



Strategies for Wastewater Management in Sri Lanka

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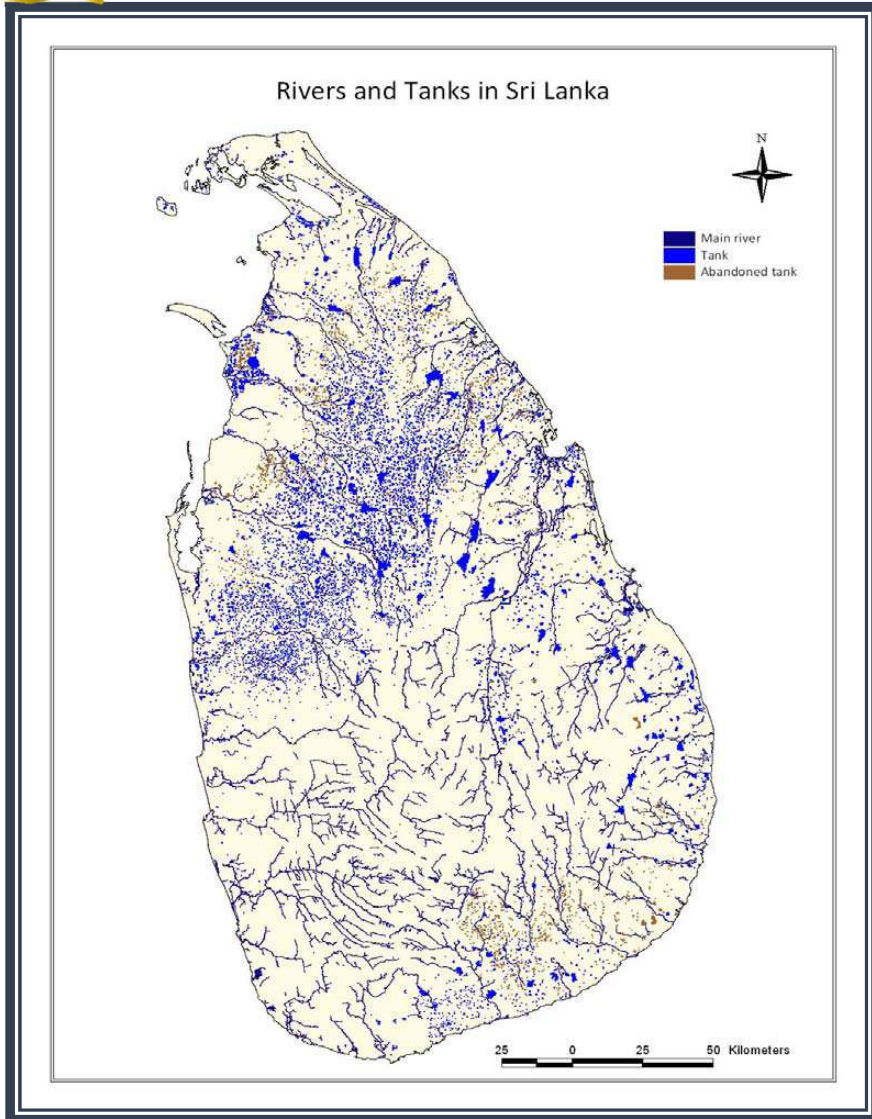


1. Introduction

Status of water Resources in Sri Lanka

- Rain water
 - Annual Rain fall
 - **Wet zone – over 2000mm/year**
 - **Intermediate zone – between 1500- 2000 mm/year**
 - **Dry Zone – 1500 mm/year or less**
- Surface water
 - River basins – 103 Total length – 4,500km
 - About 14000 irrigation tanks in use
 - Total area of irrigation & multipurpose reservoirs – 169,941 hectares
- Ground water Resources
 - 7,800 million m³ about 72% of the rural population rely on ground water.

(Source : Central Bank Report 2010)



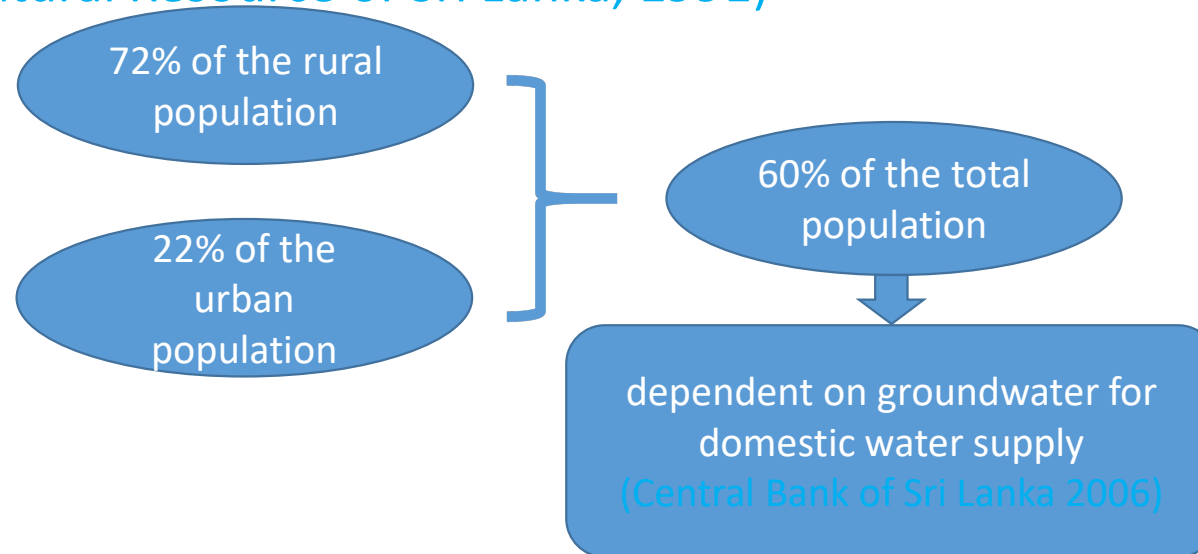
- 103 river basins
 - 29 - Flows directly into ocean
 - 06 - Back barrier coastal lagoons
 - 04 - Rivers/Oya that empties into other rivers, wetlands and marshlands
 - 64 – Rivers/Oya that empties into lagoons
-
- Out of 29 direct flowing rivers
 - 15 perennial rivers
 - 14 seasonal rivers
 - 16 rivers >100Km
 - Radial distribution of river basins from central hills
 - Mahaweli is the largest river basin (catchment area – 10,327 *Km*²)
 - 12 river basins with a catchment area of more than > 1000 *Km*²



