

“PROTEC OUR RIVERS”

River Science

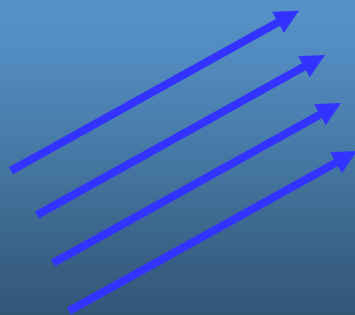
- Not that old compared to Lake Science or Limnology
- Since Noel Hynes Work in early 1960s
- Vannote and co-workers forwarded “River Continuum Concept” (1980)
- Nutrient Transport along the rivers
- Downstream drift
- Leaf litter decomposing
- Feeding guild and functional Feeding Groups
- Coupled with Eco-hydrology and phytotechnology
- Microbial Loop
- Latest, Near Census River Science

Atmospheric Depression

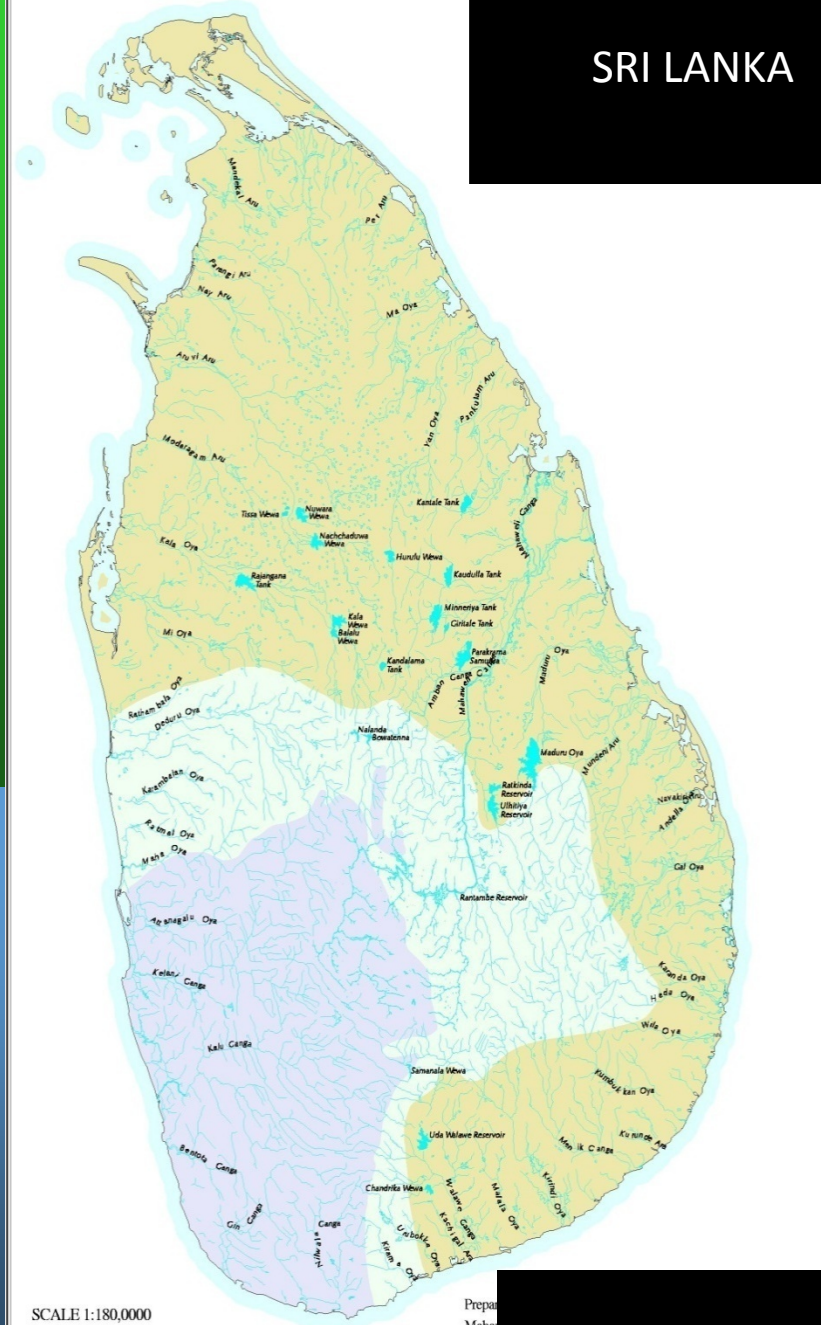


Arabic Sea

SW Monsoon

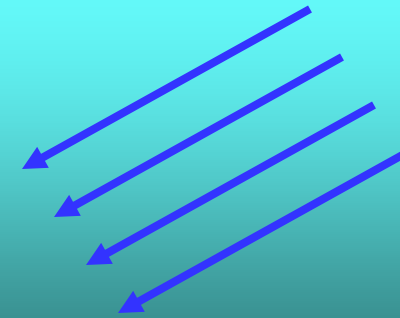


SRI LANKA



SCALE 1:180,000

Prepa
Maha
Our R



NE Monsoon

Atmospheric Depression



Bay of Bengal

Streams and Rivers

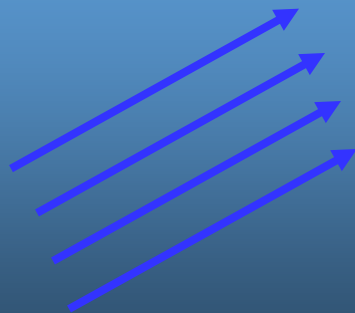
- Natural Resources
- Responsible for material transport on the planet earth via hydrologic cycle
- Hydrologic Cycle is the best treatment plant in nature
- Provide a variety of goods and services (Energy, food, transport, etc.,)
- People use river systems but, also misuse

