About the Speaker : Sanjeewa Illangasingha

- From Anuradhapura, Sri Lanka
- Chartered Civil Engineer , Works 15 years at Mahaweli Authority of Sri Lanka
- Double Master’s from the UNESCO-IHE Delft, Nederland's, and University of Peradeniya, Sri Lanka
  Completed PhD in Disaster Management @ ICHARM/GRIPS, Japan
- Water Resources Planning, Planning & design (soft & Hard) for Climate Change Adaptation and Disaster Risk Reduction (DRR), Water Management
- Interesting Water sharing polices and flood and drought monitoring tools, Hydropower

A HOLISTIC ANALYSIS SYSTEM TO SUPPORT WATER RESOURCE POLICY DECISIONS UNDER CLIMATE CHANGE

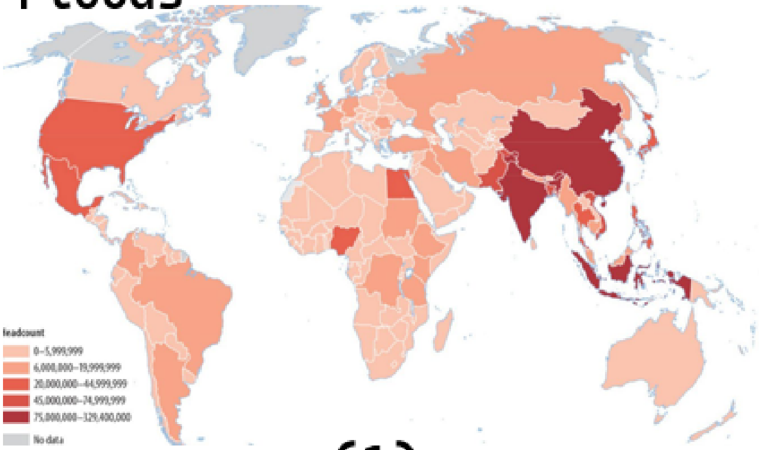
(SOLUTIONS WITH UTILIZE EARTH INTELLIGENCE)

2024 AOGEO Symposium
Special Session 2 Highlighting the Early-Careers
5th Sep 2024 13.00-14.00

Situation of the Disasters & Root Causes

- ✓ Tsunami /, Floods, Droughts , Landslides, Land Subsidence ,Cyclones ,Lighting/Thunderstone ,Coastal Erosion , Salinization
- ✓ Earth Quakes , Forest Fire , Heat Wave/Human-made Disasters
- ✓ 74% of natural disasters were water-related (Between 2001 and 2018) (UN WWDR, 2020)
- ✓ Over 90% of natural disasters were water-related in 2023 (UNEP,2024)

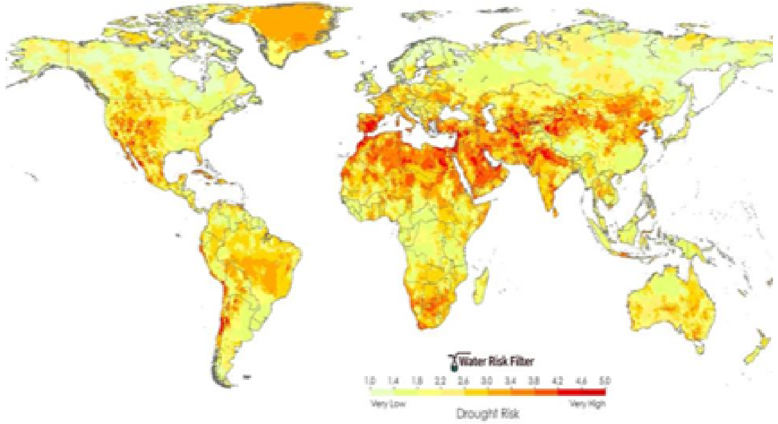
Climate change Impact - Floods



(1)

Millions people exposure to 15cm or more flood inundation risk (Source WB,2022)

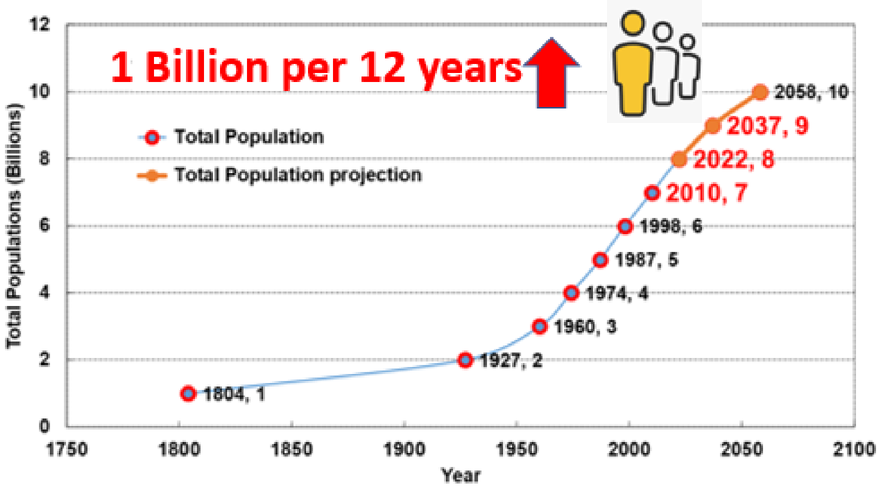
Climate change Impact - Droughts



(2)

