~1 mins ~1 mins

User needs

IWUMD, DWIR, DMH, DDM

Output for stakeholders



Routine operation

IWUMD, DWIR, DMH, DHPI

- Remote monitoring /reducing site-visit loads
- Understand real situation
- Investigate risk

~20-25 mins delay

Emergency case *DMH*

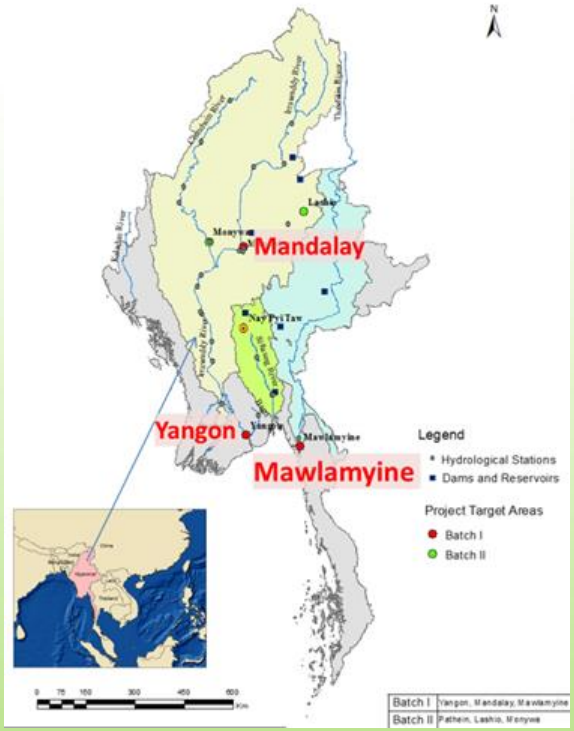
- Issuing warning

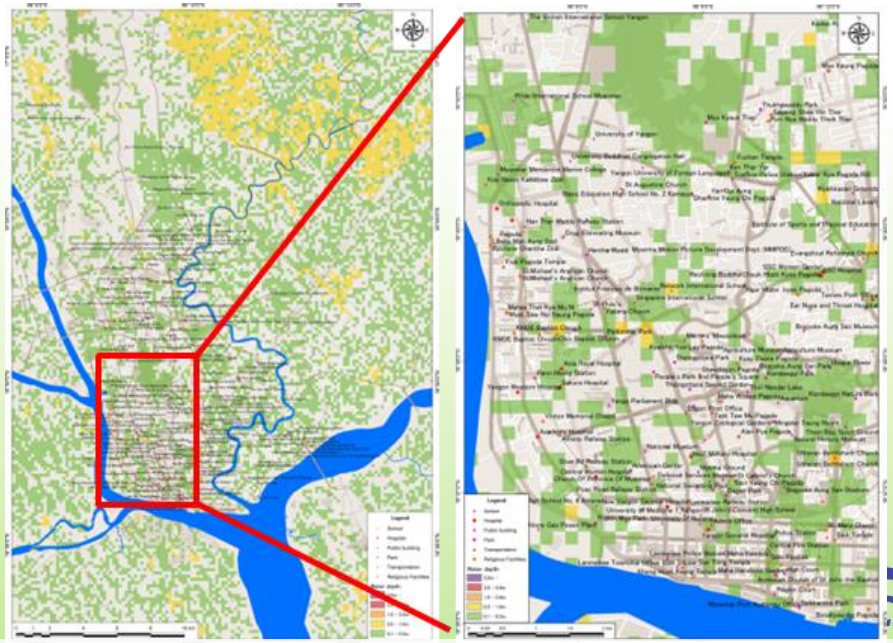
Emergency response

DDM (EOC)

ADB TA-8456 Republic of the Union of Myanmar: Transformation of Urban Management (2014.07 ~ 2016.11)