Atmospheric Depression

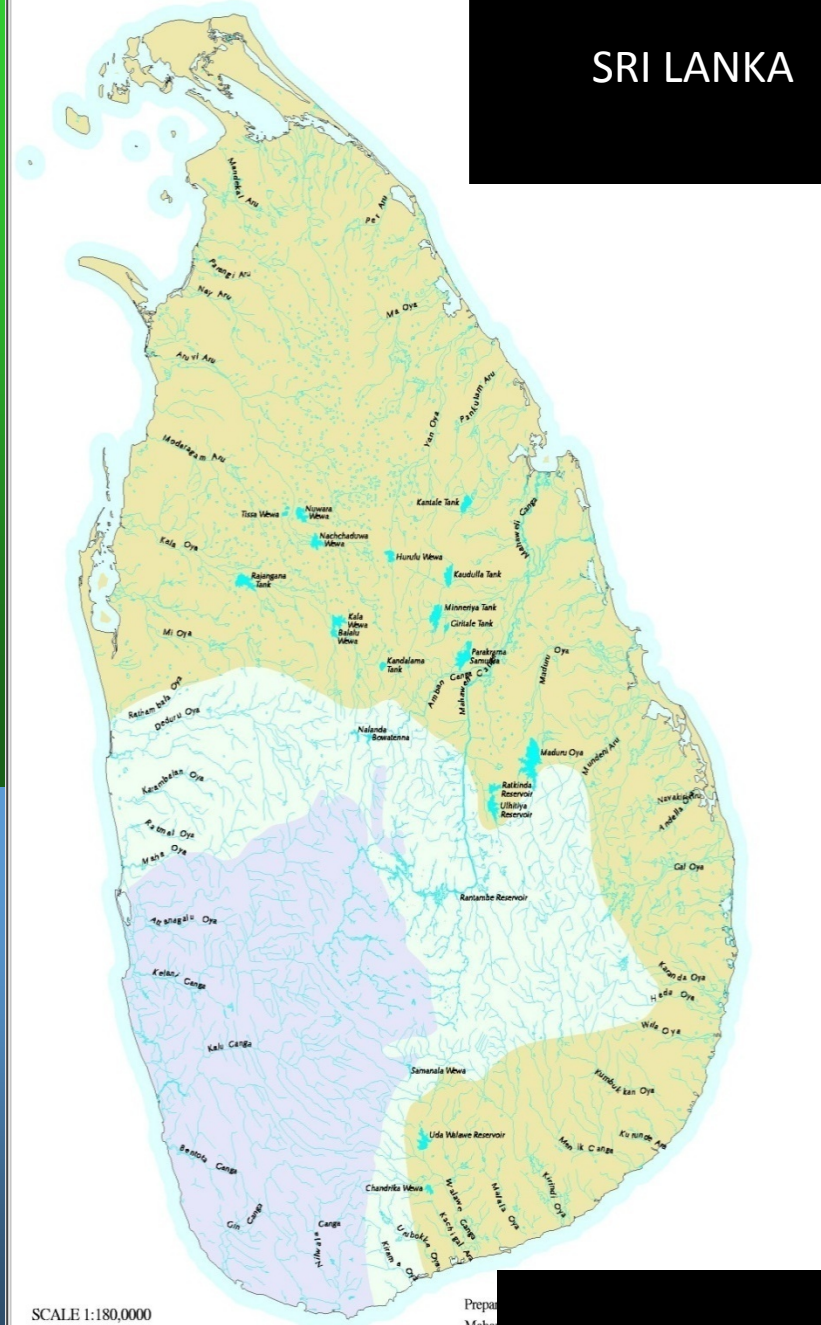


Arabic Sea

SW Monsoon

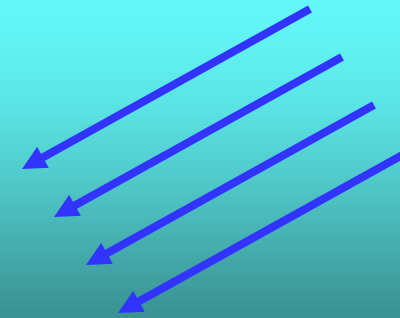


SRI LANKA



SCALE 1:180,000

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NE Monsoon

Atmospheric Depression



Bay of Bengal

Misconception of 103 River basins in Sri Lanka

To be corrected as 103 drainage basins, of which only 16 have perennial flows

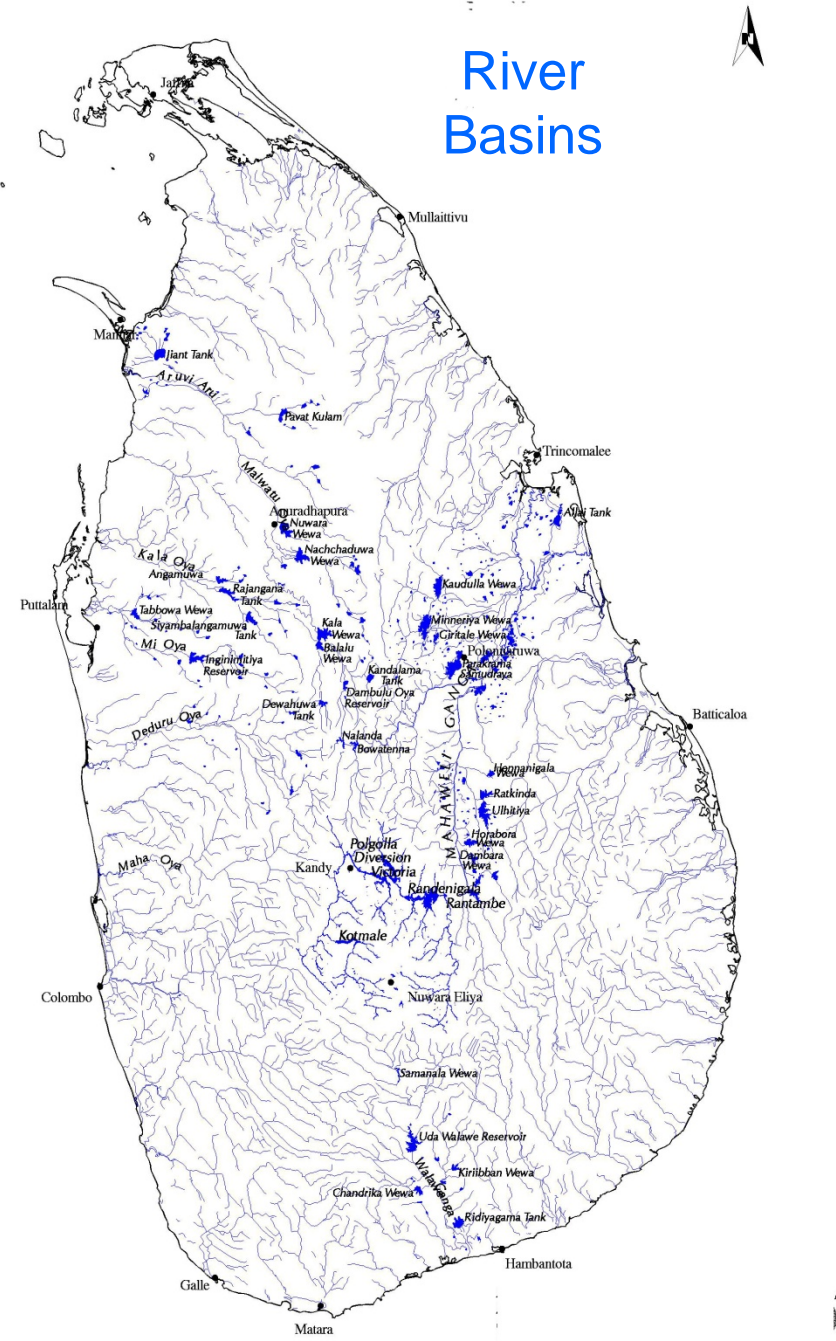
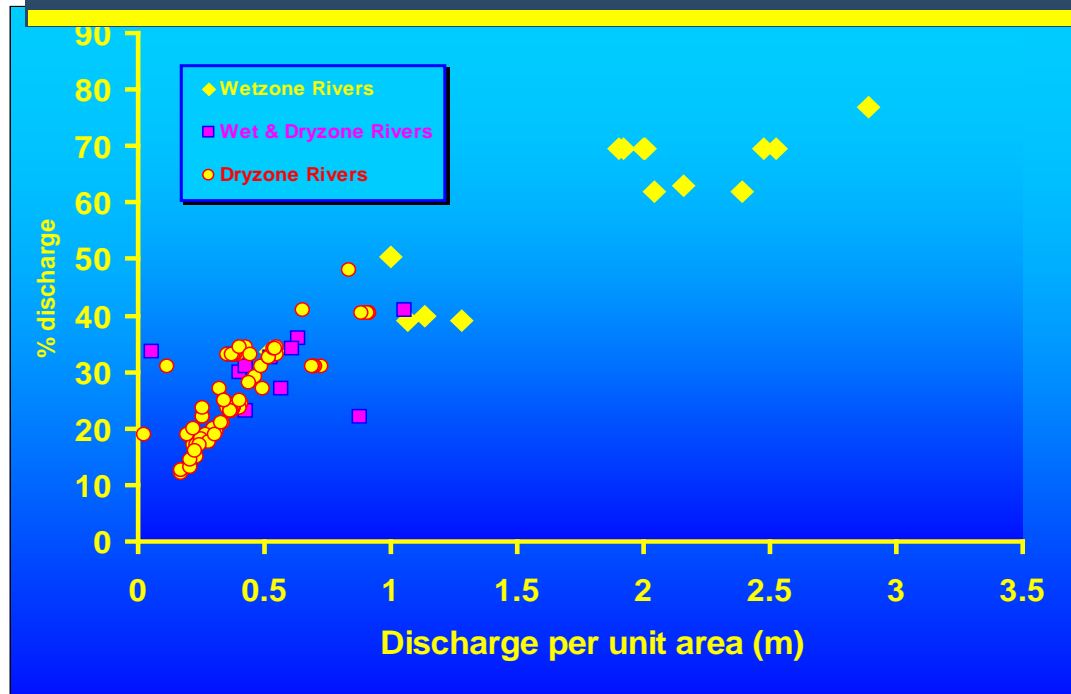
River	Disch. mcm	Range (mcm)	# Rivers
		1000-4999	7
Mahaweli	4009	500-999	2
Kalu	4038	300-499	11
Kelani	3417	100-299	15
Maha Oya	1746	50-99	12
Deduru Oya	1608	25-49	26
Gin	1262	010-24	17
Nilwala	1152	001-09	13

Water Resources

Rainfall 1593 mm/y

PPT Volume 109 km³

Discharge into Indian Ocean 27.8 km³



Mahaweli, Kelani, Kalu and Walawe rivers are not rising from Adam's Peak

- Mahaweli River from Pidurutalagala as Nanu Oya
- Kelani River from Adma's Peak as Baththulu Oya
- Kalu Ganga from Adma's Peak as Seetha Ganguala
- Walaw River from Horton Plains as Belihul Oya from Bakers Fall

Bolgoda Ganga, Telwatte Ganga, Madu Ganga,
Hikkaduwa Ganga etc., are not rivers;

they are back barrier lagoons originated during mid-
Holocene sea level rise

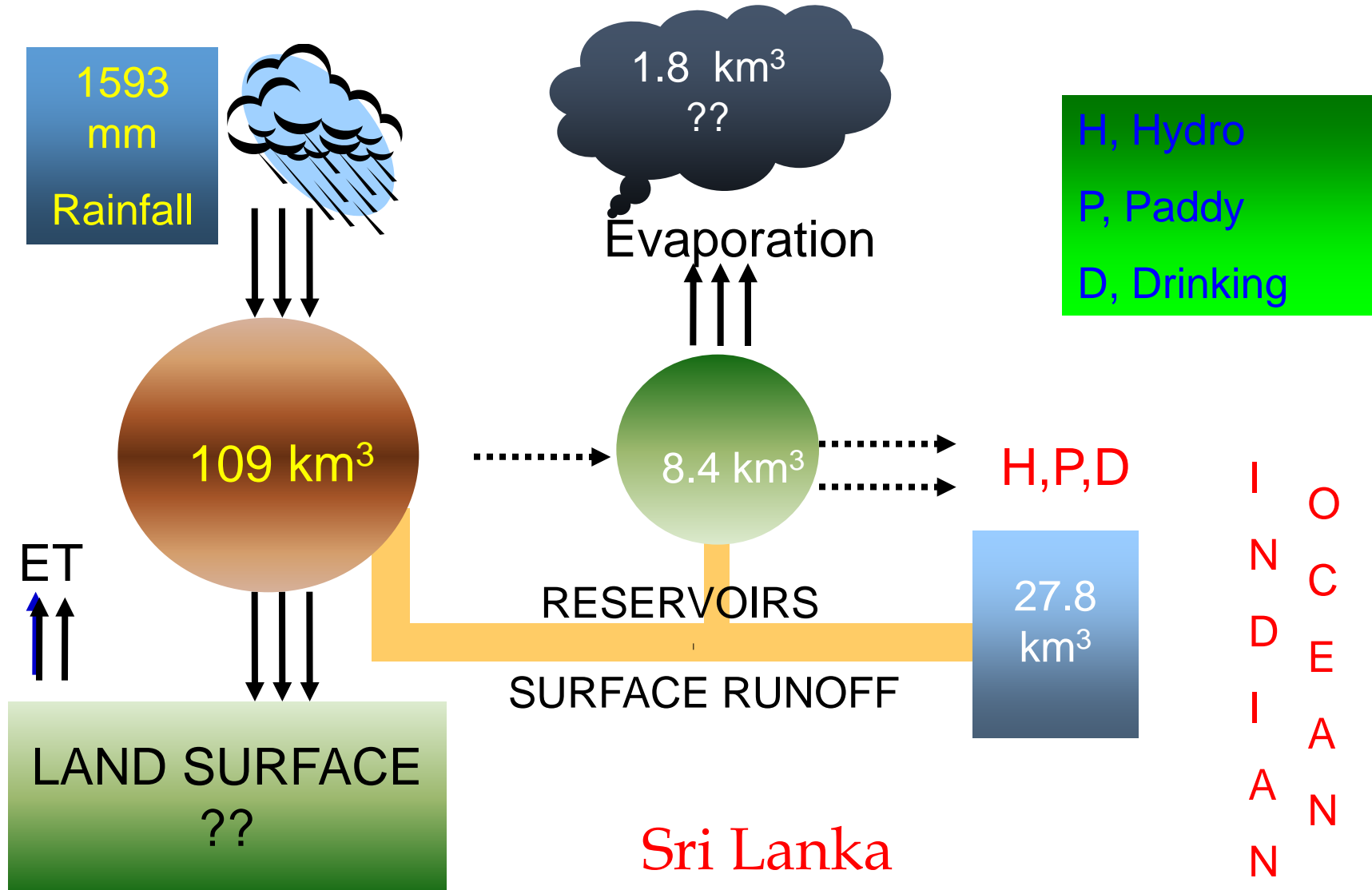
None of the major rivers has continuous flow from headwaters to downstream

