



AWCI Session

Prior to

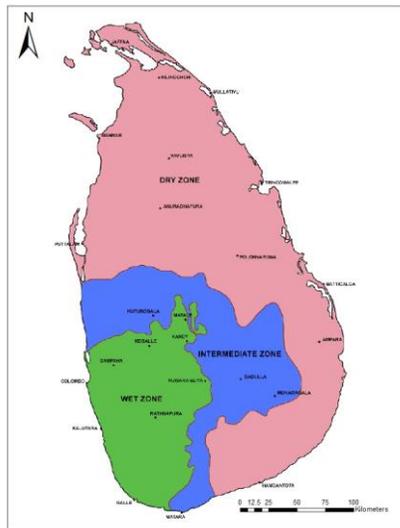
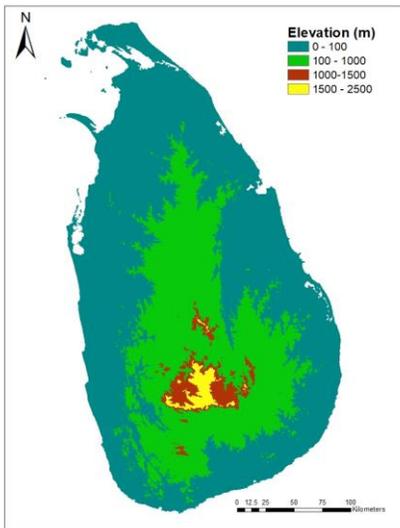
