TG1
GEOSS 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 (ICHARM)
Frequent Serious Floods and Sediment Disasters

Typhoon No. 19 (Hagibis)

**Total rainfall from 10 to 13, Oct. 2019**

- 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)

Typhoon No. 19 (Hagibis)

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

Frontal Rain Disaster in July 2018

Historical maximum 48-hour rainfall was recorded at 124 stations.
Three Key Global Agendas Agreed in 2015

- **Concerted Actions are Required**

  - **March 2015**: Sendai Framework on Disaster Risk Reduction
  - **September 2015**: Sustainable Development Goals
  - **December 2015**: Paris Agreement (COP 21)

**Understanding Governance Investment Preparedness/BBB**

- **Resilient**
- **Sustainable**
- **Inclusive**

**Quality Growth**
TG1
GEOSS 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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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

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

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)
### Scoring:
- 0 = Do nothing
- 1 = Less active
- 2 = Active
- 3 = Very active

### Timing:
- **Current (C)**
- **Aspirational (A)**

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<td>Adaptation</td>
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<td>Mitigation</td>
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<tr>
<td>Understanding disaster risk</td>
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<td>Strengthening disaster risk governance to manage disaster risk</td>
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<td>C</td>
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<tr>
<td>Investing in disaster risk reduction for resilience</td>
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<td>C</td>
</tr>
<tr>
<td>Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction</td>
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<td>3</td>
<td>C</td>
</tr>
<tr>
<td>Data Sharing Infrastructure</td>
<td></td>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td>User Engagement and</td>
<td></td>
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</table>

**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”

NWRC
(National Water Resources Committee)

NDMC
(National Disaster Management Council)

Participating Organizations
(Provisional)

- DHP
- GAD
- DMA
- MPA
- DUHD
- SD

Core Management Group

- IWUMD
  (Irrigation and Water Utilization Management Department)
- DMH
  (Department of Meteorology and Hydrology)
- NWRC Secretariat
- NDMC Secretariat
- DOP
- DDM
  (Department of Disaster Management)

Regional / State / District Government

City / Township Development Committee

Science & Technology Communities

YTU, etc.
Near real-time flood forecast system for the Bago River

**AWS data**
- Rainfall
- Pressure
- Wind
- Relative Humidity
- Temperature

**Satellite products**
- Rainfall
- Water-level
- Tide

**AHS data**
- Rainfall
- Water-level
- Tide

**BIAS correction**
- Rainfall

**Real Time System**
- Geoprocessing forcing
- RRI Model
- Discharge
- Water level
- Inundation

**Output for stakeholders**
- ~10 mins delay
- ~1 mins delay
- ~5 mins delay
- ~15-20 mins delay

**User needs**
- IWUMD, DWIR, DMH, DDM

**Cross-section**
- SATREPS, DWIR

**Drainage structure**
- IWUMD

**Routine operation**
- IWUMD, DWIR, DMH, DHPI
  - Remote monitoring /reducing site-visit loads
  - Understand real situation
  - Investigate risk

**Emergency case**
- DMH
  - Issuing warning

**Emergency response**
- DDM (EOC)

**Dam operation**
- Outflow
- Capacity
- Water level

(Future integration)
Activities for “Platform on Water Resilience and Disasters”

- February 4\textsuperscript{th} and 5\textsuperscript{th}, 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 6\textsuperscript{th}, 2019 at Nay Pyi taw.
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

Co-chair
Usec. Emil K. Sadain
(Mr. Michael T. Alpasan)
Co-chair
Usec. Renato U. Solidum, Jr.
(Ms. Maria Lynn P. Melosantos)

DPWH
(Mr. Ramon A. Arriola III)
Respective secretariats
(Mr. Jerry Fano)
- Promoting dialogue

PAGASA
(Dr. Vicente B. Malano)
Respective secretariats
(Mr. Socrates F. Paat, Jr.)
- Coordinating the demonstration in the Pampanga River basin

DOST Region XI
(Dr. Anthony C Sales)
Respective secretariats
(Mr. Jonathan P. Victolero)
- Coordinating the demonstration in the Davao River basin