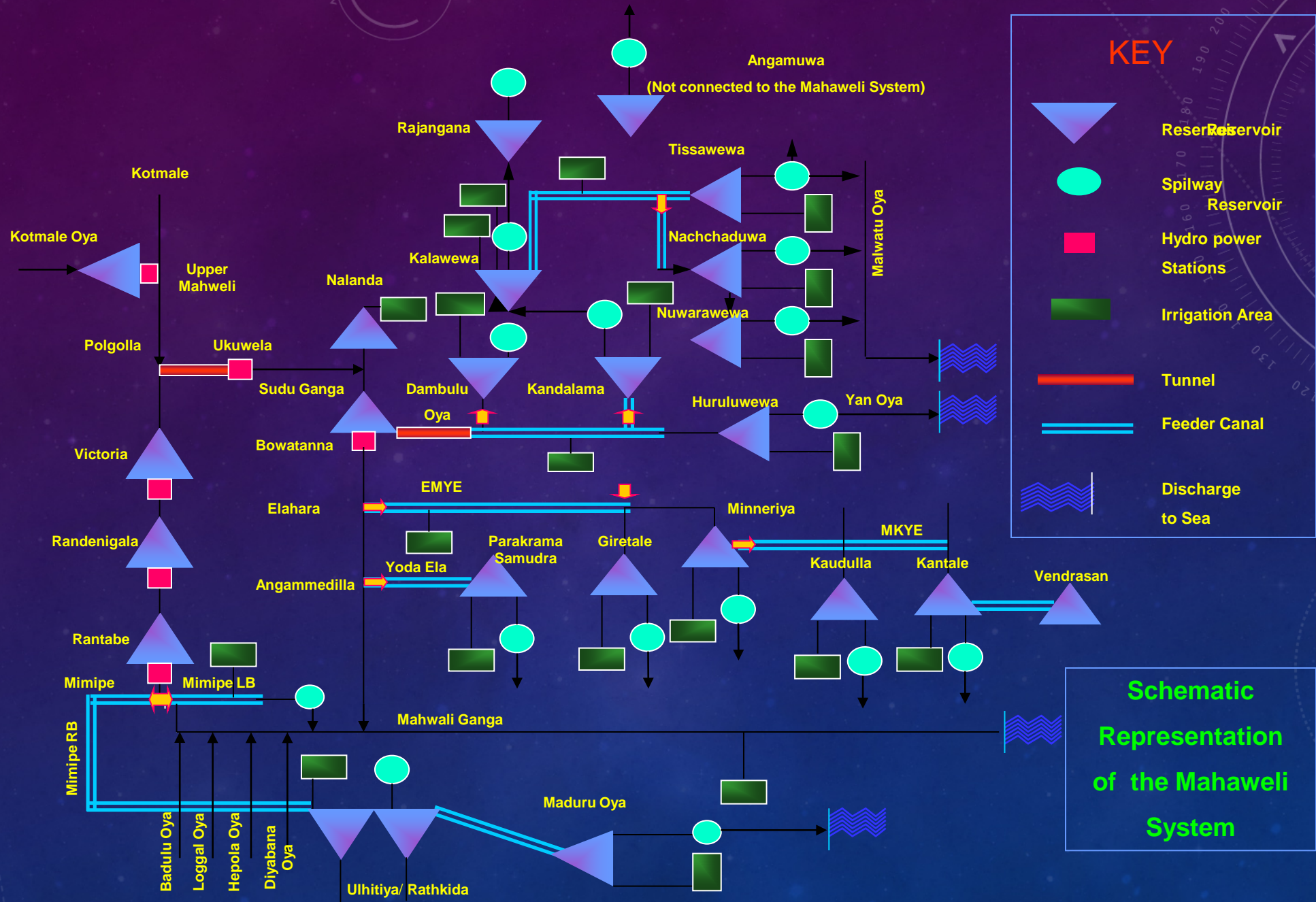
Certain Stretches of trunk streams are totally dead and continuum of river ecosystems

- Loss of flood plains or “villus”
- Disappeared delta
- Loss of material fluxes into the ocean

Yan Oya delta and Malathu Oya will be disappeared following the construction of proposed Malathu Oya and Yan Oya reservoirs

Local Hydrologic Cycle





Kotmale

Kotmale Oya

Upper Mahweli

Polgolla

Ukuwela

Victoria

Randenigala

Rantabe

Mimipe

Mimipe LB

Badulu Oya
Loggal Oya
Hepola Oya
Diyabana Oya

Rajangana

Nalanda

Kalawewa

Sudu Ganga

Dambulu Oya

Bowatanna

Angammedilla

Mahwali Ganga

Maduru Oya

Ulthiya/ Rathkida

Angamuwawa

(Not connected to the Mahaweli System)