1/5% of large cities are at high/very high risk of drought (WWF,2018)

World Populations Increasing



(3)

Rapid increasing of Population (UN Population, 2022)

Requirement of Addressing the DRR policies

1. Sustainable Development Goals / SDGs (2015)
2. Paris Agreement / PA (2015)
3. Sendai Framework for Disaster Risk Reduction / SFDRR (2015)
4. Kumomoto Declaration / KD 2022
5. Water Conference 2023 / WC 2023

Climate Change (CC) Disasters

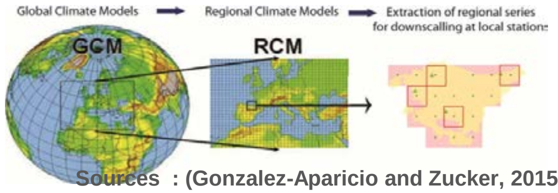
Climate Services for Projecting the Future Climatic variable

There are Gaps for applying science and technology for **CC on Decision Making**

Building Sustainable society by strengthen disaster resilience (1) + (3)

(A) Five principles for using global climate model (GCM) outputs in decision-making on climate variabilities

1. The climate models used for decision-making should accurately represent the current regional climate
2. When using GCMs at the regional or local scale, downscaling and bias correction should be implemented
3. The climatic sensitivity of climate models should be identified
4. The disparities in outcomes among climate models should be understood
5. Climate models should be able to address diverse environments



Sources : (Gonzalez-Aparicio and Zucker, 2015)

(B) Five guiding principles aimed at addressing gaps in hydrological analysis for analyzing the influence of Climate change on water availability

1. Utilize reliable GCM outputs as inputs to hydrological models
2. Seamless - capable hydrology models
3. Climate change features identification: using various hydro-meteorological indices SPI,SSI,SSMI,SETI
4. Recognize key climate change phenomena
5. Diverse environments capability

Rainfall Projection → **Hydrological Parameter** → **Solution by Trans Basin Water Sharing** → **Conclusion**

