ICHARM / PWRI

International Centre for Water Hazard and Risk Management
under the auspices of UNESCO,
Public Works Research Institute (PWRI), Japan

United Nations Educational, Scientific and Cultural Organization

International Centre for Water Hazard and Risk Management under the auspices of UNESCO

Public Works Research Institute, National Research and Development Agency, Japan

Organization & Budget

Public Works Research Institute (PWRI)

President

- Tsukuba Central Research Institute
- Civil Engineering Research Institute for Cold Region (CERI)
- Center for Advanced Engineering Structural Assessment and Research (CAESAR)
- Innovative Materials and Resources Research Center (iMaRRC)

International Centre for Water Hazard and Risk Management (ICHARM)
officially established March 2006

Executive Director (1)

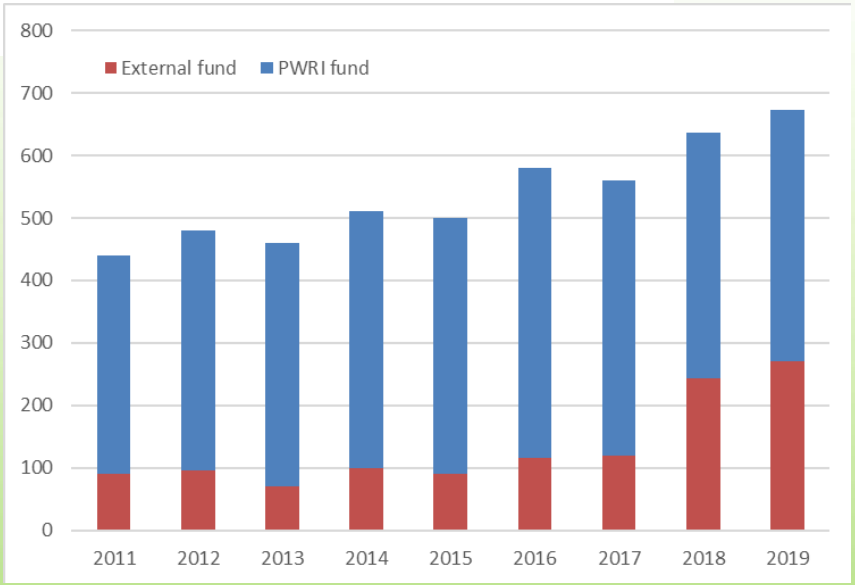
46

- Deputy Director of ICHARM (Director of Water-related Hazard Research Group) (1)
- Director for Special Research (1)
- Training & Research Advisor (1)

- Chief Researcher (Water-related Hazard) (1)
- Chief Researcher (Risk Management) (1)
- Chief Researcher (Networking and PR) (1)
- Chief Researcher (for Training) #1:serving concurrently

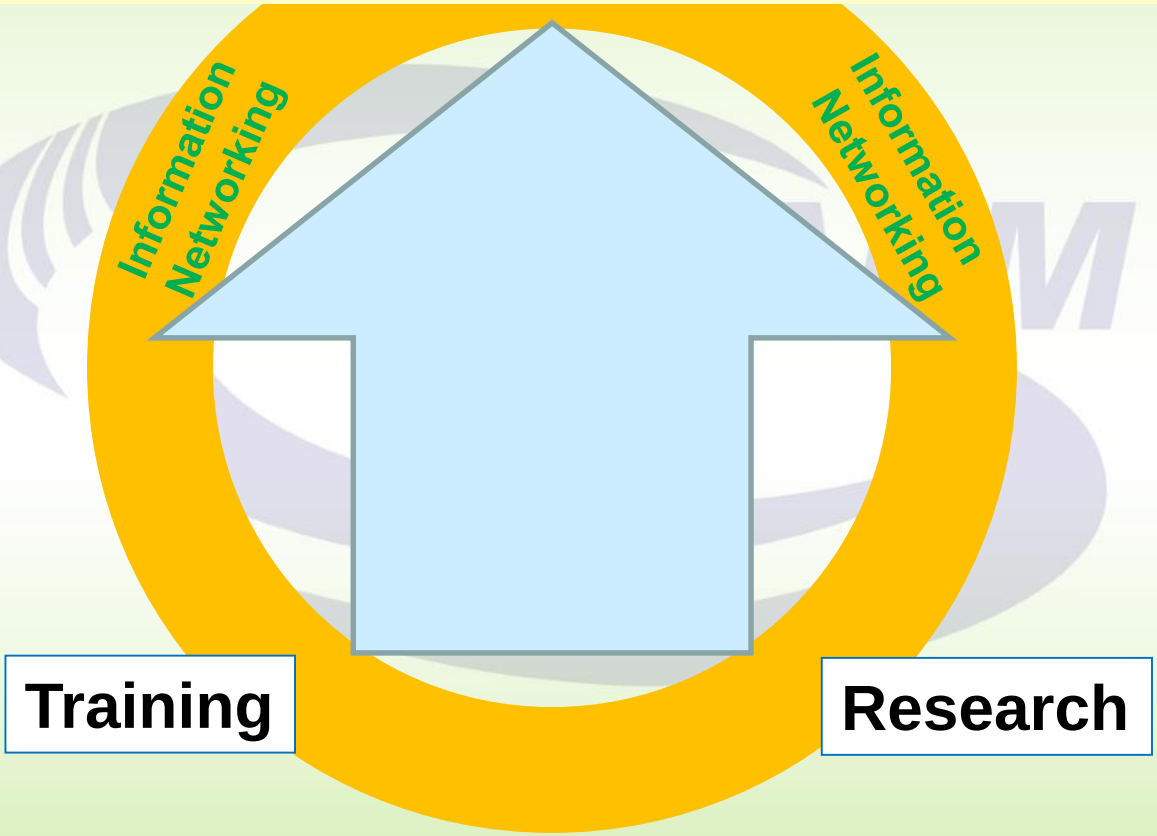
- Senior Researcher (9)
- Research Specialist (10)
- Researcher (2)
- Research Assistant (1)
- Administrative Staff (4)
- Administrative Assistant (13)

Budget (million yen)



Challenge to Localism

Delivering best available knowledge to local practices



Long Term Targets

- Analyzing and formulating policy ideas
- 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

- Developing integrated disaster risk assessment
- Identifying locality and commonality

Risk Change Identification

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Data & Statistics

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

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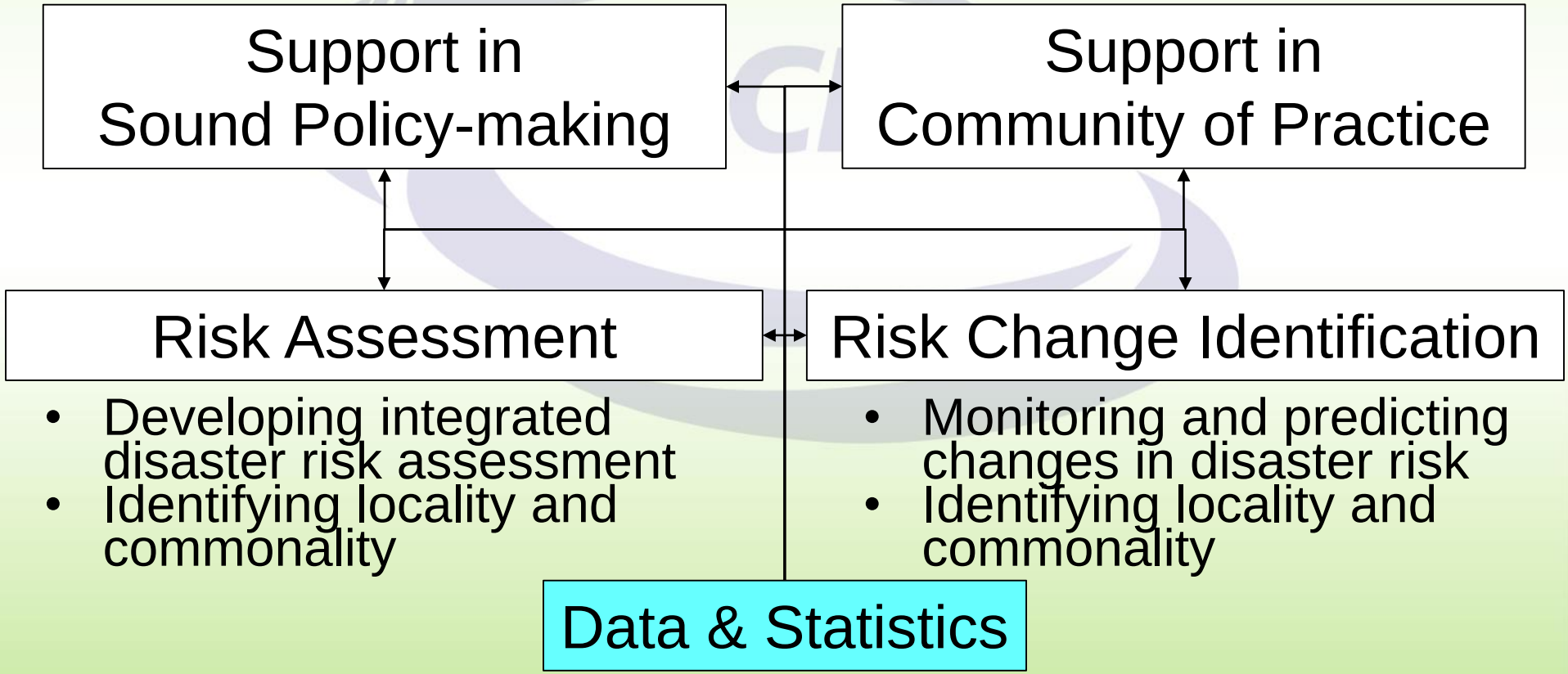

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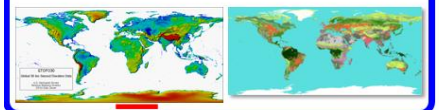
Integrated Flood Analysis System(IFAS)

Hydrological Modeling

Rainfall-Runoff-Inundation (RRI)

Global data: topography, land use, etc.