Tissawewa

Nachchaduwa

Nuwarawewa

Kandalama

Huruluwewa

Yan Oya

EMYE

Minneriya

MKYE

Parakrama Samudra

Giretala

Kaudulla

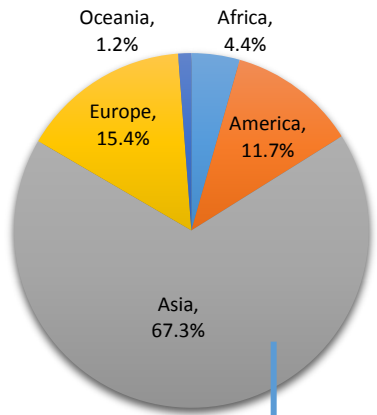
Kantale

Vendrasan

Malwatu Oya





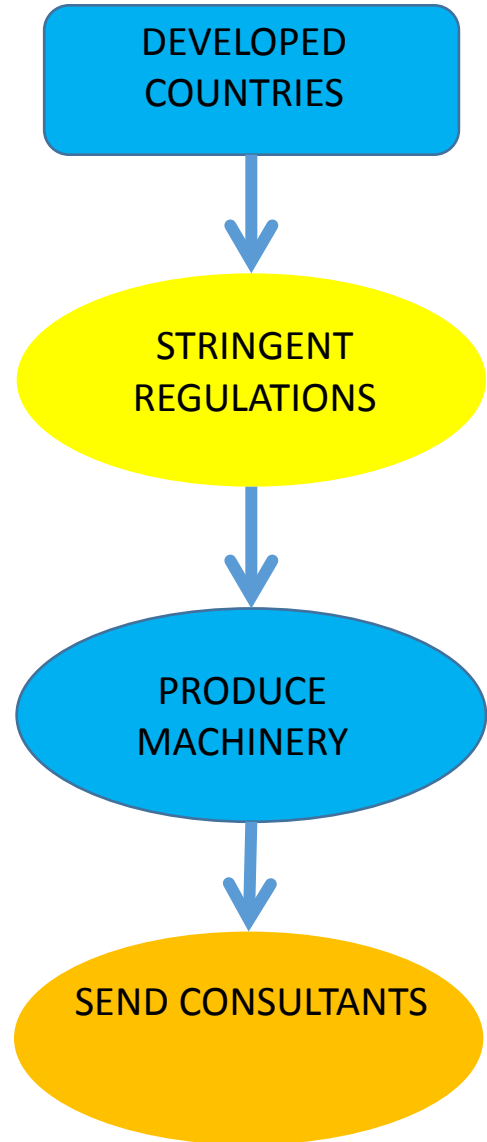


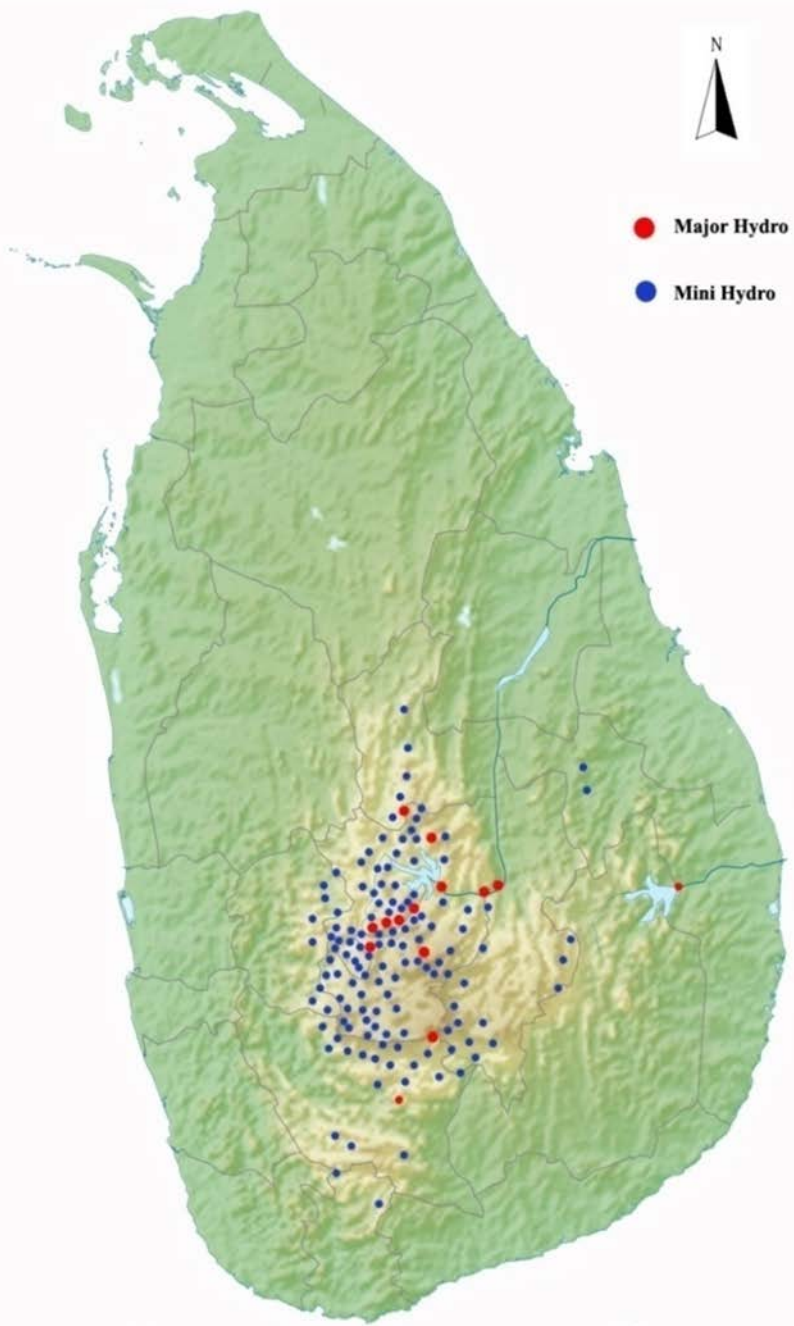
world potential

65.4 % in China

SMALL HYDROPOWER POTENTIAL IN SAARC COUNTRIES

Country	Potential (MW)	Tapped (MW)	%
Bangladesh	0.15	0.01	7
Nepal	1430	70	5
Sri Lanka	400	302	73.5
India	15000	3198	21
