

TG1

GEOS ASIAN WATER CYCLE INITIATIVE (AWCI)

Co-Chairs

Dr. Srikanth Herath

Senior Advisor, Ministry of Megapolis and Western Development, Sri Lanka

Dr. Angelica Gutierrez

Chair of GEOGLOWS, NOAA, USA

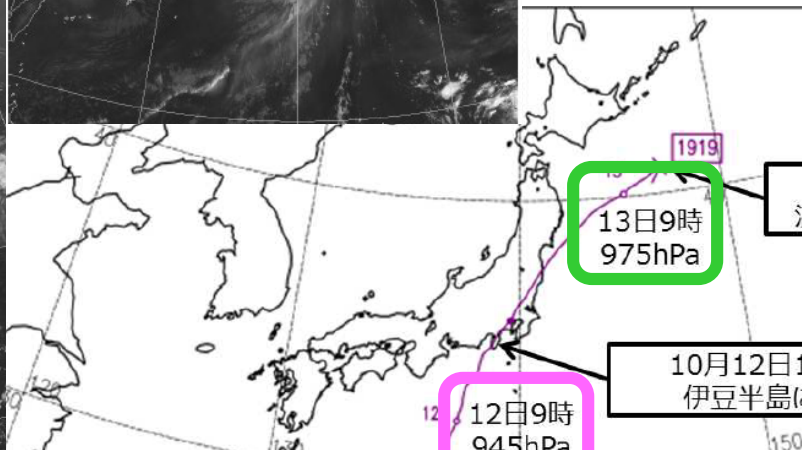
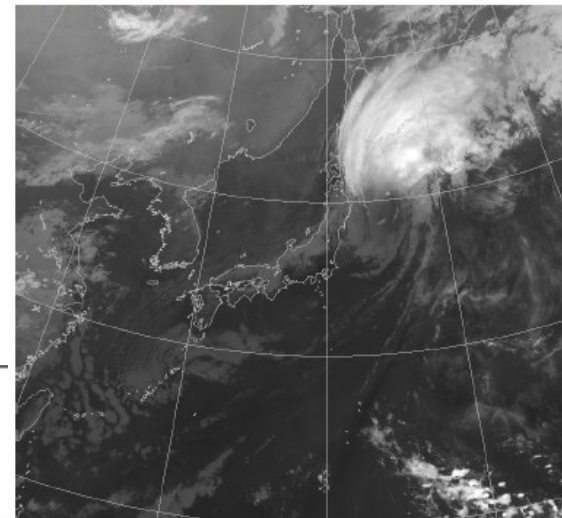
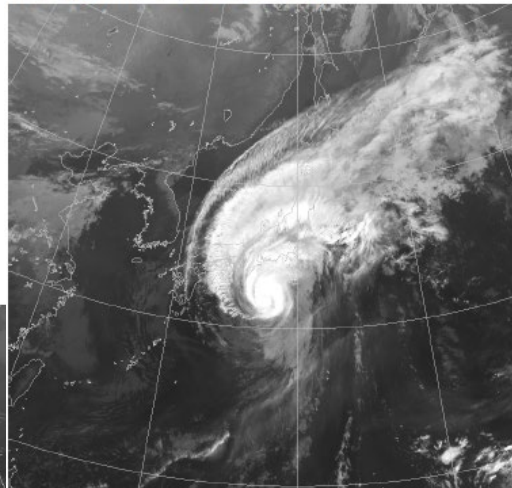
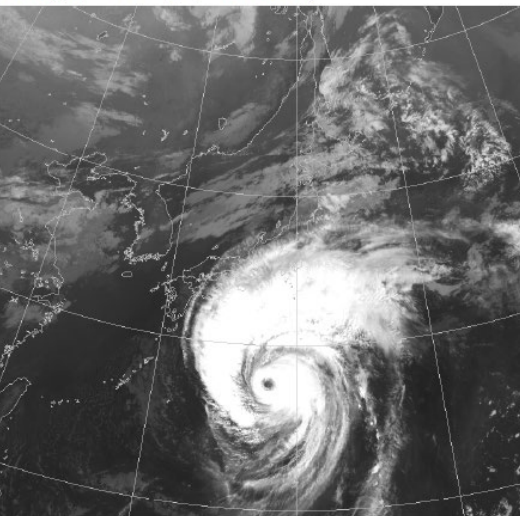
Prof. Toshio Koike

International Centre for Water Hazard and Risk Management (ICCHARM)

10月12日09時

10月13日09時

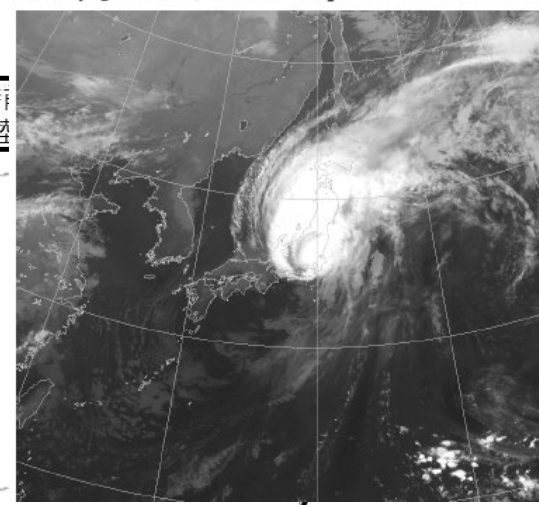
10月11日09時



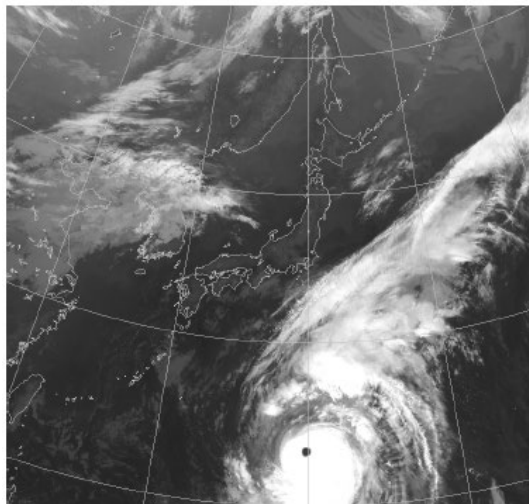
10月13日12時
温帯低気圧に変わる

10月12日21時

10月12日19時
伊豆半島に上陸



10月10日09時



11日9時
925hPa

10日9時
915hPa

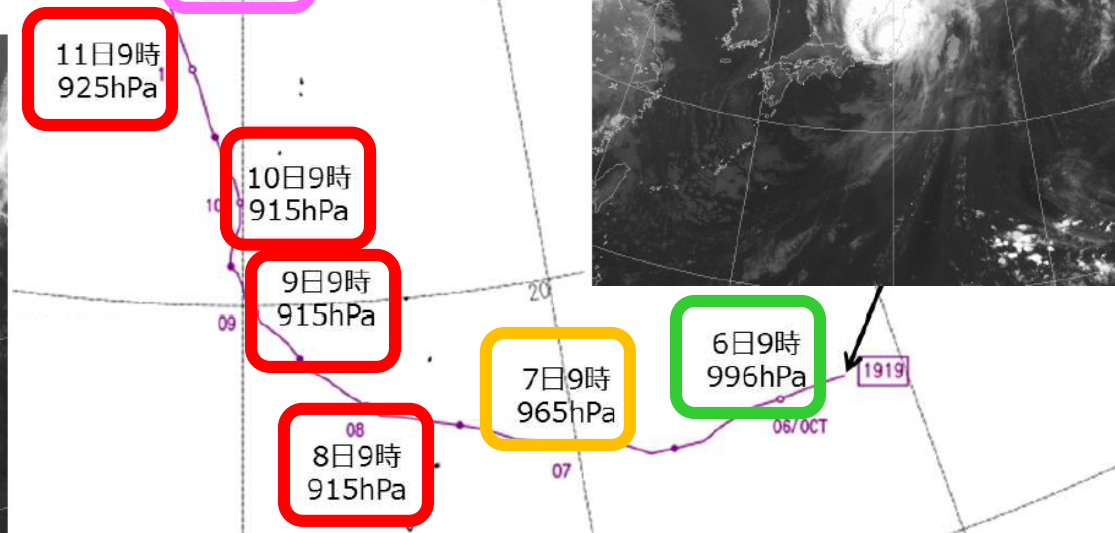
9日9時
915hPa

8日9時
915hPa

7日9時
965hPa

6日9時
996hPa

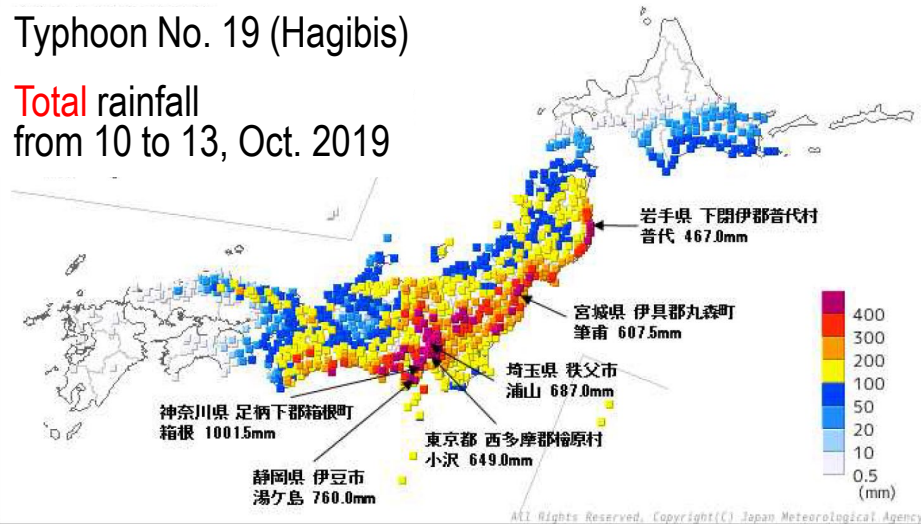
1919



Frequent Serious Floods and Sediment Disasters

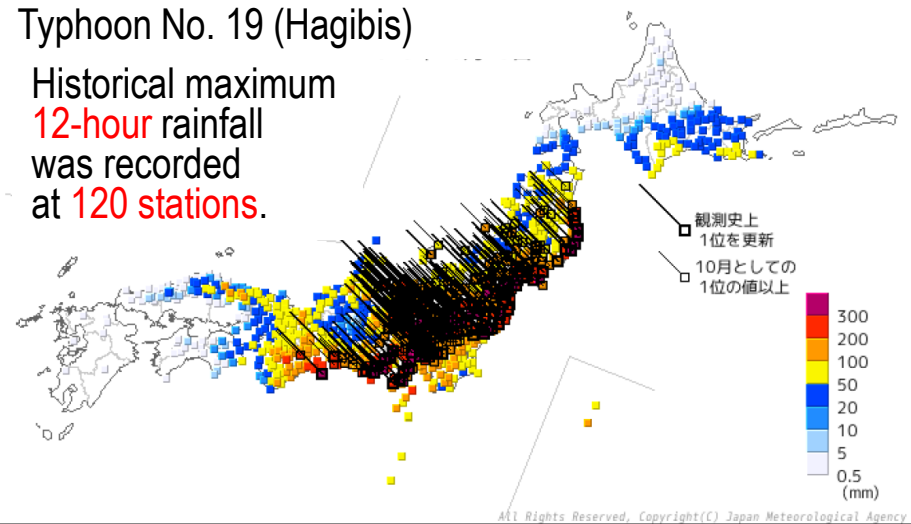
Typhoon No. 19 (Hagibis)

Total rainfall
from 10 to 13, Oct. 2019



Typhoon No. 19 (Hagibis)

Historical maximum
12-hour rainfall
was recorded
at **120 stations**.