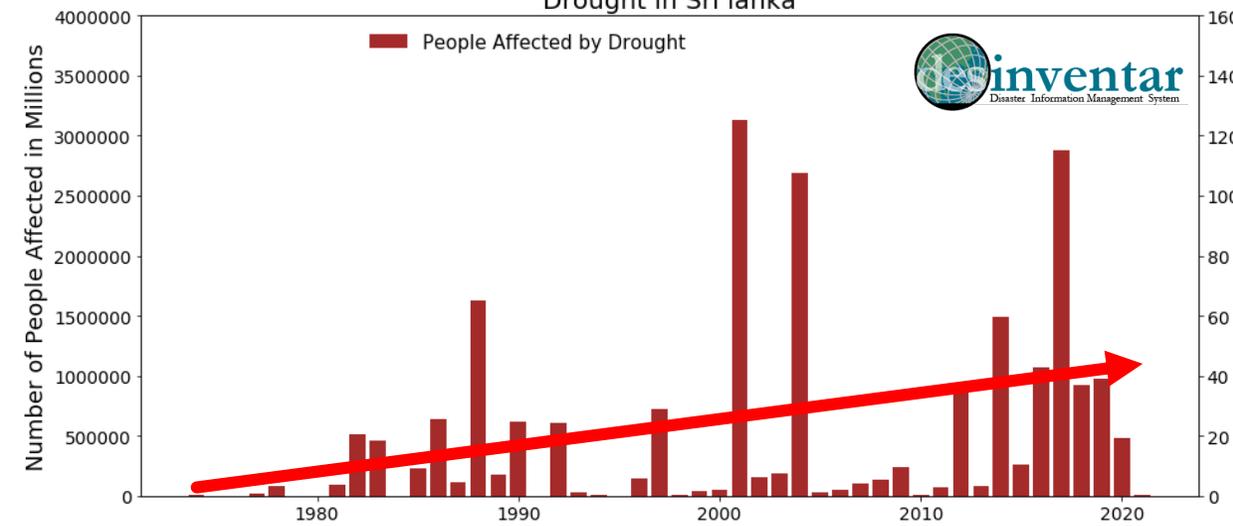
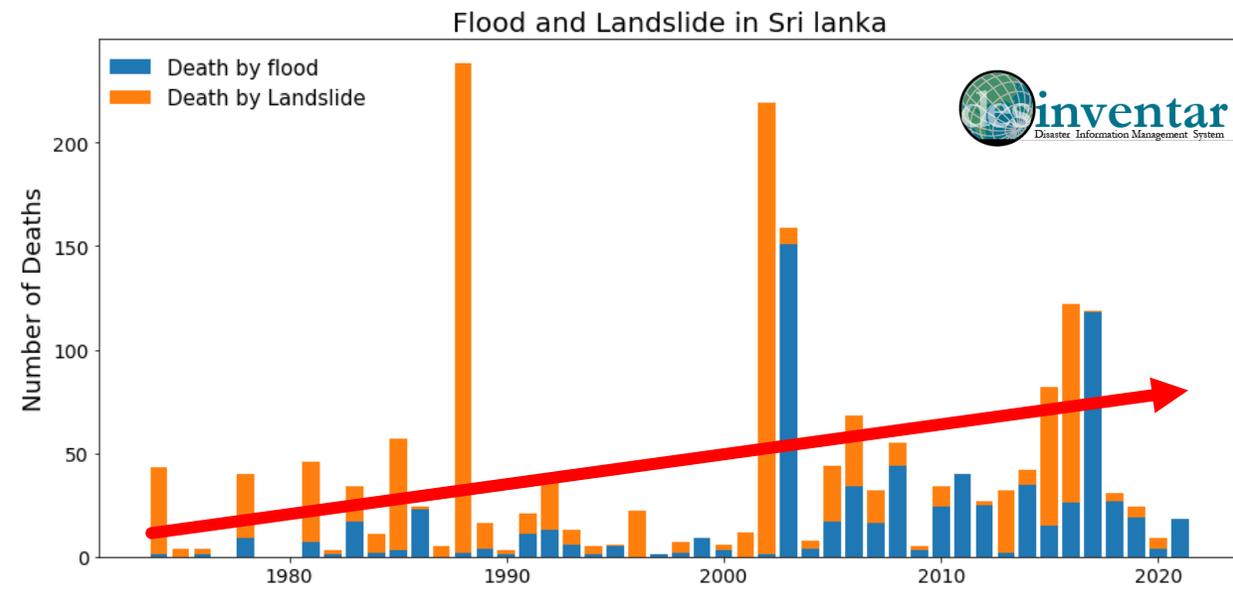
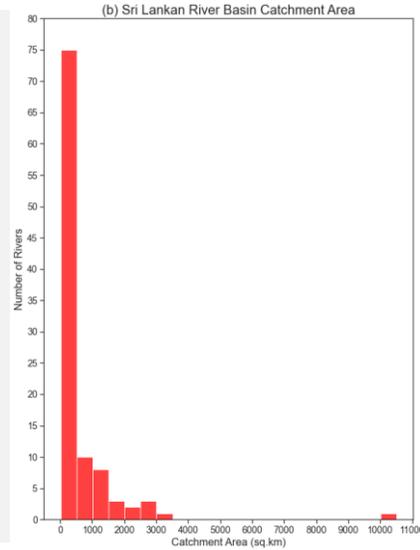
14th AOGEO Symposium

