2.11 Sri Lanka

1 | Country Information

Table 2.11.1 Basic indicators

Land area (km²)		65, 610 (2023)
Total population		22.3 million (2023)
GDP (current USD)		84 billion (2023)
Per capita GDP (current USD)		3,830 (2023)
Average annual rainfall (mm/year)		2,000 (2023)
Total renewable water resources (km³)		52.8 (2020)
Total annual freshwater withdrawals (billion m³)		13 (2005)
Annual freshwater withdrawal by sector	Agriculture	87.3% (2005)
	Industry	6.4% (2005)
	Municipal (including domestic)	6.2% (2005)

(Source: Central Bank report 2023)

Figure 2.11.1 Diyawanna Lake, Sri Jayewardenepura Kotte, Colombo, Sri Lanka

A popular urban water body, Diyawanna Lake is used for various domestic, industrial & recreational activities. However, studies have revealed that it is deteriorating due to discharges from domestic and industrial sources. To protect the water body and the beneficial uses of the general public, more stringent wastewater discharge standards were imposed under regulation No. 2264/17 of 27.01.2022.

2 | State of Water Resources

Sri Lanka is a tropical island country with an average annual rainfall of 900–5,000 mm (see Fig. 2.11.2), which provides 131,230 million m³ of freshwater annually. Zones in its southwest are the wettest, receiving over 2,000 mm/year, while northern (and some southeast) areas are considered dry zones with under 1,500 mm/year. There are 103 river basins; the largest river is the Mahaweli River, covering an area of 10,448 km² over its 335 km length (MENR and UNEP 2009). Rivers in the wet zones contribute over 50% of the runoff, despite covering only about one third of the land area. There are over 3,400 wetlands, which include ancient irrigation reservoirs, recently constructed multipurpose reservoirs, tanks and lakes.

Groundwater resources in the country are estimated at 7,253 million m³ and represent the main source of water, especially in rural areas, where around 72% of the rural population relies on them for domestic uses.

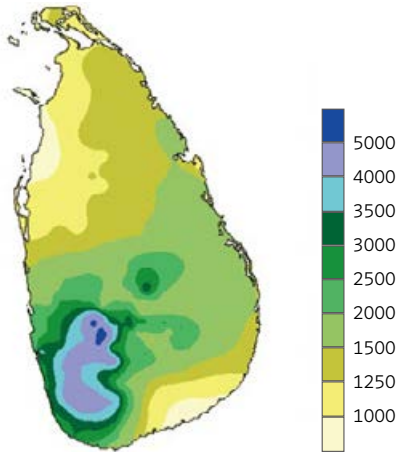

Figure 2.11.2 Annual precipitation distribution (in mm), Sri Lanka

3 | State of Ambient Water Quality

Pollution due to domestic and industrial wastewater as well as leachate from garbage continues to be a problem for surface water and groundwater resources in Sri Lanka. Central wastewater treatment facilities cover less than 5% of the population, and commonly comprise onsite septic tanks among urban dwellings. The heavy use of synthetic fertilizers on farms and the resultant runoff and leaching of nutrients is another cause of nutrient pollution in the surface and groundwater.

(1) Rivers

The water quality of main water courses is within the limits of the ambient water quality standard. However, untreated or insufficiently treated wastewater in urban areas is the main cause of river pollution. For instance, the Kelani River, the second largest river basin in Sri Lanka, is one of the most polluted due to the rapid growth of industry and high population density along the river.

Illegal dumping of solid wastes into waterways is also a serious concern. Expansion of sand mining activities also affects the river water quality, such as with increased turbidity, decreased water flow and accelerated saltwater intrusion. Table 2.11.2 shows the recent state of water quality for certain rivers.