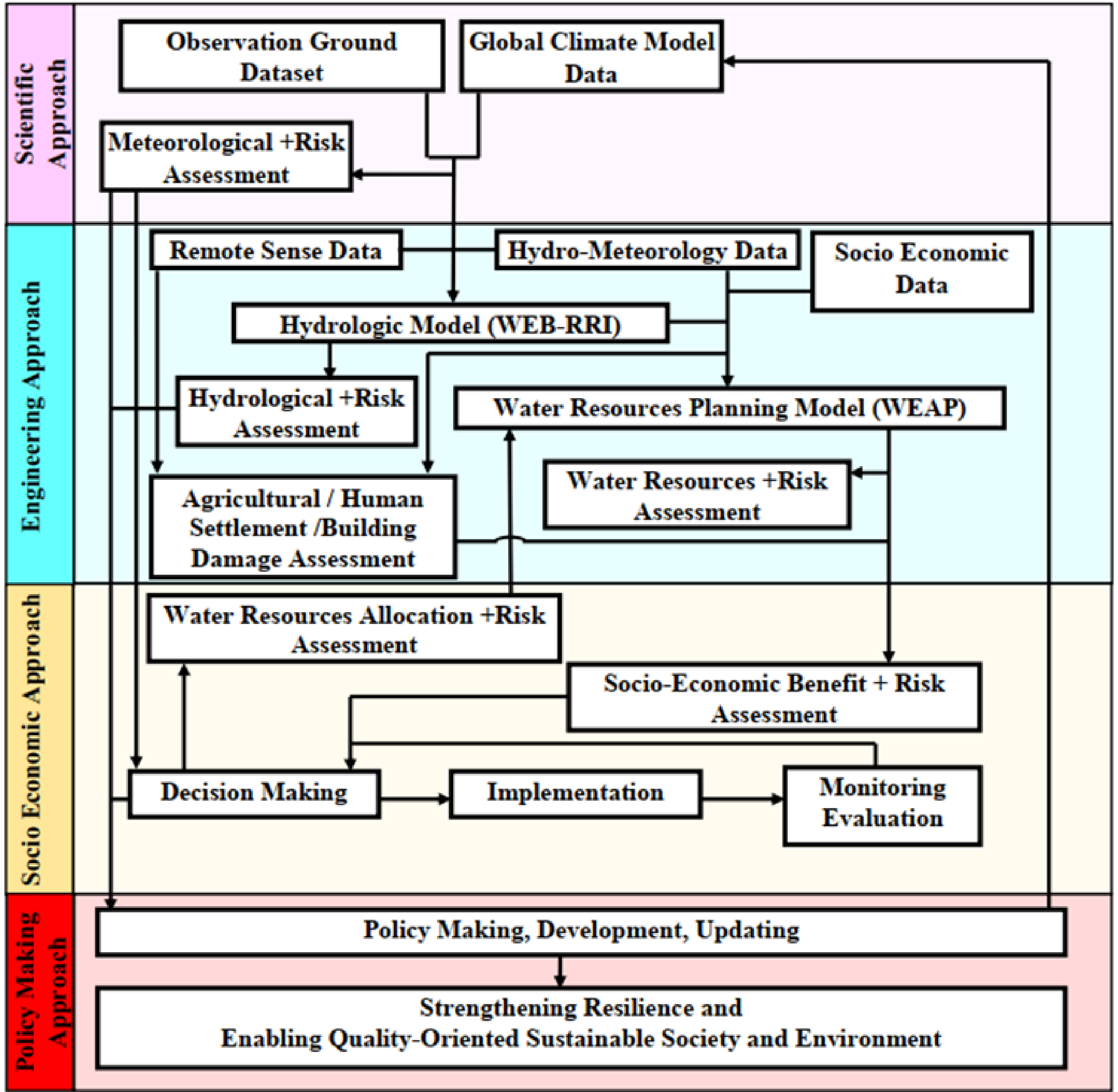
Framework

Rainfall Projection

Hydrological Parameter

Solution by Trans Basin Water Sharing

Conclusion



Scientific Approach

Observation Ground Dataset

Global Climate Model Data

Meteorological +Risk Assessment

Engineering Approach

Remote Sense Data

Hydro-Meteorology Data

Socio Economic Data

Hydrologic Model (WEB-RRI)

Hydrological +Risk Assessment

Water Resources Planning Model (WEAP)