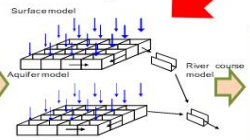


Ground-gauged and satellite rainfall

input

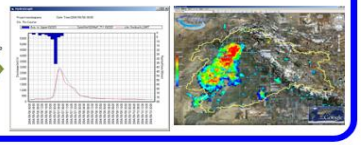
Model creation

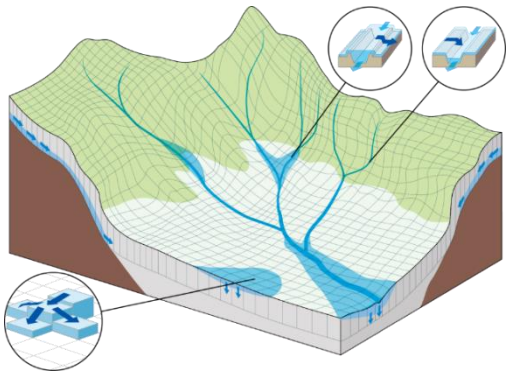
Runoff analysis

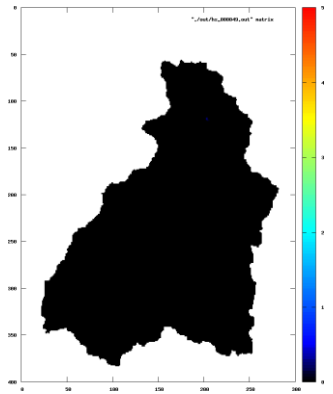


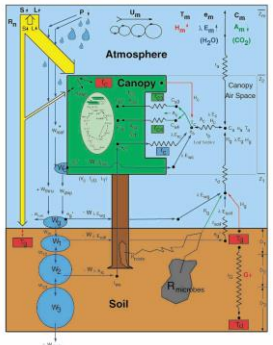
input

River discharge, Water level, Rainfall distribution





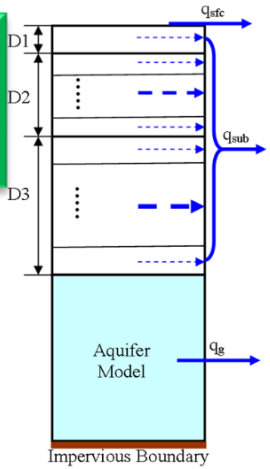


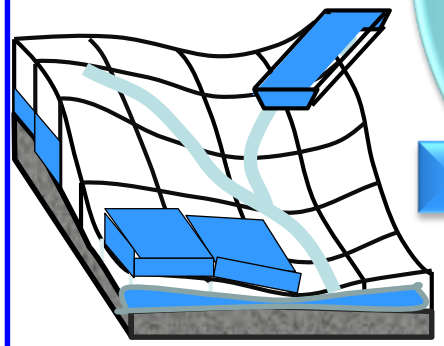


Energy and Water Flux Balance

Vertical Soil Moisture Profile

Water & Energy Budget RRI (WEB-RRI)



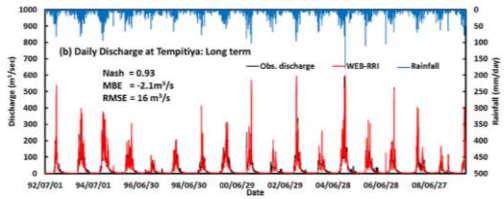


River Flow

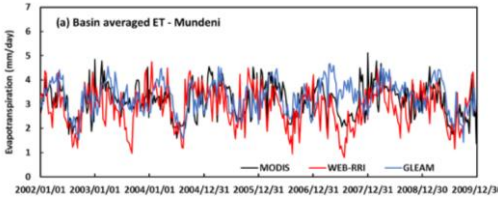
Surface Flow
Ground Water

Interaction

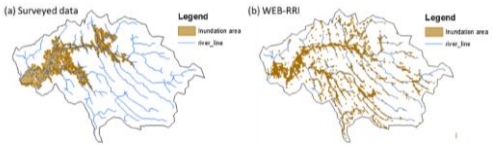
Model Validation



Long-term river runoff

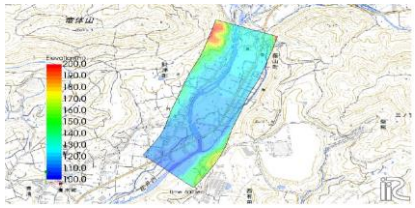


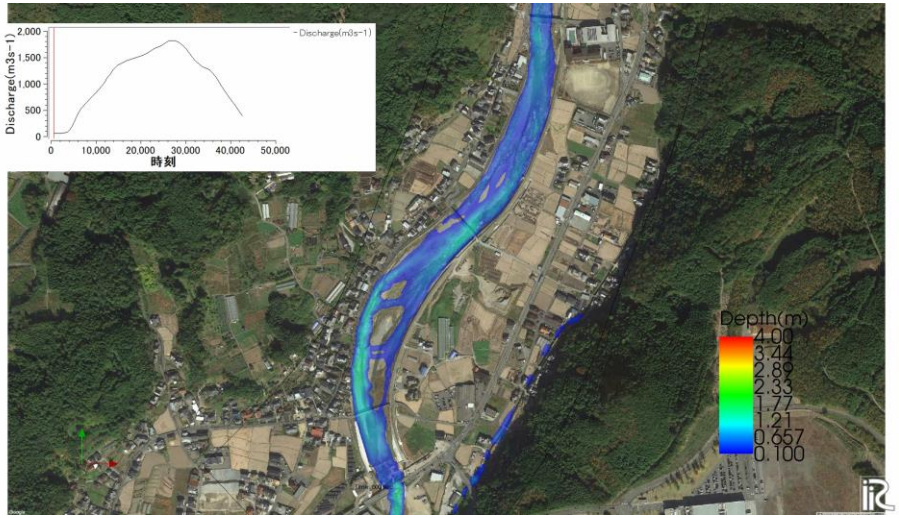
Basin-averaged ET

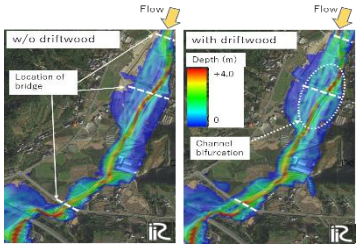


Inundation area

Development and implementation of a method to simulate the flood flow with sediment and driftwood







Design flood and inundation considering sediment transport.

Simulation result of the flood flow with sediment and driftwood

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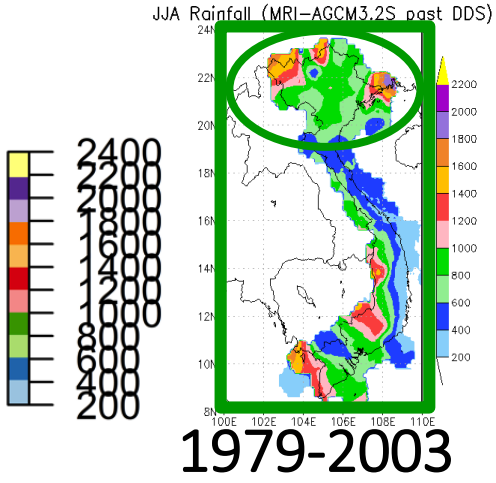
Average Rainfall in June-July-August (JJA)