Bhutan	8	8.0	100
Afghanistan	1200	75	6
Pakistan	2265	281	12

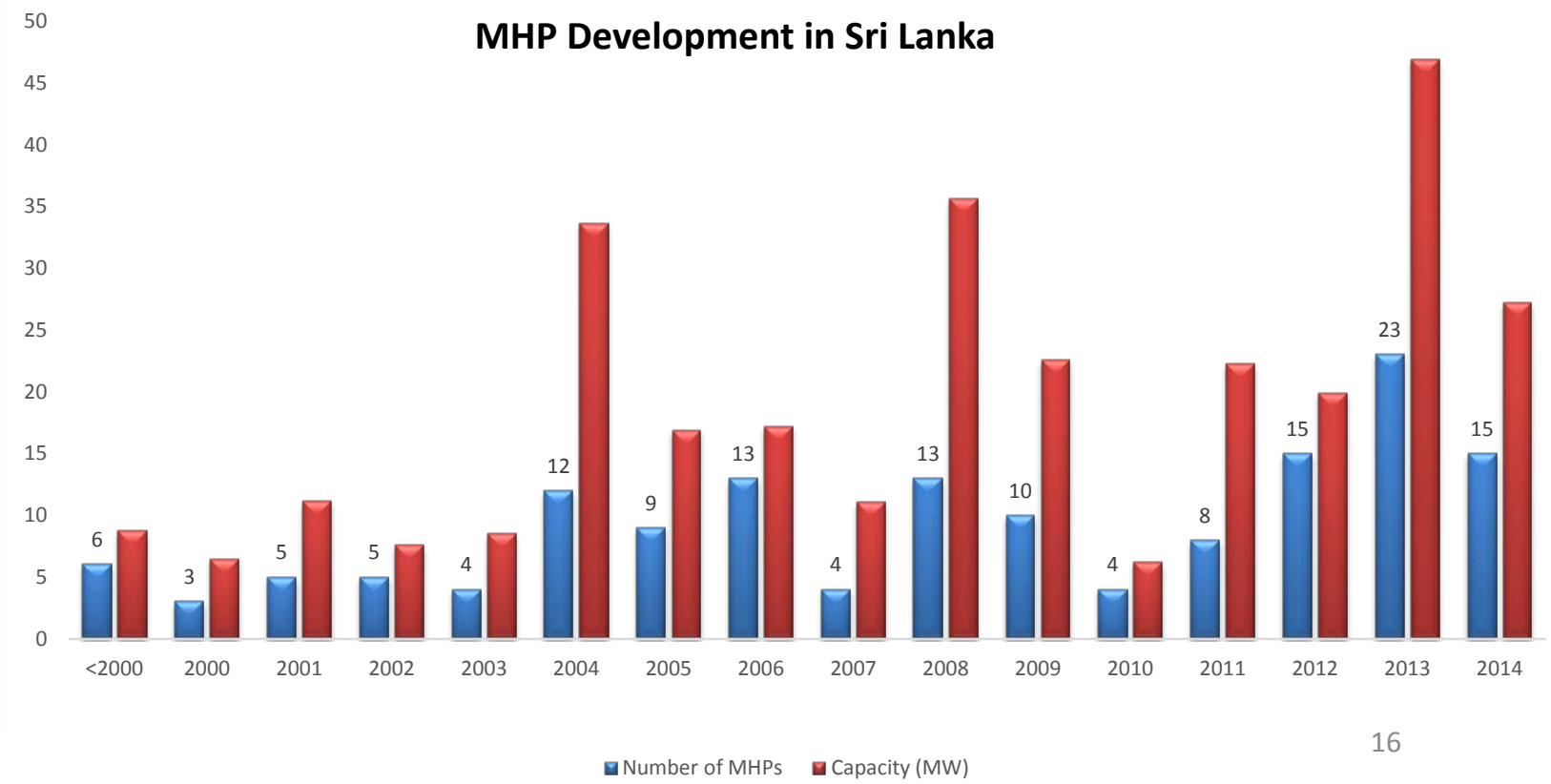




Mini Hydropower Plants in Sri Lanka

Mahaweli River	60
Kelani Ganga	31
Kalu Ganga	28
Walawe River	11
Others	13
Total	143
Under construction	37

MHP Development in Sri Lanka



Mini-hydro Massive Constructions



Devastating Destructions



Weirs

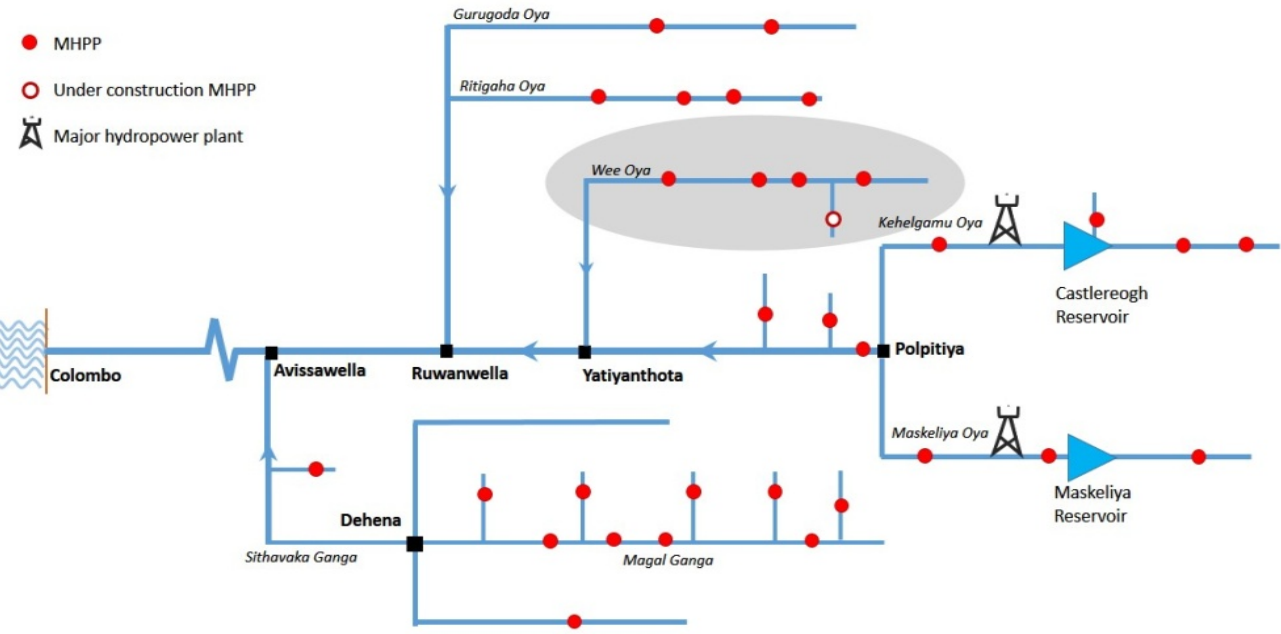
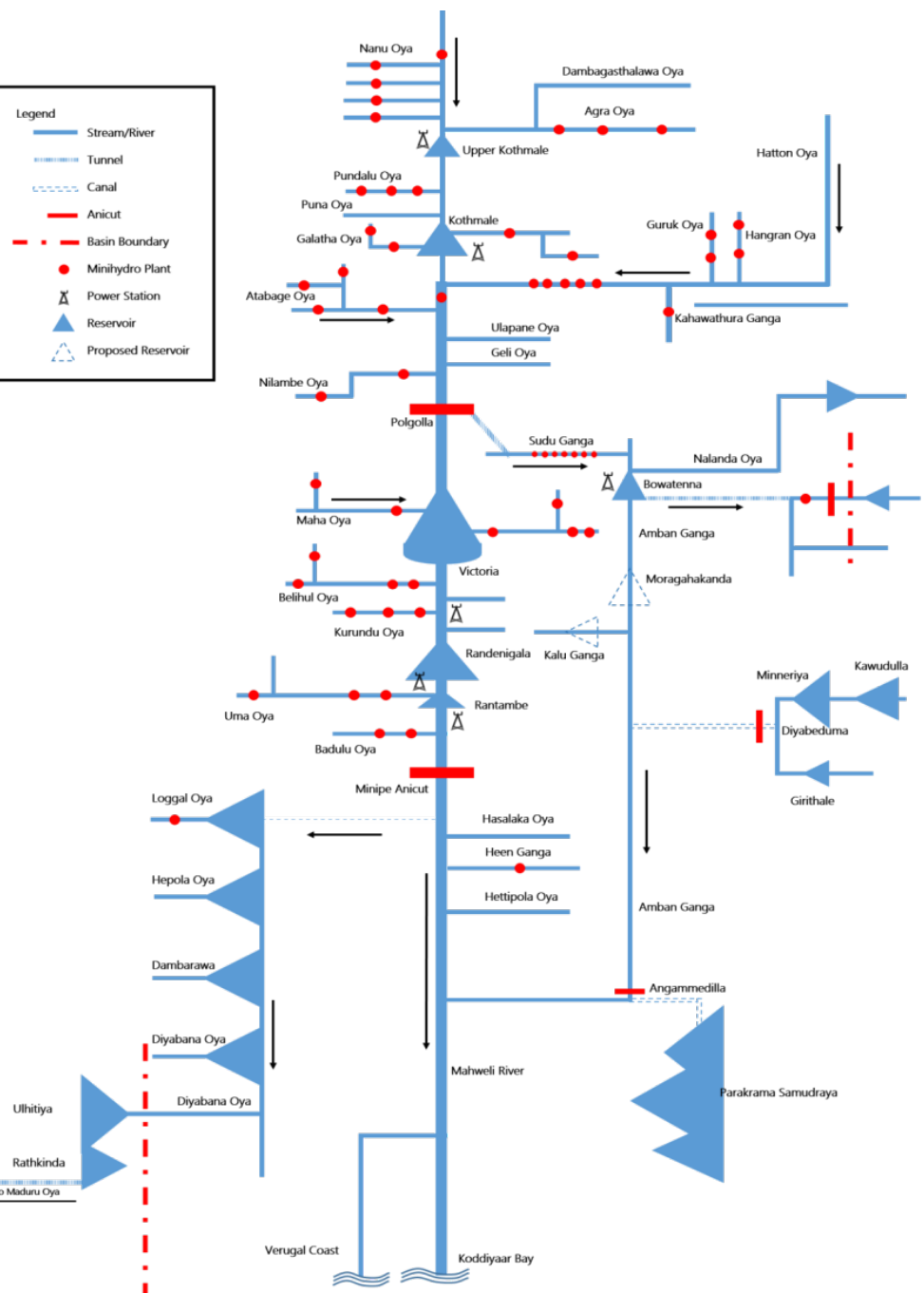
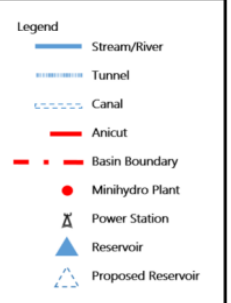