Participating Organizations

DA
DENR
DILG
NIA
MGB

DND
DOST
DSWD
PAGASA
PHIVOLCS

NEDA
PSA
NWRB
CSO
LGUs

University of Philippines
- Los Baños
- Diliman
- Mindanao

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<tr>
<th>Agency</th>
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<td>DPWH</td>
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<td>DOST</td>
<td>PHIVOLCS</td>
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<td>PCIEERD</td>
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<td>Regional Office XI</td>
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<td>DENR</td>
<td>NAMRIA</td>
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<td>DILG</td>
<td>WSSPMO-OPDS</td>
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<td>DND</td>
<td>OCD</td>
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<td>NIA</td>
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<td>UP Los Banos</td>
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<td>UP Diliman</td>
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<td>UP Mindanao</td>
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<tr>
<td>Univ. of Tokyo</td>
<td>EDITORIA</td>
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<tr>
<td>ICHARM</td>
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<tr>
<td>Typhoon Committee</td>
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</table>
## Platform in the Philippines

### 1. Data Archiving

#### Damage

<table>
<thead>
<tr>
<th>Data</th>
<th>Source of Information</th>
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<tbody>
<tr>
<td>Casualties &amp; missing person</td>
<td>OCD</td>
</tr>
<tr>
<td>Num. of affected people</td>
<td>OCD</td>
</tr>
<tr>
<td>Agricultural damage</td>
<td>DA</td>
</tr>
<tr>
<td>Housing damage</td>
<td>OCD</td>
</tr>
<tr>
<td>Damage to critical infrastructure</td>
<td>DPWH, LGU</td>
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<tr>
<td>Direct economic loss other than agricultural loss</td>
<td>LGU, NEDA</td>
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#### Hazard

<table>
<thead>
<tr>
<th>Data</th>
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<tbody>
<tr>
<td>DEM (LiDAR)</td>
<td>UP Mindanao</td>
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<tr>
<td>DEM (IfSAR)</td>
<td>NAMRIA</td>
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<tr>
<td>Hydromet data</td>
<td>PAGASA, ASTI, DREAM</td>
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<tr>
<td>Inundation depth (LiDAR)</td>
<td>UP Diliman, UP Mindanao</td>
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<tr>
<td>Inundation depth (interview)</td>
<td>PAGASA</td>
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<tr>
<td>Rainfall</td>
<td>PAGASA</td>
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<tr>
<td>River flow</td>
<td>DPWH, UP Mindanao</td>
</tr>
<tr>
<td>River cross section</td>
<td>DPWH, UP Mindanao</td>
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<tr>
<td>Tidal level</td>
<td>NAMRIA</td>
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#### Socioeconomic

<table>
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<th>Data</th>
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<tr>
<td>Land use</td>
<td>LGU, DOST</td>
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<tr>
<td>Agriculture</td>
<td>PSA, DA</td>
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<tr>
<td>Population</td>
<td>PSA</td>
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<tr>
<td>Infrastructure</td>
<td>DPWH/LGU</td>
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<td>Industry</td>
<td>DTI</td>
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<td>Commerce</td>
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<td>Drainage facility</td>
<td>DPWH/LGU</td>
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<td>Information</td>
<td>PSA, NEDA</td>
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<tr>
<td>Sectoral Regional GDP</td>
<td>PSA</td>
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<tr>
<td>Sectoral employed population</td>
<td>PSA</td>
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<tr>
<td>Tax revenue</td>
<td>BIR</td>
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<tr>
<td>Land price</td>
<td>City Assessors Office</td>
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</table>

**Collected**

### Input Item:

- Data Domain, Area, District:
- Category:
- Data Source
- Data Type
- Period
- Resolution
PLATFORa IN THE PHILIPPINES

2. Flood Forecasting & Early Warning (Preliminary)

http://ph-pampanga.diasjp.net/RRI/ri_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 km²
  - Length: 160 km

- Seasonal Variation of Rainfall
  - (increase during July to September)