Statistical Downscaling

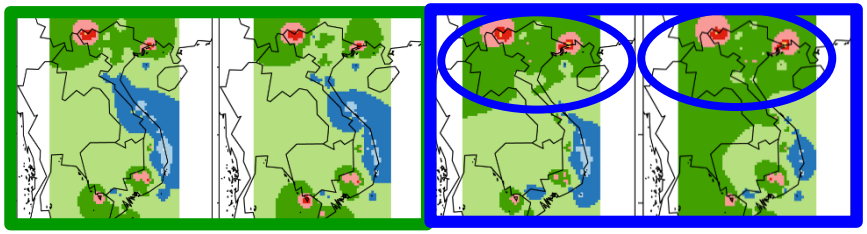
Dynamical Downscaling



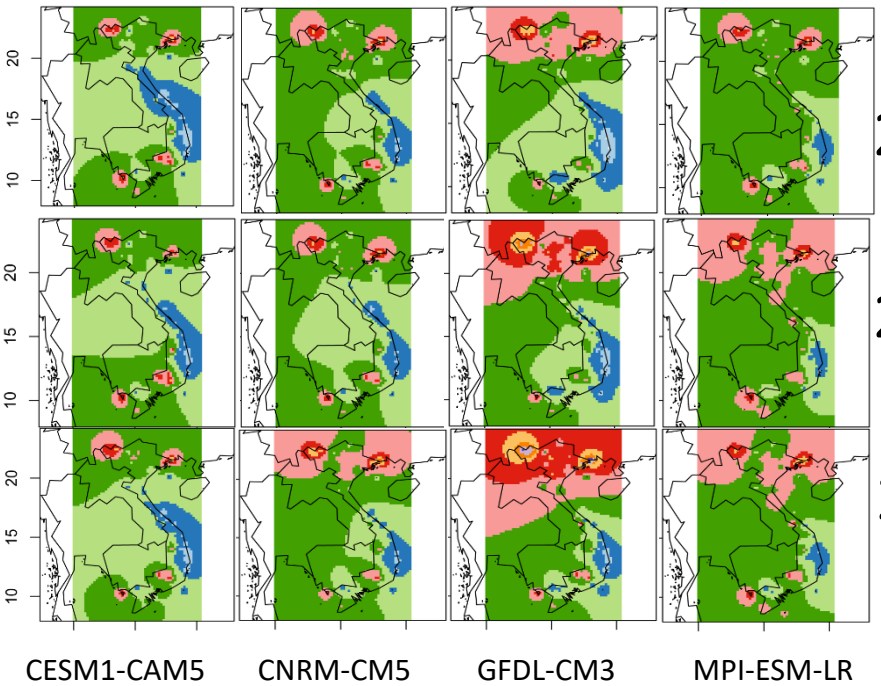
1979-2003

2075-99

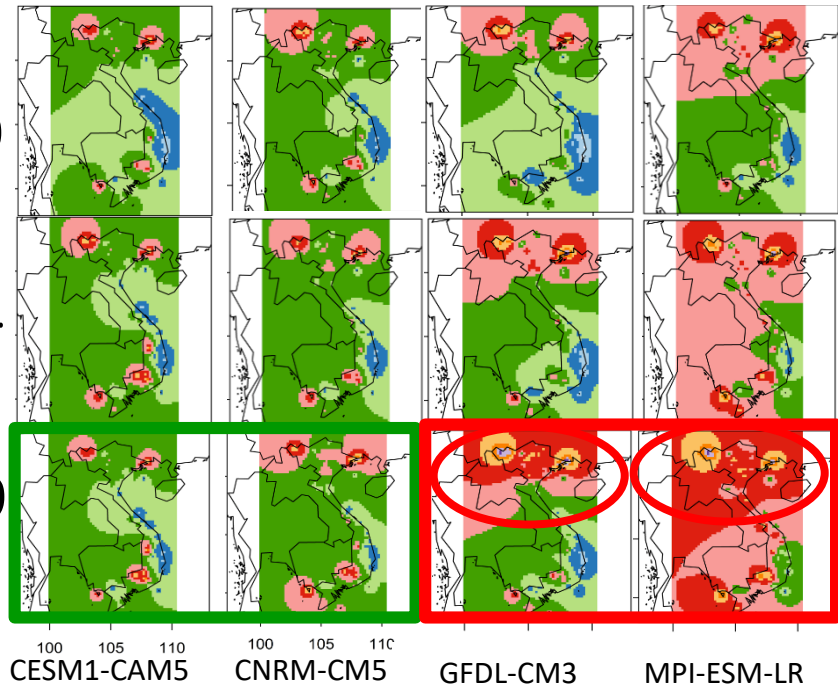
1979-2003



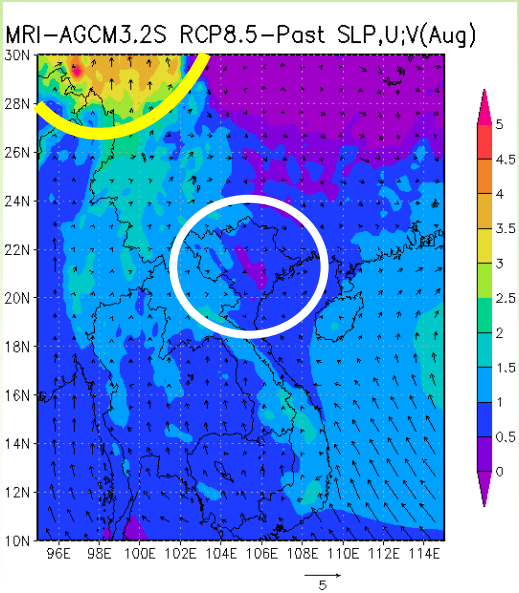
RCP2.6



RCP8.5

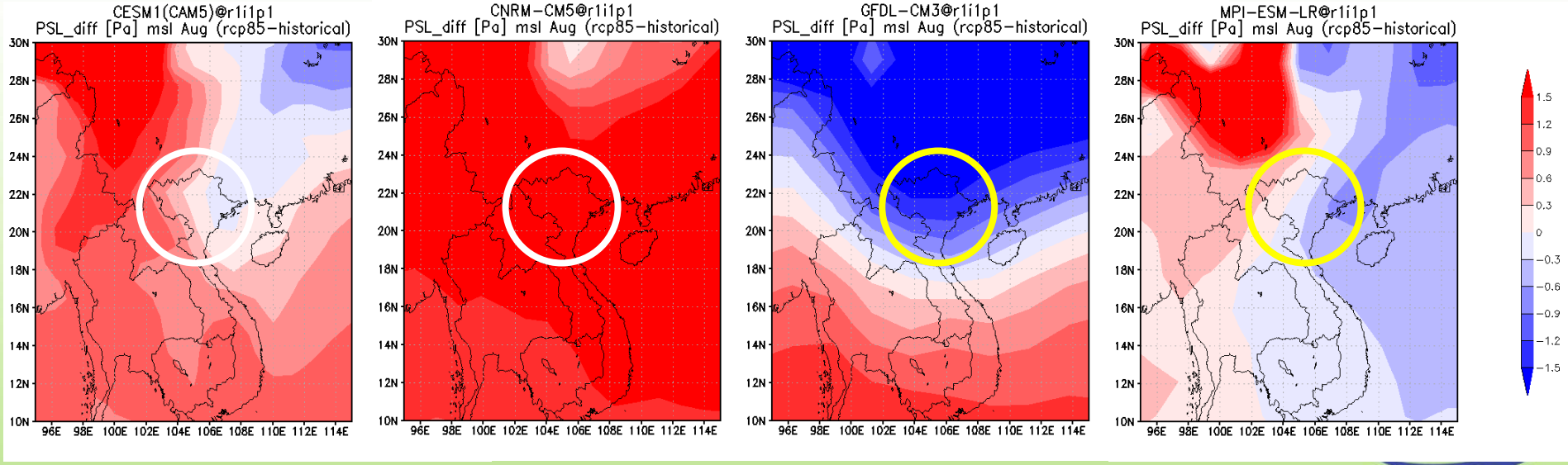


Anti-cyclonic field will be strengthened .



Anti-cyclonic field will be strengthened .

Cyclonic field will be strengthened .



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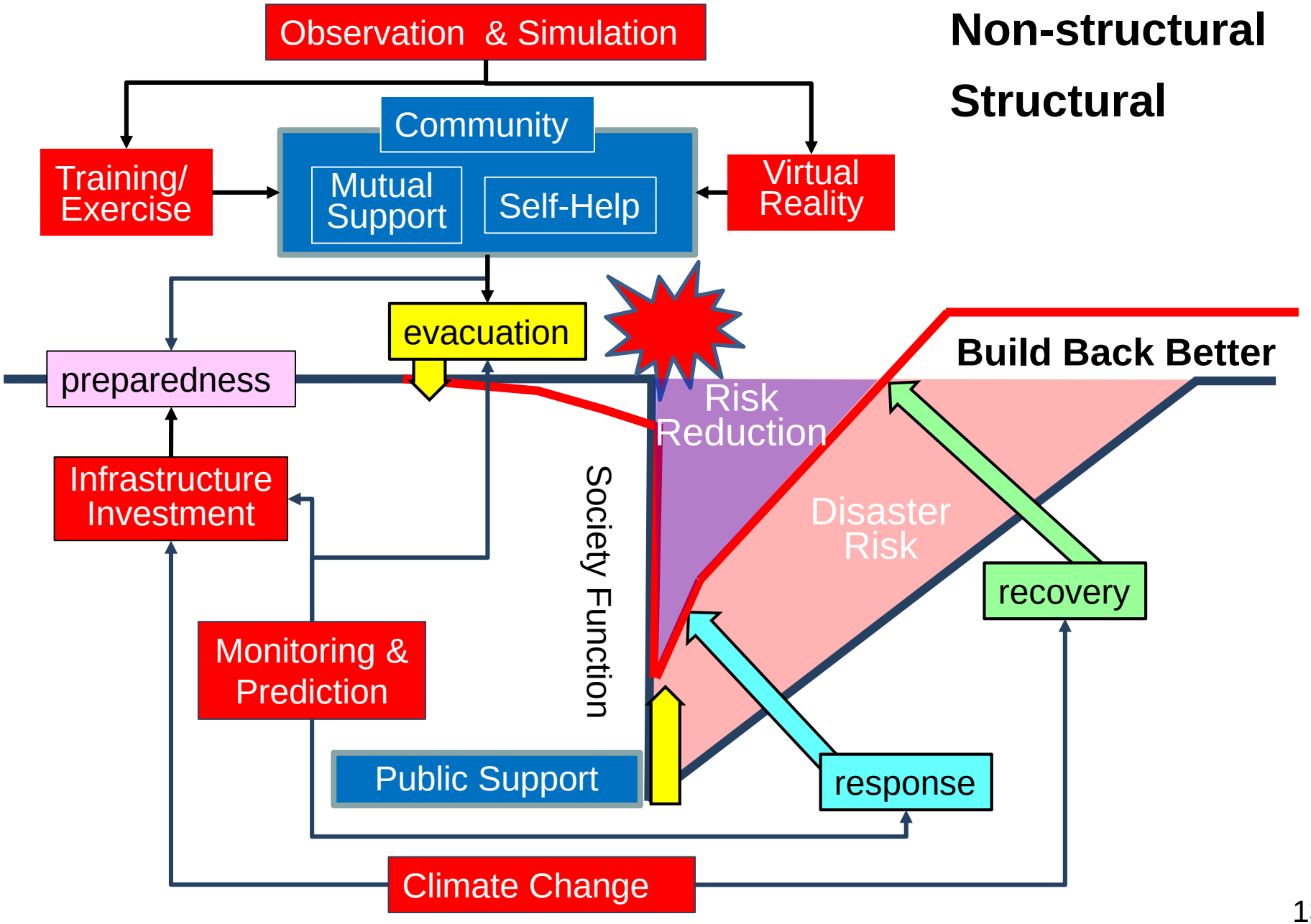
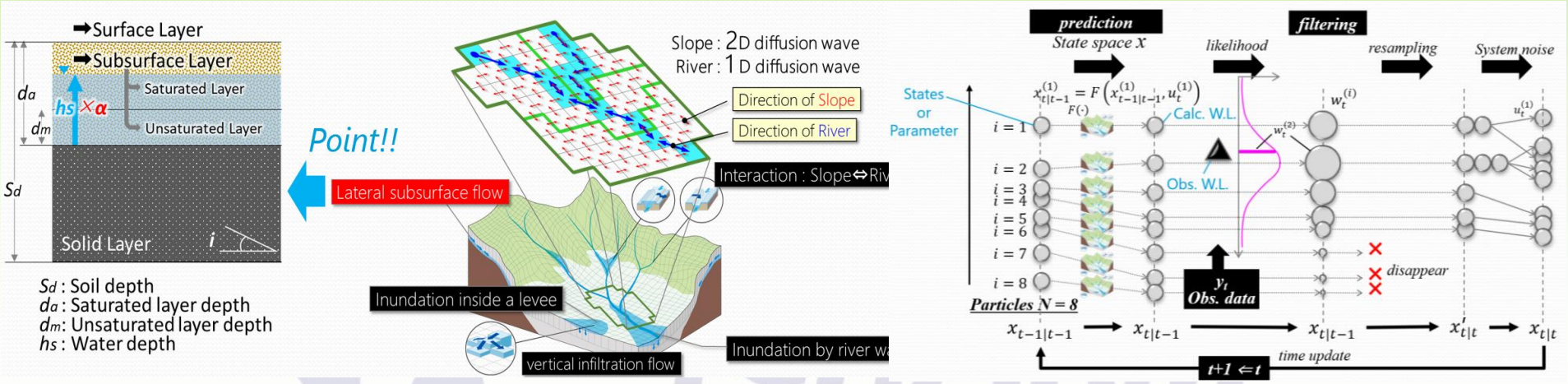
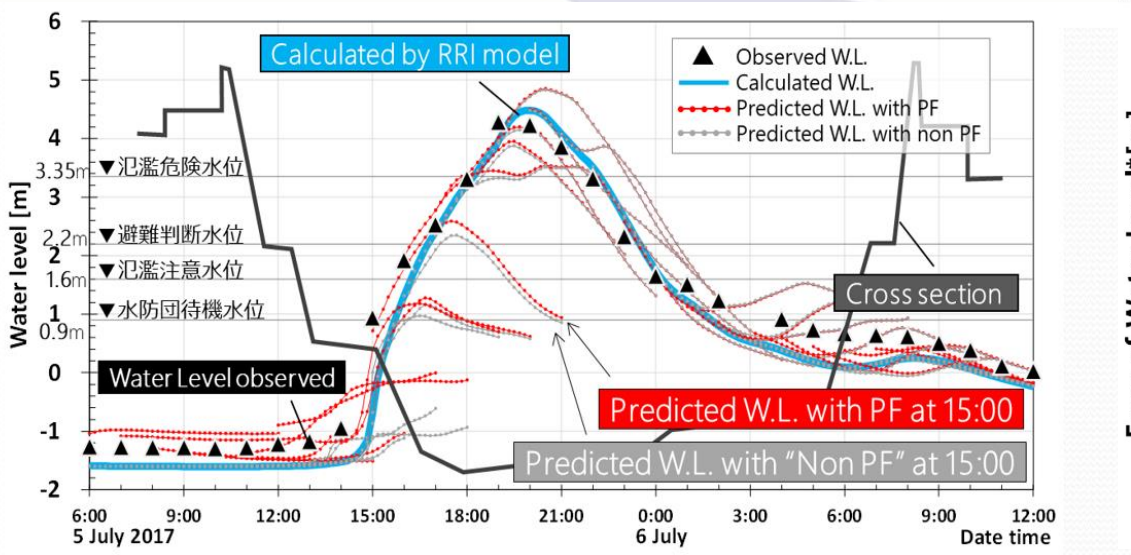
Our Challenges