Missing/Dead: **101** people

Completely/Partially Collapsed:
6,891 houses

Inundated above the Floor Level:
33,425 houses

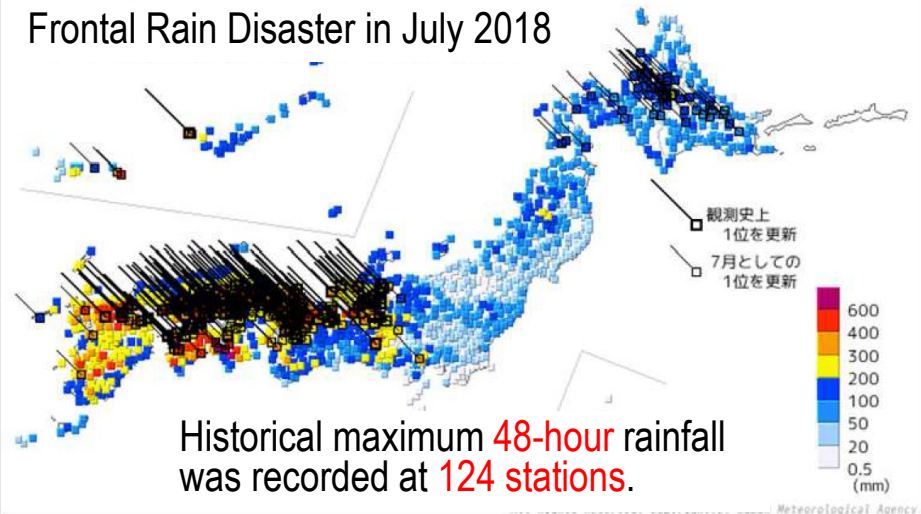
Bank Breach:

- **12** locations in 7 Class A Rivers
- **128** locations in 67 Class B Rivers

Sediment Disasters: **785** areas

(Cabinet Office Nov.1st,2019)

Frontal Rain Disaster in July 2018



Historical maximum **48-hour** rainfall
was recorded at **124 stations**.

Three Key Global Agendas Agreed in 2015

Understanding Governance Investment Preparedness/BBB



Concerted Actions are Required



TG1

GEOS ASIAN WATER CYCLE INITIATIVE (AWCI)

Towards

- Concerted actions for the three global key agendas.
- Successful implementation of “International Decade (2018-2028) for Action -Water for Sustainable Development”.

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Prof. Toshio Koike

International Centre for Water Hazard and Risk Management (ICHARM)

TG1 GEOSS ASIAN WATER CYCLE INITIATIVE (AWCI)

Report on the AWCI Activities

Prof. Toshio Koike

International Centre for Water Hazard and Risk Management (ICHARM)

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



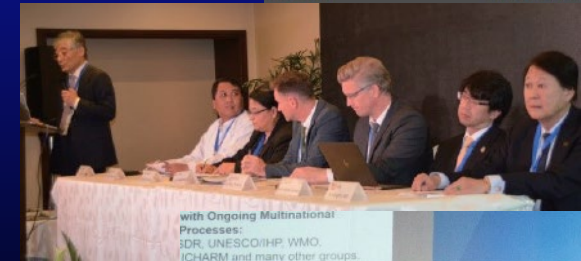
9th GEOSS Asia-Pacific Symposium
Implementation Plans in Asia
Jan. 2017, Tokyo



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



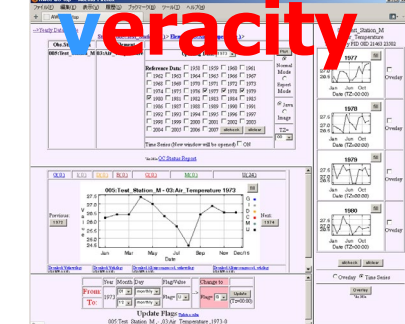
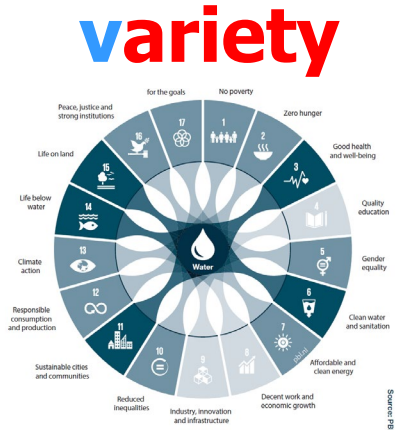
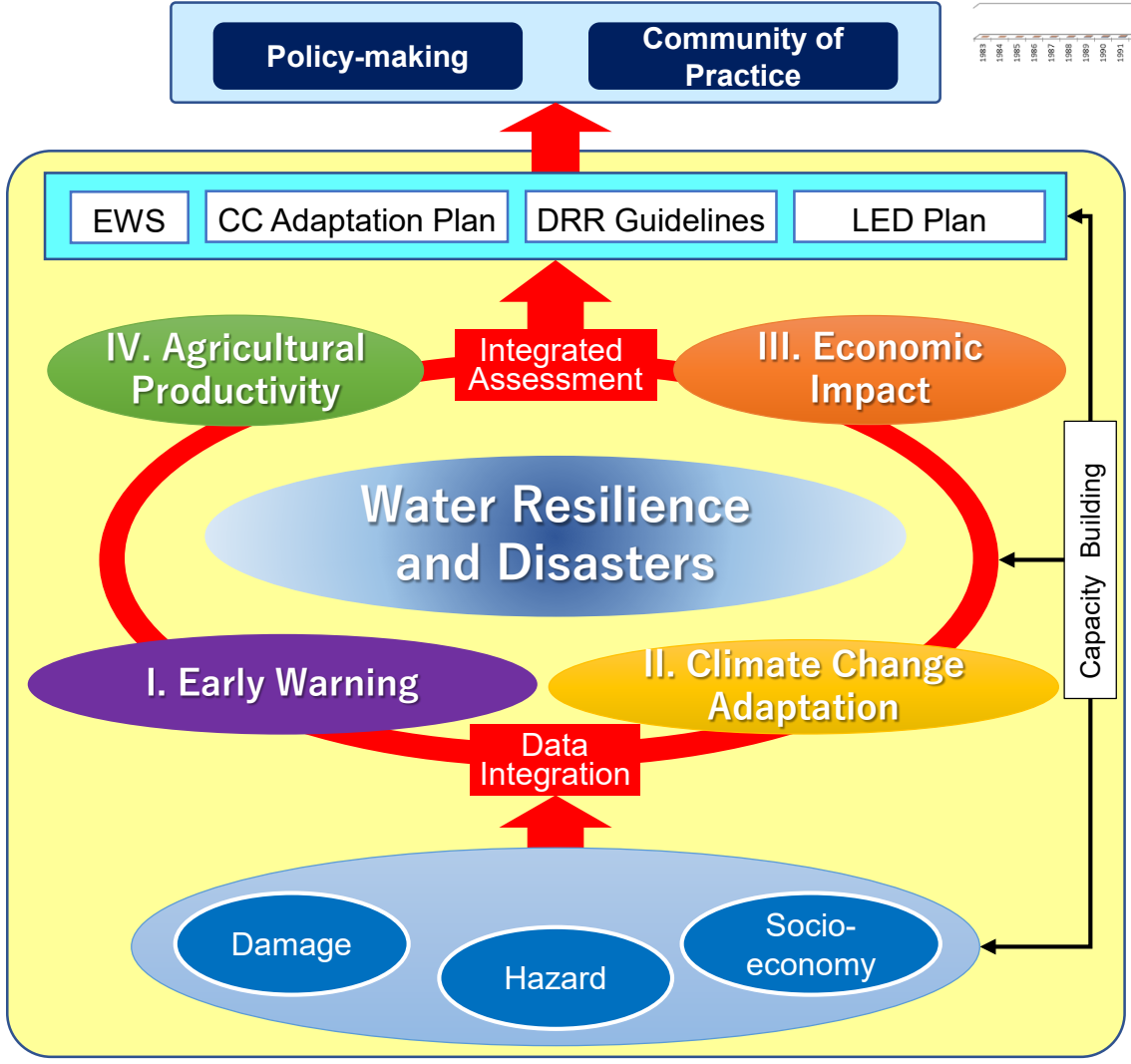
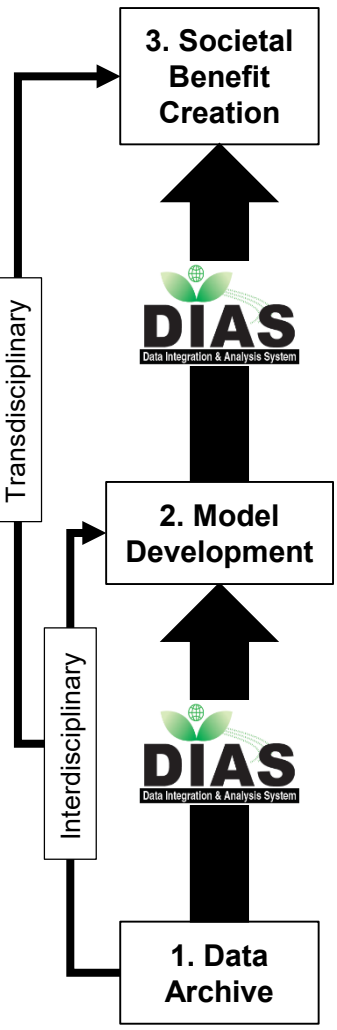
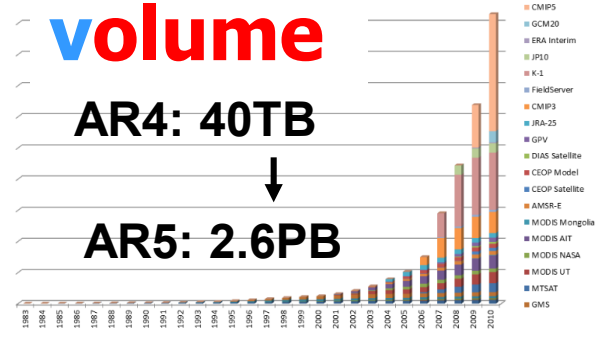
"Water and Disasters in the Context of Climate Change
- from the Mountains to the Islands"
3rd Asia-Pacific Water Summit, Dec. 2017, Yangon