Sri Lanka



Sri Lanka

- Country in South Asia
- Population : 22 million
- Topography : 0 to 2525 m
- 103 river basins
- 4 climatic seasons
- 3 climatic zones
- 2 main agricultural seasons



Climatic Seasons	Intermediate-2 (IM-2) (400 ~ 1200 mm)		North East Monsoon (NE) (500 ~ 1200 mm)				Intermediate-1 (IM-1) (100 ~ 250 mm)		South West Monsoon (SW) (1000 ~ 4000 mm)				
Months	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Agriculture Seasons	Off 2		Maha Season				Off 1		Yala Season			Off 2	

GLOBAL CLIMATE RISK INDEX 2019

Ranking 2017 (2016)	Country	CRI score	Death toll	Deaths per 100 000 inhabitants	Absolute losses (in million US\$ PPP)	Losses per unit GDP in %	Human Development Index 2017 ¹⁰
1 (105)	Puerto Rico ¹¹	1.50	2 978	90.242	82 315.240	63.328	-
2 (4)	Sri Lanka	9.00	246	1.147	3 129.351	1.135	76
3 (120)	Dominica	9.33	31	43.662	1 686.894	215.440	103
4 (14)	Nepal	10.50	164	0.559	1 909.982	2.412	149

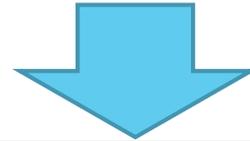
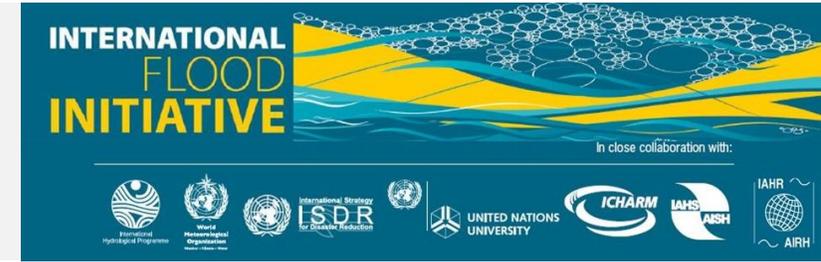
10 ECONOMIES WORST AFFECTED BY NATURE LOSS BY 2050*

- MADAGASCAR
- TOGO
- VIETNAM
- MOZAMBIQUE
- URUGUAY
- SRI LANKA
- SINGAPORE
- NEW ZEALAND
- OMAN
- PORTUGAL

* Worst affected in terms of % reduction in national annual GDP by 2050, compared to scenario in 2050 in which ecosystem services do not change.
PANDA.ORG/GLOBALFUTURES

Platform on Water Resilience and Disasters in Sri Lanka

IFI promotes an integrated approach to flood management to take advantage of the benefits of floods and use of flood plains while minimizing the social, environmental and economic risks through collaboration among international organizations.



Under IFI scheme, for strengthening Water-related Disasters Resilience and Enabling Sustainable Development in Sri Lanka, the Platform on Water Resilience and Disasters was established with the support of ICHARM in 2017.