Water Resources +Risk Assessment

Agricultural / Human Settlement /Building Damage Assessment

Socio Economic Approach

Water Resources Allocation +Risk Assessment

Socio-Economic Benefit + Risk Assessment

Decision Making

Implementation

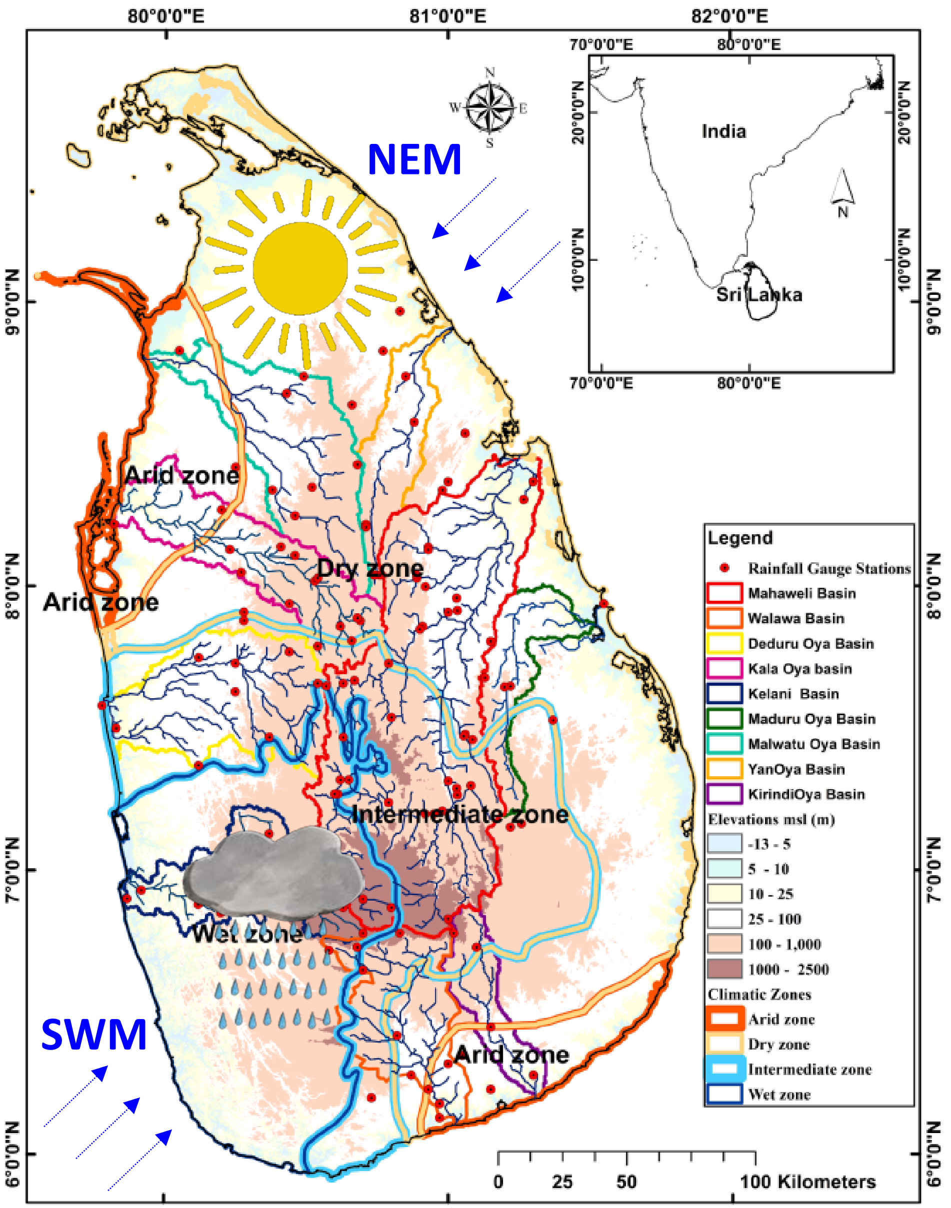
Monitoring Evaluation

Policy Making Approach

Policy Making, Development, Updating

Strengthening Resilience and Enabling Quality-Oriented Sustainable Society and Environment

Study Area – Application for Diverse Regions



✓Total Area : 65,610 km^2

✓No. of river basins :103

✓Major Reservoirs and Dams : 80

✓Small Tanks : 14000< , Small Anicuts:12500<

✓Annual Average Rainfall:2000 mm

✓4 Climatic Zones (based on annual rainfall)

(Wet > 2500 mm , Intermediate < 2500 mm , dry < 1750 mm , Arid <1200 mm)

✓Two Monsoon – SWM –May- Sept.
NEM – Oct- Feb.

✓Total Water Volume : 133 Billion m^3

✓Discharge to sea : 66 Billion m^3
(N. Eriyagama et al 2015)

✓Command area :625,000 ha

✓Main Hydro Power- 1500 MW

AOGEO

Earth Intelligence Utilization:

✓ The Earth observation data sources

- ➢ Climate projections, Hydrology model development and projection, Drought Monitoring and Projection, Water Resources Planning Model Development

(e.g., satellite data / remote sensing ,ground data, hydrometeorology data)

✓ Innovative Methods:

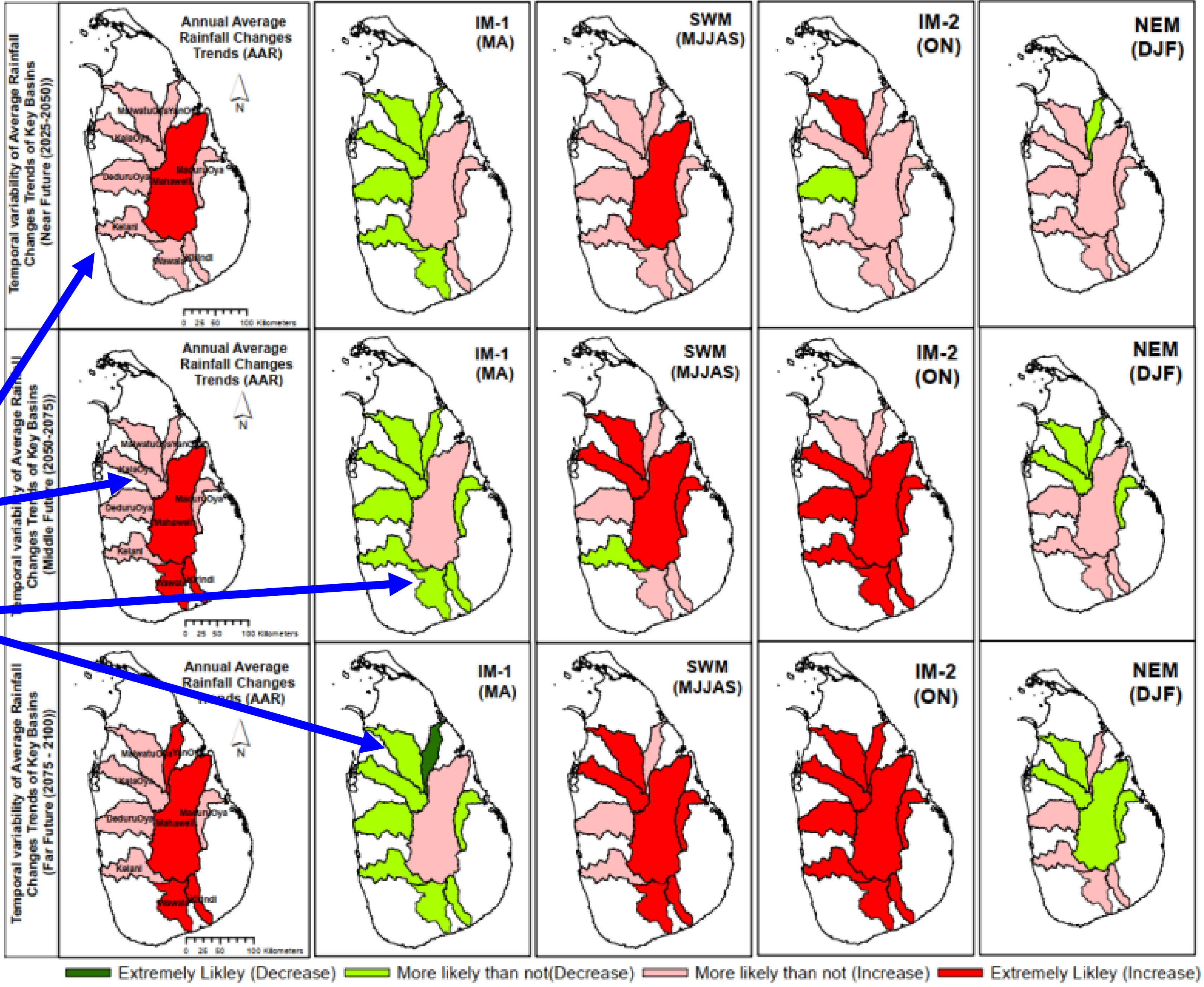
- ➢ Big data analytics to process and analyse these data sources (DIAS Platform CIM5 data, observation rainfall and runoff data)
- ➢ Machine learning – Drought projection
- ➢ Couple model development WEB-RRI with WEAP