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



Platform on Water Resilience and Disasters



Making Every Drop Count

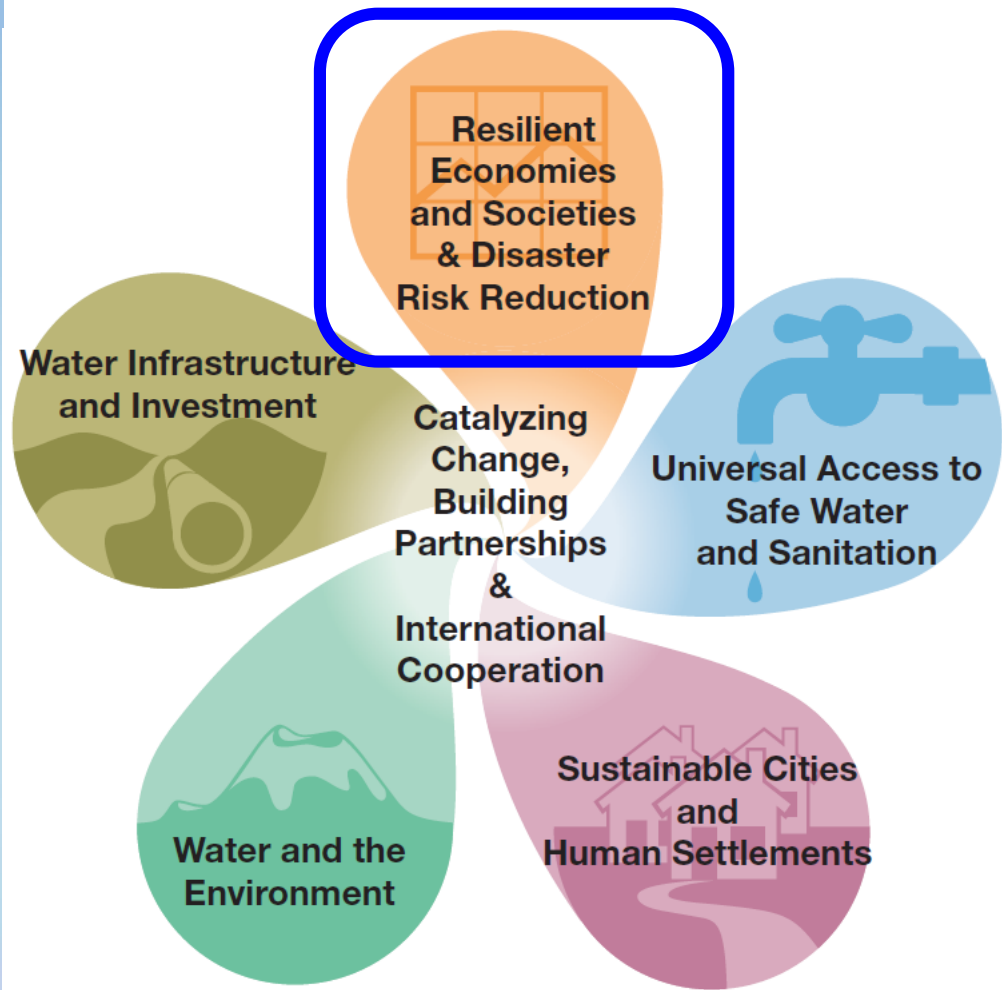


An Agenda for Water Action



HIGH-LEVEL PANEL ON WATER
OUTCOME DOCUMENT

14 March 2018



**WATER
DATA**



**VALUING
WATER**



**WATER
GOVERNANCE**

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.

GEOSS Asian Water Cycle Initiative (AWCI) The 11th GEOSS Asia-Pacific Symposium Kyoto, JAPAN, October 24th-26th, 2018



- Progress reports of the Platforms in Myanmar, the Philippines and Sri Lanka.
- Contribution to the SDGs, Paris Agreement, and Sendai Framework.
- Joint discussion between TG1:AWCI and TG5:AsiaRiCE.

Sustainable Development Goals for 2030

It is critical to end poverty and hunger, achieve gender equity, and make societies and economies resilient to water-related disasters in both urban and rural areas. **AWCI launches full-scale efforts to activate Platforms on Water Resilience and Disasters by promoting dialogues, reinforcing partnerships, sharing data, information, models, tools, experiences and ideas, and expanding sustainable practices.** AWCI promotes initiatives that will address targets in Goal 6 on Water use efficiency and Integrated Water Resources Management as well as SDGs related to Poverty (1), Food Security (2) and Life on Land (11).

Paris Climate Agreement

AWCI accelerates regional coordination to build capacity for identifying, monitoring and predicting the changing probability of water-related disasters and their associated risks, develop and share user-friendly analysis tools, and engage all stakeholders in climate change adaptation planning and implementation at the national scale and fill the gap between adaptation and mitigation by choosing adaptation options that are beneficial to mitigation.

Sendai Framework for Disaster Risk Development

AWCI facilitates the implementation of Platforms on Water Resilience and Disasters to promote the four priorities for action in the Sendai Framework. **AWCI provides usable and actionable information on thematic activities including preparedness and mitigation at each step of water-related disaster management.** AWCI also archives disaster damage data and maintains statistics for encouraging investments for water-related disaster risk reduction.

Scoring:
0=Do nothing
1=less active
2=active
3=very active

Timing:

- **Current (C)**
- **Aspirational (A)**

For SDGs:

Application:

- **Directly addresses SDG indicators (D)**
- **Enables countries to achieve the Goal (I)**

	GEO Priorities	Cross-Cutting Areas	TG1	Class.
SDGs	1.NO POVERTY		3	A,I
	2.ZERO HUNGER		3	A,I
	3. GOOD HEALTH AND WELL-BEING		1	A,I
	4.QUALITY EDUCATION		1	A,I
	5.GENDER EQUALITY		2	A,I
	6.CLEAN WATER AND SANITATION		3	C,D
	7.AFFORDABLE AND CLEAN ENERGY		2	C,I
	8.DECENT WORK AND ECONOMIC GROWTH		1	A,I
	9.INDUSTRY, INNOVATION AND INFRASTRUCTURE		2	C,I
	10.REDUCED INEQUALITIES		1	A,I
	11.SUSTAINABLE CITIES AND COMMUNITIES		3	C,I
	12.RESPONSIBLE CONSUMPTION AND PRODUCTION		1	A,I
	13.CLIMATE ACTION		3	C,I
	14.LIFE BELOW WATER		2	A,I
	15.LIFE ON LAND		3	C, I
	16.PEACE, JUSTICE AND STRONG INSTITUTIONS		1	A, I
	17.PARTNERSHIP FOR THE GOALS		3	C,I

Scoring:
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Timing:

- **Current (C)**
- **Aspirational (A)**

GEO Priorities		Cross-Cutting Areas	TG1	Class.
Paris Agreement	Adaptation		3	C
	Loss & Damage		3	C
	Capacity Development/Technology Tra+B9		3	C
	National Reporting/Global Stocktake		0	
	Mitigation		2	A
Sendai Framework	Understanding disaster risk		3	C
	Strengthening disaster risk governance to manage disaster risk		3	C
	Investing in disaster risk reduction for resilience		3	C
	Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction		3	C
		Data Sharing Infrastructure		3
	User Engagement and		3	C
		Total:	64	

Activities for “Platform on Water Resilience and Disasters”

【The objective and target basins】

- Objective: To identify current and future disasters risks for preparation (e.g., early warning) and mitigation (e.g., contingency planning).
- Target basins: Sittaung River and Bago River

【Participated Stakeholders】

➤ Myanmar side

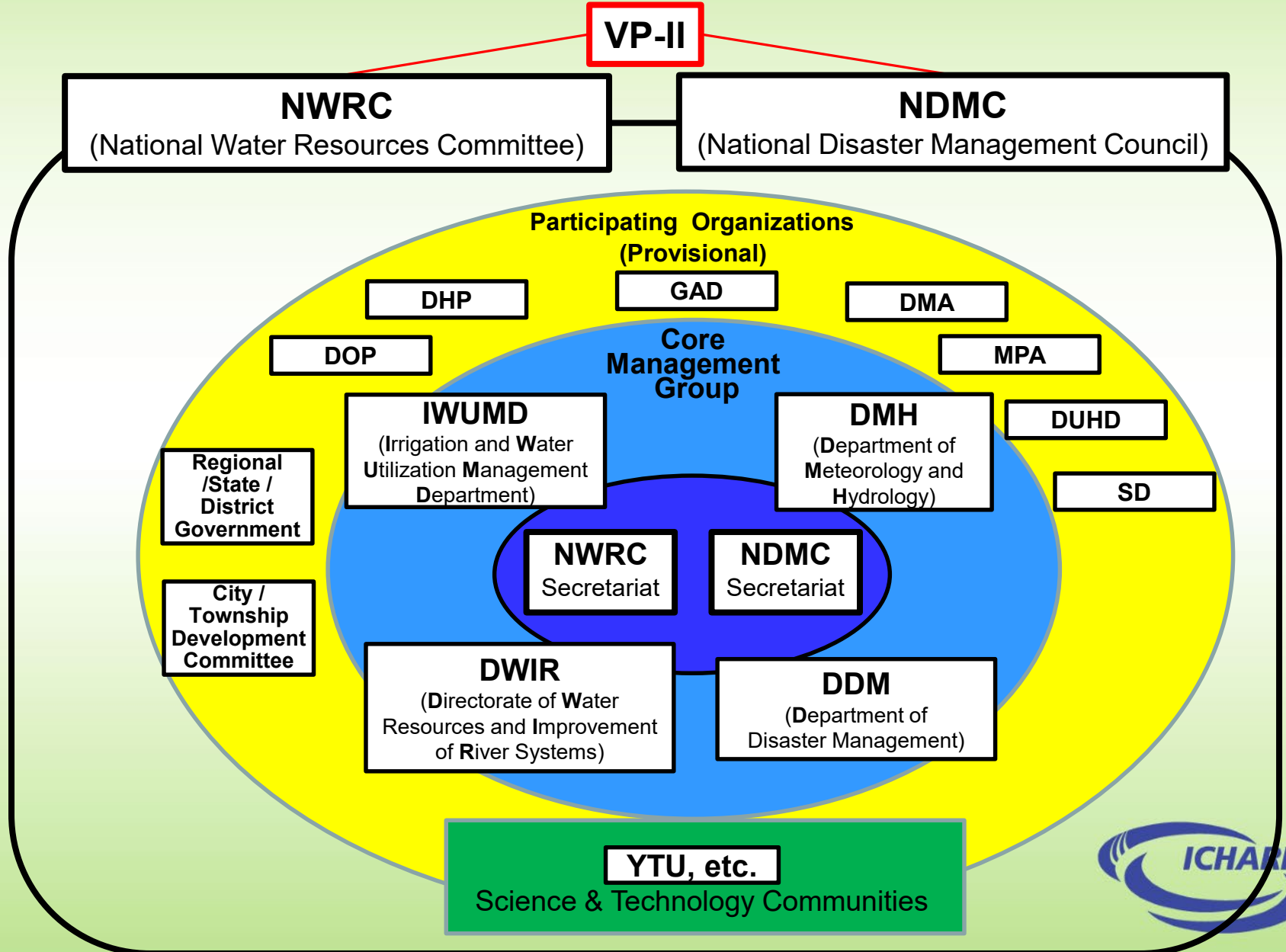
- DWRI, Ministry of Transport and Communications
- DMH, Ministry of Transport and Communications
- DDM, Ministry of Social Welfare, Relief and Resettlement
- IWUMD, Ministry of Agriculture, Livestock and Irrigation
- YTU, Yangon Technical university