Targeted Actions

Climate Change
& Adaptation

Contingency
Planning

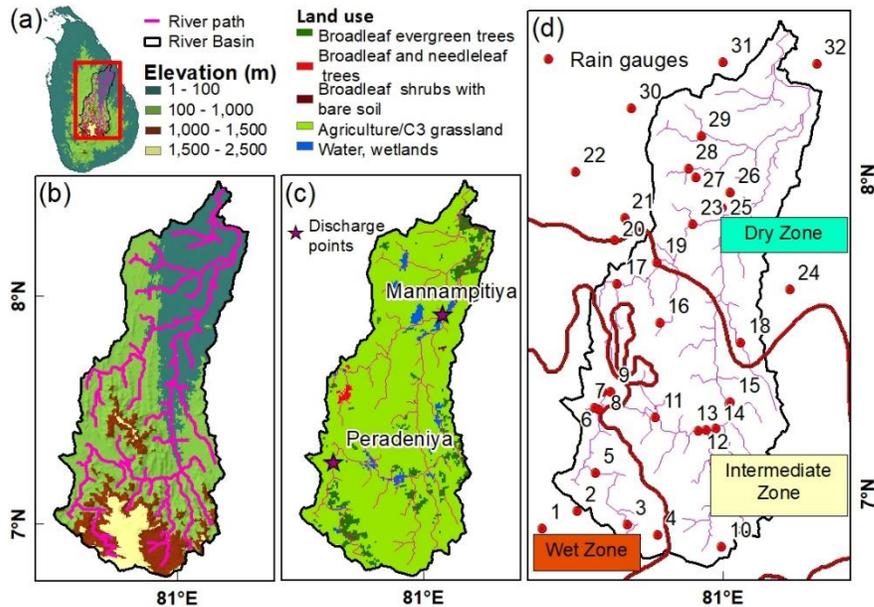
Flood Early
Warning

Economic
Impacts of
Disasters

Capacity
Building

Progress: Climate Change & Adaptation

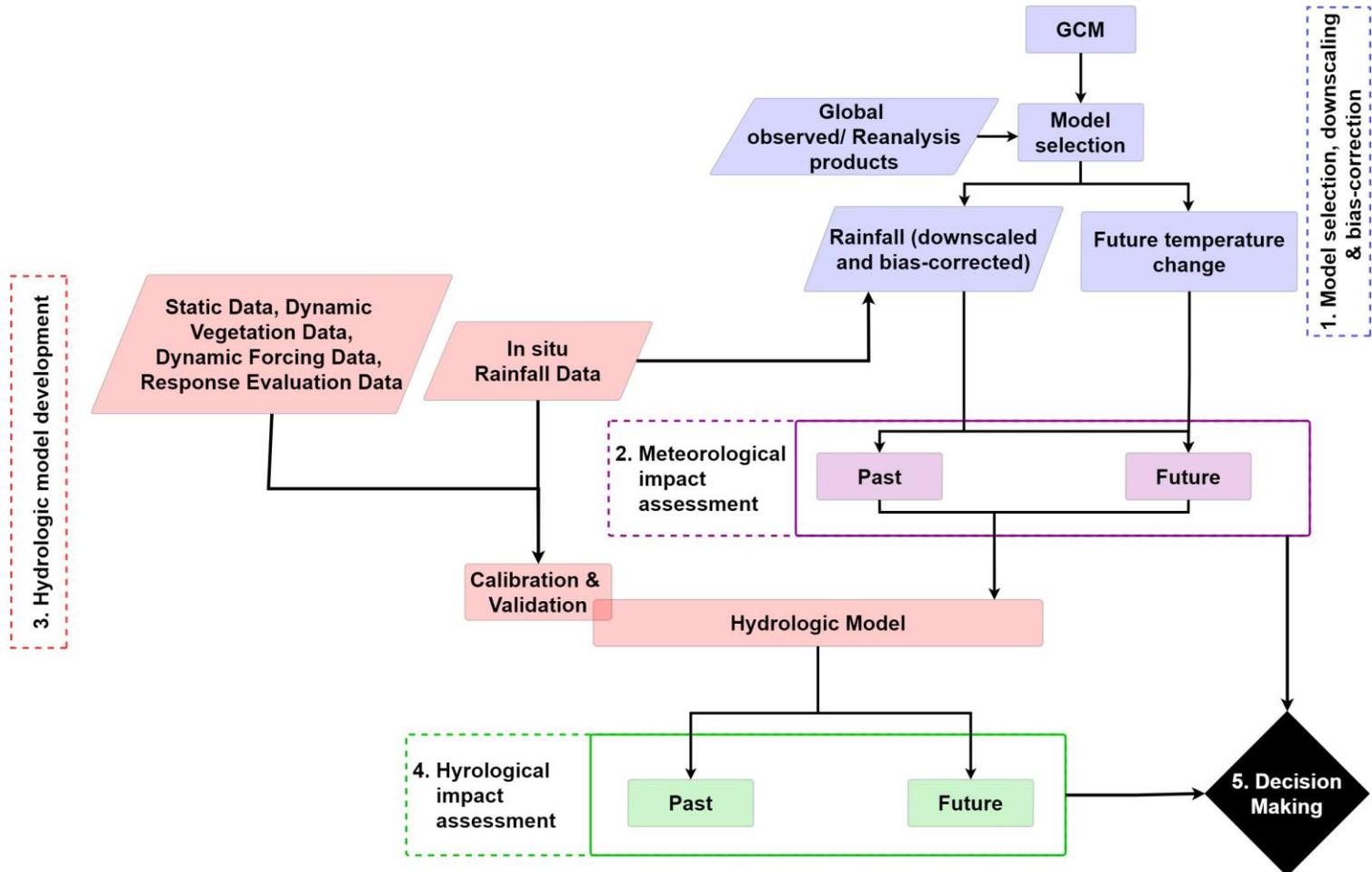
Understanding of risk through climate change impact assessment in Mahaweli River Basin