Table 2.11.2 State of river water quality

River	Year	COD (mg/L)	BOD (mg/L)	NO_3^- (mg/L)	PO_4^{3-} (mg/L)
Kalani River	2022	6.95	2.5	2.4	0.02
	2023	14.1	2.2	0.9	0.026
Maa Oya	2022	1.5	3.7	1.2	0.023
	2023	1.5	5.1	1.2	0.015
Maragala Oya	2022	1.4	8.9	0.2	<0.1
Badulu Oya	2022	1.5	10	0.4	<0.1
	2023	1.78	10.085	0.5	<0.1
Menik River	2022	1.775	10.1	0.1	<0.1
	2023	10.75	1.95	0.1	<0.1
Nilwala River	2019	5.6	1	0.9	<0.012
Deduru Oya	2019	3.23	20.1	1.4	<0.013
	2020	26.06	2.95	9.9	<0.01
Attanagalu Oya	2019	16.83	3.71	<0.01	<0.01
Mahaweli River	2020	7.75	5	0.3	<0.01
Diyawanna Lake	2022	24.9	2.3	1.5	0.1
	2023	15.6	3.3	1.1	0.1
Malwathu Oya	2020	23.7	1.7	0.02	0.1

(Source: CEA 2023)

(2) Lakes and reservoirs

In general, the water quality of lakes and reservoirs is considered to be good. Table 2.11.3 summarizes the water quality status of selected reservoirs.

Table 2.11.3 Water quality of certain reservoirs

River	Year	BOD (mg/L)	COD (mg/L)	NO_3^- (mg/L)	PO_4^{3-} (mg/L)
Kurunagala Tank	2023	4.25	25.35	NA	<0.01
Wennaruwa Wewa	2023	2.76	18.98	NA	<0.01
Gregory Lake	2019	8.42	31	1.53	0.04
Nuwara Wewa	2019	2.53	28.27	NA	0.06
	2020	5.81	18.91	NA	0.03
Tissa Wewa	2019	3	35	NA	0.04
	2020	3.56	23.92	NA	0.02

(Source: CEA 2023)

(3) Coastal water

Water pollution in coastal water bodies has grown over the past few decades due to rapid development activities and human settlement both in and outside coastal areas, the establishment of new industries, and hotels and tourism. Over 60% of industrial establishments are located along Sri Lanka's coastal zone, such as the coastal districts of Colombo and Gampaha.

Aquaculture farms located in coastal areas have caused a considerable impact on mangrove ecosystems and the coastal water quality, where most of the coastal water bodies are deteriorating. At present, Sri Lanka has no established ambient water quality standards for coastal waters, which thus needs to be addressed urgently.

(4) Groundwater

A common groundwater quality problem in the country is microbial contamination and nutrients (such as nitrate) caused by leachate from on-site sanitation systems such as pit latrines (see Table 2.11.4). Excessive fertilizer use and untreated wastewater are other factors responsible for the high nitrate levels of the groundwater. In coastal areas, salinity is a prominent issue and is caused by a combination of factors such as excessive groundwater use and sea encroachment.

Table 2.11.4 Variation in groundwater quality across different areas (2014–2018)*

Sampling area	TDS (mg/L)	*E coli* (CFU /100 mL)	COD (mg/L)	TSS (mg/L)	PO_4^{3-} (mg/L)	NO_3^- (mg/L)
Farmland	160–172	22–40	10–13	140–155	0.3–0.6	0.3–0.5
Solid waste dumping site	270–296	10–790	1,220	13–93	0.2–0.5	3.1–7.4
City	80–105	4–608	16–20	6–58	0.2–0.4	0.3–7.4

*Based on research by the University of Peradeniya and National Water Supply and Drainage Board

(Source: CEA 2019)

Industry is another source of groundwater contamination in Sri Lanka. A study conducted under the WEPA Action Program (2017) found high levels of COD, nitrate, and electrical conductivity (EC) in groundwater samples collected near some industries in the Gampaha district.

4 | State of Wastewater Treatment

(1) Domestic wastewater

National sewerage coverage is limited to less than 3%, while the rest of the country relies on on-site sanitation such as septic tanks, ventilated improved pit latrines (VIPs), and unimproved sources (pit latrines and unknown types). There are ongoing and planned wastewater treatment projects to treat domestic wastewater in major cities or linked with certain housing schemes. Tables 2.11.5 and 2.11.6 show the state of existing wastewater treatment facilities.