Groundwater Usage in Sri Lanka

- Estimated groundwater potential in Sri Lanka: app. $7800 \times 10^6 \text{m}^3/\text{year}$
- Rainwater is the main source of recharge.

(Natural Resource of Sri Lanka, 1991)



- Towns of Jaffna, Batticaloa, Mannar, Vavuniya and Puttalam: >90% depending on groundwater aquifers



- **Per Capita Water Usage**

- ~160 Liters/day

- **Annual Fresh Water Withdrawals by sectors**

- Agriculture 87.3%
- Industry 6.4%
- Municipal (including domestic) 6.2 %

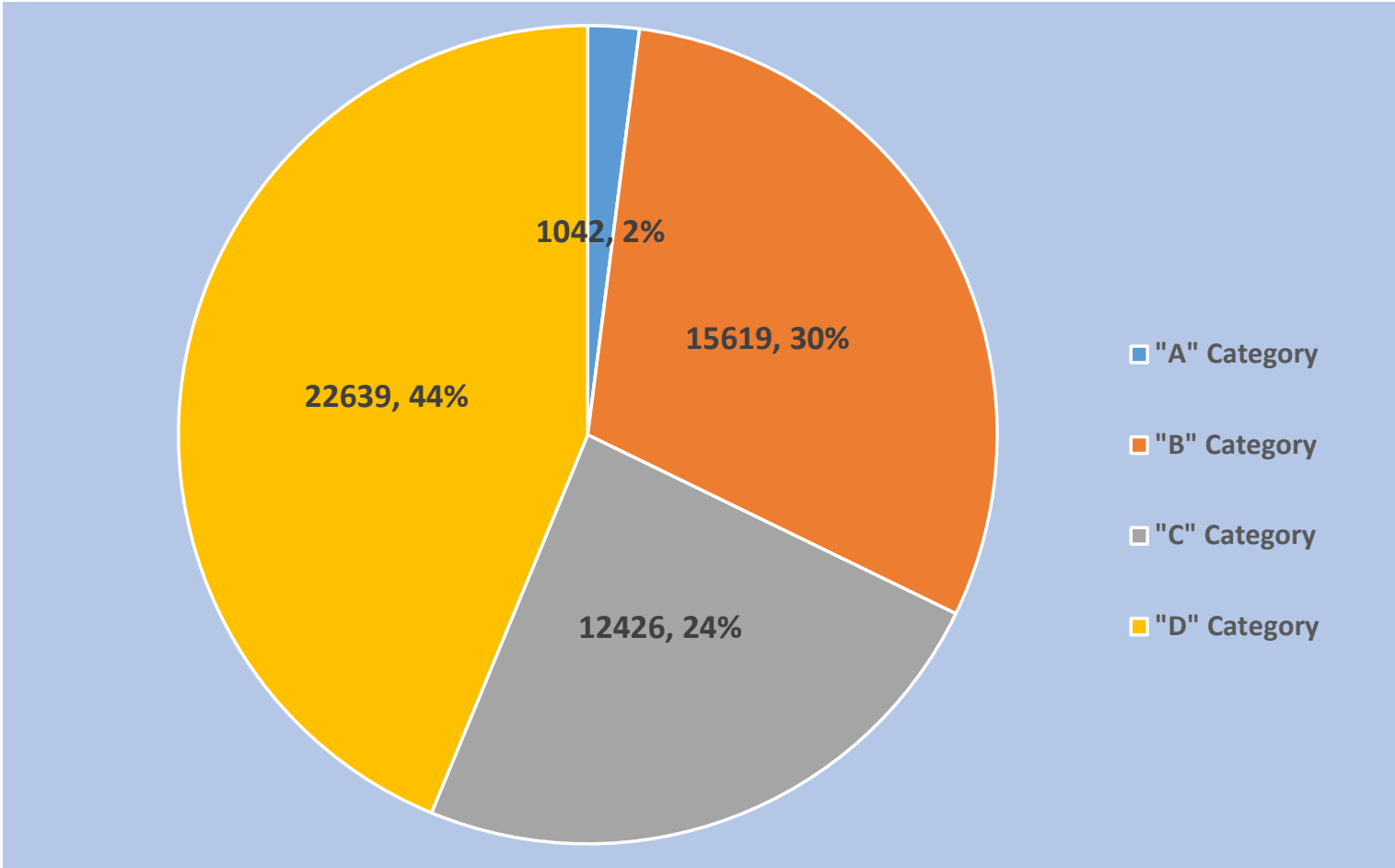
(Source : Central Bank Report 2010)