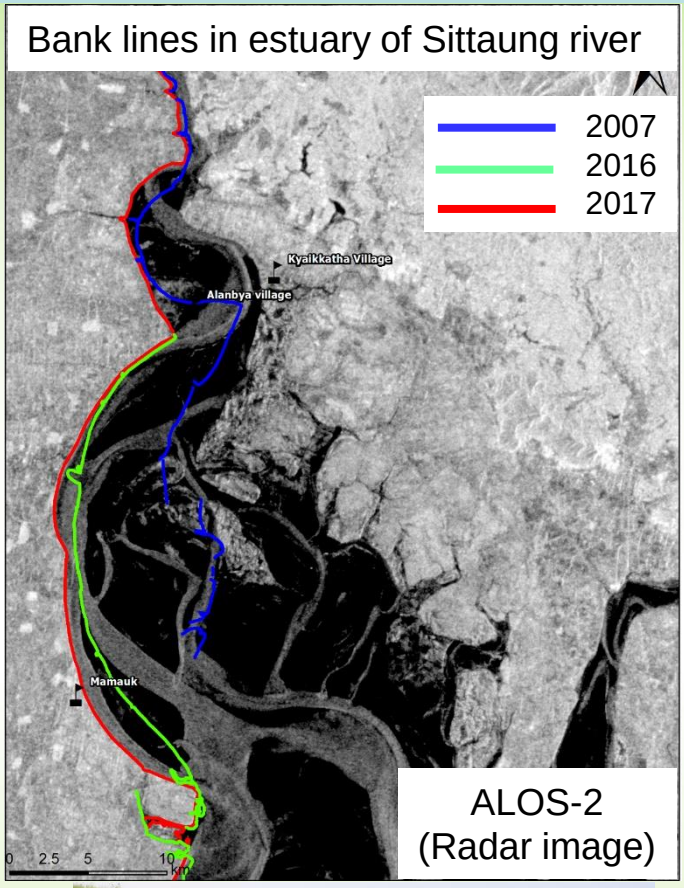
- Asian Development Bank (ADB) implemented a project "Transformation of Urban Management" to promote sustainable urban development for three large cities.
- ICHARM played as a project leader in flood management, mainly responsible for technology transfer and enhancement of the organizational capacity of the Myanmar government by providing knowledge and skill in flood risk assessment and reduction.