Future seasonal and annual precipitation likelihood trend for basins

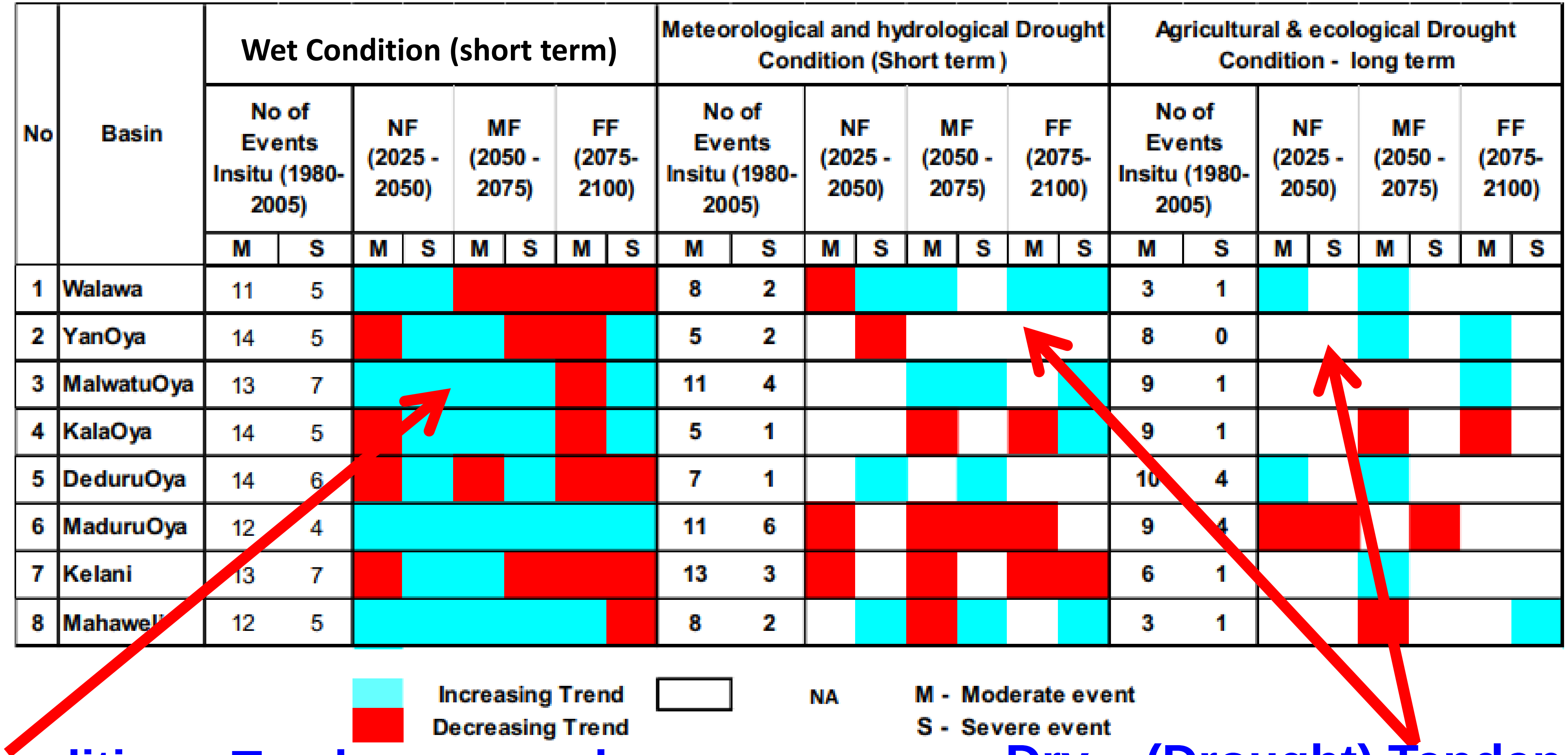
🟥 Increasing

🟩 Decreasing

For More Details



Integrated Hydrometeorological Indices Analysis: SPI, SSI, SSMI, and SETI Event Projections (Overview)



No	Basin	Wet Condition (short term)								Meteorological and hydrological Drought Condition (Short term)								Agricultural & ecological Drought Condition - long term							
		No of Events Insitu (1980-2005)		NF (2025 - 2050)		MF (2050 - 2075)		FF (2075-2100)		No of Events Insitu (1980-2005)		NF (2025 - 2050)		MF (2050 - 2075)		FF (2075-2100)		No of Events Insitu (1980-2005)		NF (2025 - 2050)		MF (2050 - 2075)		FF (2075-2100)	
		M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S
1	Walawa	11	5	🟦	🟦	🟥	🟥	🟥	🟥	8	2	🟥	🟦	🟦	⬜	🟦	🟦	3	1	🟦	⬜	🟦	⬜	⬜	⬜
2	YanOya	14	5	🟥	🟦	🟦	🟥	🟥	🟦	5	2	⬜	🟥	⬜	⬜	⬜	⬜	8	0	⬜	⬜	🟦	⬜	🟦	⬜
3	MalwatuOya	13	7	🟦	🟦	🟦	🟦	🟥	🟦	11	4	⬜	⬜	🟦	🟦	⬜	🟦	9	1	⬜	⬜	⬜	⬜	🟦	⬜
4	KalaOya	14	5	🟥	🟦	🟦	🟦	🟥	🟦	5	1	⬜	⬜	🟥	⬜	🟥	🟦	9	1	⬜	⬜	🟥	⬜	🟥	⬜
5	DeduruOya	14	6	🟥	🟦	🟥	🟦	🟥	🟥	7	1	⬜	🟦	⬜	🟦	⬜	⬜	10	4	🟦	⬜	🟦	⬜	⬜	⬜
6	MaduruOya	12	4	🟦	🟦	🟦	🟦	🟦	🟦	11	6	🟥	⬜	🟥	🟥	🟥	⬜	9	4	🟥	🟥	⬜	🟥	⬜	⬜
7	Kelani	13	7	🟥	🟦	🟦	🟥	🟥	🟥	13	3	🟥	⬜	🟥	⬜	🟥	🟥	6	1	⬜	⬜	🟦	⬜	⬜	⬜
8	Mahawel	12	5	🟦	🟦	🟦	🟦	🟦	🟥	8	2	⬜	🟦	🟥	🟦	⬜	🟦	3	1	⬜	⬜	🟥	⬜	⬜	🟦