2. Water Pollution Sources

- **Point Sources**
 - Industrial discharges
 - Services (Hospitals, Hotels, prisons etc.)
 - Common wastewater treatment plants
 - Sea outfalls
- **None Point Sources**
 - Domestic activities
 - Agricultural activities
 - Dumping of garbage
 - Land clearing / Soil erosion
 - Construction activities
 - Natural disasters
 - Plastic pollution

Total Number of high , medium & low polluting industries
June 2024 (CEA / EPL DATA BASE)





Export Processing Zones

	Export Processing Zone	TP capacity/m ³ /d	Treatment method	Operated by
1	Biyagama	21,000	Mechanically Aerated lagoon system, oxidation ditch system	NWSDB
2	Seetawaka	9,900	Oxidation Ditch System	NWSDB
3	Koggala	675	Activated Sludge Extended Aeration system	NWSDB
4	Katunayaka	3000	Flow through Aerated Lagoons system	BOI
5	Mirigama	400	Activated Sludge Extended Aeration system	BOI
6	Wathupitiwala	900	Sequencing Batch Reactor system	BOI
7	Polgahawela	450	Oxidation Ditch system	BOI
8	Mawathagama	500	Oxidation Ditch system	BOI
9	Horana	1,000	Rotating Biological Contactors system	BOI
10	Malwatta	450	Oxidation Ditch system	BOI
	Total	37,825		



Sewerage Generation and Treatment Plants

• Sanitation Type & Estimated Population Coverage (2019)

- Piped Sewerage (Offsite) - 507,435 (2.5%)
- Onsite Sanitation - 16,887,200 (83.2%)
- Without Proper Sanitation - (Includes Type Unknown/Other, Pit Latrines) - 2,902,500 (14.3%)
- By 2025 expected sewerage network coverage is 3.2 %

Type	constructed for Export Processing Zones to treat industrial effluents	Constructed for Housing schemes to treat domestic WW	On going Projects major / minor
Number	10	13	18



Sewer Treatment Facilities in Major Cities

Sewerage System	City	Population	TP Capacity/M ³ /d	WWTP Process	Operated by
Greater Colombo Sewerage System	Colombo	700,000		2 Ocean outfalls in CMC system	CMC
	Dehiwala/ Mt. Laviniya	223,000			
	Kolonnawa	60,000			
Kataragama	Kataragama	20,935	3,000	Aerated lagoon with maturation pond	NWSDB
Hikkaduwa	Hikkaduwa	30,000	1,020	Facultative & Maturation pond	NWSDB
Rathmalana/Moratuwa	Rathmalana	408 industries+ 20,000	17,000	A2O process	NWSDB
Jaela/Ekala	Ja Ela	8,300	7,500	A2O process	NWSDB
Greater Kurunegala	Kurunegala	25,000	4,500	A2O process	NWSDB
	Total	1,087,235			



Major Housing Schemes

Housing Scheme	No of Connections	TP capacity/m ³ /d	Population Coverage	Treatment method	Operated by
Soysapura connected to rathmalana	1,987		8,345	Imhoff tank +Trickling filter system now connected to BNR system	NWSDB
Mattegoda	1,154	600	4,846	Waste stabilization pond system	NWSDB
Jayawadanagama	669		2,809	Connected to CMC sea out fall at Wellawatta	NWSDB
Maddumagewatta	315		1,323	Connected to CMC sea out fall at Wellawatta	NWSDB
Raddolugama	2,045	6,000	8,589	activated sludge system	NWSDB
Hantana	394	550	1,654	Imhoff tank combined with Trickling filter	NWSDB
Royal Park	249		1,045	Connected to CMC sea out fall at Wellawatta	NWSDB
Kuruminiyawatta	202		848	Connected to CMC sea out fall at Wellawatta	NWSDB
Total	7,015		29,463		

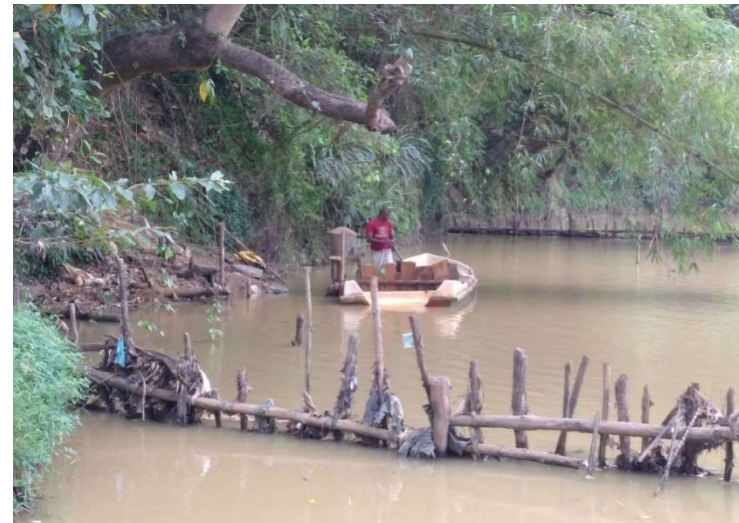


Domestic wastewater discharge in to Kelani river





River bank erosion & mining





Garbage Dumping





3. Water Pollution Control Strategies

1. Legal Framework
2. Administrative Systems
3. Surveillance Monitoring
4. Industrial Facilitation
5. Education and Awareness



3.1. Legal Framework for Water Pollution Control

- Constitution 1978
- Parliament Acts
 - National Environmental Act
 - Water Resource Board Act
 - Marine Environment Protection Act
 - National Water Supply & Drainage Board Act
- Provincial Statutes
- Local Governmental Authority Laws