Downstream

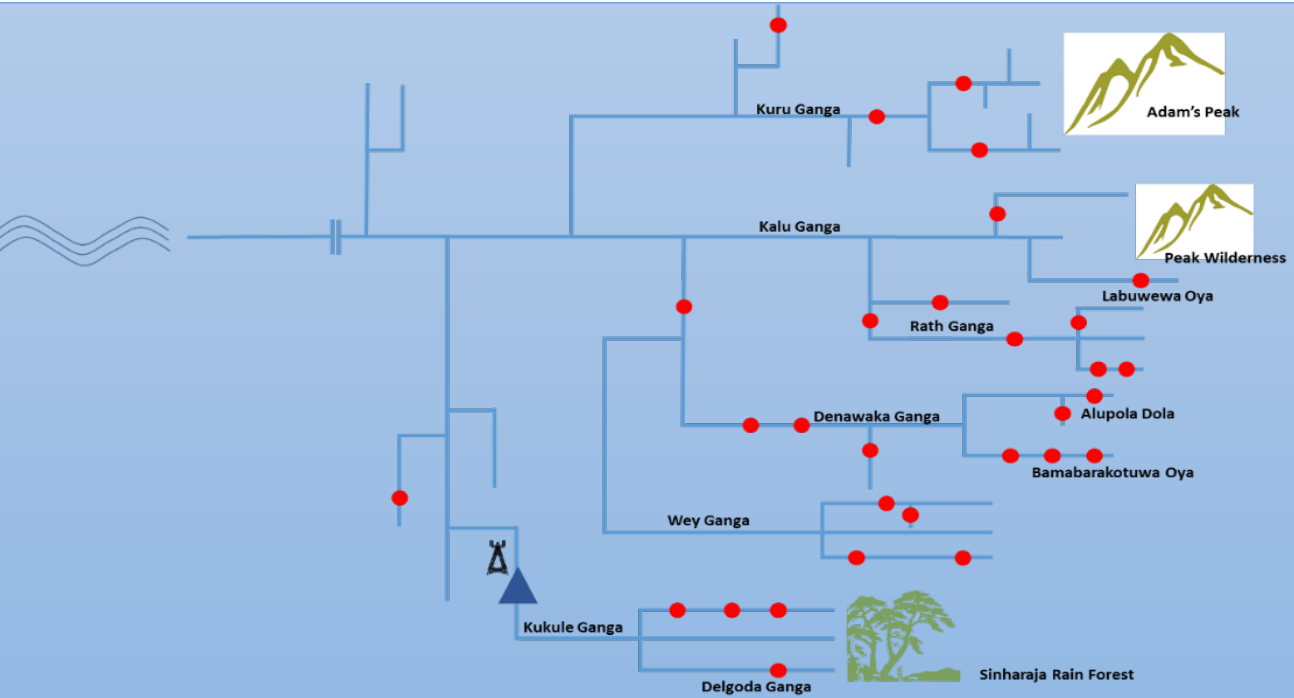


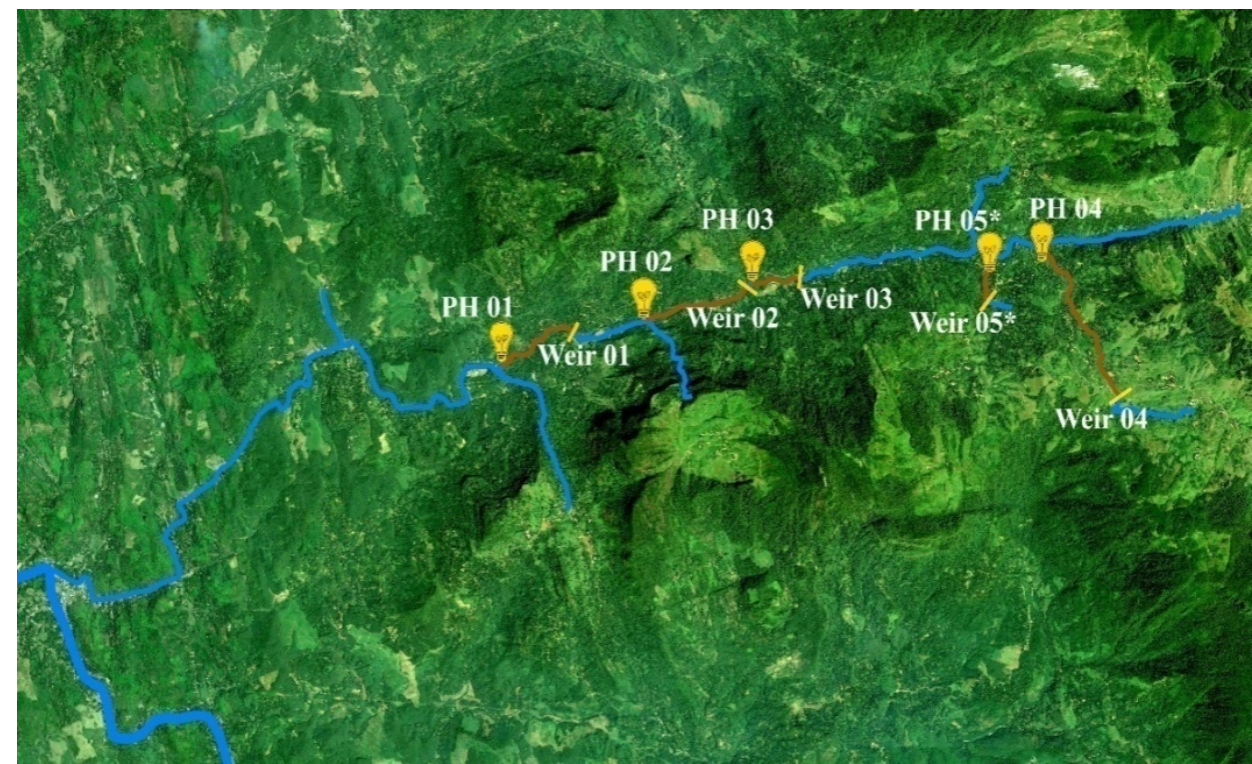
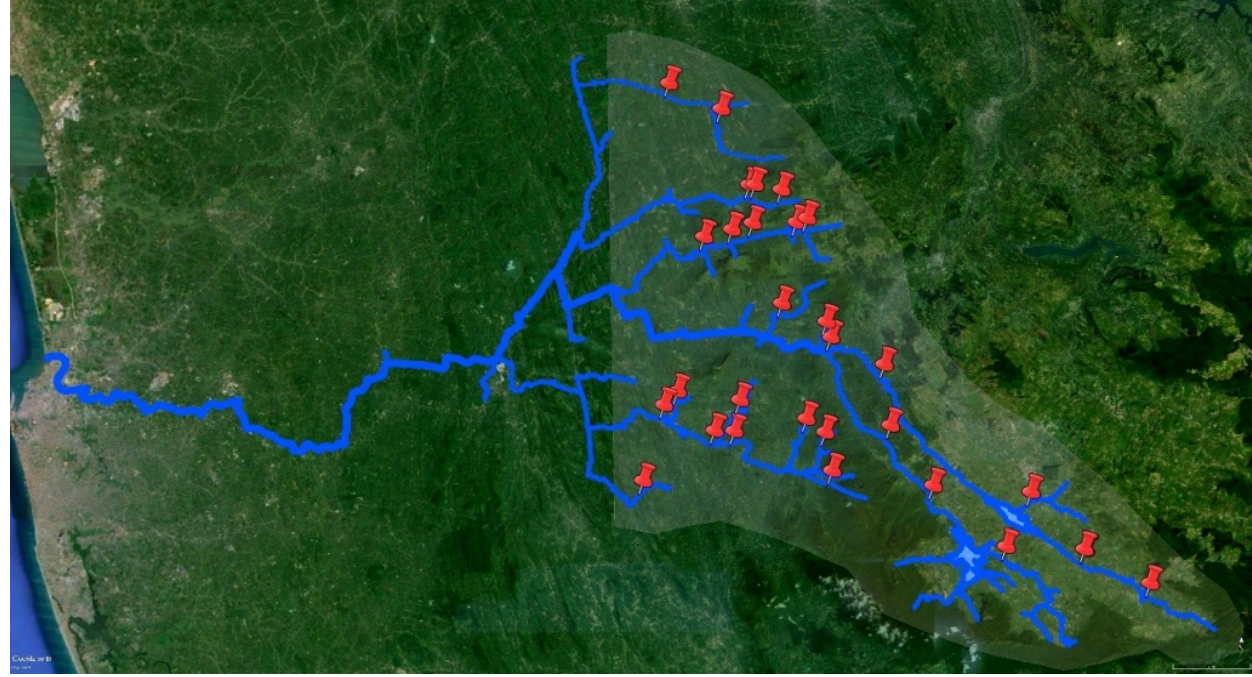
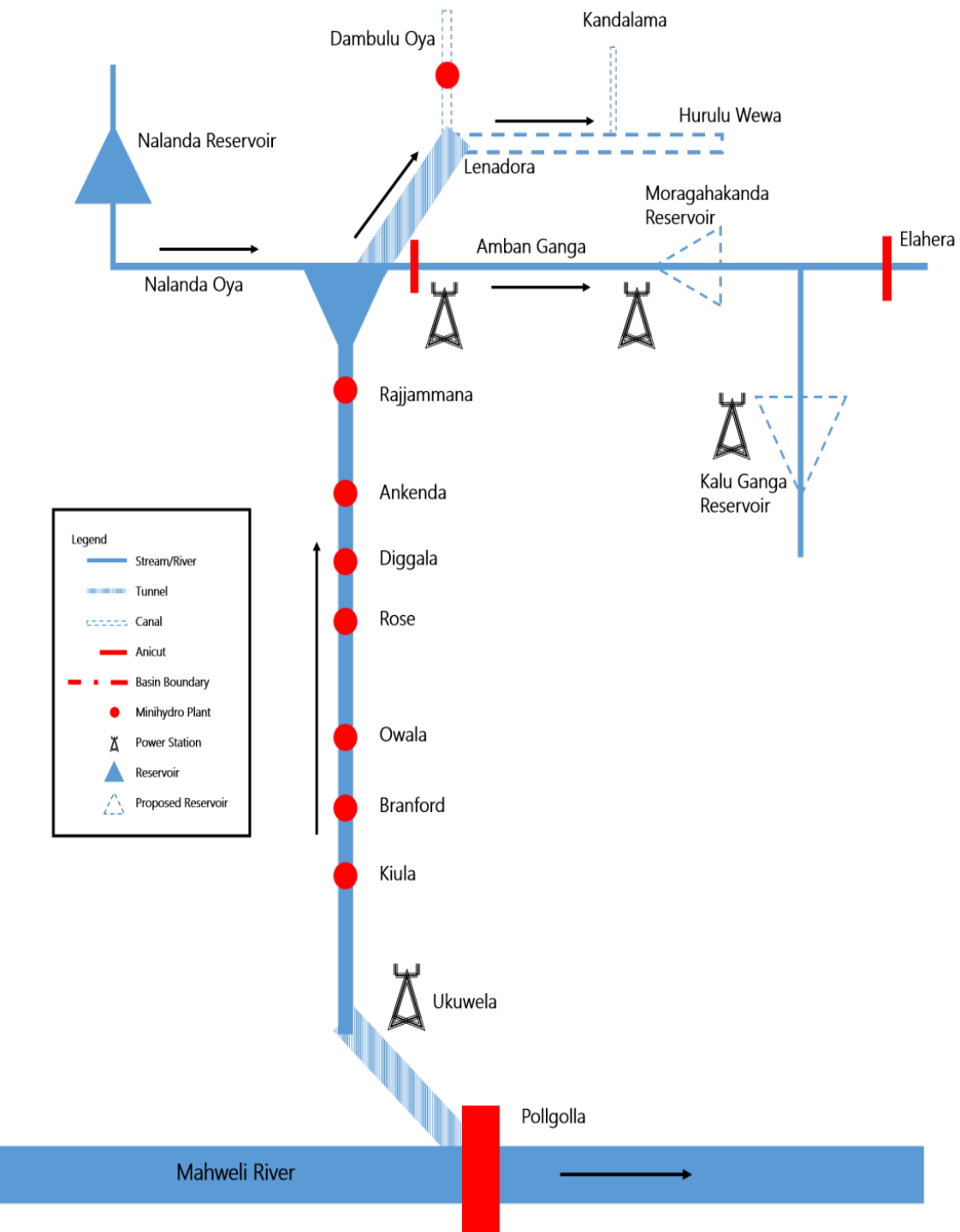
**Environmental
Flow**



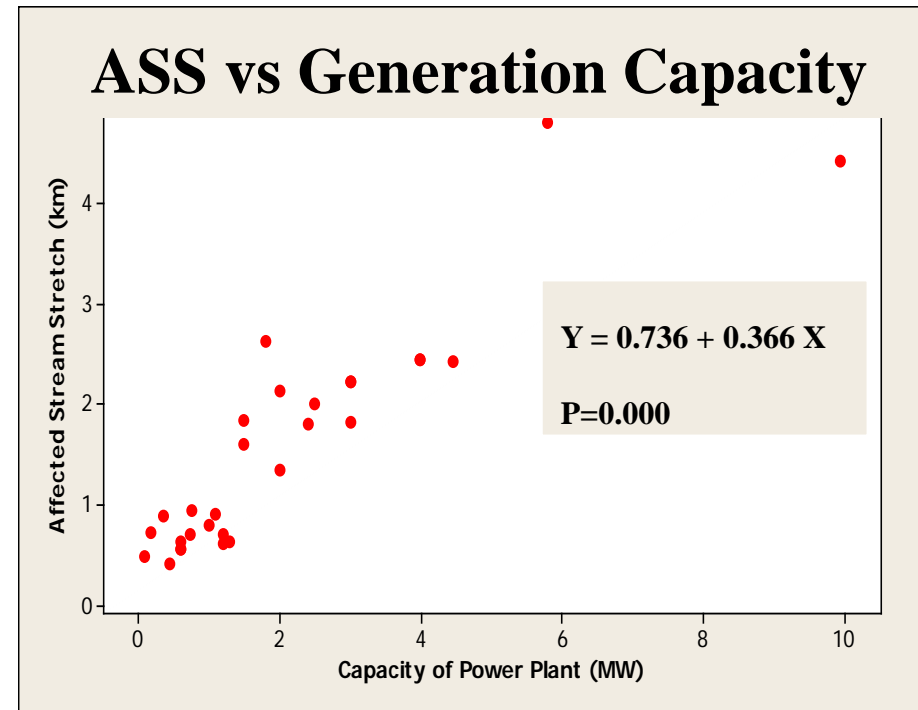


Hydropower Locations on Kelani River





River Basin	Number of Plants	Installation Capacity (MW)	Affected Stream Stretch (km)
Mahaweli	57	113.4	77.3
Kelani	32	55.61	47.34
Kalu	28	69.91	20.82
Walawe	14	26.84	17.31
Gin	02	3.95	0.80
Nilawala	03	1.10	0.60
Kirindi Oya	02	1.40	0.40
Maa Oya	03	7.50	4.30
Maduru Oya	02	7.00	00.0
Total	143	279.2	168.9



Basin	River length	Flow through channels, conduits and penstocks
Mahaweli	345 km	100 km
Kelani	145 km	89 km
Kalu	129 km	? km

Affected stream stretch varies with increasing generation capacity (correlation = 0.817)

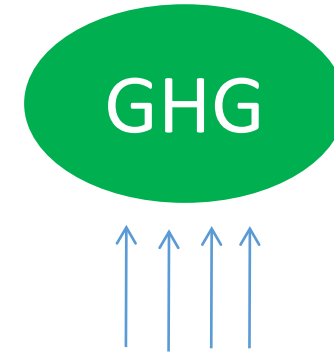
Although Run-of-River Systems ,no regular environmental flows between the weir and the power house

Moneraela Weir



Small stagnant pools are scattered along the river stretch from headwater to downstream between the weir and the power house in all four cases

Polluted water with epilithic algae, perhaps cyanobacteria with mosquito larvae were abundant in stagnant pools with dense litter