🟦 Increasing Trend

🟥 Decreasing Trend

⬜ NA

M - Moderate event

S - Severe event

Wet Condition - Tendency vary by basin, temporal

Dry – (Drought) Tendency Not so Clear, Uncertainty

Flood Damage on Paddy

High Sensitivities of Paddy Damage

Increasing Flood Damage on Paddy

			total paddy extend (%)	GCMs																	
				1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	NF	MF	FF
1	**Walawa**	235	2.8	-7	-67	15	64	-2	64	[illegible]	59	202	74	-42	21	16	220	-2	- 3	+ 4	+ 3
2	**YanOya**	265	5.4	9	9	69	71	39	70	-6	200	69	57	47	-45	266	14	56	+ 5	+ 4	+ 4
3	**MalwatuOya**	556	2.7	-1	645	233	58	65	22	723	386	86	397	-15	740	98	19	246	+ 4	+ 5	+ 4
4	**KalaOya**	655	3.4	-21	177	1	20	119	132	272	-9	90	742	-15	180	2	82	377	+ 4	+ 4	+ 4
5	**DeduruOya**	712	5.0	9	-14	38	7	17	77	18	-7	48	68	42	-2	53	28	56	+ 4	+ 4	+ 4
6	**MaduruOya**	120	4.2	14	-14	0	0	0	29	14	0	50	17	0	-14	0	67	0	+ 3	+ 4	+ 3
7	**Kelani**	169	34.6	13	-22	-14	22	9	28	4	-7	42	32	1	10	-3	43	7	+ 3	+ 4	+ 4
8	**Mahaweli**	1201	13.5	-2	-13	58	17	47	47	-31	67	38	58	81	-10	7	73	20	+ 3	+ 4	+ 4

Sensitivity

🟧	Degree of Difference of Damage increase (0 - 25 %)	🟩	Degree of Difference of Damage decrease (0 - 25 %)
🟨	Degree of Difference of Damage increase (25 - 50 %)	🟩	Degree of Difference of Damage decrease (25 - 50 %)
🟫	Degree of Difference of Damage increase (50 - 100 %)	🟩	Degree of Difference of Damage decrease (50 - 100 %)
🟧	Degree of Difference of Damage increase (100 % <)	🟩	Degree of Difference of Damage decrease (100 % <)

Trends

🟦	Increase
🟥	Decrease
🟨	Same

Drought Damage on Paddy / Basin Ave. VHI

2. Sensitivity of future projections for probable maximum paddy damage due to agricultural drought based on Basin Average Vegetation Health Index (VHI)

No	River Basin	Basin Average Vegetation Health Index (VHI) - Past (1980-2005)					Basin Average Vegetation Health Index (VHI) - NF (2025-2050)					Basin Average Vegetation Health Index (VHI) - MF (2050-2075)					Basin Average Vegetation Health Index (VHI) - FF (2075- 2100)					VHI Trends		
		GCMs																						
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	NF	MF	FF
1	Walawa	0.327	0.397	0.381	0.288	0.372	0.339	0.408	0.383	0.347	0.346	0.383	0.383	0.31	0.253	0.392	0.385	0.372	0.4	0.403	0.388	4	3	3
2	YanOya	0.167	0.236	0.142	0.203	0.156	0.174	0.131	0.172	0.188	0.239	0.129	0.139	0.114	0.219	0.17	0.219	0.145	0.195	0.255	0.159	-3	-4	-3
3	MalwatuOya	0.266	0.188	0.026	0.229	0.254	0.371	0.114	0.026	0.316	0.244	0.145	-0.01	0.043	0.134	0.253	0.194	0.007	-0.14	-0.1	0.141	3	-4	-5
4	KalaOya	0.363	0.32	0.348	0.186	0.256	0.268	0.267	0.281	0.347	0.132	0.17	0.181	0.215	0.18	0.377	0.288	0.4	0.314	0.302	0.212	3	-3	3
5	DeduruOya	0.705	0.739	0.691	0.759	0.711	0.765	0.714	0.733	0.674	0.686	0.724	0.767	0.72	0.722	0.655	0.717	0.686	0.748	0.711	0.711	-4	-3	-5
6	MaduruOya	0.495	0.438	0.506	0.476	0.46	0.481	0.438	0.46	0.437	0.422	0.451	0.526	0.471	0.45	0.444	0.422	0.4	0.466	0.428	0.496	-5	-3	-4
7	Kelani	0.56	0.571	0.554	0.523	0.558	0.551	0.578	0.532	0.556	0.56	0.564	0.527	0.552	0.523	0.573	0.559	0.541	0.536	0.59	0.577	3	-3	3
8	Mahaweli	0.382	0.366	0.354	0.365	0.348	0.356	0.362	0.367	0.368	0.366	0.355	0.343	0.321	0.377	0.368	0.378	0.365	0.327	0.351	0.359	5	-3	4

Duration

NF (2025-2050)
MF (2050-2075)
FF (2075-2100)

Sensitivity

🟫	< 0.2	Extreme & Severe Drought	⬜	< 0.4	Mild drought
🟧	<0.3	Moderate Drought	🟩	>0.4	No drought

Probability (likelihood) Occurrence Matrix	% Range	In case of five models
More likely than not	> 50 - 100 %	(3/5,4/5)
Extremely Likely	95 - 100 %	5 /5

Trends

🟦 Increase -Less Damage
🟥 Decrease- More Damage

Demand site coverage

Example-Two Demand Sites + GCM (CNRM-CM5)