- Constitutional Provisions
 - **Chapter VI, 27-(14):** The state shall protect, preserve and improve the environment for the benefit of the community
 - **Chapter VI, 28-(f):** It is the duty of every person in Sri Lanka to protect nature and conserve its riches
- Parliament laws (Examples)
 - **National environmental act**
 - Water supply and drainage board act
 - Water resources board act



National Environmental Act

- National Environmental Act (NEA)- No. 47 of 1980
 - No. 56 of 1988 amendment with regulatory provisions
 - No. 53 of 2000 amendment
- Establishment of CEA-1981
 - Implementation of the NEA
- Part IV of the NEA-
 - Environmental Protection & Management
 - Part IV(A)-Environment Protection
 - Part IV(B)-Environment Quality
 - Part IV(C)-Approval of Projects



Part IV(A)-Environment Protection

I. Environment Protection License (EPL) Procedure

- Activities (industries) for which a license (EPL) is required are published in Gazette Extraordinary No. 2264/18 dated 27.01.2022

ii. Scheduled Waste Management License (SWML) Procedure

- Scheduled wastes are listed in Regulation No 1534/18 dated 25.01.2008
- Any person who generate/ store/ transport/ treatment of the said scheduled wastes should obtaining a Scheduled Waste Management License (SWML) legal requirement.



Part IV(C)-Approval of Projects

iii. Environmental Impact Assessment (EIA)

- Prescribed Projects are listed in the regulation No 772/22 dated 24.06.1993 and its amendments.
- Prior to commence any prescribed project, Environmental Approval should be obtained through Environmental Impact Assessment (EIA) process.



Part IV B- Maintain Environment Quality

i Effluent Discharge Standards

Gazette Extraordinary No. 2264/17 dated 27.01.2022

ii Impose more stringent standards & criteria

iii Ambient Water Quality Standards

Gazette Extraordinary No. 2148/20 dated 11.05.2019



Effluent Discharge standards No 2264/17 dated 27.01.2022

- Tolerance limits for the discharge of wastewater or effluent into Marine Waters;
near shore water, short sea outfall, long sea outfall
- Tolerance limits for the discharge of wastewater or effluents into **Coastal Waters**
- Tolerance limits for the discharge of wastewater or effluent into **Inland Surface Waters**
- Tolerance limits for the discharge of wastewater or effluent **on land for agriculture purposes**
- Tolerance limits for the **discharge of leachates** in respect of either solid waste or hazardous waste landfill into **either Inland Surface Waters, Coastal Water.**
- Tolerance limits for the discharge of wastewater or effluent into **public sewer network, connected either to a common treatment plant or a sea outfall or a combination of both**

(can be down loaded from www.cea.lk)

Ambient Water Quality Standards No. 2148/20 dated 11.05.2019



Parameter	Category A Water source for simple treatment	Category B Bathing & contact Recreational water	Category C Fish & Aquatic life water	Category D Water source for general treatment	Category E Irrigation & Agriculture	Category F Minimum water quality
TSS (mg/l)	25	-	40	1500	2100	-
DO at 25C	6	5	5	4	3	3
BOD (mg/l)	3	4	4	5	12	15
COD (mg/l)	10	10	15	30	-	40
Total Coli form (MPN/100ml)	10,000	10,000	-	10,000	-	-
NO ₃ ⁻ (mg/l) ^{*3}	10	10	10	10		10
PO ₄ ⁻ (mg/l) ^{*4}	0.7	0.7	0.4	0.7	-	-



3.2 Administrative Systems to Control Water Pollution

- Environmental Recommendation for siting of prescribed industries
- Approvals for siting of High & Medium Polluting Industries
- Restrict siting of high polluting industries in up stream of water intakes
- Registration of gully bowsers transporting industrial effluent
- Minimize application of fertilizer and pesticides



3.3 Water quality monitoring framework in the CEA

- Regular monitoring-
 - 9 main rivers out of 103
 - 3 tanks
- Randomly monitor other water bodies according to the urgent requirements
- Self monitoring of polluting activities
 - High polluting need quarterly basis
 - Medium polluting need biannually or annually
- Central laboratory and 9 provincial laboratories
- 74 CEA registered private laboratories
- 1 real time water quality monitoring station



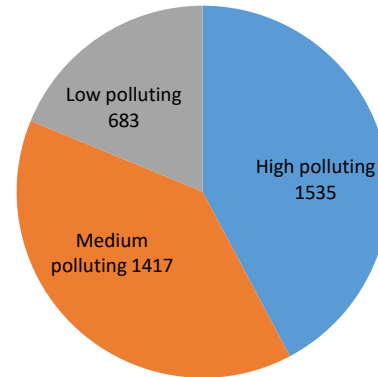
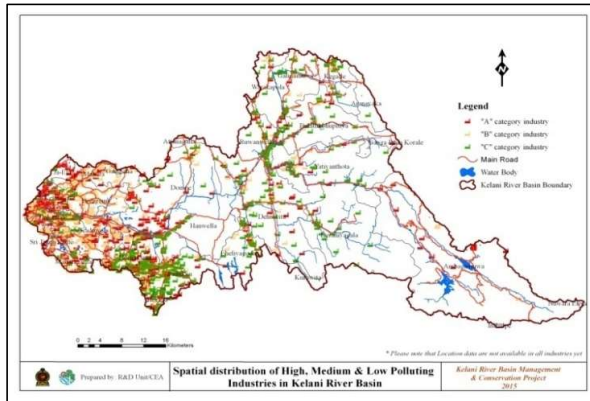
Status of Water Quality & monitoring frequency

Water Quality Status (BOD, COD) of few Major Water Courses in SL (2021 – 2023)