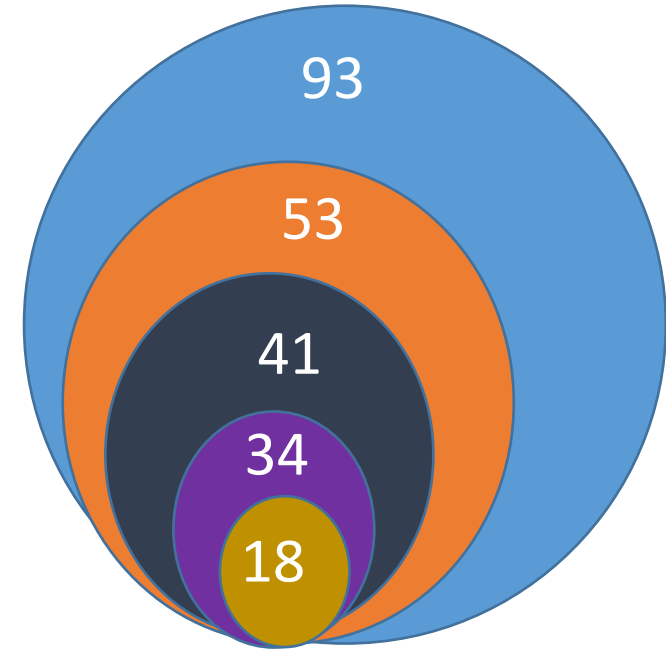
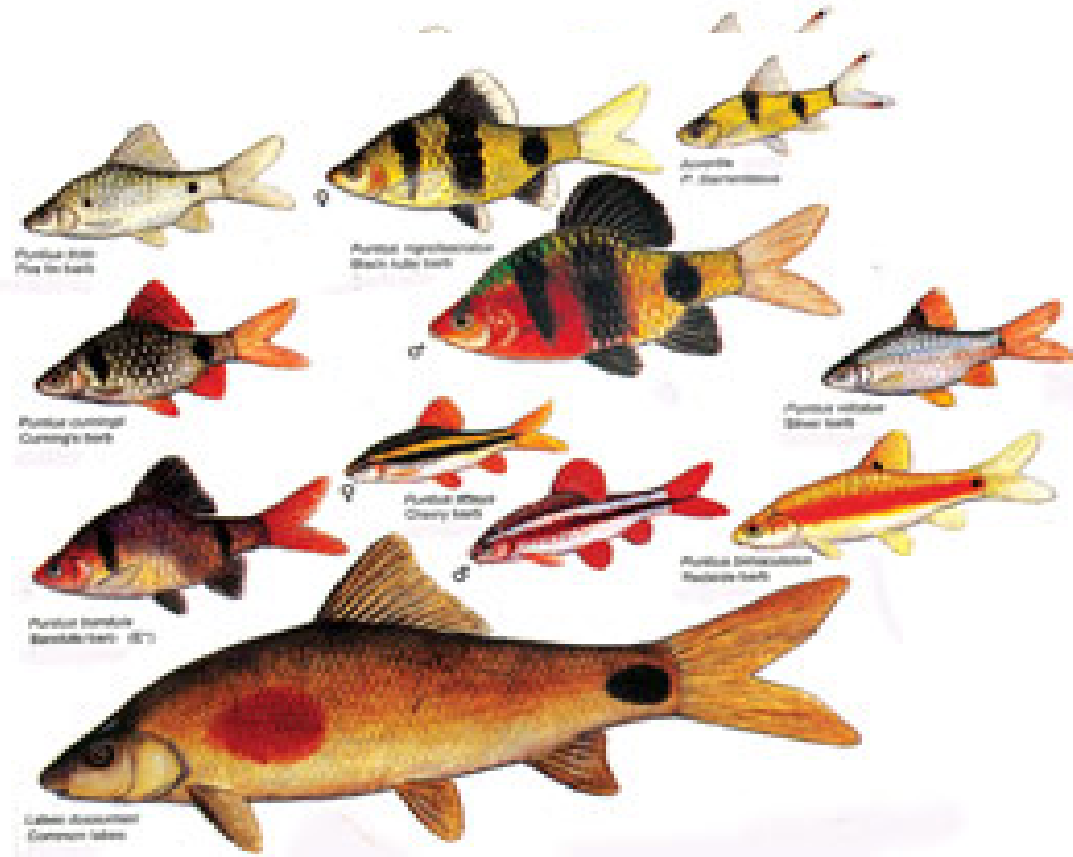


Fragmented micro habitat not suitable for fish

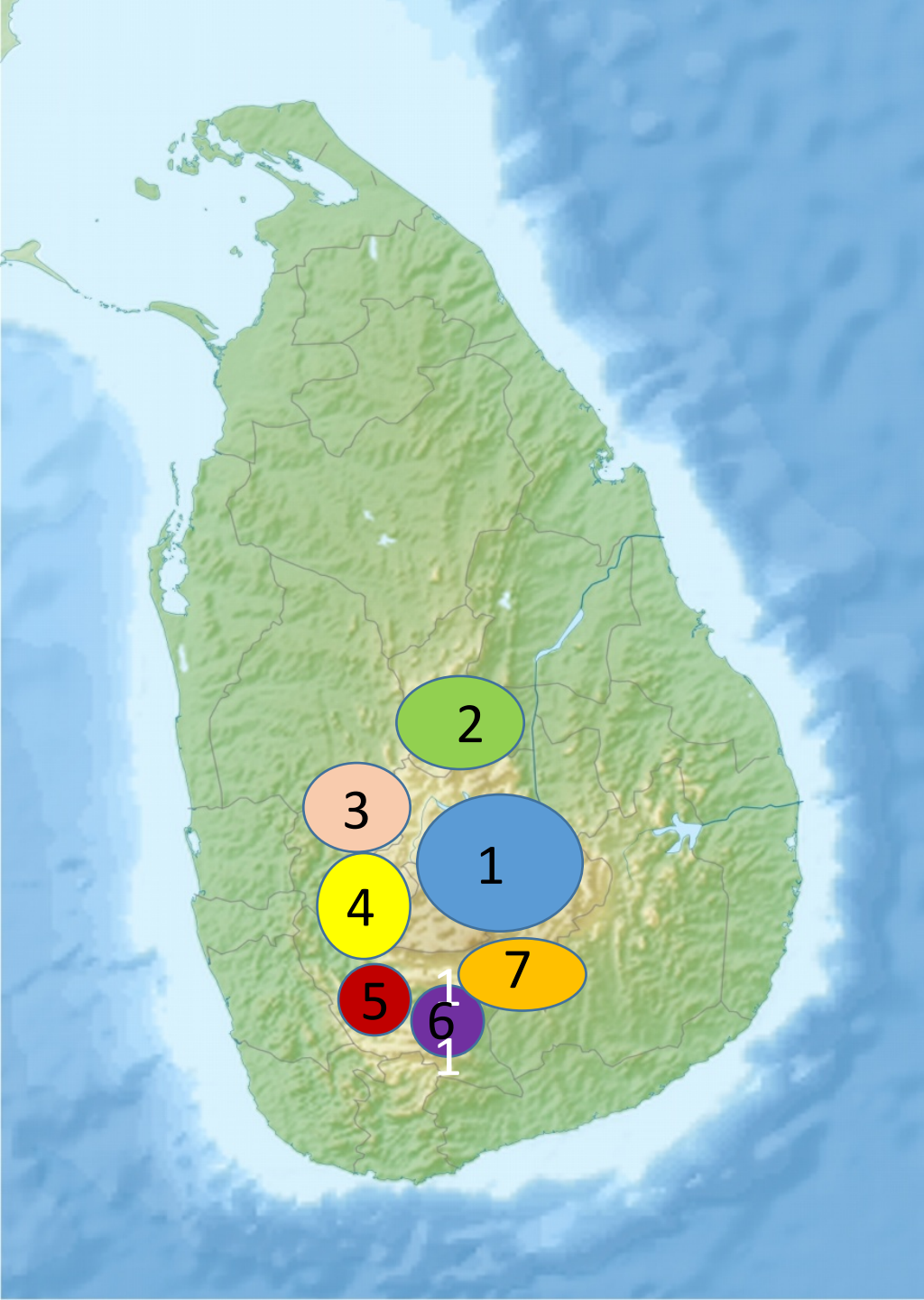






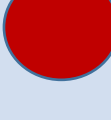


Stagnant pools with dense litter

Freshwater Fishes in Sri Lanka



93	Freshwater fishes in Sri Lanka
53	Found in hill streams
41	Endemic to Sri Lanka
34	Found only in hill streams
14	Critically endangered



Bio geographic Region	Endemics	Critically Endangered
 Mahaweli	08	01
 Knuckles	11	04
 Kelani	17	01
 Kalu	17	02
 Gin	17	03
 Nilwala	14	02
 Walawe	09	01

Small Hydropower Plants

- Alter stream flow
- Expose stream bed
- Stop fish movements
- Affect waterfalls
- Change stream habitats
- Erode river banks
- Gradually kill streams
- Fade away beauty of nature

Affected Stream Stretches

- Create habitats for mosquitoes
- Vanish bathing pools
- Alter water quality
- Emit GHGs
- Promote toxigenic algae
- Promote vector borne diseases
- Change groundwater balance
- Affect riparian community

The negative effects of small hydropower operation on endemic fish and migratory eels are obvious

Many stakeholders including so-called ecologists are responsible for this pathetic ecological crime.