- Catchment Area = 10,300 sq.km
- Length of the river = 335 km
- Annual yield = 11,000 MCM

Reference:

Selvarajah, H., Koike, T., Rasmy, M., Tamakawa, K., Yamamoto, A., Kitsuregawa, M., Zhou, L. Development of an Integrated Approach for the Assessment of Climate Change Impacts on the Hydro-Meteorological Characteristics of the Mahaweli River Basin, Sri Lanka. *Water* 2021, 13, 1218. <https://doi.org/10.3390/w13091218>



Requirement of Early warning

- Climate change impact assessment, depicts a 20 years average information.
- But the onset and withdrawal of extreme events are still uncertain based on the available information

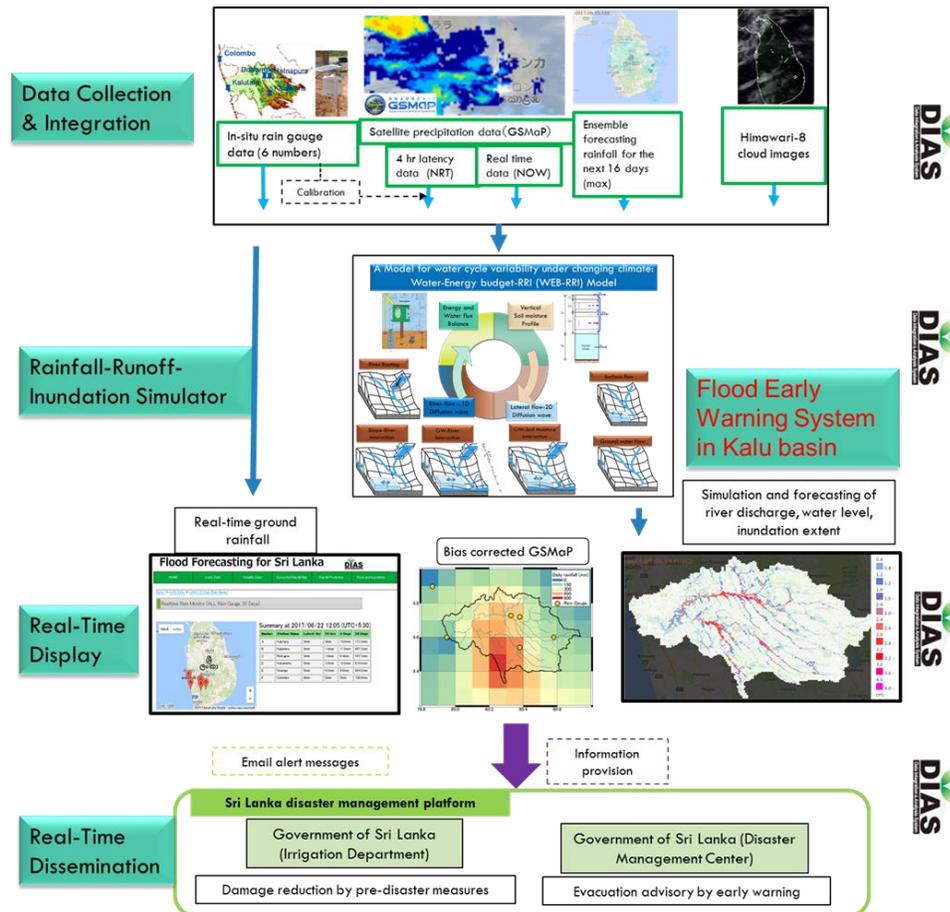
Therefore:

- ▶ Use seasonal forecasting and short term weather prediction for flood and drought management as;
 - ▶ Forecasting uses the latest observation
 - ▶ Weather prediction is more accurate up to a maximum of 2 weeks
 - ▶ Seasonal forecast prediction horizon is in months
 - ▶ Both are very useful in flood and drought management

Progress: Flood Early Warning

Early Warning System for Kalu River Basin (Test operation in DIAS)

<http://ff-srilanka.diasip.net>

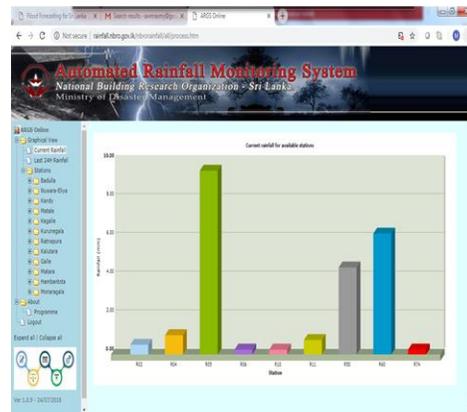


- ▶ One week ahead ensemble rainfall forecasting us
- ▶ Rainfall monitoring and integration (use of automated rain gauges for bias correction of GsMap data with ground data)
- ▶ Flood monitoring and forecasting
- ▶ Visualization and online dissemination

Future Plan: Flood Early Warning

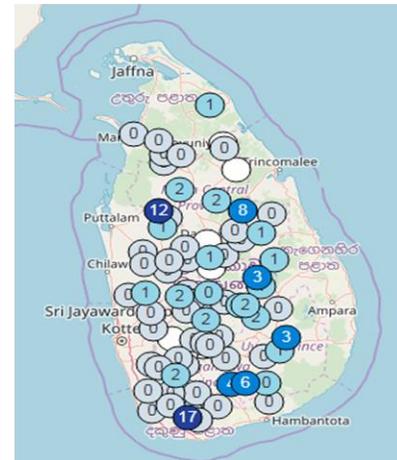
Early Warning System for Vulnerable River Basin (Upgrading the system to operational level)

NBRO



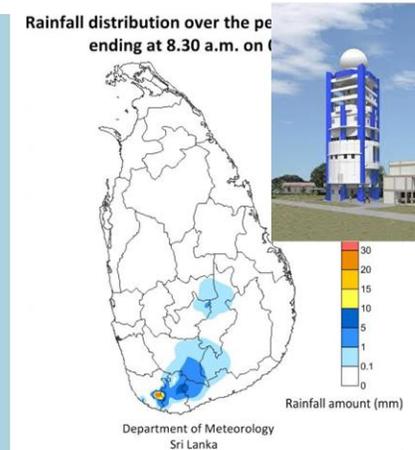
Automated Rainfall Monitoring System - ARGS

Irrigation Department & Mahaweli Authority



Hydro Meteorological Information System (HMIS)

MET Department



Doppler Weather Radar Network

Crucial information for enriching EWS & expand the prototype to be Island wide operational EWS

Progress : Capacity Building

Training & Capacity Building Programs in Sri Lanka

PhD in Disaster Management

- 1 candidate has completed
- 1 candidate has enrolled

Masters in Disaster Management

- 3 candidates have enrolled



- **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



August 21, 2019 (Wednesday) –

- Introduction to real-time flood forecasting system in the Kalu River basin.
- Hands-on training on climate models and statistical downscaling, and assessment of heavy rainfall events in future climate.