➤ Japanese side

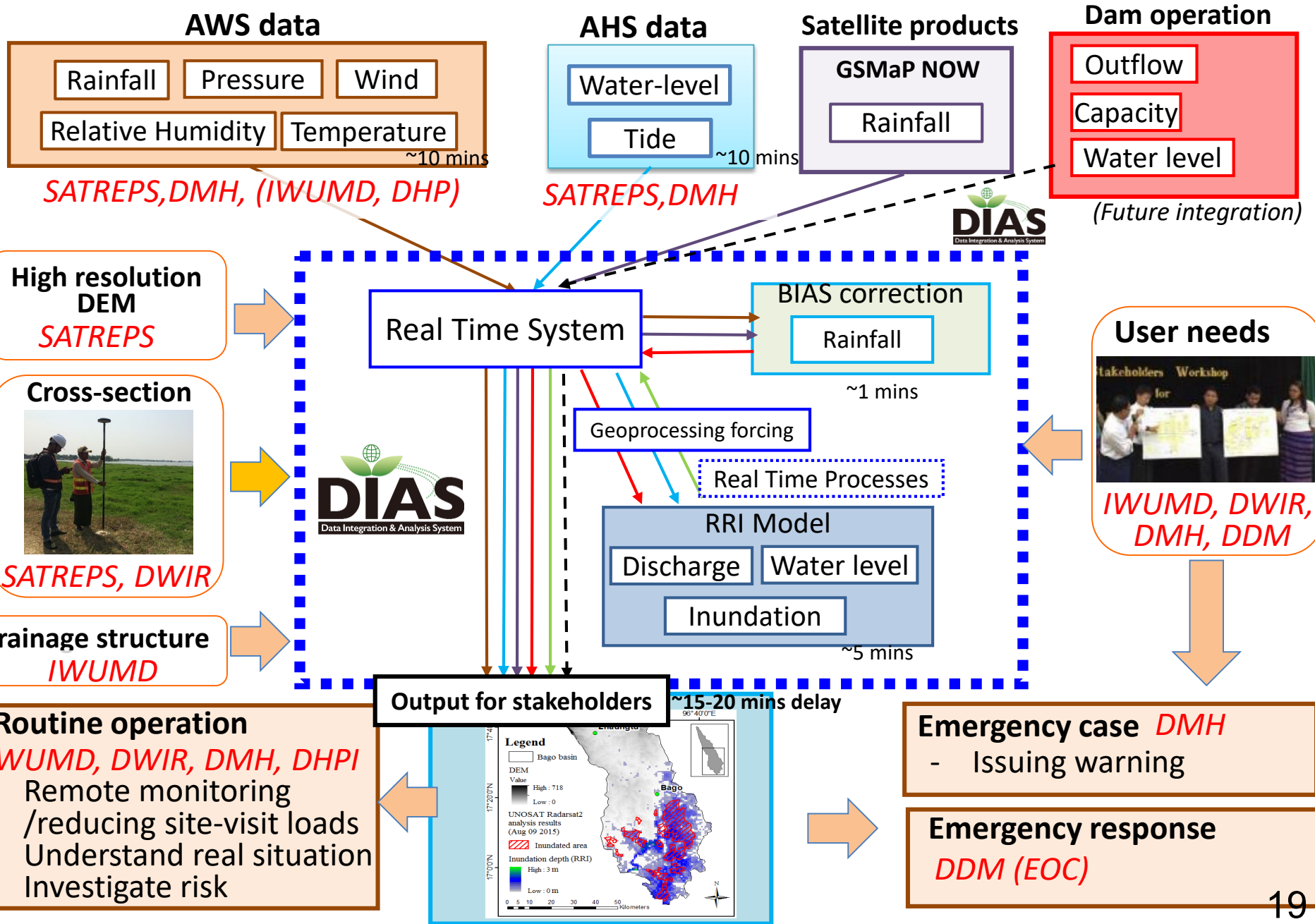
- ICHARM
- University of Tokyo
- JICA

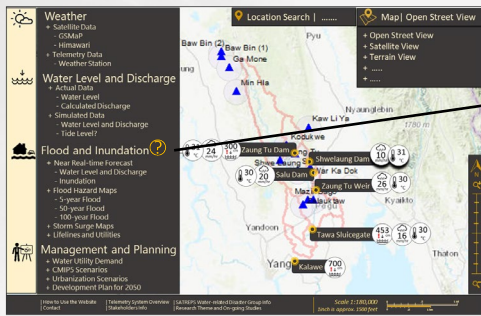


Institutional Structure of “Platform on Water Resilience and Disasters”



Near real-time flood forecast system for the Bago River





Flood and Inundation ?

- + Near Real-time Forecast
- Water Level and Discharge
- Inundation
- + Flood Hazard Maps
- 5-year Flood
- 50-year Flood
- 100-year Flood
- + Storm Surge Maps
- + Lifelines and Utilities

- + Near Real-time Forecast
- Water Level and Discharge
- Inundation
- + Flood Hazard Maps
- 5-year Flood
- 50-year Flood
- 100-year Flood
- + Storm Surge Maps
- + Lifelines and Utilities

Flood and Inundation

NRT MAP | 24HR | 48HR | 72HR

Day 00:00

START: 2018-02-14 09:00 | END: 2018-02-14 19:00 | MMT | **PLAY**

Near Real-time Forecast

HAZARD MAP | 2YR | 10YR | 50YR | **100YR**

Flood Hazard Maps

LEGEND:

- 20yr WL Flood
- Sim water level
- Obs water level

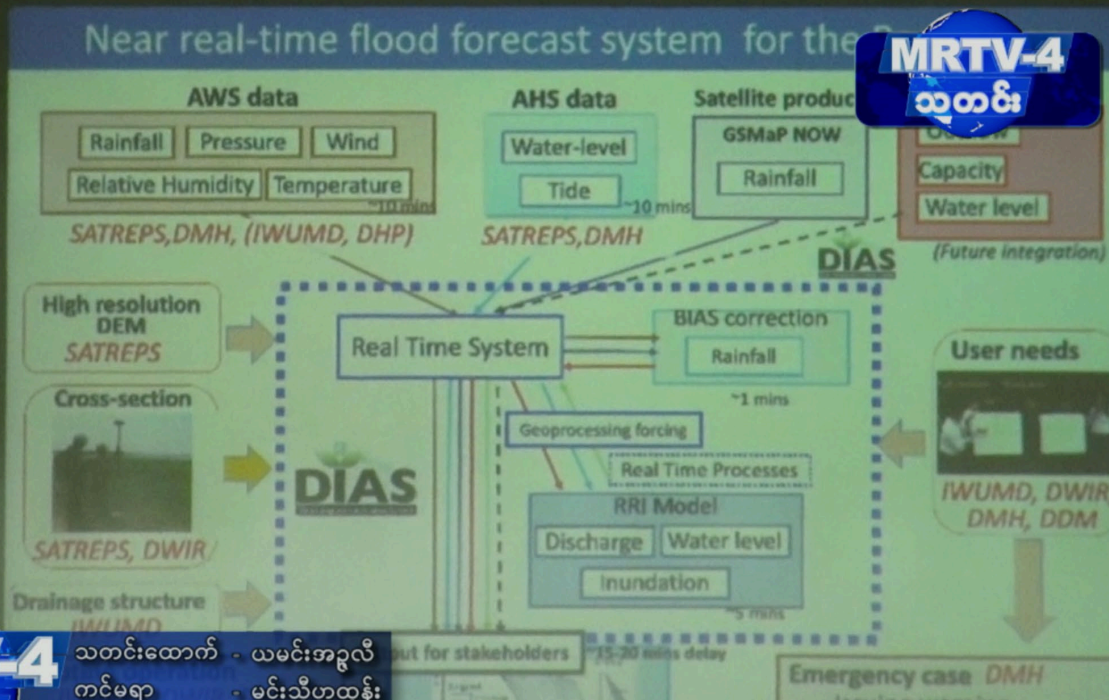
Zaung Tu Dam

Tawa Sluiceway

Dagon Bridge

July 10, 2019

Myanmar National TV Broadcast (MRTV4)



သတင်းထောက် - ယမင်းအုလိ
 တင်မရာ - မင်းသီဟထွန်း
 တည်းဖြတ် - ခင်ချိုဝင်း

- Reducing site visit times
- Understand real situation
- Investigate risk



Activities for “Platform on Water Resilience and Disasters”

● February 4th and 5th ,2019 at YTU (Training of DIAS)

(1) Objectives

Participants learn:

1. in-situ data management for the Platform using DIAS
2. the methods and tools necessary for in-situ data uploading, quality controlling and metadata registration of DIAS
3. the methods and tools necessary for processing CMIP5 climate model projections of future precipitation for assessment of climate change impacts

(2) Participating Organizations

DWIR/ DMH/ DDM/ IWUMD/ YTU

(3) Contributors

University of Tokyo (UT) and ICHARM, PWRI.



The outcome was reported in the Disaster Management Collaboration Dialogue (DMCD) between Myanmar and Japan on February 6th, 2019 at Nay Pyi tau.



Activities for “Platform on Water Resilience and Disasters”

- Next High Level Meeting

- (1) Agenda (tentative)

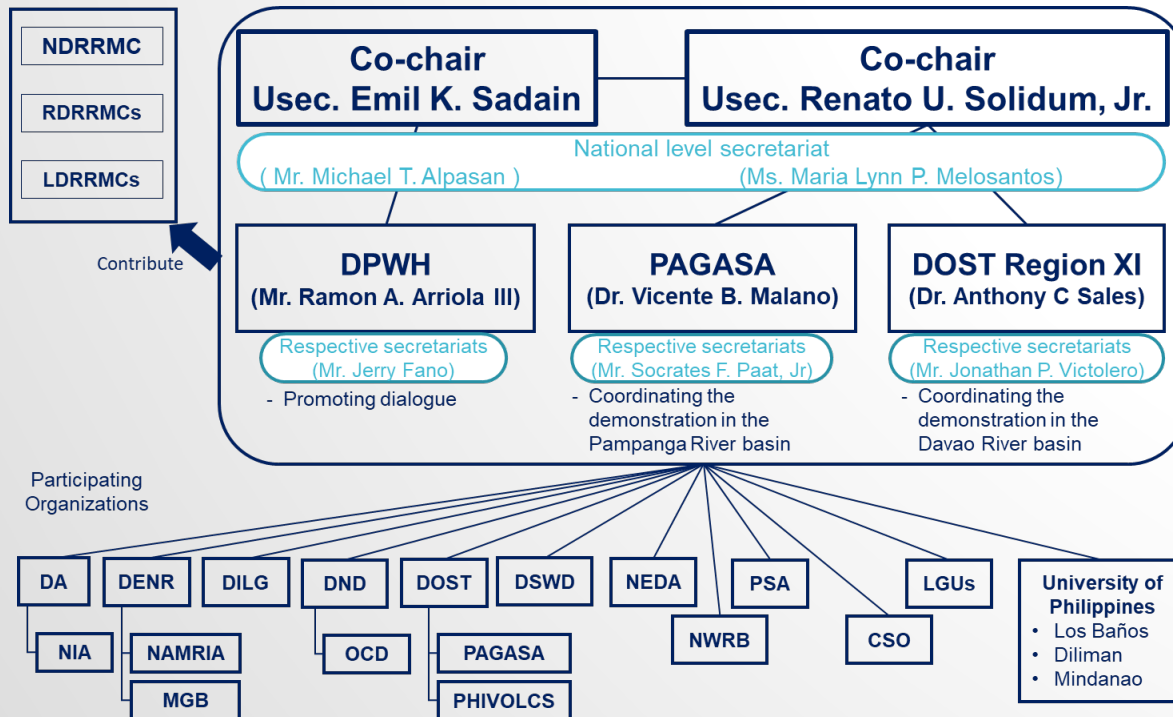
- Model demonstration of Sittaung and Bago river
 - Study in Sittaung river estuary