Lost Spray Zones due to Major (Red) and Minor (Blue) Hydropower Development

Mahaweli Basin

Aberdeen

Devon Fall

Pundalu Oya

St. Clair Fall

Victoria Fall

Delta Fall

Glassaugh Fall

Kabaragala Fall

Manelwela Fall

Kelani Basin

Laxapana Fall

Ellpita Ella

Ganthuna Fall

Nakkawila Fall

Ritigaha Oya Fall

Wee Oya Fall

Kalu River Basin

Alupola Fall

Dehan Fall

Bambarabotwa

Oya Fall

Nilwala Basin

Ethamala Ella



Walawe Basin

Lemastota Oya

Fall

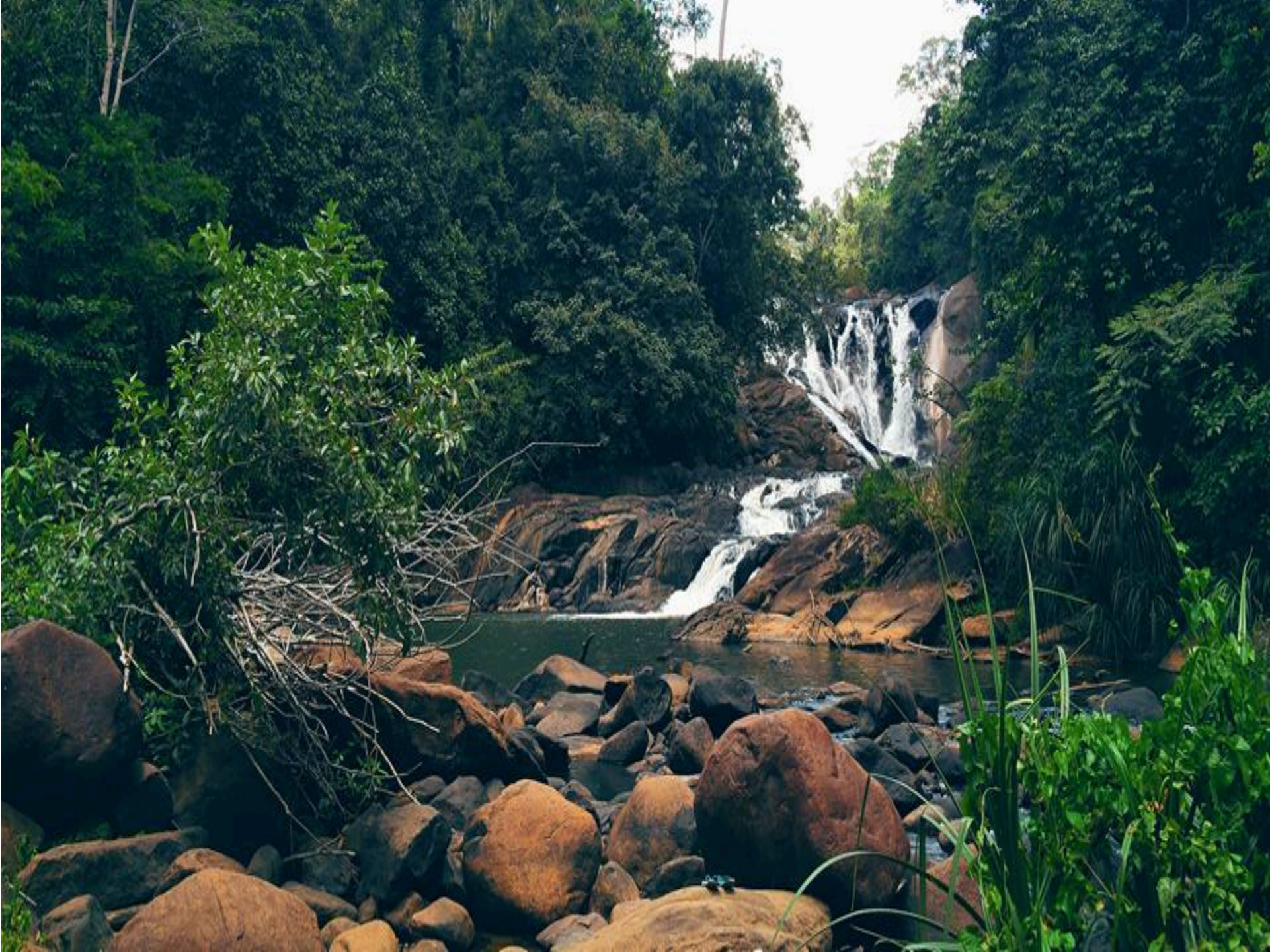


St Clair Fall – then



St Clair Fall – today





Tunnel and Conduit Network in the Highland (km)				
Basin	Major hydro		Mini Hydro	
	Tunnels	Penstocks	Tunnels	Penstocks+Canals
Mahweli	55.6	0.90		77
Kelani	0.88	22.4		33
Kalu	5.70	0.84		28
Walawe	4.50	0.88		17
Others				15
Total	67	25		170

Penstocks and concrete canals are more injurious on forest vegetation than tunnels

Tunnels do not allow lateral transport of moisture

Both penstocks and concrete canals prevent lateral transport of moisture and root penetration of canopy trees



Kazakhstan

Aral
Sea

Syr Darya

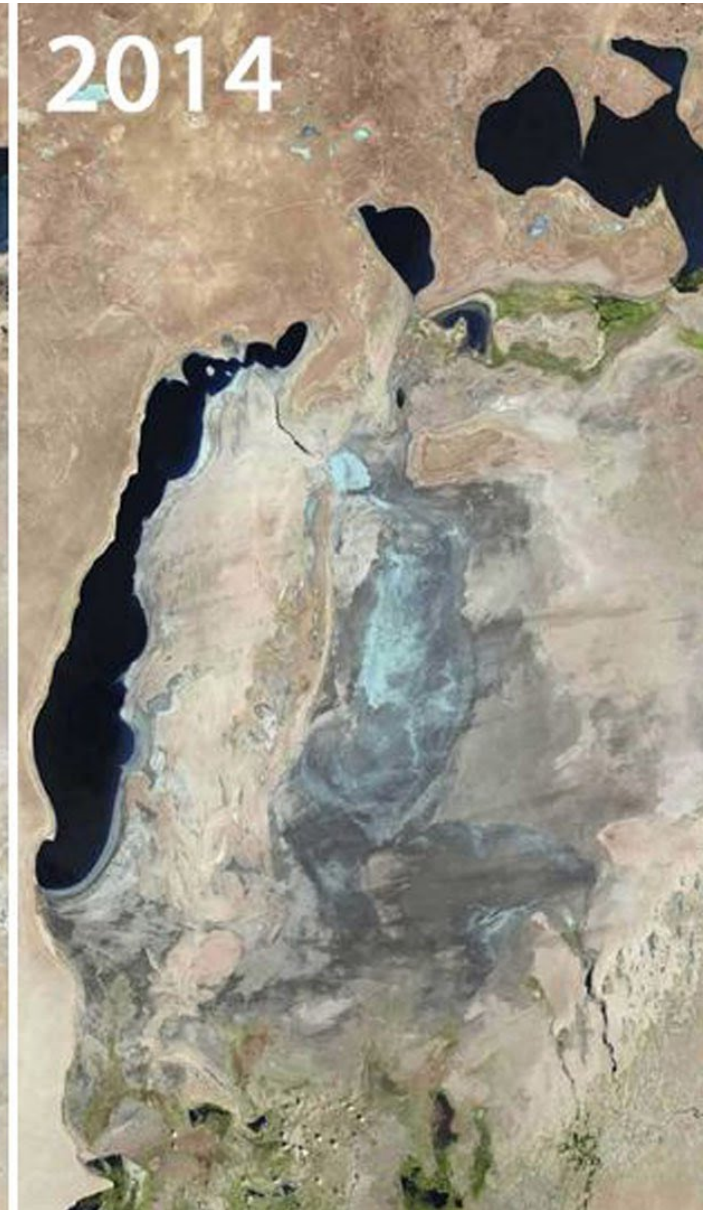
Caspian
Sea

Uzbekistan

Turkmenistan

Amu Darya



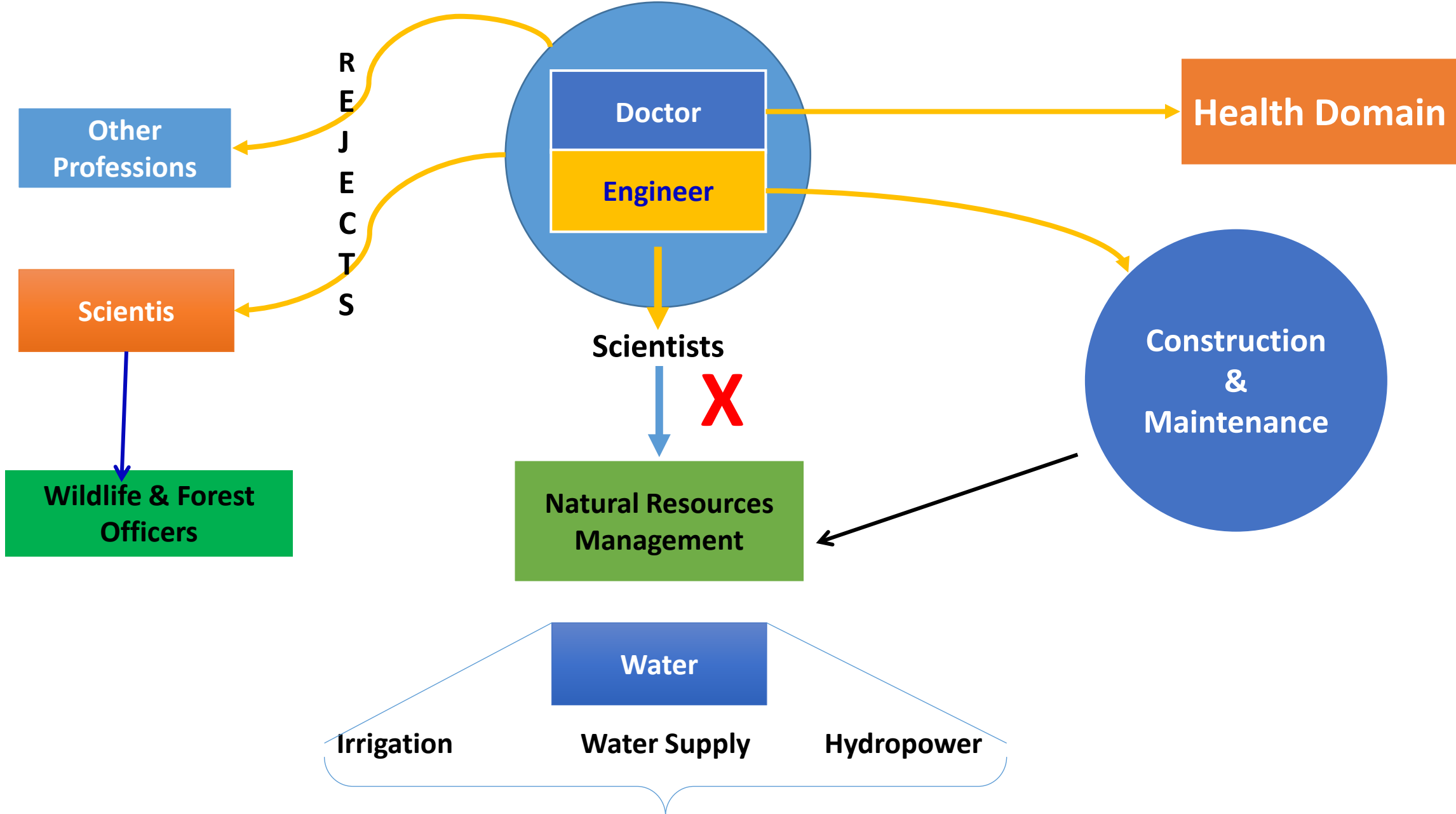




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No Coordination with Scientists

Thank you !