Table 2.11.5 Existing wastewater treatment facilities in major cities

Scheme	Treatment capacity (m^3/day)	Beneficiaries
Colombo City	379,470	345,000
Dehiwala Mt. Lavinia	32,660	30,000
Kolonnawa	19,870	12,850
Moratuwa/Ratmalana	17,000	12,760
Ja Ela/Ekala	7,250	10,575
Kurunagala	4,500	9,275
Kandy	14,000	13,080
Kataragama sacred city	3,000	2,500
Hikkaduwa	970	527
Raddolugama housing scheme	3,000	9,450
Jayawadanagama housing scheme	1,000	5,454
Mattegoda housing scheme	1,000	5,360
Hantana housing scheme	360	421

(Source: Sanitation master plan 2021–2023)

Table 2.11.6 Wastewater treatment in major housing schemes

Scheme	Treatment capacity (m^3/day)	Beneficiaries
Mattegoda	600	4,850
Jayawadanagama	NA	2,810
Maddumagewatta	NA	1,320
Raddolugama	6,000	8,590
Kuruminiyawatta	NA	850
Royal Park	NA	1,045
Hantana	550	1,650

(Source: Sanitation master plan 2021–2023)

(2) Industrial wastewater

In Sri Lanka, industries are categorized into four groups, A, B, C and D as per the gazette notification No. 2264/18 of 27.01.2022 published under National Environment Act No. 47 of 1980. The Central Environmental Authority issues Environmental Protection Licenses (EPL) based on this categorization for Types A, B, and C industries (high and medium polluting), while local authorities issue EPL for Type D (low polluting) industries (see Table 2.11.7).

Table 2.11.7 Numbers of environmental protection licenses issued by industry category, 2023

Category	A	B	C	D
No. of Industries	1,044	15,556	12,267	23,439

(Source: CEA database 2024)

Most industrial zones have their own wastewater treatment systems for treating wastewater from factories operating within their boundaries. There is little or no data on the state of wastewater generation and treatment from small and medium-sized industries. Table 2.11.8 shows the state of wastewater treatment in several export processing zones.

Table 2.11.8 Wastewater treatment in certain export processing zones

Export processing zone	Treatment capacity (m^3/day)
Biyagama	21,000
Seetawaka	9,900
Koggala	1,000
Katunayaka	7,500
Mirigama	400
Wathupitiwala	600
Polgahawela	450
Mawathagama	500
Horana	1,000
Malwatta	450

(Source: Sanitation Master plan 2021–2030)

According to the National Water Supply and Drainage Board Law, No. 02 of 1974, different tariff structures apply for domestic and industrial sewer services based on total amounts of water consumption from all water supply sources for each billing month. The domestic sewer service provided for commercial purpose charges a flat rate of 40 LKR per cubic meter, while for residential purpose the tariff rate varies according to water consumption. For residential purpose, an additional service charge of 200 LKR also applies. For industrial purpose, a flat rate of 65 LKR per cubic meter applies.

5 | Frameworks for Water Environmental Management

The Constitution of Sri Lanka states that protection, preservation, and improvement of the environment for the benefit of the community is the responsibility of the state (Article 27/14) and that every person in the country has a duty to "protect nature and conserve its riches" (Article 28). Surface water resources such as rivers, streams and lakes are controlled by the government under the Crown Lands Ordinance and the Constitution.

The National Environment Action Plan 2021–2030 (NEAP) is a comprehensive action plan which is being executed to achieve the sustainable development goals. The plan identifies nine thematic areas, focusing on air quality management, biodiversity conservation and sustainable use, climate actions for sustainability, conservation and sustainable use of coastal and marine resources, sustainable land resources management, holistic waste management, integrated water resources management, environmental management in cities and human settlements and greening industries.

NEAP provides a holistic approach in environment management through its special focus on the water environment, which is a cross-cutting sector affecting almost all the identified thematic areas.