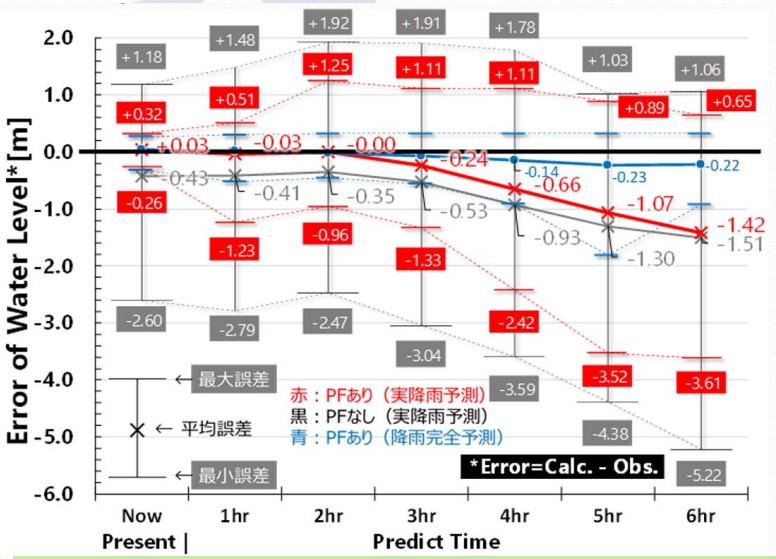


Flood Water Level Prediction System by Coupling RRI and Particle Filter



Initial Soil Moisture Condition of RRI Assimilated by Using Observed River Level and Particle Filter





Predicted Water Level can be Used Initial Soil Moisture Condition of RRI Assimilated by Using Observed River Level and Particle Filter

Study on Flood Awareness by Flood Simulated Experience using Virtual Reality

Application

Software: Unity
Device: VR goggles (Oculus Go)

Scenario of Flood experience in VR space

Situation: Inundation in single-family house due to river flood

Start in 1st floor

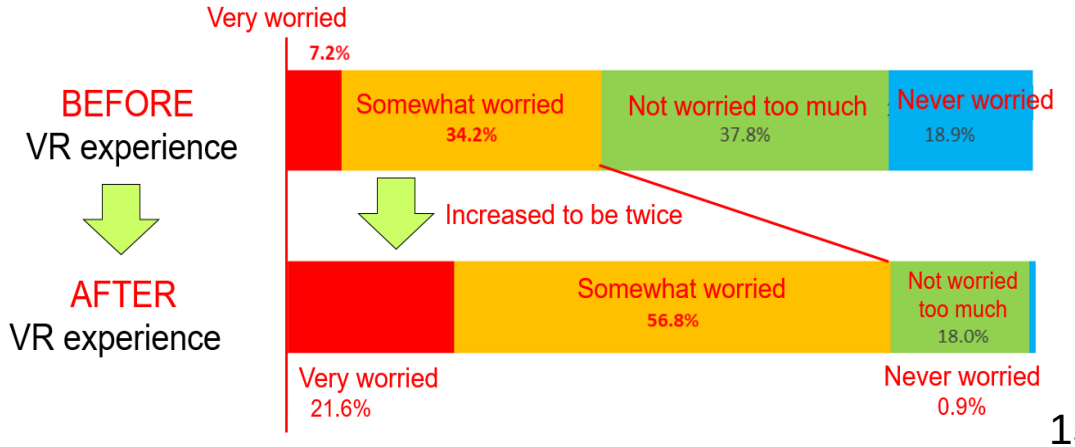
Road in front of the house starts inundated

1st floor was inundated

2nd floor starts inundated

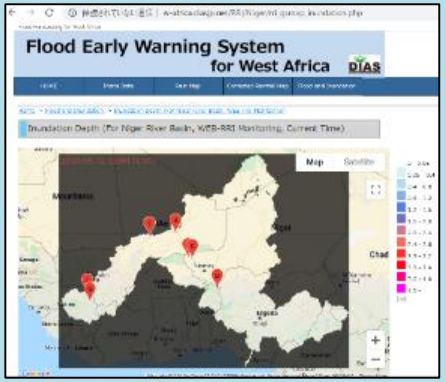
Evacuated to above the roof

Q. Are you usually worried about flooding during the rainy and typhoon seasons?



e-Learning of Flood Contingency Planning in West Africa

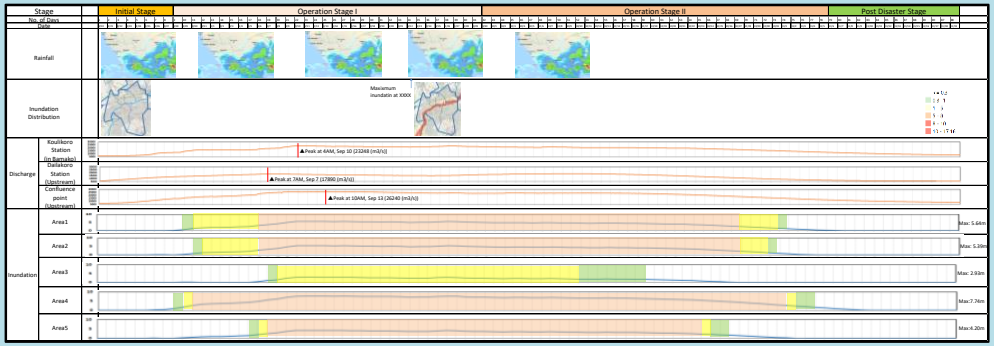
1. Download flood simulation output data from DIAS system



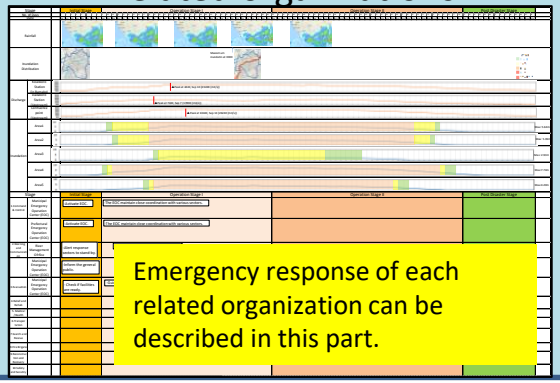
2. Make flood hazard map
(Tutorial of mapping is also provided as hands-on training material)

3.Identify flood hot-spot districts

4.Make Flood disaster scenario in whole region/province/ municipality and identified flood hot-spot districts



5.Describe chronological response by related organizations



Emergency response of each related organization can be described in this part.

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Platform on Water Resilience and Disasters in the Philippines