- (2) Schedule (tentative)

- End of 2019 or beginning of 2020 in Nay Pyi Taw

PLATFORM IN THE PHILIPPINES

Institutional Structure



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

PLATFORM IN THE PHILIPPINES

1. Data Archiving

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

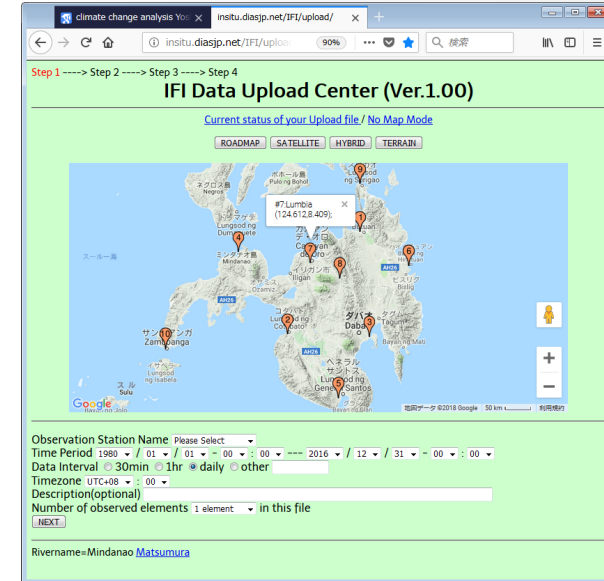
Hazard

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

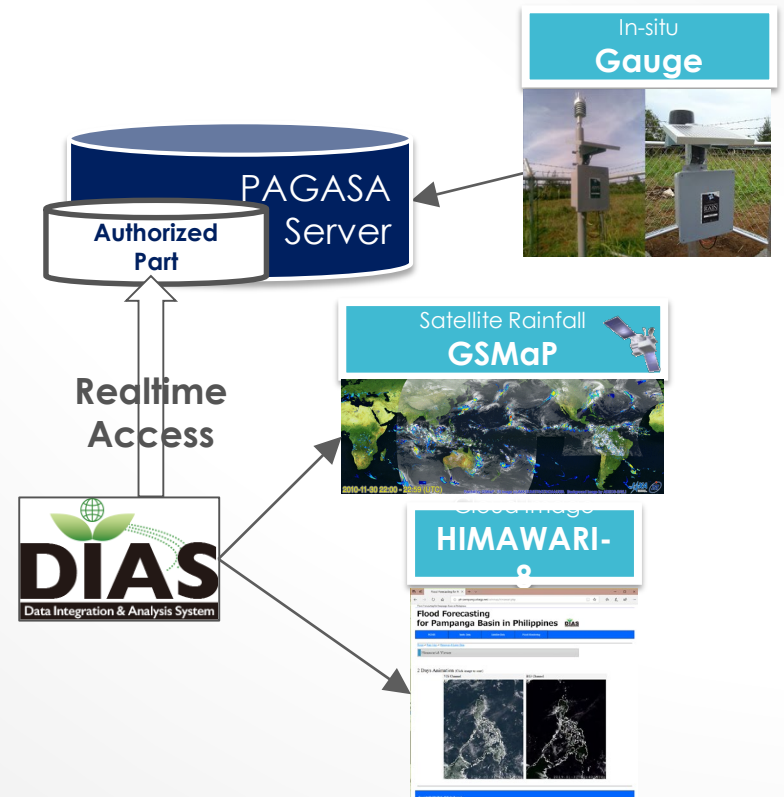
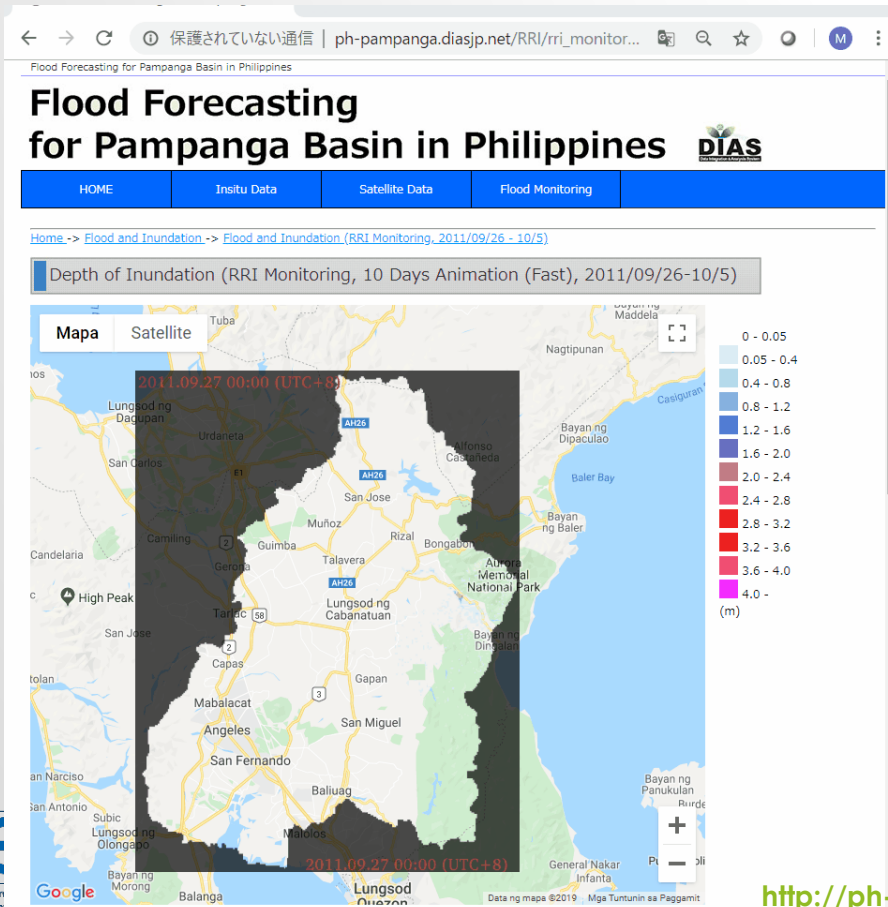


Input Item;

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

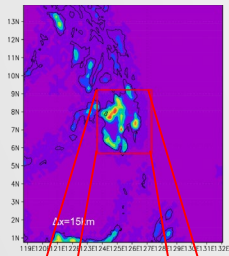
PLATFORM IN THE PHILIPPINES

2. Flood Forecasting & Early Warning (Preliminary)

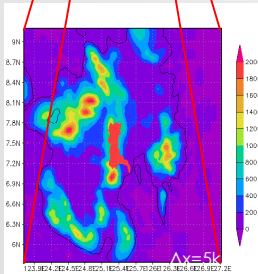


PLATFORM IN THE PHILIPPINES

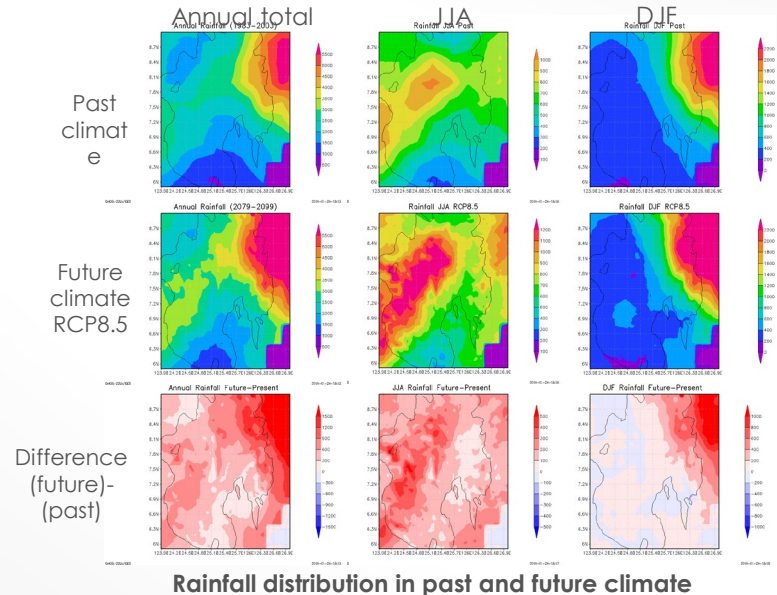
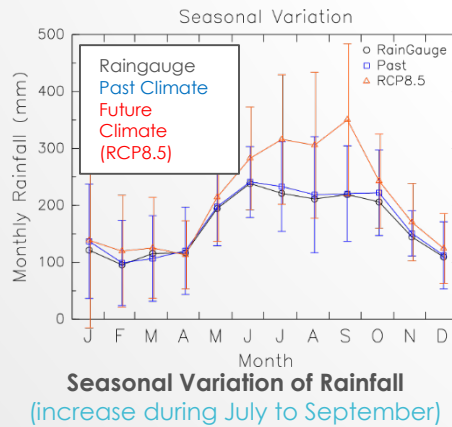
3. Climate Change Impact (Davao River Basin)



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



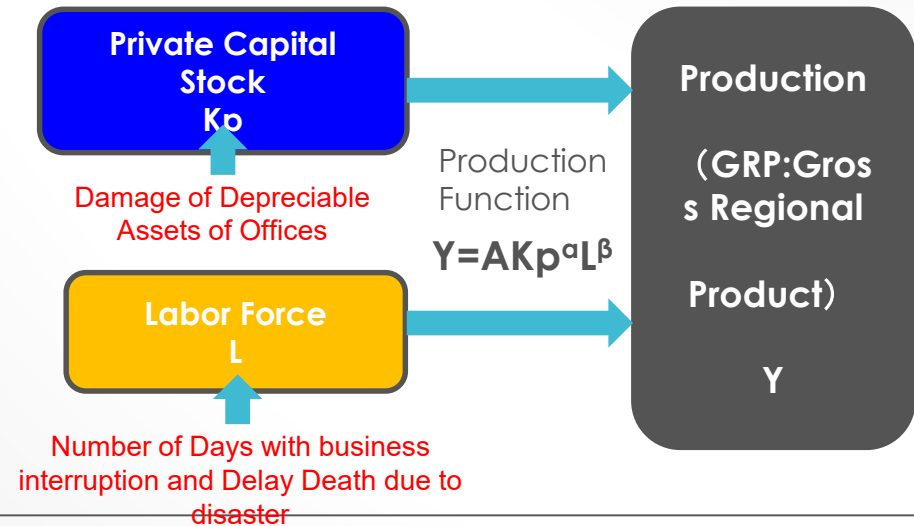
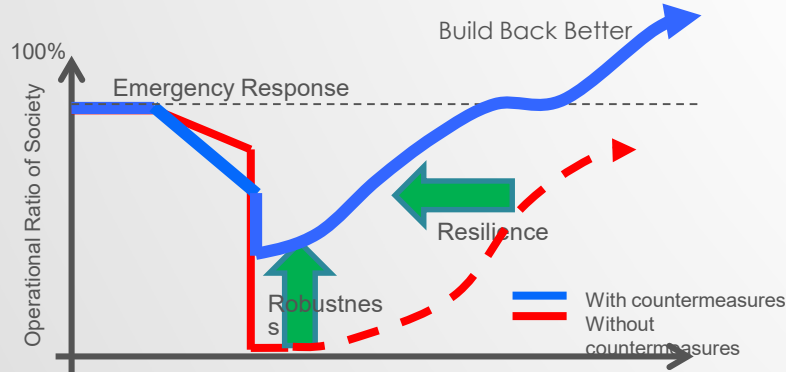
Davao River
 Area: 1623 km²
 Length: 160 km