(1) Legislation

The National Environmental Act (NEA) No. 47 of 1980 (amended as Act No. 53 of 2000) is the only umbrella law aiming "for the protection, management and enhancement of the environment, for the regulation, maintenance and control of the quality of the environment; for the prevention, abatement and control of pollution". According to the act, discharges, deposits or emissions of waste into the environment cannot be carried out without a license and must comply with the standards and criteria prescribed. Other acts and ordinances related to water environmental management are illustrated in Fig. 2.11.3.

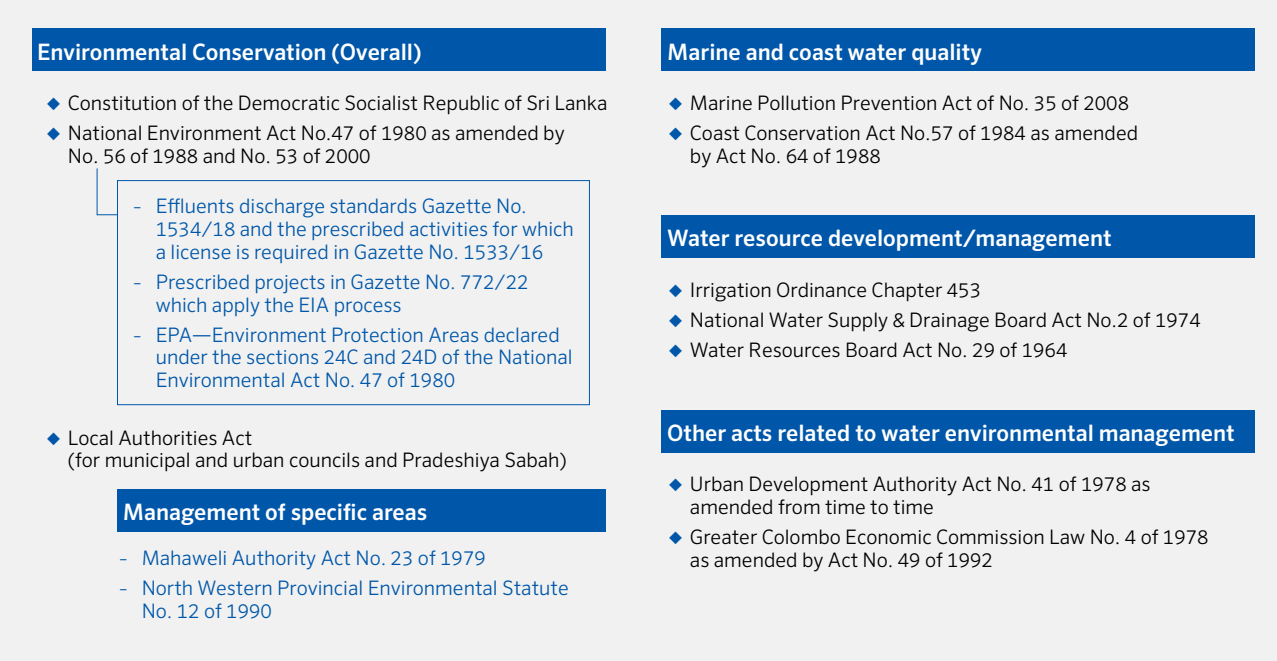

Figure 2.11.3 Laws and regulations related to water environmental management

(Source: created based on information from CEA)

(2) Institutional arrangement

Different governmental agencies control different areas of water environment management in Sri Lanka, as summarized in Table 2.11.9. The Ministry of Environment, established in 2001, is the national authority for formulating policies and guidelines for conservation of the environment and natural resources. Under the ministry, the CEA is responsible for implementation of policies and regulations pertaining to environmental pollution control and management. The CEA was established in 1981 as the authority with regulatory powers to control, manage and enhance the environment.

The Marine Environment Protection Authority (MEPA) has regulatory power over the prevention of marine pollution. Other governmental organizations that are related to construction, engineering services, housing and common amenities, such as the Condominium Management Authority, National Housing Development Authority, and the Board of Investment (BOI) of Sri Lanka are indirectly related to the water environment as their activities significantly affect the condition of water quality. Local governments also play an important role in water environmental management through the regulation of low-impact industries and activities prescribed by orders issued under the NEA. Public health inspectors at the local level control on-site sanitation systems such as pit latrines and septic tanks.