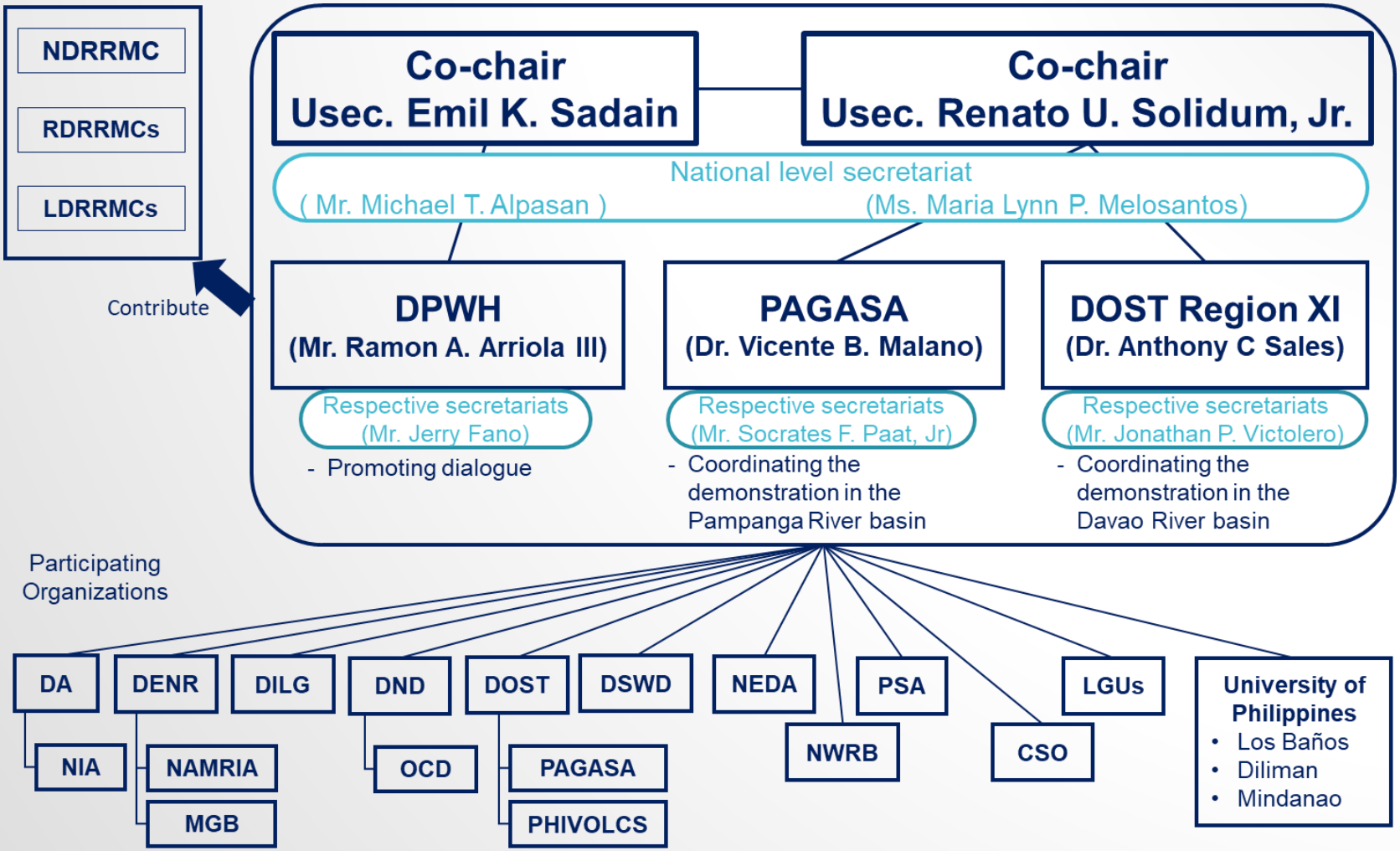
The 3rd Plenary Meeting of Platform

7th, Thursday, February, 2019
Luxent Hotel, Quezon City, Metro Manila

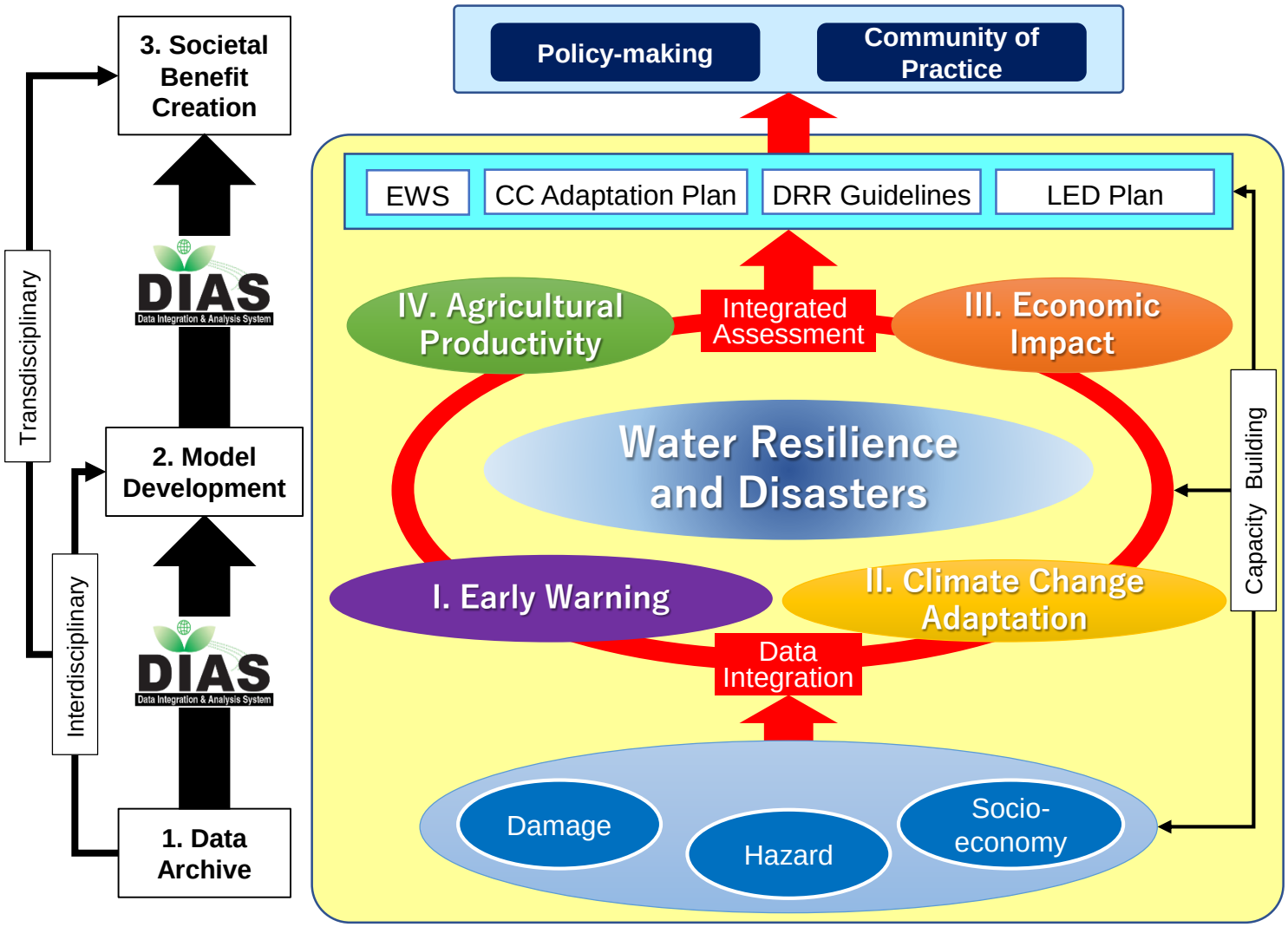
Agency	Office/Division
DPWH	UPMO-FCMC
	Regional Office III
	Regional Office XI
DOST	PAGASA
	PHIVOLCS
	PCIEERD
	Regional Office II
	Regional Office III
	Regional Office XI
DENR	NAMRIA
	Regional Office XI
DILG	WSSPMO-OPDS
DND	OCD
	Regional Office XI
DSWD	
LGA	
MGB	
NEDA	Regional Office III
	Regional Office XI
NWRB	
PSA	
NIA	
UP Los Banos	
UP Diliman	
UP Mindanao	
Univ. of Tokyo	EDITORIA
ICHARM	
Typhoon Committee	

78 participants from 28 offices

Platform on Water Resilience and Disasters in the Philippines



Platform on Water Resilience and Disasters in the Philippines



Platform on Water Resilience and Disasters in the Philippines

1. Data Collection

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

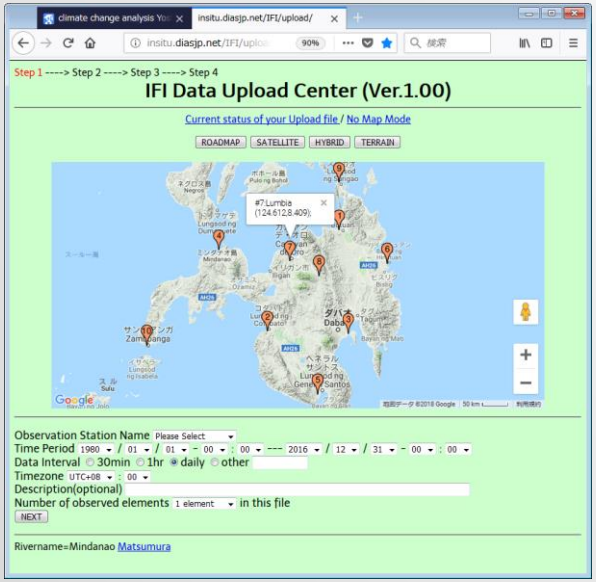
Hazard

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

Socioeconomic

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
Sectoral Regional GDP	PSA
Sectoral employed population	PSA
Tax revenue	BIR
Land price	City Assessors Office

Collected



2. Metadata Template

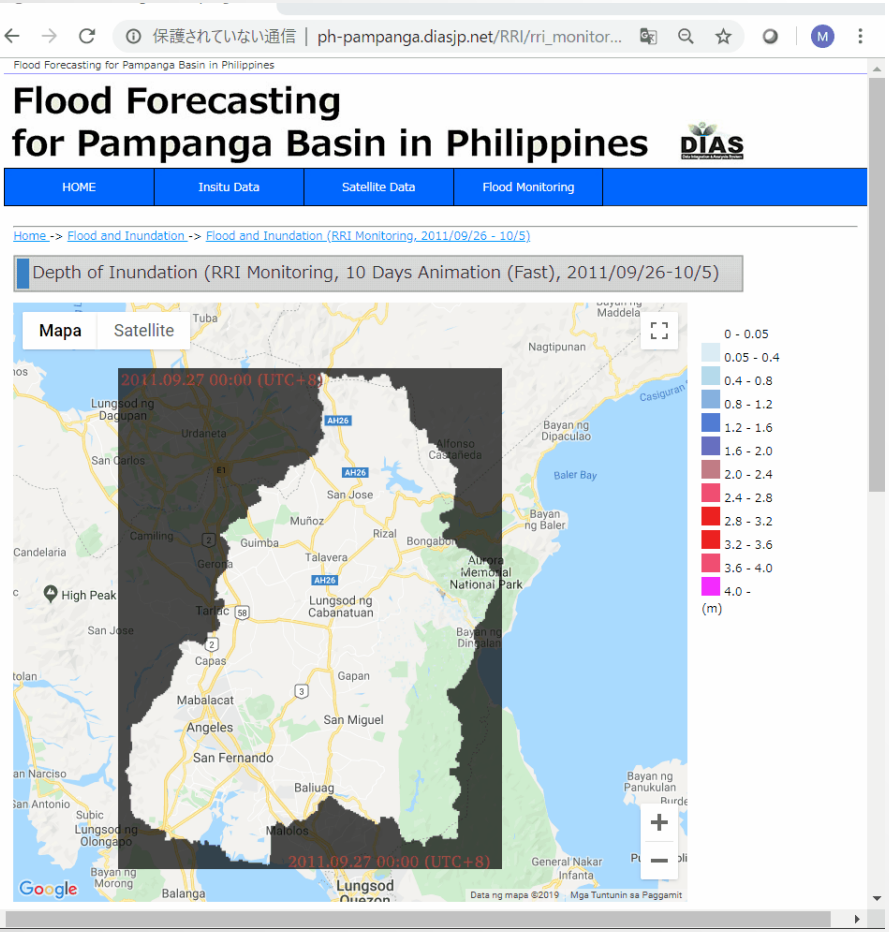
Category	Data	Source of information	Data Type	Specification
Hazard	DEM (LiDAR)	UP Mindanao	Grid	Year: Area: Davao River basin Spatial Resolution: 10m Elements:
	DEM (ifSAR)	NAMRIA	Grid	Year: Area: Davao River basin Spatial Resolution: 5m Elements:
	Rainfall	PAGASA	Time series (Point) ☑ Digital ☐ Paper	Name(s) or Total number: 10 Period: 1980-2016 Temporal Resolution: Daily Elements: Meteorological observation
	Meteorological data	PAGASA	Time series (Point) ☑ Digital ☐ Paper	Name(s) or Total number: 10 Period: 1980-2016 Temporal Resolution: Daily Elements: Meteorological observation
	Water level	PAGASA DPWH UP Mindanao	Time series (Point) ☐ Digital ☐ Paper	Name(s) or Total number: Period: Temporal Resolution: Elements:
	River flow	PAGASA DPWH UP Mindanao	Time series (Point) ☑ Digital ☐ Paper	Name(s) or Total number: 1 (Davao, Lacson, Calinan) Period: 2/2001 - 12/2017 Temporal Resolution: occasional Elements: Field discharge measurement
	River cross section	DPWH UP Mindanao	Geometry (Point) ☐ Digital ☑ Paper	Name(s) or Total number: 270 Period: 2003 Temporal Resolution: - Elements: Field measurement
	Tidal level	NAMRIA	Time series (Point) ☐ Digital ☐ Paper	Name(s) or Total number: Period: Temporal Resolution: Elements:
	Inundation depth (LiDAR)	UP Diliman	Map ☐ Digital ☐ Paper	Year: 2016 Area: Davao City Spatial Resolution: 1/500000 Elements: Flood hazard map (100 year return period, 1.5m depth)
	Inundation depth (interview)	PAGASA	Map/Point ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:
	Dam operation	NIA	Time series (Point) ☐ Digital ☐ Paper	Name(s) or Total number: Period: Temporal Resolution: Elements:
	Casualties & missing person	OCD	Statistics ☐ Digital ☐ Paper	Period: 2012, 2013, 2014, 2015, 2016, 2017 (event-base) Area: Region XI Grid ☐ Nation ☐ Region ☐ Province ☐ City ☐ Municipality ☐ Barangay
Damage	Population	PSA	Grid/Statistics ☑ Digital ☐ Paper	Year: 1960, 1970, 1975, 1980, 1990, 1995, 2000, 2007, 2010, 2015 Area: Region XI Spatial Resolution: Regional Elements: Population Census
	Land use	LGU DOST NEDA DENR	Map/Statistics ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:
	Agricultural damage	PSA DA DENR	Map/Statistics ☑ Digital ☐ Paper	Year: 2015, 2016, 2017 Area: Nation Spatial Resolution: National Elements: Value of Production, Farm gate Price, Volume of Production
	Critical infrastructure damage	DPWH LGU	Map/Statistics ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:
	Industry Economic damage	DTI	Map/Statistics ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:
Socio-economy	Commerce	DTI	Map/Statistics ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:
	Drainage facility	DPWH LGU	Map/Statistics ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:
	Information	DPWH LGU	Map/Statistics ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:
	Sectoral regional GDP	PSA	Map/Statistics ☑ Digital ☐ Paper	Year: 2015, 2016, 2017 Area: Region XI Spatial Resolution: Regional Elements: Sectoral region GDP at current prices & at constant 2000 prices
	Sectoral employed population	PSA	Map/Statistics ☑ Digital ☐ Paper	Year: 2017, 2018 Area: Nation Spatial Resolution: National Elements:
	Tax revenue	DPWH LGU	Map/Statistics ☑ Digital ☐ Paper	Year: 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018 Area: Region XI Spatial Resolution: Regional Elements: Income tax, Gross income
	Land price	PSA NEDA	Map/Statistics ☐ Digital ☐ Paper	Year: Area: Spatial Resolution: Elements:

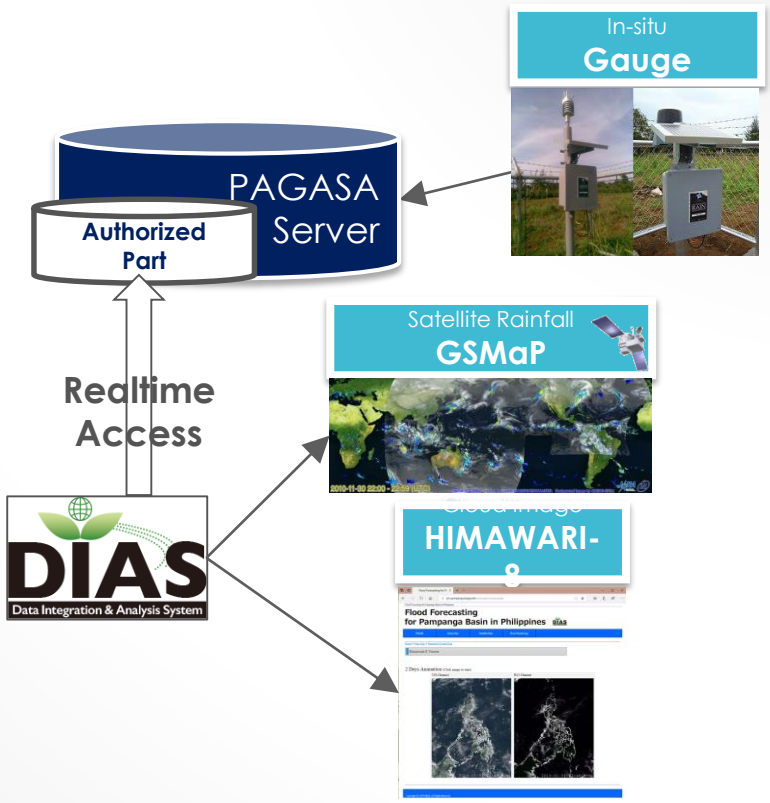
3. Web-based Data Uploading System

Input Item;

Data Domain, Area, District :
Category:
Data Source
Data Type
Period
Resolution

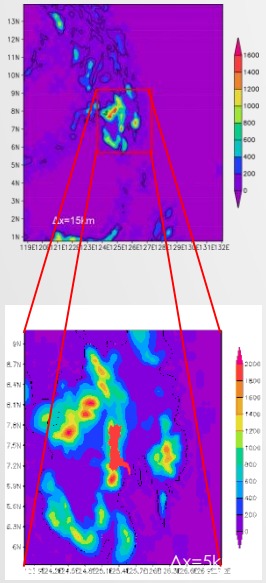
2. Flood Forecasting & Early Warning (Preliminary)





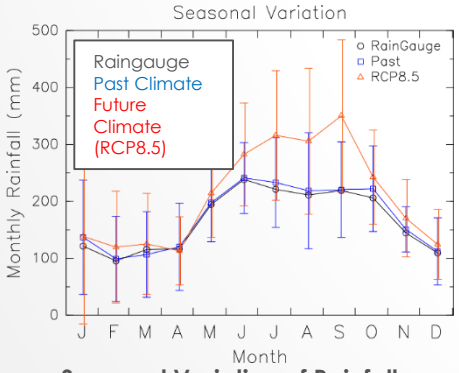
http://ph-pampanga.diasjp.net/RRI/rri_monitoring_20110926.php

3. Climate Change Impact (Davao River Basin)

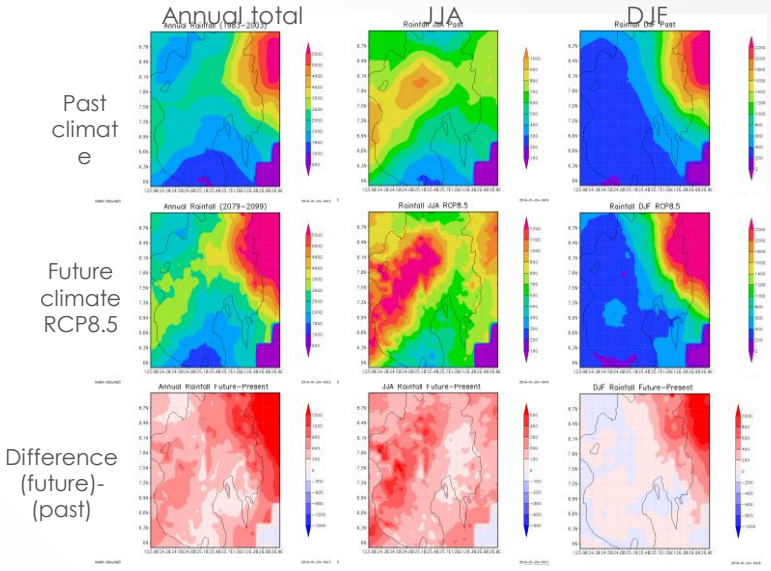


WRF model setting
Outer frame: 15km, 100x100
Inner frame: 5km, 79x79
Vertical layer: 40
Cumulus: Grell 3D

Davao River
Area: 1623 km^2
Length: 160 km



Seasonal Variation of Rainfall
(increase during July to September)



Rainfall distribution in past and future climate

33% increase of 1/50 extreme rainfall & July-September rainfall increase 45%
⇒Average discharge increases + one flood event causes more damage

Platform on Water Resilience and Disasters in the Philippines

Activity Design

Experiencing Climate Change

Climate change impact assessment based on S&T

Visualization

1/100 Flood (200m grid)

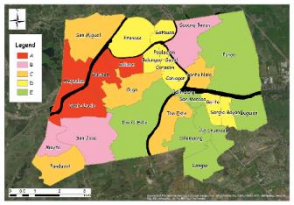
Experiencing Events

Infrastructure design

Strengthening Resilience

Predict climate change impact and scenario

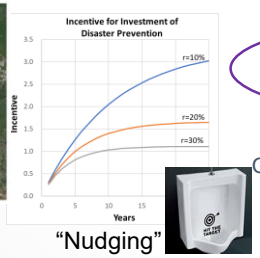
Resilient society beyond saving lives



Evacuation

Area **BCM**; **B**usiness **C**ontinuity **M**anagement

Resilient communities



"Nudging" psychological process to disaster risk

Incentive for investment

Toward the Prosperous Davao

Design a brilliant future

Coordination with relevant ongoing energies

SAFE: S&T Action Frontline for Emergencies and Hazards Program

Be Climate Smart NOW

Groundwater use

Agriculture, Aquaculture and Natural Resources (AANR)

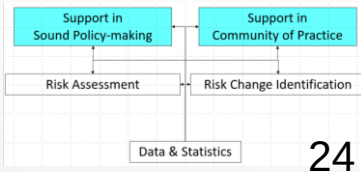
biodiversity

Setting All

DAVAO LIFE IS HERE

Attractive policy proposal

Bright tomorrow of Davao



Platform on Water Resilience and Disasters in the Philippines

Workplan of Capacity Development on Climate Change in Davao City

1. CC Orientation

Objective
- Contribution adaptation measures development
- Encouragement and coordination of multi-stakeholder engagement

Oct. 2019

Expected Output
- Activity design for CC adaptation
- Barangay-level damage data analysis

2. Platform Plenary Meeting

Objective
- Status sharing and update of the Platform activities among all members
- Discussion on further activities of Platform

Apr. 2020

Expected Output
- FF System for Davao RB
- Data integration examples

3. DIAS End-user Training

Objective
- To capacitate end-users on the know-how of DIAS
- To maximize the utilization of DIAS

2020

Expected Output
- Data uploading by stakeholders
- Data integration products

4. Policy & Benchmarking WS

Objective
- Contribution to local policy-making on CC
- Best practice on the importance, applicability and usability.

2020

Expected Output
- Policy proposal on CC adaptation to Mayor
- Community action

Academic Field Surveys in Japan and Overseas Countries

Flood damage in Mabi Town due to a levee breach along the Oda River

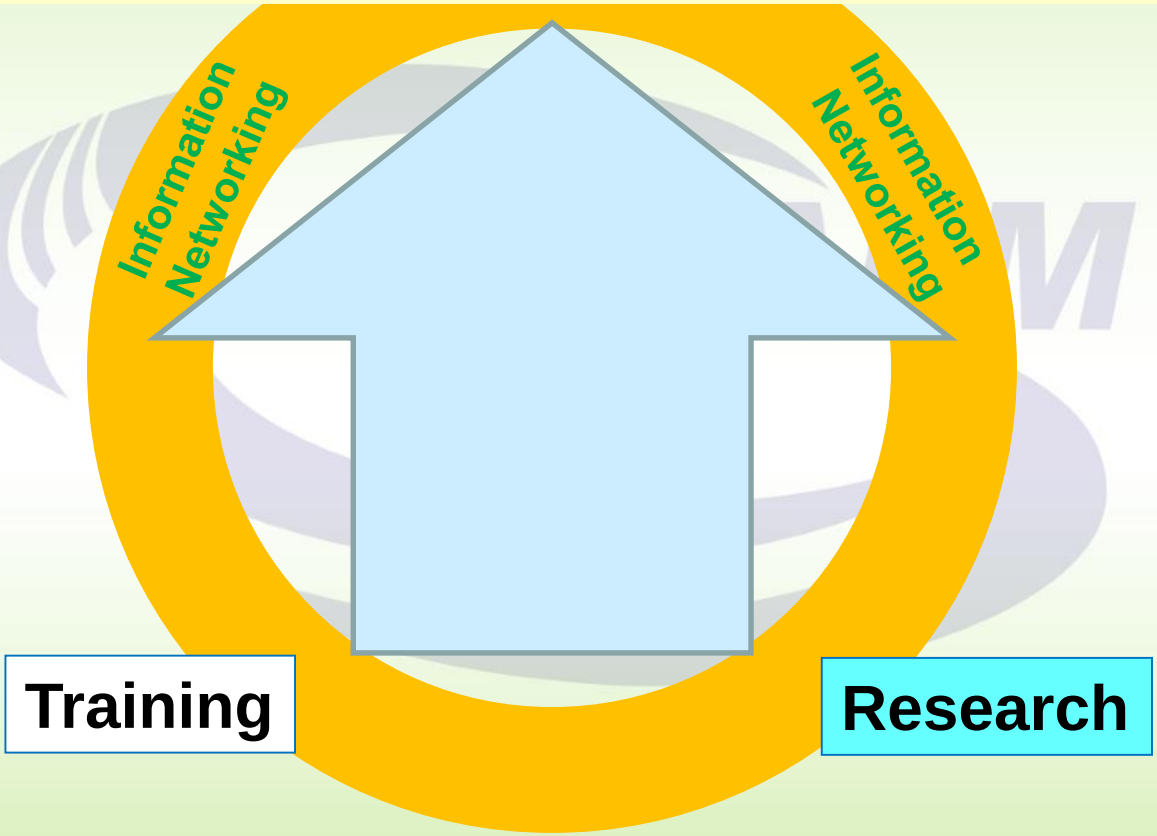
A house half-buried after a flood with a massive amount of sediment hit the area (Marumori Town, Miyagi Prefecture)