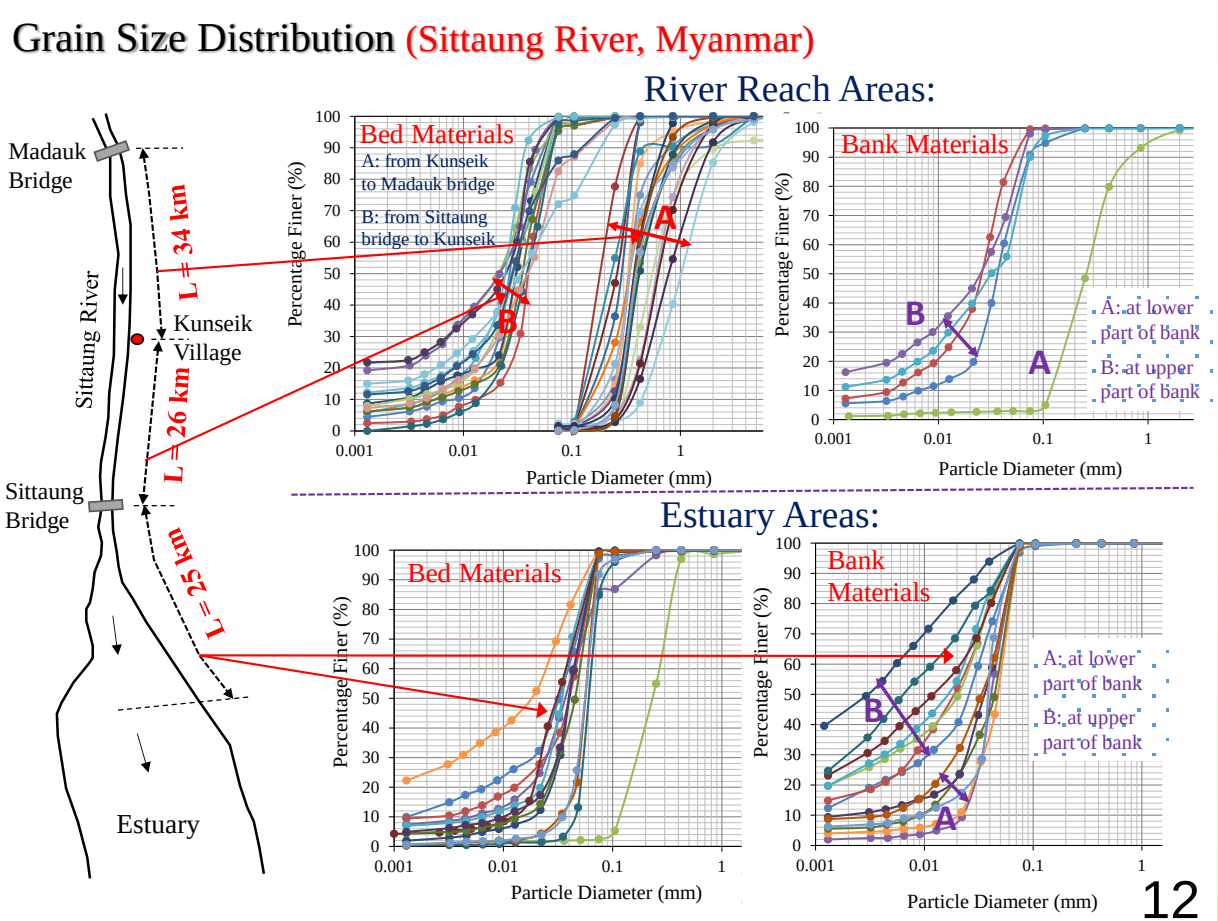


Flood Hazard Map in Yangon for 100-year flood (Green(0.1-0.5m), Yellow(0.5-1.0m))

Findings from the field survey at Sittaung River



- West river bank has been eroded over 10 km in these 10 years, which has caused the extinction of the riverine village and farmland.
- River bed materials in estuary and river mouth areas are thought to be supplied by the eroded bank materials and wash load from upper reach.



Sri Lanka

Activities on "Platform on Water Resilience and Disasters"

Meetings for establishment of "Platform on Water Resilience and Disaster"

Post-Disaster Activities after flood and landslide of late May, 2017

- 1st Plenary Session on August 24, 2017
- 2nd Plenary Session on March 28, 2018

Sri Lankan Minister joined at the 2nd Plenary Session

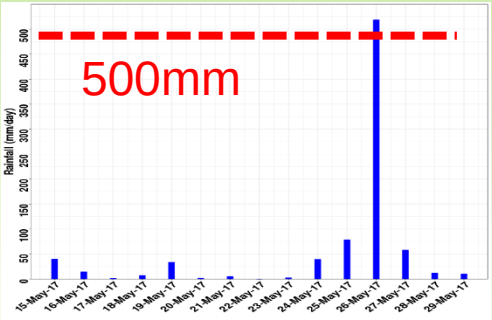
Participated Stakeholders

Irrigation
Disaster
Meteorology
Geological survey
Landslide
Urban

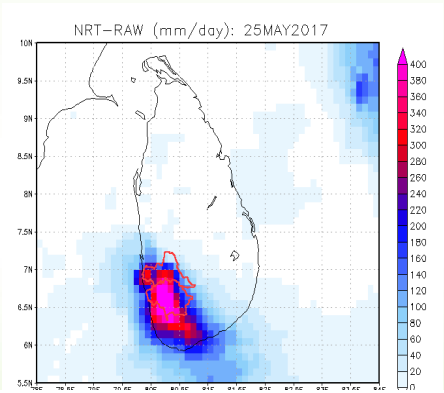
- **ID** : **I**rrigation **D**epartment
- **DMC** : **D**isaster **M**anagement **C**enter
- **MD** : **M**eteorological **D**epartment
- **SD** : **S**urvey **D**epartment
- **NBRO** : **N**ational **B**uilding **R**esearch **O**rganization
- **MMWD** : **M**inistry of **M**agapolis and **W**estern **D**evelopment

ICHARM

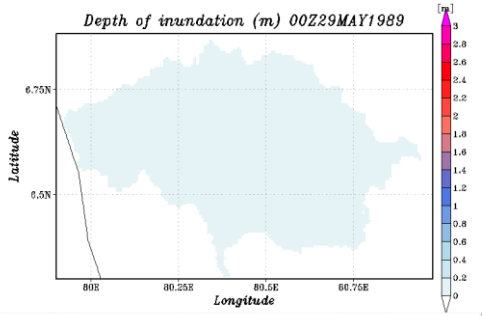
DIAS-ICHARM: Flood Information Sharing Support in Sri Lanka



Real-time Rain Gauge Data



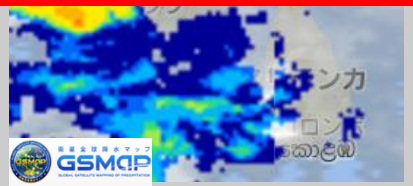
Bias-corrected Satellite Rainfall



Inundation

Implemented by EDITORIA and ICHARM on DIAS

In-situ rain gauge data (6 numbers)