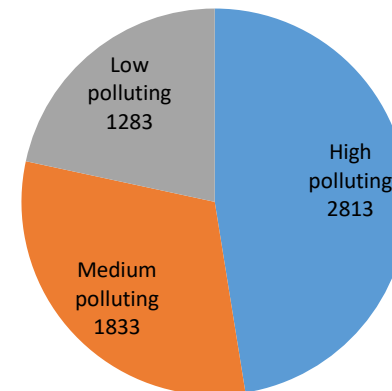
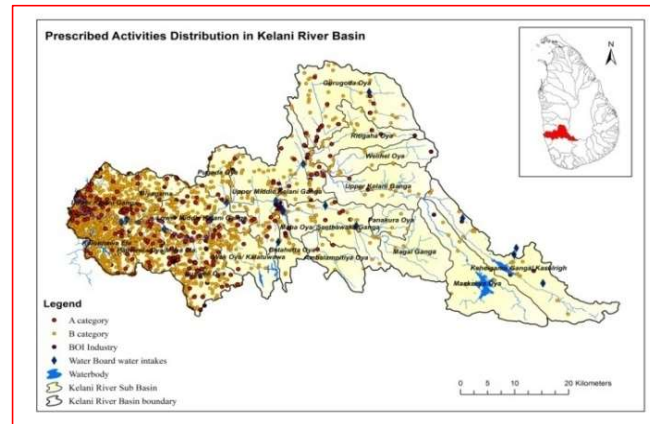
	River/Lake	Average BOD, mg/l	Average COD, mg/l	No of Locations	No of Parameters	Monitoring Frequency
1	Kelani River	2	10	17	23	Once a month
2	Kalu River	4	7	12	10	Once a month
3	Maha Oya	2	7.1	8	14	Once a month
4	Nilwala River	2	10	8	11	Once a month
5	Badulu Oya	1.5	10	7	12	Once a month
6	Diyawanna Oya	3.5	22.4	8	14	Once a month
7	Kurunegala Tank	3	27	4	9	Once a month
8	Menik Ganga	2	11	4	12	Once a month
10	Deduru Oya	2	10	6	11	Once a month
11	Attanagalu oya	3.4	20	6	12	Once a month
12	Wennaruwa tank	2	18	3	9	Once a month