August 22, 2019 (Thursday) –

- Setting up for RRI model for flood modeling under changing climate



Flood Early Warning & Risk mapping

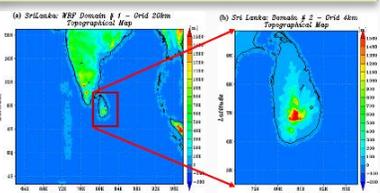


Climate Change Impacts Assessments

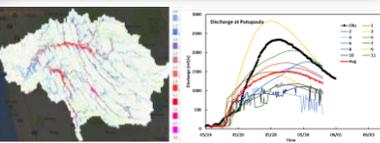


Capacity Building for Facilitators

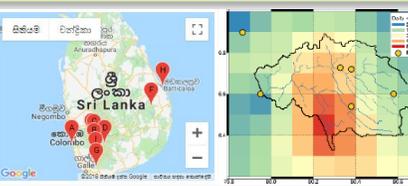
Basin Scale
Rainfall forecasting



Flood monitoring & forecasting



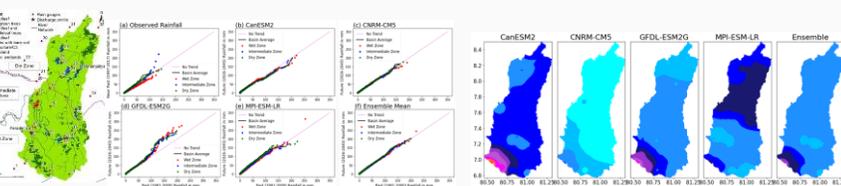
Rainfall monitoring and integration



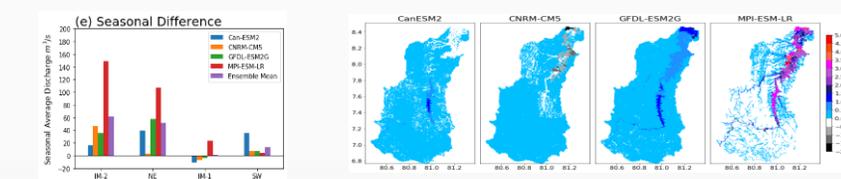
Visualization & Online dissemination



Basin
GCM projected rainfall downscaling and impact assessments on rainfall



Qualitative and quantitative Changes in river discharges and floods



Hot-spot
High-resolution flood inundation mapping (2-D, 3-D)



Support planning of evacuation, prevention, rescue, and recovery

- Hazard & Risk Information
- Crisis management & resource allocation tools

Hot-spot
High-resolution flood hazard mapping (2-D, 3-D)



Evidence-based long-term planning policy making

- Hazard & Risk Information
- Optimized dam and irrigation practices (hydropower vs irrigation)



Contingency planning with national and local agencies

Economic Impacts of disasters

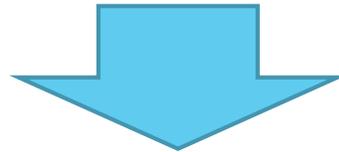
Adaptation planning

E-Learning Materials (Lectures & tutorials)

- Flood Early Warning
 - Ensemble rainfall forecasting
 - Rainfall monitoring and integration
 - Flood modeling
 - Flood mapping (2-D, 3-D)
 - Contingency planning
 - Disaster impact assessment
- Climate Change Impact Assessments
 - GCM downscaling
 - Flood modeling & hazard mapping
 - contingency planning
 - Dam optimization

Capacity Building Requirements

- ▶ Capacity Building on
 - ▶ Hydrological modelling, forecasting and early warning
 - ▶ Climate change impact assesment
 - ▶ Drought monitoring and prediction
 - ▶ Flood hazard mapping and visualization
 - ▶ Sediment disaster risk identification
 - ▶ Evacuation and contingency planning under COVID-19
 - ▶ Ensemble rainfall forecasting
 - ▶ Forecast informed reservoir operation for flood control and power generation
 - ▶ Cultural and historical approaches for disaster resilience and sustainability