A) Without Diversion Demand Site Coverage - Past (1990 -2015) - Yala Season

Basin	Demand Site	No of seasons				
		Water Demand Coverage Percentage (sufficient / Insufficient)				
		100%	75 - 99%	50 - 75%	25 – 50 %	0 - 25 %
MalwatuOya	Anuradhapura-WB	9	0	0	2	5
KalaOya	H-Kalawewa	2	0	3	7	4

A) With Current Diversion Demand Site Coverage - Past (1990 -2015) - Yala Season

Basin	Demand Site	No of seasons				
		Water Demand Coverage Percentage (sufficient / Insufficient)				
		100%	75 - 99%	50 - 75%	25 – 50 %	0 - 25 %
MalwatuOya	Anuradhapura-WB	16	0	0	0	0
KalaOya	H-Kalawewa	16	0	0	0	0

B) Without Diversion Demand Site Coverage - Near Future (2025 – 2045) - Yala Season (CNRM-CM5)

Basin	Demand Site	No of seasons				
		Water Demand Coverage Percentage (sufficient / Insufficient)				
		100%	75 - 99%	50 - 75%	25 – 50 %	0 - 25 %
MalwatuOya	Anuradhapura-WB	6	0	0	0	14
KalaOya	H-Kalawewa	1	0	1	12	6

B) With Current Diversion Demand Site Coverage - Near Future (2025 – 2045) - Yala Season (CNRM-CM5)

Basin	Demand Site	No of seasons				
		Water Demand Coverage Percentage (sufficient / Insufficient)				
		100%	75 - 99%	50 - 75%	25 – 50 %	0 - 25 %
MalwatuOya	Anuradhapura-WB	20	0	0	0	0
KalaOya	H-Kalawewa	20	0	0	0	0

Without Diversion

With Current Diversion

AOGEO

With Current Diversion (PAST + Future (GCM) CAN_ESM2,CNRM_CM5)

Basin	Demand Site	Coverage Summary - Number Seasons (Water Sufficient/insufficient)																																																																				
		Yala Season (SWM)																				Maha Season (NEM)																				Yala (SWM)															Maha Season (NEM)														
		PAST (1990-2015)					GCM1-CNRM-CM5															PAST (1990-2015)					GCM1-CNRM-CM5															GCM2-CanESM2															GCM2-CanESM2														
							NF(2025-2045)					MF(2050-2070)					FF(2075-2095)										NF(2025-2045)					MF(2050-2070)					FF(2075-2095)					NF(2025-2045)					MF(2050-2070)					FF(2075-2095)					NF(2025-2045)					MF(2050-2070)					FF(2075-2095)				
		Coverage Percentage /(%)																																																																				
		100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25	100	99-75	75-50	50-25	<25
Malwatuoya	Anuradhapura-WB	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
MaduruOya	B-Maduru Left Bank	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	C1,C2-Ulhiiya/Rathkinda	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	D1-Giritale	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	D1-Kantale	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	D1-Kaudula	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	D1-Minneriya	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	D2-ParakramaSamudyara	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
KalaOya	Dambulla-WB	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
KalaOya	Eppawala-WB	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
KalaOya	H-DambuluOya	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
KalaOya	H-Kalawewa	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
KalaOya	H-Kandalama	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
KalaOya	H-Rajanganaya/Neela.	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
MalwatuOya	IH-Nachchaduwa	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
MalwatuOya	IH-Nuwarawewa	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
MalwatuOya	IH-Thisawewa	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
YanOya	KH Feeder Canal	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0
YanOya	MH-Huruluwewa	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	Peradeniya-WB	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	A- Allai	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	E - Minipe	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	20	0	0	0	0	19	0	0	0	0
Mahaweli	G -Elehera	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	16	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	19	0	0	0	0

Deficit Yala Season 🟨 Deficit Maha Season 🟪 100 % Coverage 🟦

✓ 100 % coverage Yala & Maha Season

✓ unmet demand = 0

Conclusion & Policies Proposal

- ✓ GCM sensitivity varies spatially and temporally
- ✓ More flood damages on paddy in future
- ✓ Drought projection involved more uncertainty specially in agricultural drought
- ✓ A simple detailed climate analysis chart may better communicate scientific messages to the scientific community and the public decision-makers.
- ✓ Socio-Economic direct benefits due to inter-basin(adjacent basins) water transfers for donor and recipient basins
- ✓ Climate change impacts can be mitigated by water sharing and utilization of existing water storages (resources) of the basins interconnected system

This proves that water-sharing systems can enhance societal robustness even under climate change scenarios

- ✓ **Develop a Holistic Analysis System**
- ✓ Establish or strengthen an integrated basin management authority
- ✓ Enhance Climate-Resilient Infrastructure
- ✓ Introduce automated water management and distribution system
- ✓ Promote International Collaboration

Thank you very much