Tidal bore observed at the Sittaung River estuary

Survey of bed material in the Stung Sen River

Challenge to Localism

Delivering best available knowledge to local practices



Number of peer reviewed paper (from April to March)

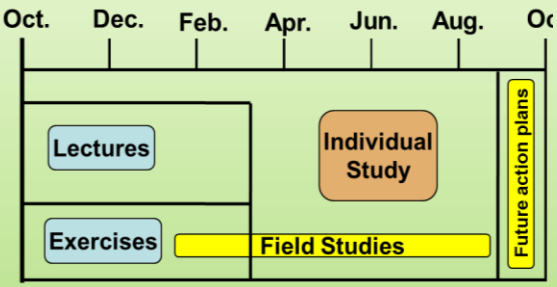
FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019
5	6	11	4	12	16	9	20	18	22	44	30	18	19

Capacity Building

More than 1,500 individuals from 57 countries

1. Master's degree course (1 year)
   - In cooperate with the National Graduate Institute for Policy Studies (GRIPS) and Japan International Cooperation Agency (JICA) since 2007.
2. Doctor's degree course (3 years)
   - In cooperate with the GRIPS (since 2010) and JICA (since 2018)
3. Follow-up Seminar for the Alumni Members
   - Kuala Lumpur 2007, Guangzhou 2008, Manila 2009, Hanoi 2010, Bangkok 2012, Dhaka 2013, Kuala Lumpur 2014, Jakarta 2015, Tokyo 2016, Manila 2017, Yangon 2017, Kathmandu 2018, Colombo 2020
4. Internship from Japan and abroad
   - Number: 2 (`09), 3(`11), 3(`12), 3(`13), 5(`14), 2(`15), 10(`16), 7(`17) , 6(`18) , 4(`19)

	Master's	Ph.D.
2007	10	
2008	7	
2009	12	
2010	12	1
2011	19	1
2012	12	2
2013	12	3
2014	13	-
2015	13	2
2016	8	2
2017	14	(1)
2018	7	(3)
2019	(11)	-
total	132	11

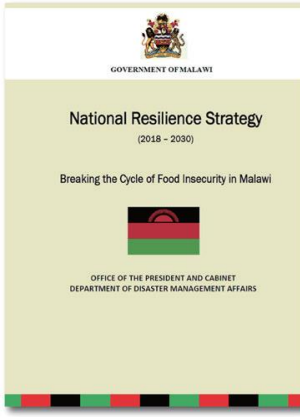


2016-2017 Master's Course

Mr. GAMA Samuel Joseph

Principal Mitigation Officer, Office of the Vice President, Department of Disaster Management Affairs - Malawi

・・・ When I had returned from my studies in Japan, I proposed to the Malawi government a need for the development of a country level National Resilience Strategy that have elements of science (risk reduction interventions) and social aspects (software DRM aspects) in order to address the problems of floods and drought that usually affects majority of Malawi communities on annual basis. The proposal was accepted by the Malawi Government and as such, I coordinated the development of a 13-year National Resilience Strategy (NRS) in 2018.



2014-2015 Master's Course

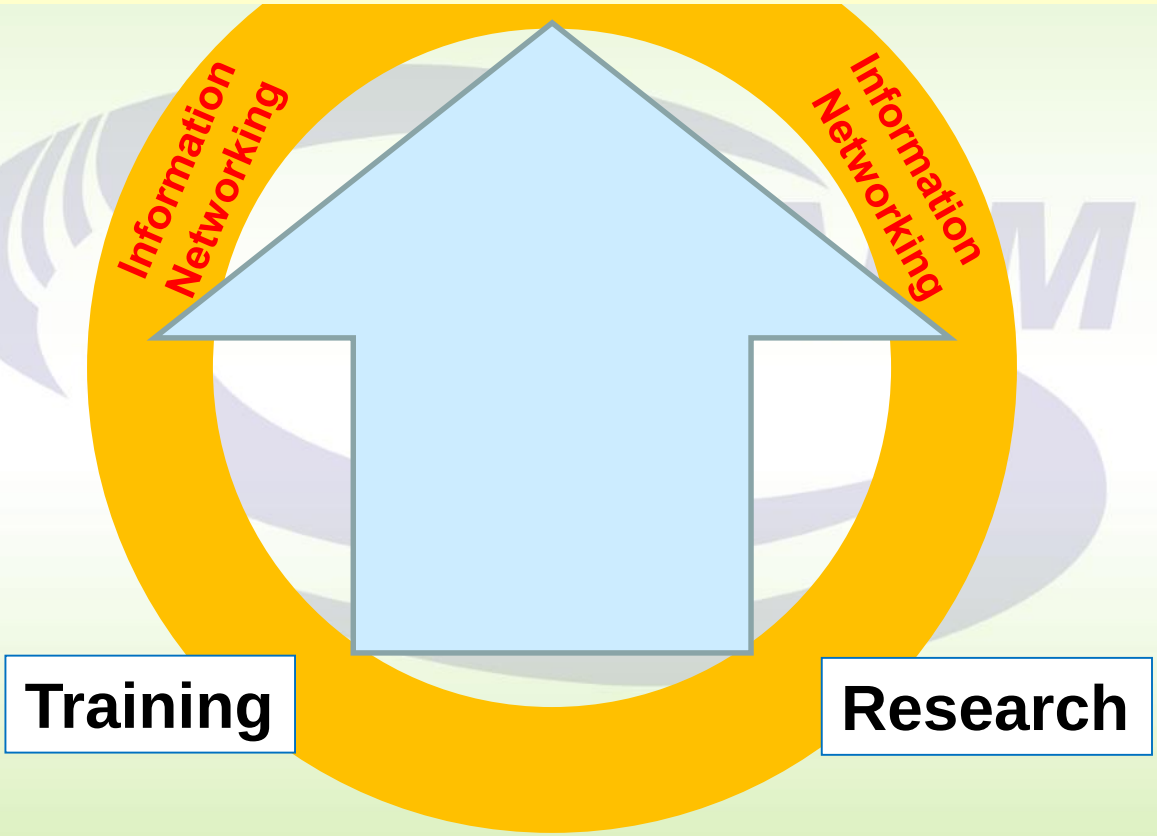
Ms. Myo Myat Thu

Deputy Staff Officer, Assistant Forecaster in River Forecasting Section, Department of Meteorology and Hydrology under the control of the Ministry of Transport and Communications, Myanmar

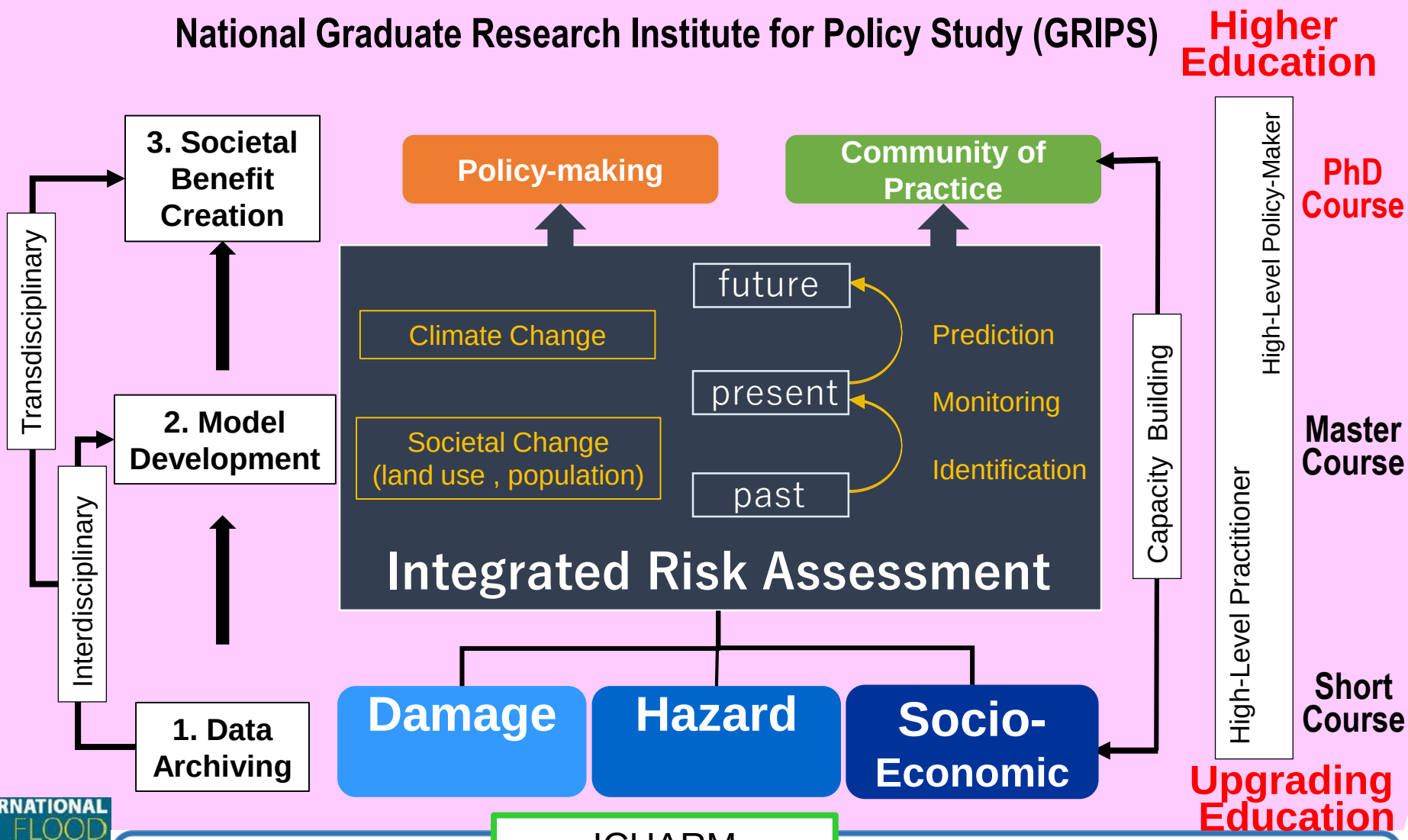
I had the great opportunities to share my experience and knowledge of a Master's degree in ICHARM to my colleagues. Since I had been working in the Research and Training Section, one of my responsibilities is to share my experiences with the trainees. By using the experiences where I got in Japan, I promote the student's intrinsic motivation in the subjects of disaster management as a tutor.