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

PLATFORM IN THE PHILIPPINES

4. Economic Assessment



$$\Delta Y = Y_{\text{after}} - Y_{\text{before}} = (AK_{\text{after}}^{\alpha} L_{\text{after}}^{\beta}) - (AK_{\text{before}}^{\alpha} L_{\text{before}}^{\beta})$$

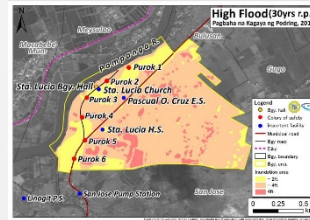
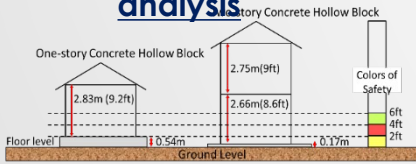
PLATFORM IN THE PHILIPPINES

5. Contingency Planning



Google Earth Street View with inundation visualization (High Flood Case)

District-base analysis



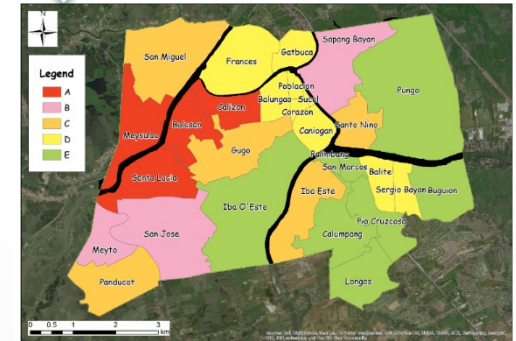
		100yrs	50yrs	30yrs	10yrs
① Lead time to start evacuation	1story	B	B	B	C
	2story	A	A	A	A
② Duration of evacuation	1story	A	B	B	C
	2story	A	A	B	B
③-1 Inundation depth at representative point		C	C	C	D
③-2 Inundation depth at Barangay Hall		D	D	D	E
④ L inundation depth at evacuation centers		AA	AA	AA	AA
⑤ Distance to nearby evacuation centers		A	A	A	A
⑥ Interruption of transportation		B	C	C	C



Total Score

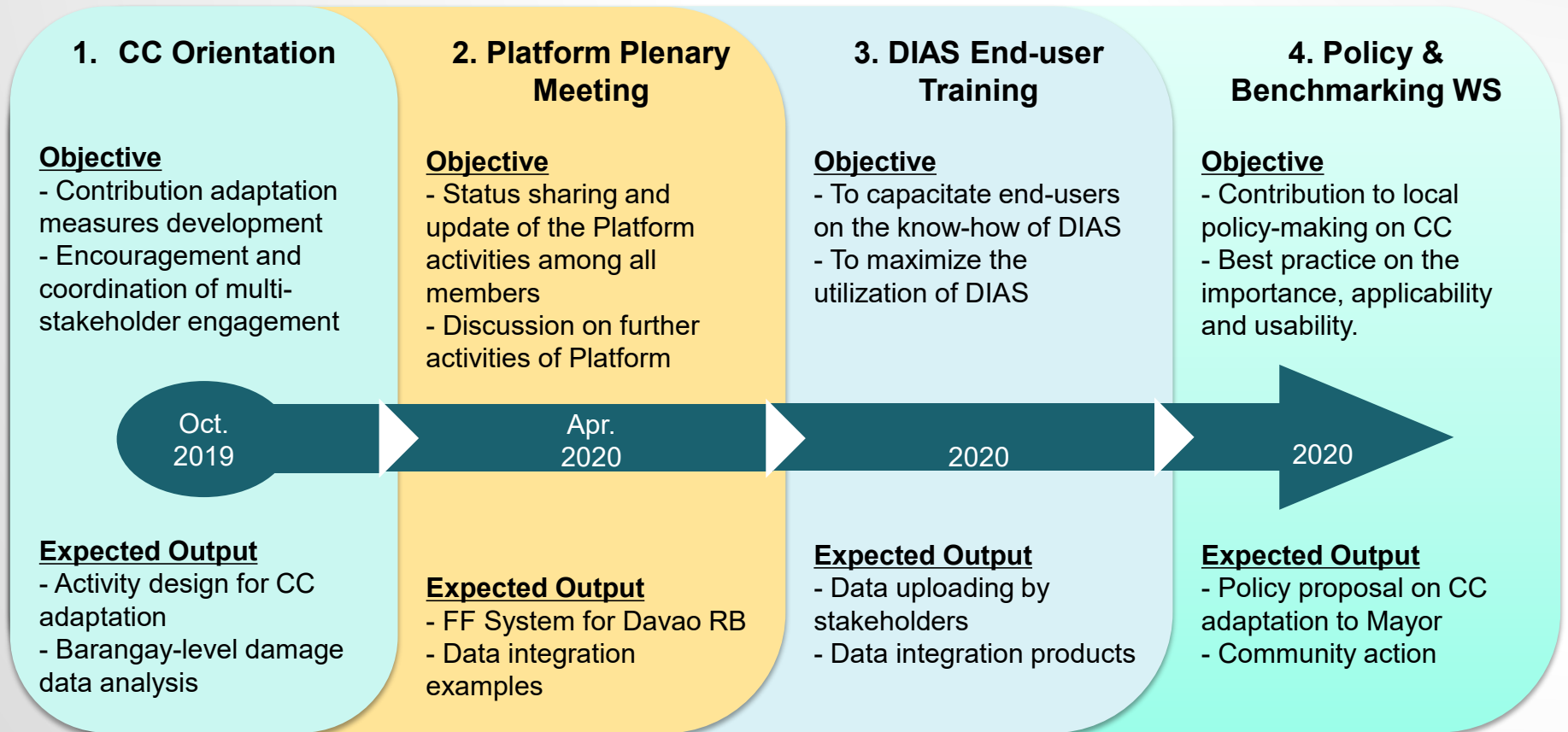
ID	Location	Sub-total				Total					
		100yr	50yr	30yr	10yr						
01	Sapang Bayan	A	32	A	31	B	29	C	24	B	116
02	Gatbuca	B	25	C	24	C	23	D	16	D	88
03	Frances	B	28	C	24	C	23	C	20	D	95
04	Meysulao	A	31	A	32	A	30	B	28	A	121
05	San Miguel	B	29	B	28	B	25	C	20	C	102
06	Sto. Nino	B	29	B	29	B	27	C	24	C	109
07	Calizon	A	34	A	31	B	29	B	28	A	122
08	Caniguan	B	27	C	23	C	20	D	17	D	87
09	Bulusan	A	33	A	33	A	31	A	30	A	127
10	Sta. Lucia	A	34	A	31	A	31	B	27	A	123
11	Meyto	A	31	B	29	B	28	B	27	B	115
12	Panducot	B	29	B	27	B	25	C	21	C	102
13	San Jose	A	32	B	28	B	28	B	26	B	114
14	Gugo	A	30	B	28	C	23	C	20	C	101
15	Pungo	C	20	D	18	D	18	E	12	E	68
16	Iba O'Este	D	17	E	14	E	14	E	14	E	59
17	Iba Este	B	29	B	29	B	26	C	24	C	108
18	Corazon	B	26	B	25	C	24	D	18	D	93
19	Poblacion	B	26	B	25	C	24	C	20	D	95
20	Balungao	B	26	B	25	C	24	D	17	D	92
21	Sucol	B	27	B	26	B	25	C	21	D	99
22	Balite	B	26	C	24	C	24	D	16	D	90
23	Sergio Bayan	B	26	B	26	C	23	D	16	D	91
24	Buglion	B	27	C	23	C	20	E	12	E	82
25	Palimbang	B	25	C	23	D	18	E	13	E	79
26	Pio Cruzcosa	D	17	E	13	E	11	E	11	E	52
27	San Marcos	C	24	C	22	C	23	D	15	E	84
28	Calumpang	D	15	E	11	E	11	E	10	E	47
29	Longos	B	26	C	22	D	18	E	12	E	78

Identify the flood hot spots



PLATFORM IN THE PHILIPPINES

WORKPLAN OF PLATFORM ACTIVITIES IN DAVAO





“Platform on Water Resilience and Disasters” in Sri Lanka – 3rd Plenary Session



- **Pre-Plenary Session Meeting & Site visit in February 2019**

- **3rd Plenary Session on February 20, 2019**

Participated Stakeholders

- ID : Irrigation Department
- DMC : Disaster Management Center
- MD : Meteorological Department
- NBRO : National Building Research Organization
- MMWD: Ministry of Magapolis & Western Development
- MA : Mahaweli Authority



Participating Organizations:

- Irrigation Department (ID) (* Coordinator and Focal point)
- National Building Research Organization (NBRO) (* Coordinator)
- Disaster Management Center (DMC) (* Focal point)
- Meteorology Department (MD)
- Ministry of Magapolis and Western Development (MMWD)
- Survey Department (SD)
- Ministry of Mahaweli Development & Environment (MMDE)

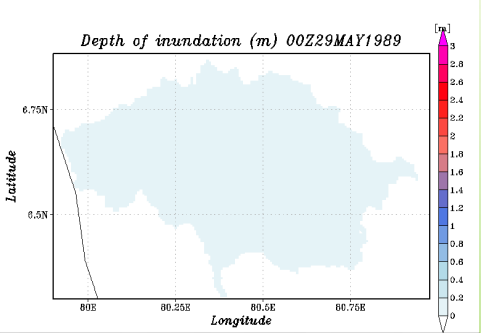
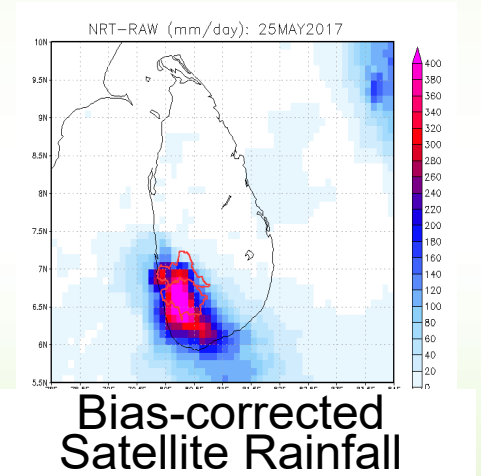
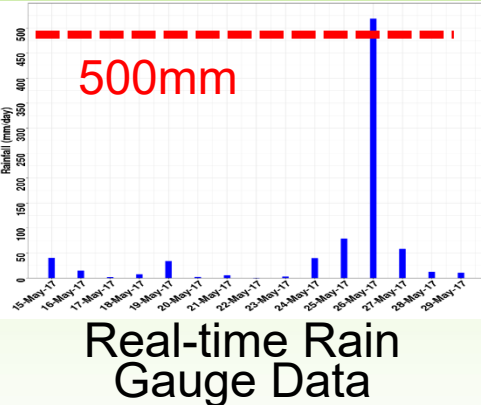
Target Actions and Coordinating Bodies