Identifying Pollution Sources in Kelani River

2015 industry distribution in KRB & pollution levels

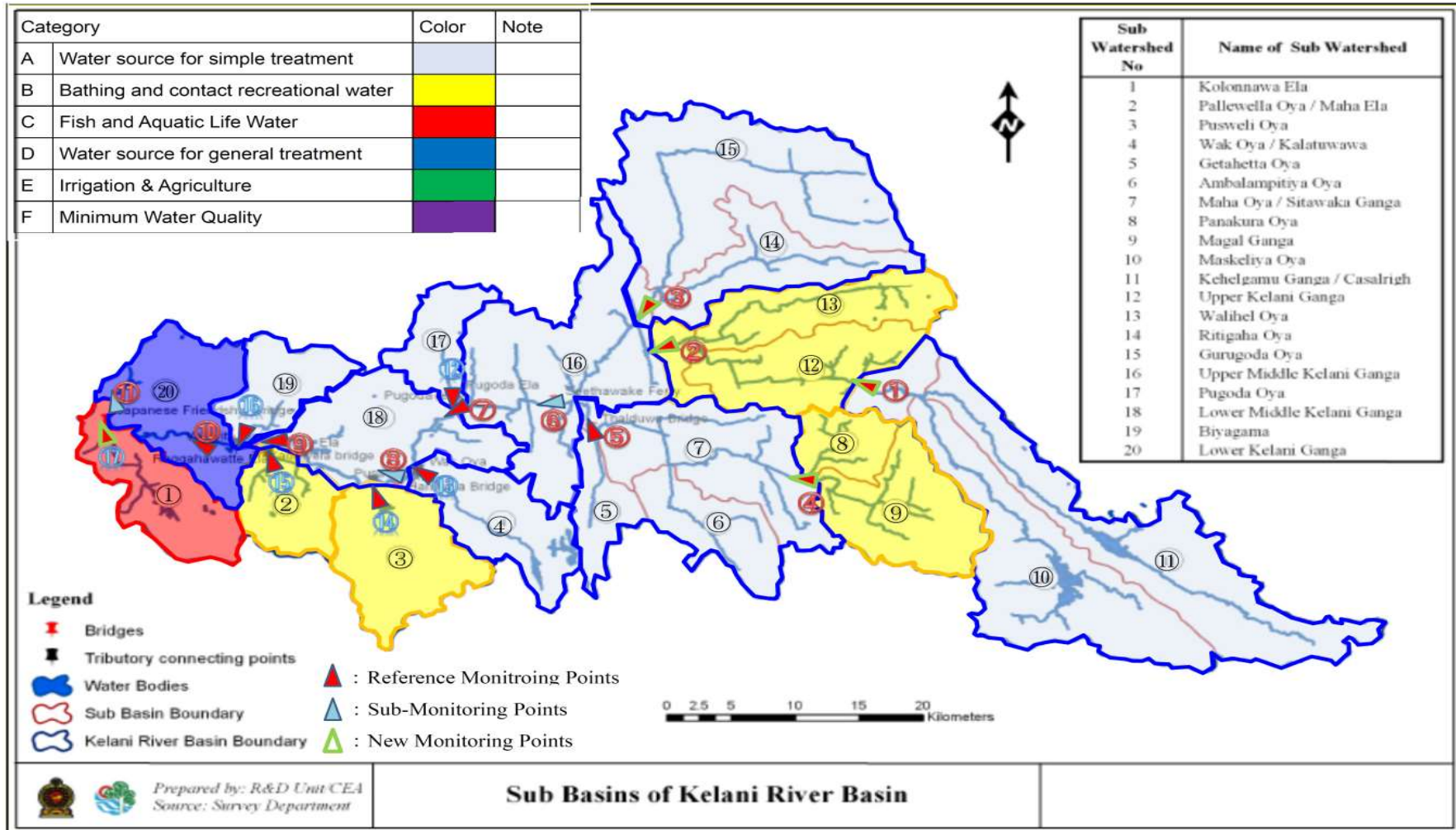


2023 industry distribution in KRB & pollution levels

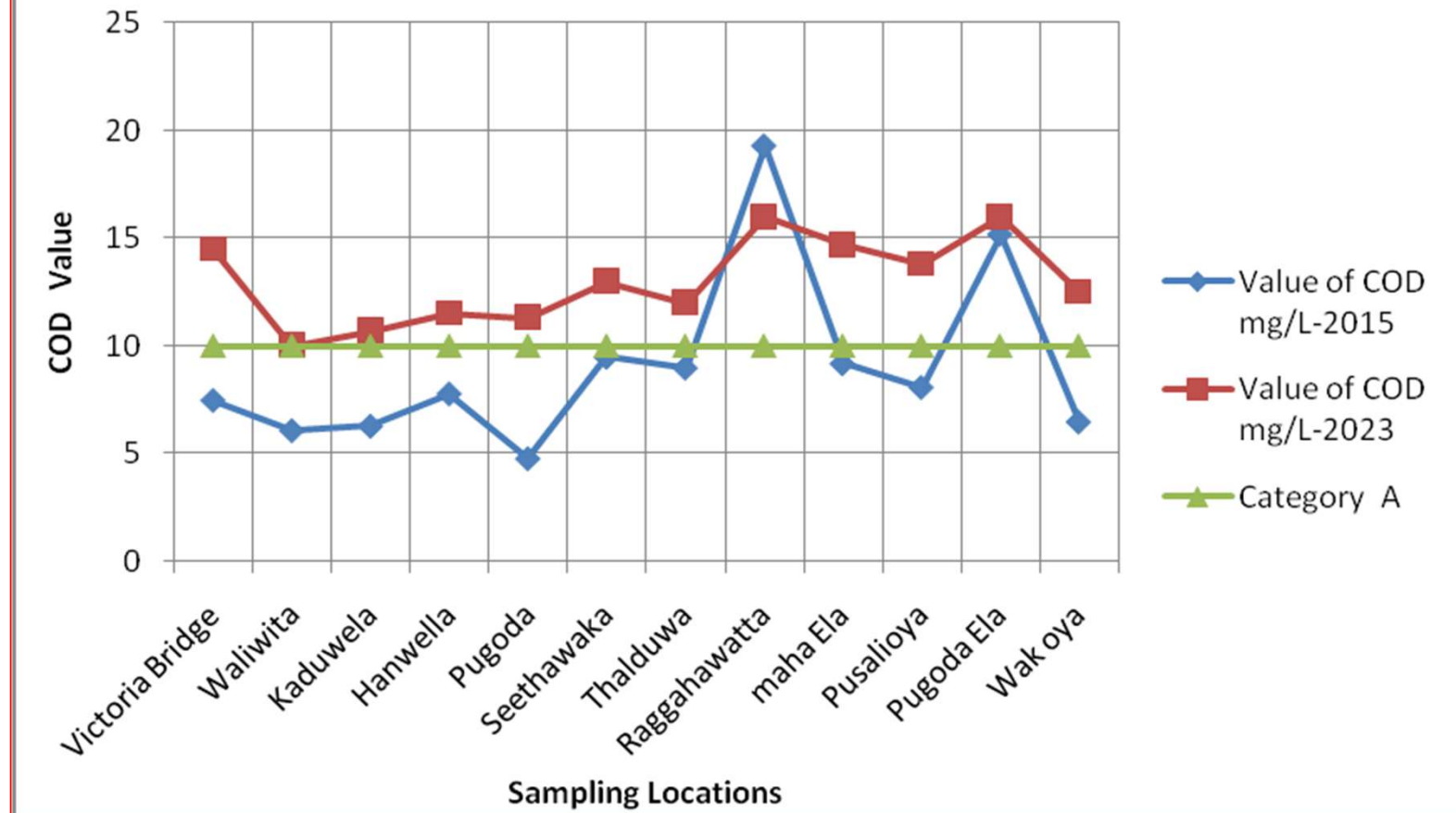




Kelani River Water Quality Monitoring locations

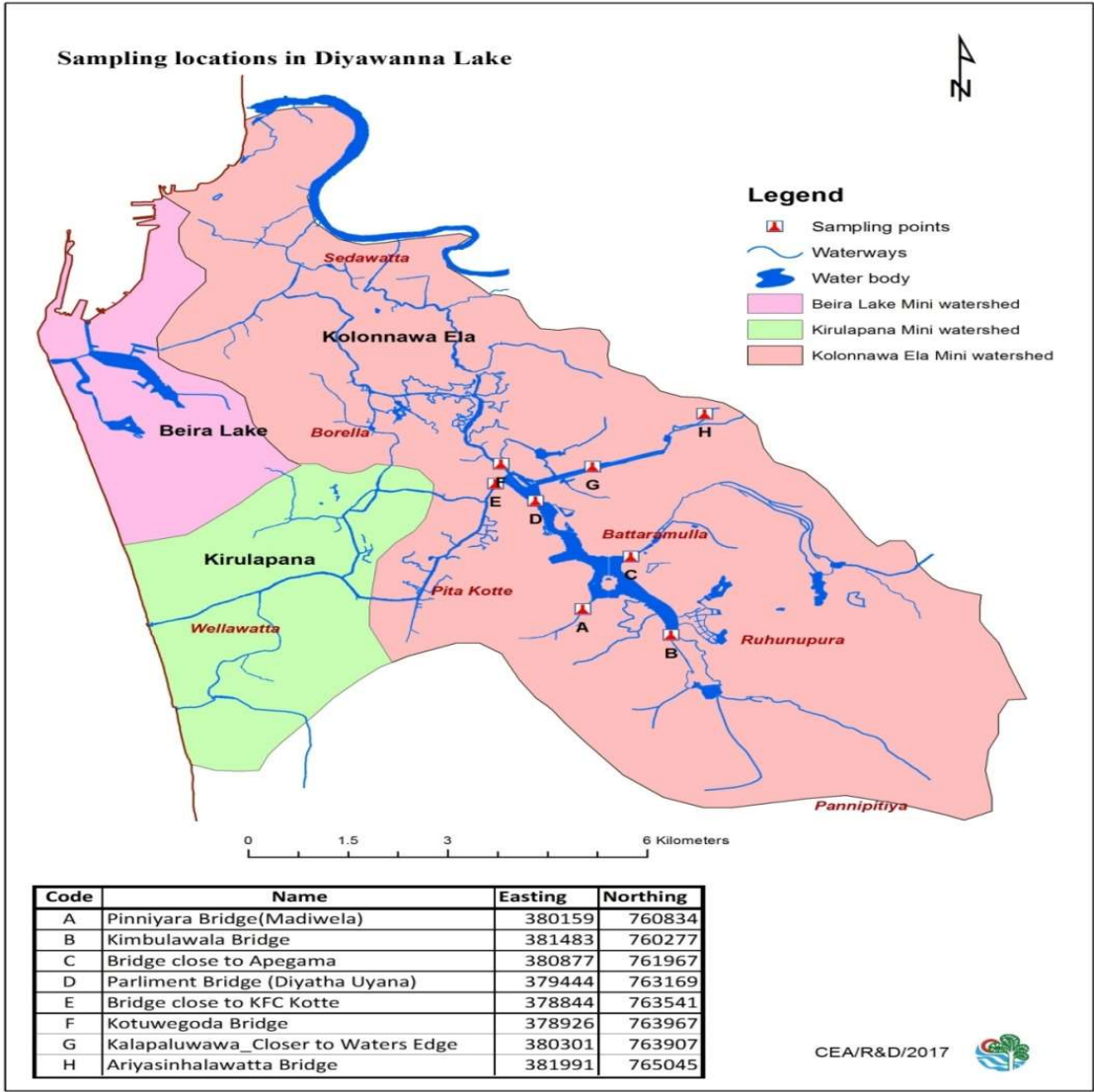


COD Value Variation -Kelani River Basin



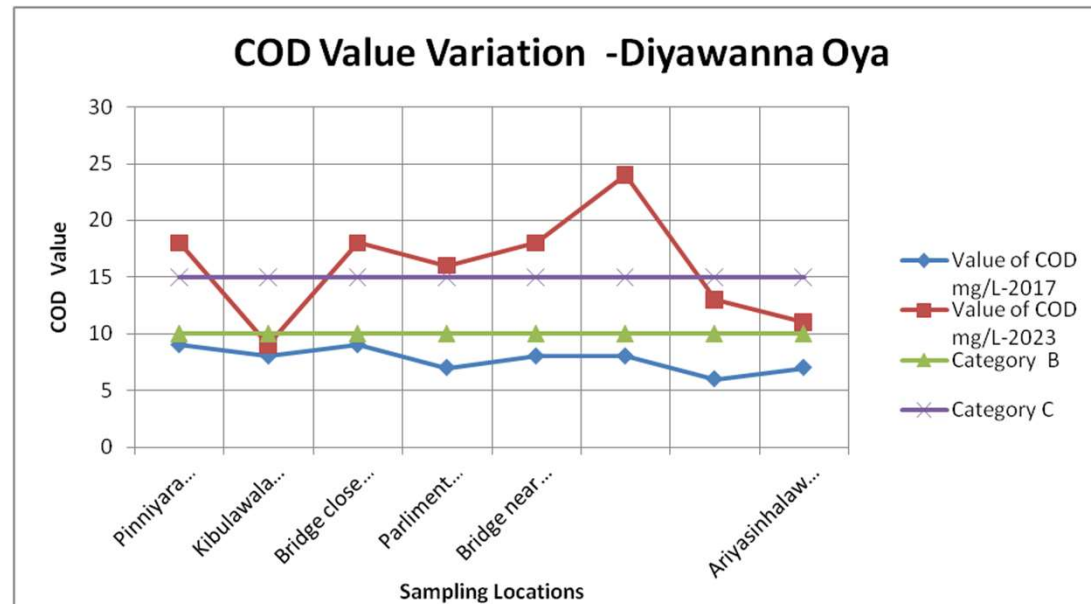


Diyawanna Lake Sampling Locations

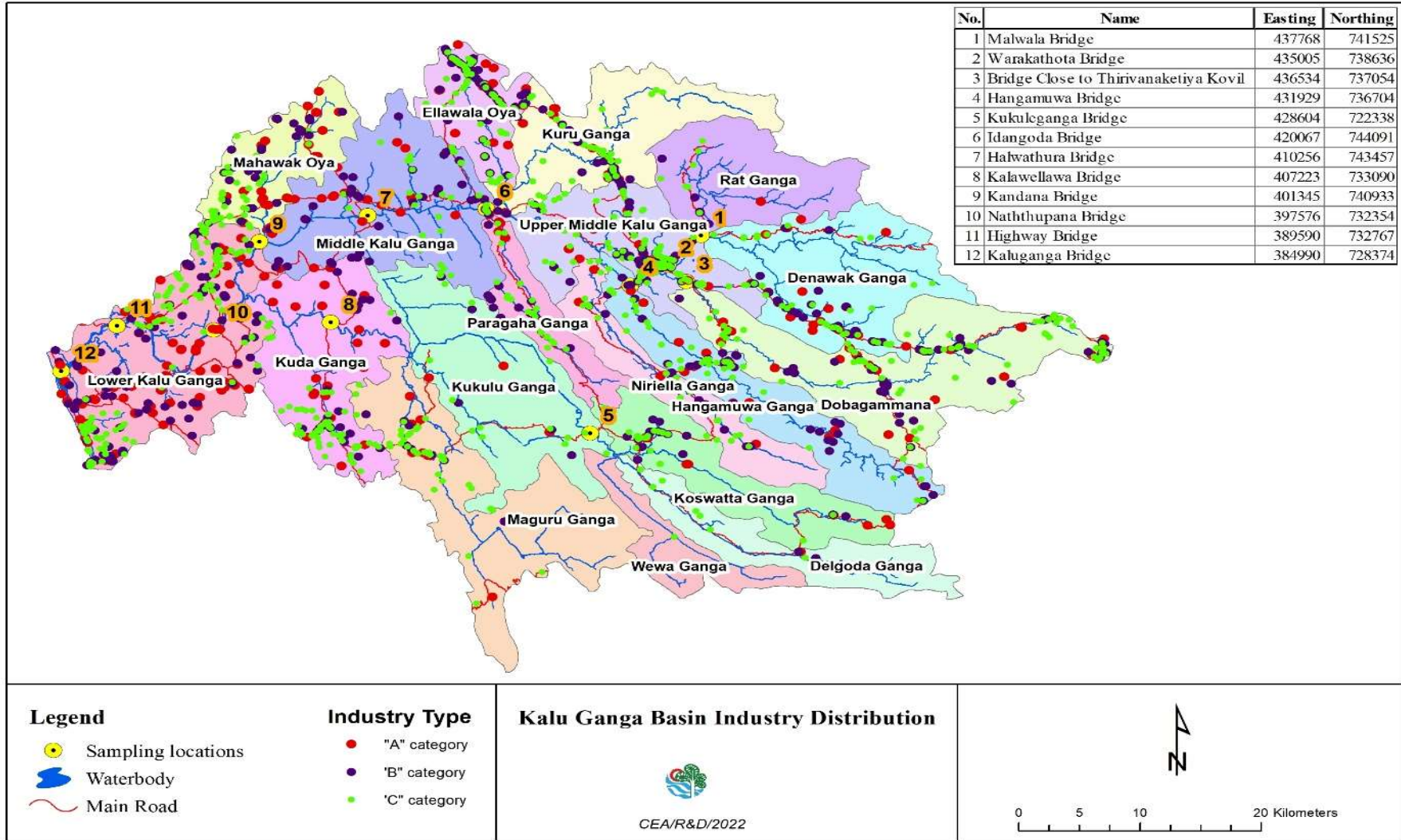


Wastewater generation & pollution status of Diyawanna Lake

Type	Total No of entities	Total WW generation m3/day	Direct discharging entities to Diyawanna lake	Direct discharge Quantity m3/day
Domestic	158	3666	42	936
Industry	72	279	27	191
Total	230	3945	69	1127



Location of industries & monitoring points in Kalu Ganga Basin





3.4 Compliance Assistance & industrial facilitation

- Preparation of guidelines for SME sectors;
eg. livestock farms, rice mills, vehicle service stations etc.
- Develop low cost and affordable effluent treatment methods e.g.: vehicle service stations