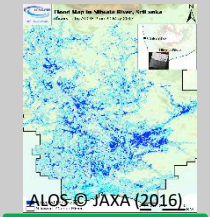
Satellite precipitation data (GSMaP)

4 hr latency data (NRT)

Real time data (NOW)

Ensemble forecasting rainfall for the next 16 days (max)

Himawari-8 cloud images



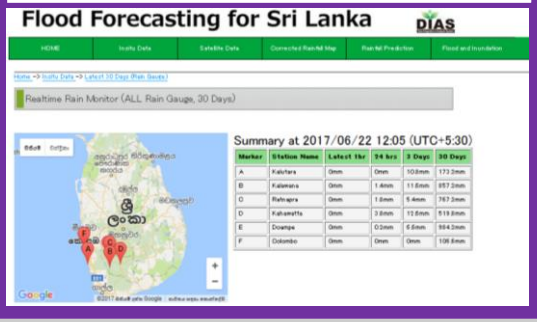
Inundation map by satellite data (ALOS-2)

Calibration

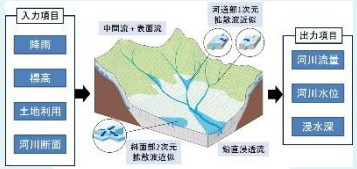
Flood Forecasting for Sri Lanka

DIAS Data Integration & Analysis System

On-line Information provision on DIAS: In-situ rainfall, satellite rainfall, calibrated and forecast rainfall, inundation simulations



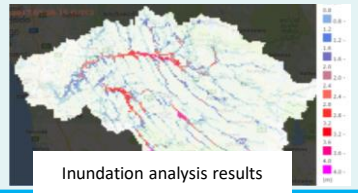
Inundation analysis by using RRI in DIAS



Concept of RRI model

RRI model

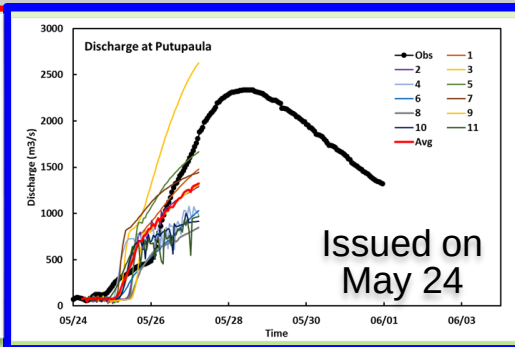
Simulation and forecasting of river discharge, water level, inundation extent



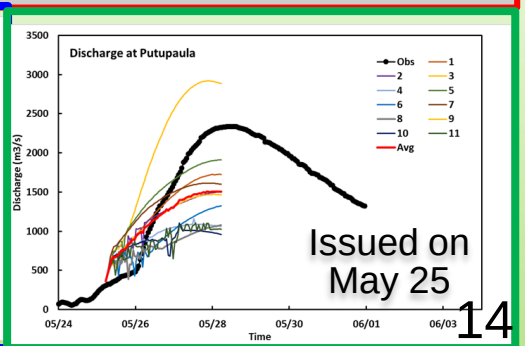
Inundation analysis results

Ensemble Flood Prediction

72hr
11 ensembles
every 24hr



Issued on May 24



Issued on May 25

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

Kevin Rutte

Prime Minister, Netherlands

János Áder

President, Hungary

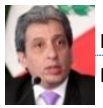
Emomalii Rahmonov

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

Co-chairs

Enrique Peña Nieto

President, Mexico

Ameenah Gurib-Fakim

President, Mauritius

Jacob Zuma

President, South Africa

Abdullah Ensour

Prime Minister, Jordan

Sheikh Hasina

Prime Minister, Bangladesh

Malcolm Turnbull

Prime Minister, Australia

Co-convened by:

Ban Ki-moon

Secretary General, United Nations

UNITED NATIONS

WORLD BANK GROUP

Jim Yong Kim

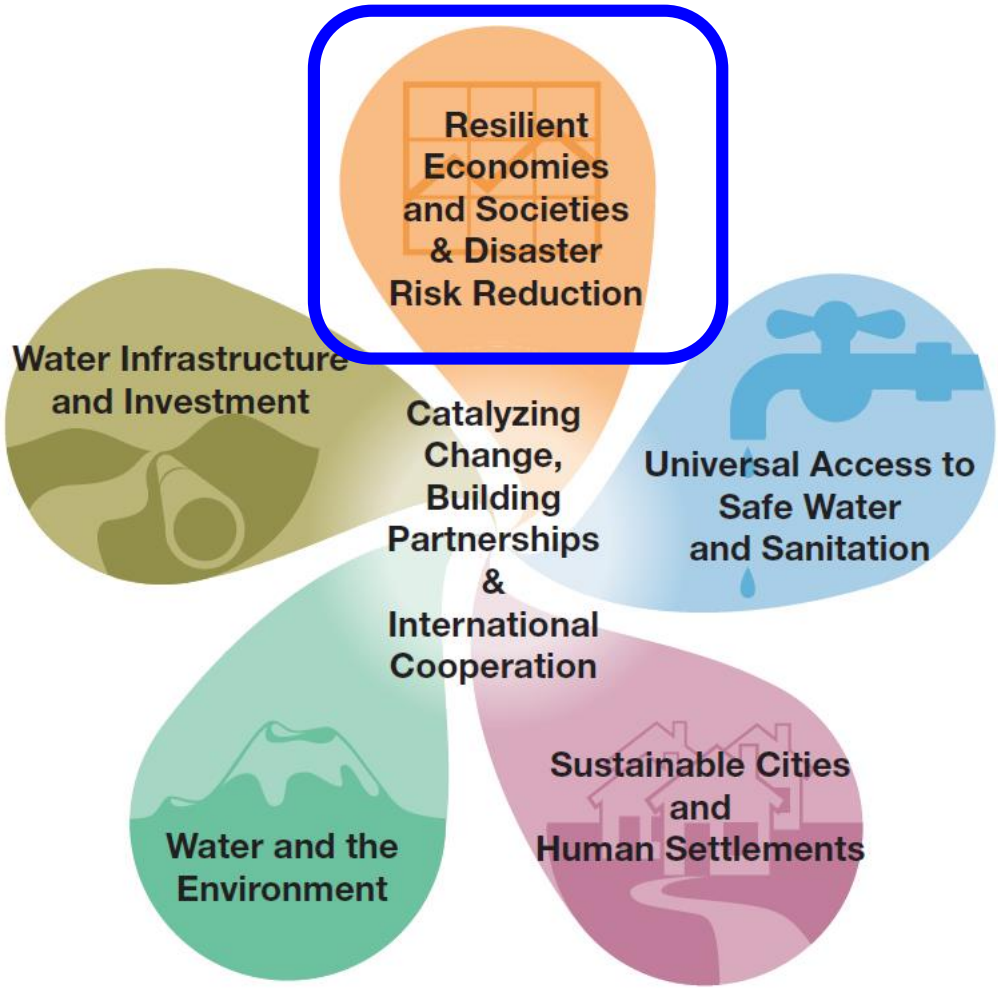
President, World Bank Group

Making Every Drop Count

An Agenda for Water Action

HIGH-LEVEL PANEL ON WATER
OUTCOME DOCUMENT

14 March 2018



HEADLINE RECOMMENDATION

Shift focus of disaster management from response to preparedness and resilience.

DETAILED RECOMMENDATIONS

- Political leadership is needed to raise awareness, strengthen science (that includes a gender perspective), policy and planning, upgrade education, and mobilize financing.
- The HLPW Action Plan should be utilized as useful guidance and a connector for advancing the actions towards achieving the Agenda 2030 (SDGs and Paris climate agreements and Sendai Framework) in an integrated manner. Platforms on Water Resilience and Disasters among all stakeholders should be formulated in countries to facilitate dialogue and scale up community-based practices.
- Disaster risk prevention and resilience should be integrated in long-term planning.
- Financing for and investment in water-related DRR and resilience should be doubled within the next five years. "Principles on Investment and Financing for Water-related DRR" should be used to make effective use of this increased investment and could help increasing investments in countries.
- Global research networks, global disaster database, integrated scientific tools for assessing risks, and a global platform integrating science and policy including higher education should be developed and put into support of countries.
- Special Thematic Sessions on Water and Disasters should be organized biennially in the UN General Assembly to raise global awareness.

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Platform on Water Resilience and Disasters