1. **Early Warning**: rainfall, flooding, landslide: ID, NBRO, MD
2. **Adaptation Planning** for Global Change:
(such as Climate Change, Urbanization) ID, MMWD, MMDE
3. **Economic Effect of Disasters**: MMDW, DMC, MMDE
4. **Contingency Planning** and Mainstreaming DRR: DMC

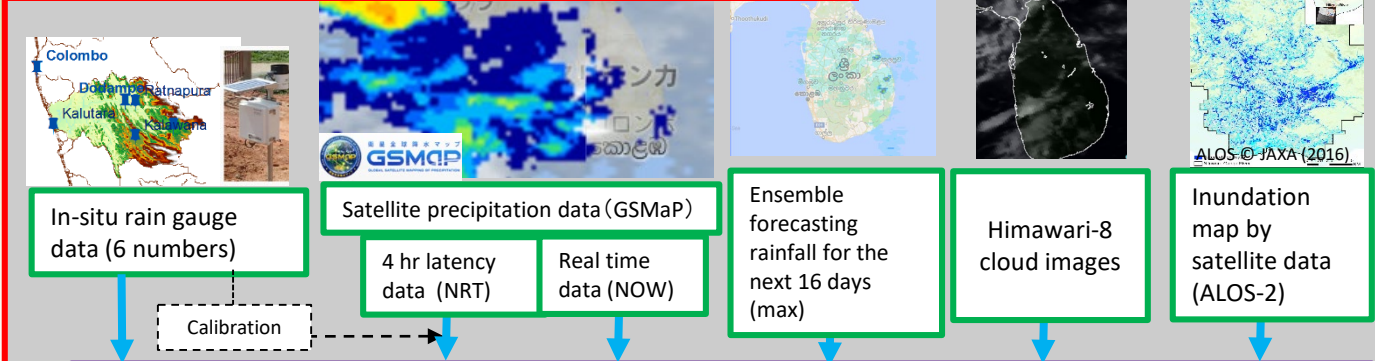
Demonstration Sites of Target Actions

1. Kalu River Basin (as a rural basin)
2. Kelani River Basin (as a urban basin)
3. Malvathu River Basin (as an arid basin)
4. Mahaweli River Basin (as an integrated basin)

DIAS-ICHARM: Sharing Flood Information in Sri Lanka



Implemented by EDITORIA and ICHARM on DIAS



Flood Forecasting for Sri Lanka

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

Flood Forecasting for Sri Lanka

Realtime Rain Monitor (ALL Rain Gauges, 30 Days)

Marker	Station Name	Latest 1hr	24 hrs	3 Days	30 Days
A	Kakirala	0mm	10.8mm	173.2mm	
B	Kalaneera	1.6mm	11.6mm	257.5mm	
C	Ratnapura	1.2mm	5.4mm	267.5mm	
D	Kakulavita	3.8mm	11.6mm	413.8mm	
E	Dumpea	0.5mm	8.6mm	384.2mm	
F	Colombo	0mm	0mm	106.6mm	

Inundation analysis by using RRI in DIAS

RRI model

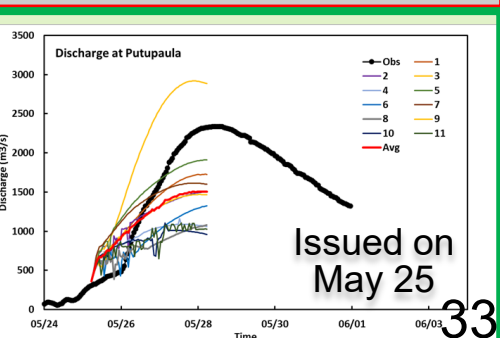
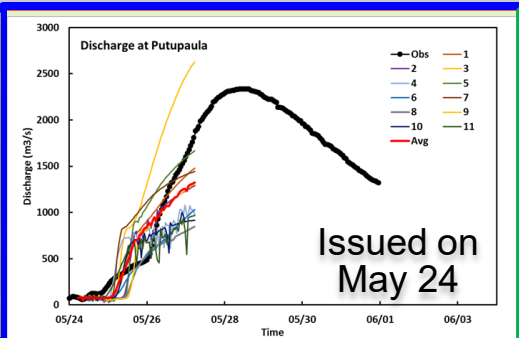
Simulation and forecasting of river discharge, water level, inundation extent

Concept of RRI model

Inundation analysis results

Ensemble Flood Prediction

72hr
11 ensembles every 24hr

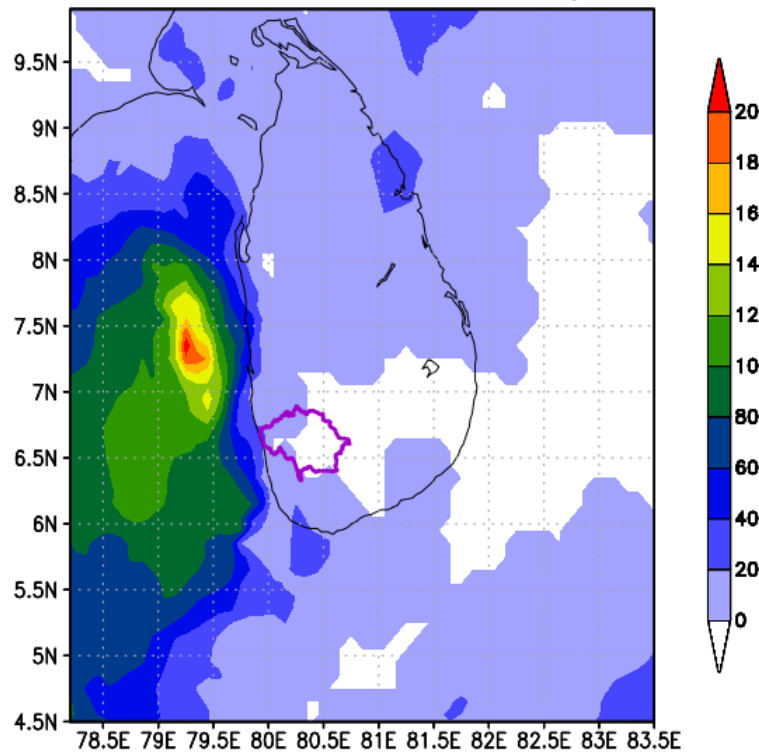


May 24 Rainfall Forecast from 18UTC22 May, 2018

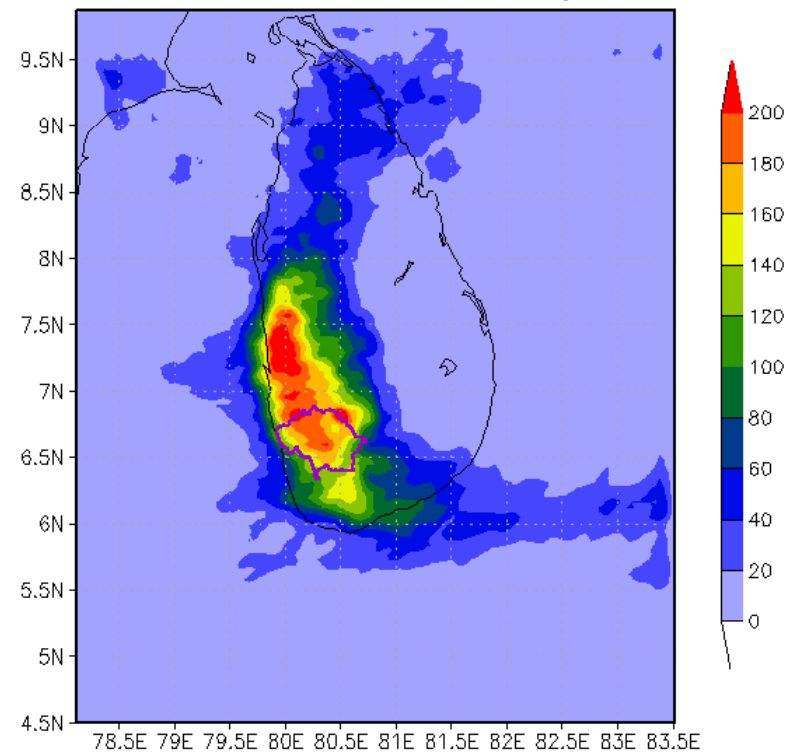
GSMaP satellite observation

Forecast (Ensemble mean)