- Registration of pollution control consultants and testing laboratories
- Soft loan (E friend I&II) schemes for pollution control activities
- Proposed tax reduction for pollution control devices
- Facilitation to dispose health care waste
- Facilitation to governmental institutions for pollution mitigation requirements.



3.5 Education and Awareness

- Organizing local & international workshops for knowledge sharing and dissemination.
- Promotion Cleaner Production Technology among industrial community.
- Introduce low cost pollution control techniques & locally developed pollution control methodologies.
- National Green Award Programme to motivate & encourage industries in environment protection & management.
- Awareness programmes on industrial pollution control for industrial community



4. Issues in Water pollution Control

- Legal system controlled only pollution concentration not the load.
- Difficulties in applying laws among government institutions
- No proper treatment systems and disposal facilities for Industrial Zones/estates
- Unplanned urbanization without proper waste/effluent disposal facilities.
- Lack of stakeholder coordination
- Improper municipal waste management by Local Government Authorities
- Lack of facility for hazardous waste management
- No proper methods for sewerage sludge & industrial sludge disposal
- Financial constrains in SMEs for pollution control
- Environment is not a prioritized subject/conflict with development
- Attitudes of public & Lack of awareness



5. Improvements in Water Quality Management

- Effective implementation of existing legislations
- Improve and amend the existing legal systems, NEA to include new provisions
- Classification of water bodies according to the ambient quality standards
- Enhance the existing water quality monitoring programme for all important and threatened water bodies
- Develop a water quality index
- Improve the coordination among relevant stakeholder institutions
- Improve collaboration with partner countries for system improvements



THANK YOU!