Challenge to Localism

Delivering best available knowledge to local practices



Platform on Water Resilience and Disasters

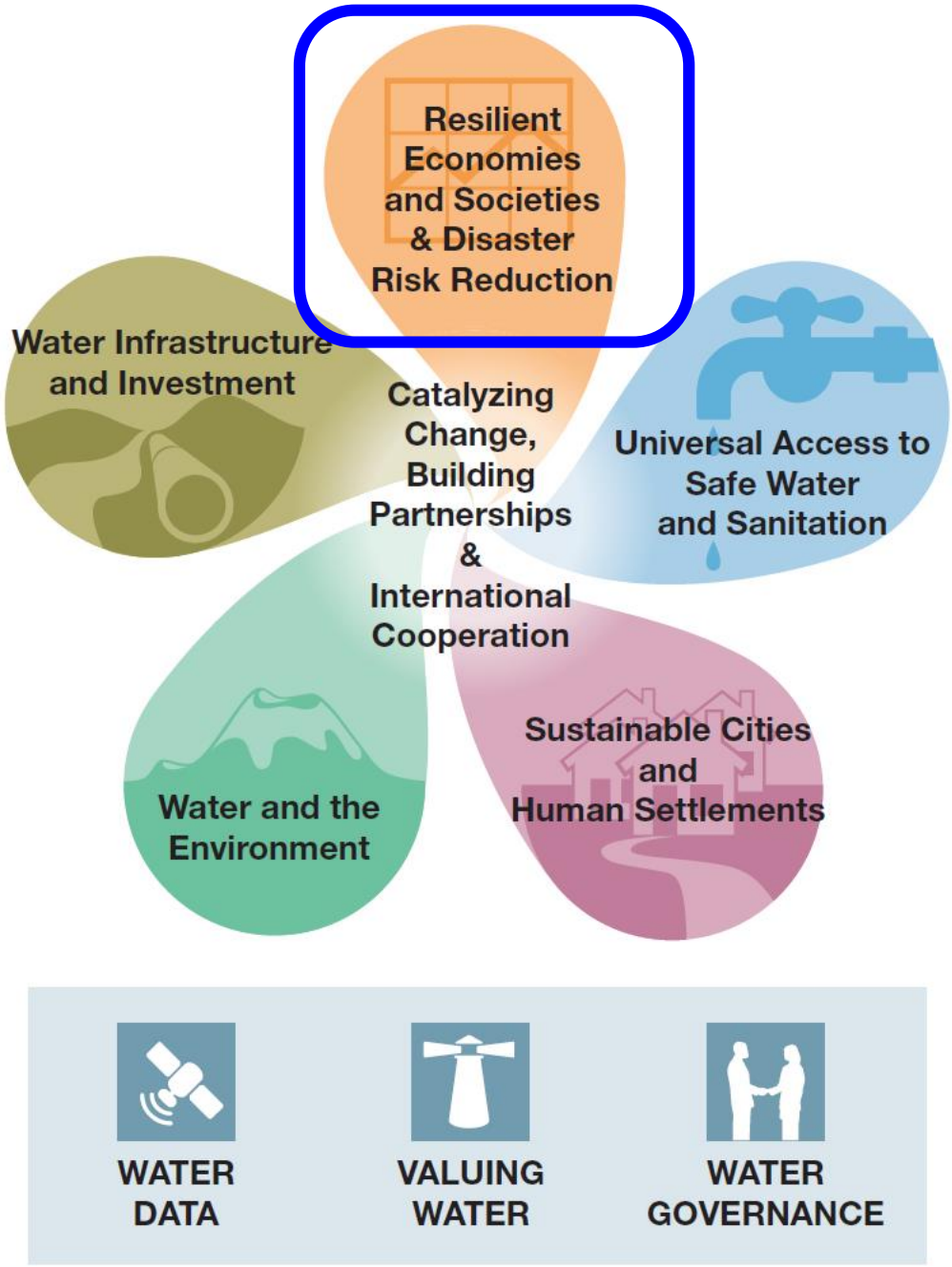


Making Every Drop Count

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.

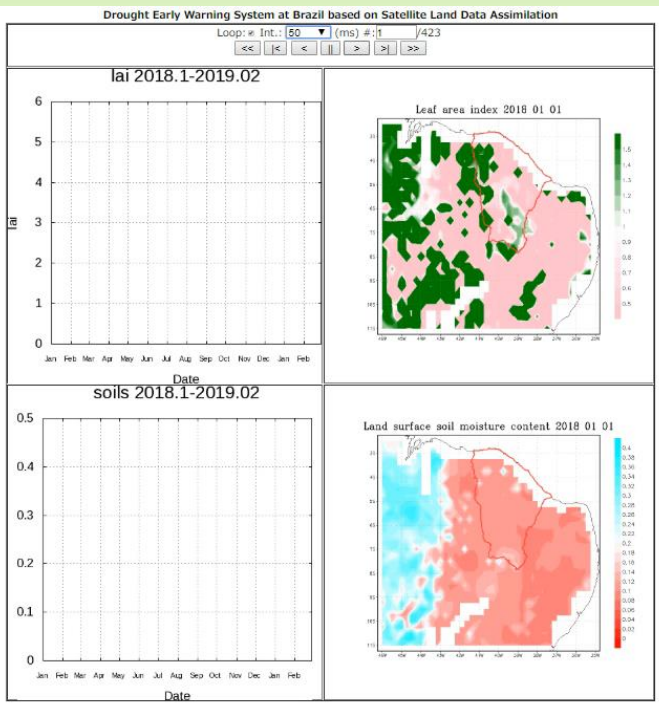
United Nations Educational, Scientific and Cultural Organization

International Centre for Water Hazard and Risk Management under the auspices of UNESCO

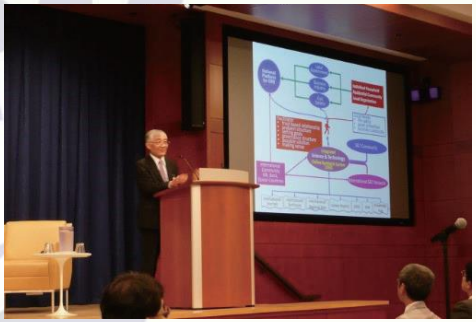
Public Works Research Institute, National Research and Development Agency, Japan

DIAS Data Integration & Analysis System

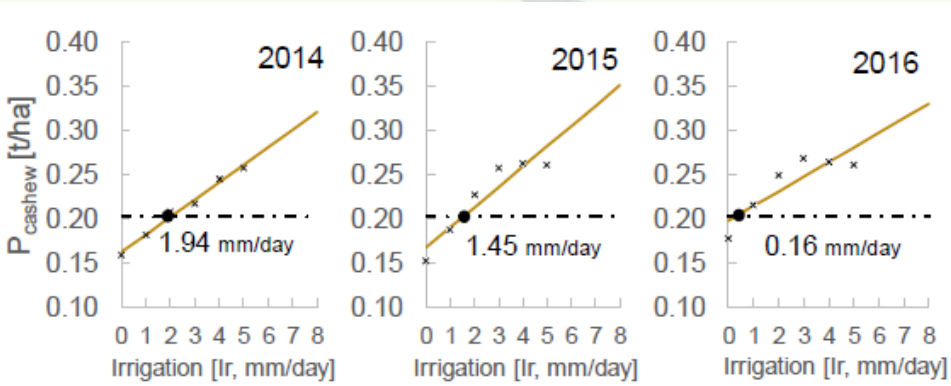
THE UNIVERSITY OF TOKYO

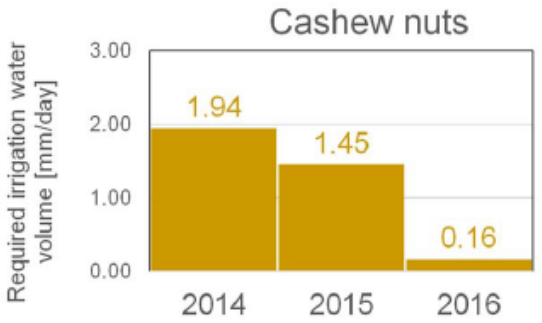


2nd Stakeholder Workshop in Fortaleza (March 2019)



Japan-World Bank Seminar on Water and Disasters
Washington, D.C. (June 2019)





The grant which financed this Pilot for Agriculture Drought Monitoring and Prediction in Brazil was received under the Japan-Bank Program for Main-streaming DRM in Developing Countries which is financed by the Government of Japan

Water Disaster Platform to Enhance Climate Resilience in Africa (WADiRE-Africa)

M. Dossou, Bénin | M. Rodéric, Bénin | M. Somda, Burkina Fa | M. Traoré, Mali | Cdt Sinali, Mali | M. Nassirou, Niger | M.Kaboré, ABN | Mme Fofana, ABV | Mme Pial, UNESCO

M. Sankadé, Burkina | Mme Koné, RCI | M. Kaman, RCI | M. Mohamed, Niger | M. Ifiemi, Nigeria | M. Nassour, Tchad | Dr Abou, UNESCO | Mme Moma, UNESCO | M. Antony, UNESCO

M. Sylvester, Ghana | M ? Barry, Guinée | M. Moïse, Guinée | Mme Tesse, Tchad | M. Agouda, Togo | M. Nawanti, Togo | M. Olabode, UNESCO | Pr Toshio, ICHARM | M. Maksym, ICHARM

Special lecture by Mr. Koïchiro Matsuura, the 8th Director-General of UNESCO

The 64th seminar was held on January 16, 2019, as a special lecture by Mr. Koichiro Matsuura, the eighth Director-General of UNESCO.

United Nations Educational, Scientific and Cultural Organization · Intergovernmental Hydrological Programme

Side event at the 23rd UNESCO-IHP Intergovernmental Council meeting (June 2018)

“Panel on Water and Disasters” at the UNESCO International Water Conference (May 2019)

27th UNESCO-IHP Regional Steering Committee Meeting for Asia and the Pacific (Oct. 2019)

ICHARM Chief Researcher Tokunaga and Ikeda
as Chair, Working Group on Hydrology (WGH) of the Typhoon Committee(TC)

Thematic Event “Technology & Innovations” at the Asia Ministerial Conference on DRR (July 2018)

Technical session at the World BOSAI Forum 2019 (November 2019)

4th UN Special Thematic Session on Water and Disasters (June 2019)

Asian Water Cycle Initiative (AWCI)
Session GEOSS Asia-Pacific Symposium
Canberra Australia (Nov. 2019)

ADBI-ICHARM Policy Dialogue on
Water-related Disaster Resilience under Climate Change
(January 2020)

Challenge to Localism

Delivering best available knowledge to local practices

Asian Water Cycle Initiative (AWCI) GEOSS Asia-Pacific Symposium
Kyoto Japan (Nov. 2018)

Training

Research

Thank you very much for your attention!