GSMaP Rainfall 00z24–12z24May,2018

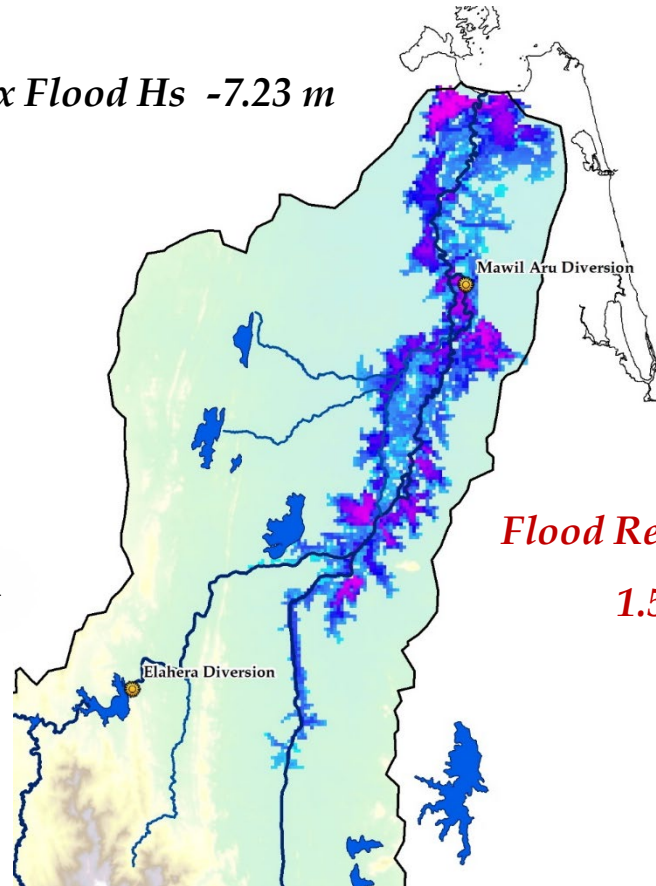


EPS Rainfall 00z24–12z24May,2018



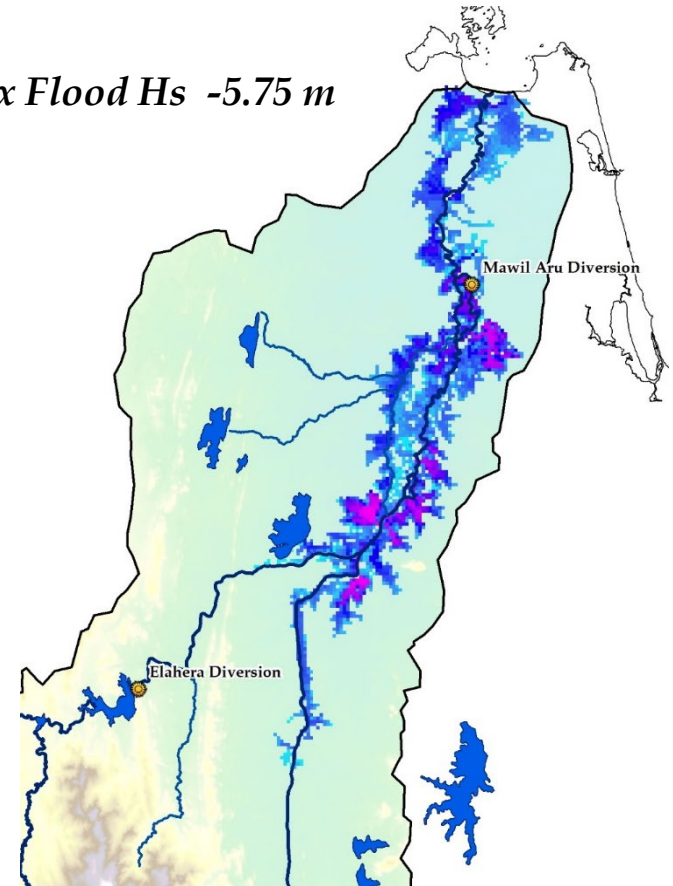
Flood Reduction in lower part due to Dam Operation Rules

Max Flood Hs -7.23 m



2014 Flood Actual Simulation

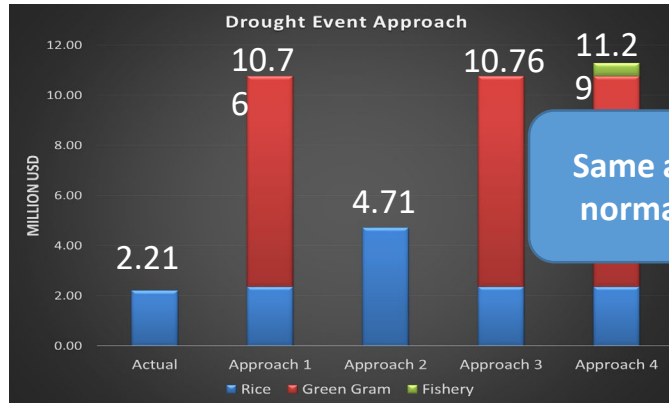
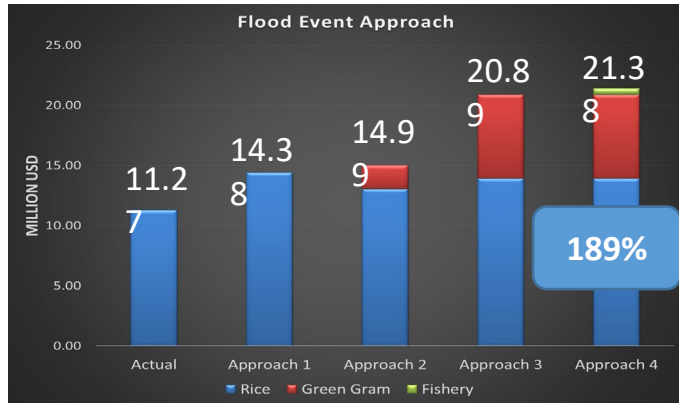
Max Flood Hs -5.75 m



2014 Flood with Dam Operation Rules

*Flood Reduced by
1.5 m*

Selection of Best Scenario comparing the possible income

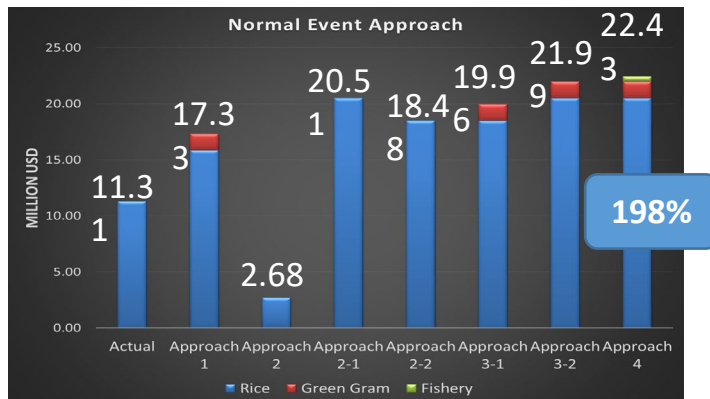


- Approach 4 is the best Scenario of IWUP in every events.

Same as normal

For this Study following Data were taken from the sources

- Yield Per ha
- Farm –gate price of rice and green gram in USD/ha
- Inland fish export value for Sri Lanka is taken assumed 5% contribution from GT



Sources :- Agricultural department and Department of Census and Statistics and National Aquaculture Development Authority of Sri Lanka



“Platform on Water Resilience and Disasters” in Sri Lanka



- **Training on climate change impact assessment for Sri Lankan government staff on August 19, 2019**



- **Follow-up meeting in August 2019**

Participated Professionals

- ID : Irrigation Department
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- MD : Meteorological Department
- NBRO : National Building Research Organization
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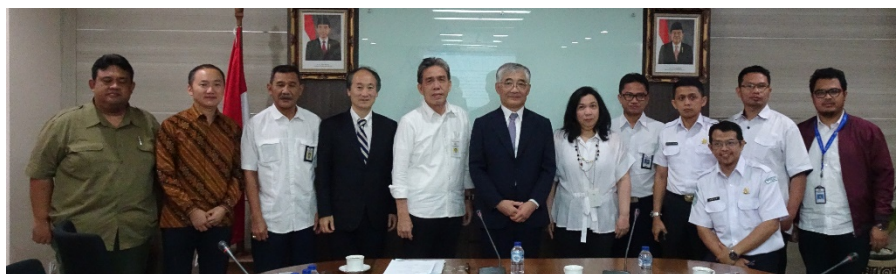


Platform activities in Indonesia

Core member of the Platform

- Ministry of Public Works and Housing (PUPR) River Management
- National Disaster Management Authority (BNPB) Disaster Information
- Meteorological, Climatological, and Geophysical Agency (BMKG) Meteorological Observation
- Ministry of Environment and Forestry (KHLK) River Basin Management (Forest)

- 2018.1.15 Consultation for establishing the Platform ①
- 2018.8.3 Consultation for establishing the Platform ②
- 2018.10.24–26 11th GEOSS AP Symposium in Kyoto
- 2018.12.4–6 Consultation for establishing the Platform ③ and Field Survey
- 2019.1.28 Consultation for establishing the Platform ④
(Proposal of adding KLHK)
- 2019.3.12 Consultation for establishing the Platform ⑤
- 2019.4.9–13 The 1st meeting on the Platform** and Field Survey
- 2019.8.5 The 2nd meeting on the Platform**

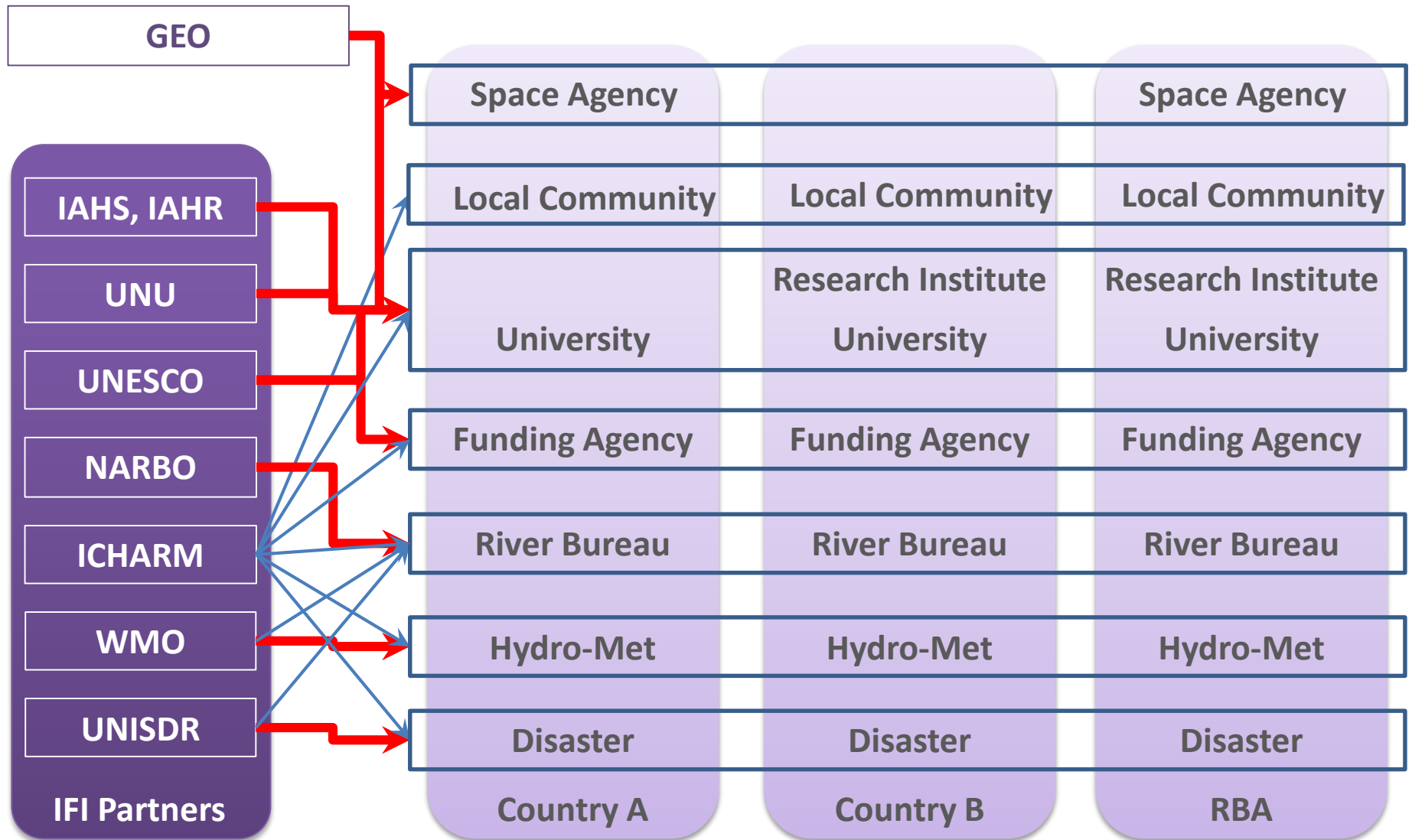


Participants of the 2nd Platform meeting



Report to PUPR Minister Dr.Basuki about 2nd meeting

Water-related Disasters



Main support: 

Sub-support: 