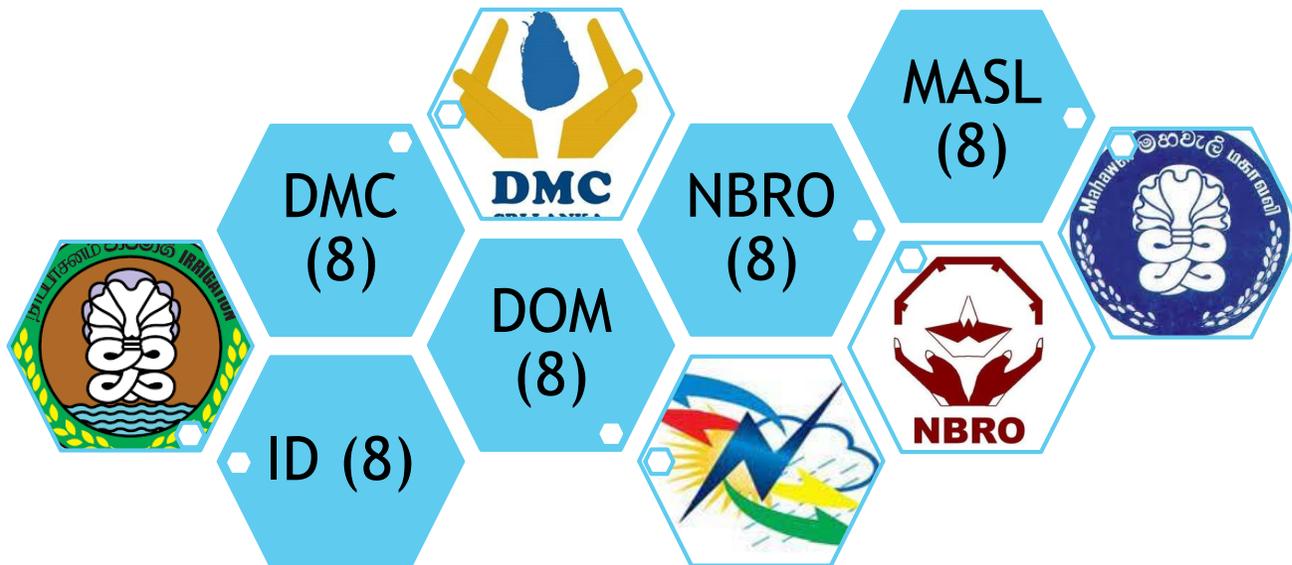
- ▶ E-learning under Online Synthesis System of Japan
 - ▶ Facilitator training (30 ~ 40 participants will join)
 - ▶ Expert training (100 ~200 participants will be trained by facilitators)

E-learning under OSS: Plan and Schedule

Totally 40 facilitators from stakeholder agencies will be trained.

- Irrigation Department
- Disaster Management Centre
- Department of Meteorology
- National Building Research Organization
- Mahaweli Authority of Sri Lanka

<i>Course 1: Science bases for climate change adaptation and disaster resilience</i>		
CC-1	Climate resilience and sustainability by all	Prof. Toshio Koike
CC-2	Introduction to atmospheric modeling for climate change impact assessment and hydrologic early warning	Prof. Tomoki Ushiyama
CC-3	Introduction to hydrological modeling for climate change impact assessment and flood early warning	Prof. Mohamed Rasmy
CC-4	Climate change impact assessment in the Mahaweli river basin	Dr. Hemakanth Selvarajah
DM-1	Introduction to agricultural drought monitoring and prediction	Dr. Hiroyuki Tsutsui
CH-1	Cultural and historical approaches for disaster resilience and sustainability	Prof. Kenzo Hiroki
<i>Course 2: Actions to be taken for climate change adaptation and disaster resilience</i>		
OSS-1	Let's use an online synthesis system for sustainability and resilience (OSS-SR)	Dr. Katsunori Tamakawa
DRR-1	Flood hazard mapping and visualization	Dr. Naoko Nagumo
DRR-2	Flood disaster evacuation and contingency planning under COVID-19	Prof. Miho Ohara
DRR-3	Sediment disaster risk identification	Dr. Daisuke Harada
DRR-4	Hydroelectric dam operation support to improve flood control and power generation	Prof. Toshio Koike
DRR-5	New strategies for reservoir operation using seasonal forecast streamflow in Mahaweli River Basin, Sri Lanka	Dr. Hemakanth Selvarajah



Thank you very much