- Past and Future Climate (RCP8.5)

- 33% increase of 1/50 extreme rainfall & July-September rainfall increase 45%

- Average discharge increases + one flood event causes more damage
4. Economic Assessment

Production Function
\[ Y = AK^\alpha L^\beta \]

Damage of Depreciable Assets of Offices

Number of Days with business interruption and Delay Death due to disaster

\[ \Delta Y = Y_{after} - Y_{before} = (AK_{after}^\alpha L_{after}^\beta) - (AK_{before}^\alpha L_{before}^\beta) \]
5. Contingency Planning

**District-base analysis**

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<tr>
<th>Location</th>
<th>Sub-total</th>
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<td>30yr</td>
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<td>100yr</td>
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<td>30yr</td>
<td>10yr</td>
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**Total Score**

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<th>100yr</th>
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<td>30yr</td>
<td>10yr</td>
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**Google Earth Street View with inundation visualization (High Flood Case)**

**Identify the flood hot spots**
PLATEFORM IN THE PHILIPPINES

WORKPLAN OF PLATFORM ACTIVITIES IN DAVAO

1. CC Orientation
   - Objective
     - Contribution adaptation measures development
     - Encouragement and coordination of multi-stakeholder engagement
   - 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
   - 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
   - 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.
   - Expected Output
     - Policy proposal on CC adaptation to Mayor
     - Community action

Oct. 2019

Apr. 2020

2020
“Platform on Water Resilience and Disasters” in Sri Lanka – 3rd Plenary Session

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

- Pre-Plenary Session Meeting & Site visit in February 2019
- 3rd Plenary Session on February 20, 2019
Platform on Water Resilience and Disasters in Sri Lanka

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: ID, MMWD, MMDE
   (such as Climate Change, Urbanization)
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

- **Real-time Rain Gauge Data**: 500mm
- **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)**

**Flood Forecasting for Sri Lanka**

- **On-line Information provision on DIAS**: In-situ rainfall, satellite rainfall, calibrated and forecast rainfall, inundation simulations
- **Bias-corrected Satellite Rainfall**
- **Inundation analysis by using RRI in DIAS**
  - **Concept of RRI model**
  - Simulation and forecasting of river discharge, water level, inundation extent
  - Inundation analysis results

- **Ensemble Flood Prediction**: 72hr, 11 ensembles every 24hr
- **Discharge at Putopaula**
  - Issued on May 24
  - Issued on May 25

**DIAS-ICHARM: Sharing Flood Information in Sri Lanka**
May 24 Rainfall Forecast from 18UTC22 May, 2018

GSMaP satellite observation

Forecast (Ensemble mean)
Flood Reduction in lower part due to Dam Operation Rules

Max Flood Hs  -7.23 m

Flood Reduced by 1.5 m

Max Flood Hs  -5.75 m

2014 Flood Actual Simulation

2014 Flood with Dam Operation Rules

Mananpitiya
Selection of Best Scenario comparing the possible income

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

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

Participated Professionals
- ID: Irrigation Department
- DMC: Disaster Management Center
- MD: Meteorological Department
- NBRO: National Building Research Organization
- MA: Mahaweli Authority

- Follow-up meeting in August 2019
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 1\textsuperscript{st} meeting on the Platform and Field Survey
2019.8.5 The 2\textsuperscript{nd} meeting on the Platform

Participants of the 2nd Platform meeting

Report to PUPR Minister Dr.Basuki about 2\textsuperscript{nd} meeting
Water-related Disasters

IFI Partners

IFC, IAHS, IAHR
UNU
UNESCO
NARBO
ICHARM
WMO
UNISDR

Main support:
Sub-support:

Country A
Hydro-Met
River Bureau
Disaster
Country B
Hydro-Met
River Bureau
Disaster
RBA

UNISDR
UNU
UNESCO
ICHARM
WMO
NARBO
IAHS, IAHR

GEO
Space Agency
Local Community
University
Research Institute
Funding Agency
River Bureau
Hydro-Met
Disaster
Country A
Country B
RBA