Table 2.11.9 Key agencies involved in management of the water environment

Name of the agency	Mandates of the agency
Ministry of Environment (MOE)	Overall management of the environment and natural resources of the country. Formulating key policies, strategies, and guidelines for environmental management.
Central Environmental Authority (CEA)	Overall responsibility for protecting the environment, including water environment.
Water Resource Board	Scientific characterization, mapping and preparation of comprehensive and integrated plans for the conservation, utilization, control and development of groundwater resources.
National Water Supply & Drainage	Operational development and installation of public and private water supply schemes based on groundwater and coordinated sewerage systems.
Department of Irrigation	Regulation and control of inland waters.
Mahaweli Authority	Maintenance and management of Mahaweli River and its reservoirs for development of lands for agriculture.
Coast Conservation & Coastal Resources Management Department	Conservation of the coastal zone and management of its resources.
Marine Environment Protection Authority	Protection of the marine environment from ship and maritime-related activities.

(Source: created based on information from CEA)

(3) Ambient water quality standards

a. Ambient water quality standards

Table 2.11.10 shows the ambient water quality standards (AWQS) under the National Environmental (AmbientWater Quality) Regulations, No. 01 of 2019. Accordingto this standard, no person shall discharge, deposit or emit any pollutant into inland surface waters exceeding AWQS. There are six categories under AWQS, classified by suitability for different uses/purposes:

i. Category A: water sources requiring simple treatment for drinking
ii. Category B: water sources suitable for bathing and contact recreation
iii. Category C: water sources suitable for aquatic life
iv. Category D: water sources that require general treatment processes for drinking
v. Category E: water sources suitable for irrigationand agricultural activities
vi. Category F: water sources of minimum quality outside of categories A to E

Table 2.11.10 Ambient water quality standards in Sri Lanka (2019)

	No	Parameter		Unit	Category					
					A	B	C	D	E	F
General	1	Colour		Pt mg/L, max	20	-	-	100	-	-
	2	Electrical Conductivity		µS/cm, max	-	-	-	-	700	-
	3	Turbidty		NTU, max	5	-	-	-	-	-
	4	TSS		mg/L, max	25	-	40	1,500	2,100	-
	5	Total Hardness (as $CaCO_3$)		mg/L	250 des 600 max	-	-	-	-	-
	6	pH		-	6.0–8.5	6.0–9.0	6.0–8.5	6.0–9.0	6.0–8.5	5.5–9.0
	7	DO at 250°C		mg/L, minimum	6	5	5	4	3	3
	8	BOD_5 at 20°C		mg/L, max	3	4	4	5	12	15
	9	COD		mg/L, max	10	10	15	30	-	40
Nutrient	10	NO_3^-		mg/L, max	10	10	10	10	-	10
	11	NH_3-N	pH<7.5	mg/L, max	-	-	0.94	-	-	9.1
			7.5 ≤ pH < 8.5		-	-	0.59	-	-	4.9
			8.5 ≤ pH		-	-	0.22	-	-	1.6
	12	PO_4^{3-}		mg/L, max	0.7	0.7	0.4	0.7	-	-
Other	13	Chloride (Cl)		mg/L, max	250	-	-	250	600	-
	14	CN		mg/L, max	0.05	0.05	0.05	0.05	0.05	0.05
	15	F		mg/L, max	1.5	-	-	1.5	-	-
	16	SO_4^{2-}		mg/L, max	250	-	-	250	1,000	-
Metal	17	Cd, total		µg/L, max	5	-	5	5	-	5
	18	Cr, total		µg/L, max	50	-	20	50	-	50
	19	Cu, total		µg/L, max	-	-	100	-	-	100
	20	Fe, total		µg/L	300 des 1,000 max	-	-	2,000	-	-
	21	Pb,total Hardness<120		µg/L, max	50	-	2	50	-	-
		120<Hardness <180					3			
		180<Hardness					4			
	22	Mn, total		µg/L, max	1,000	1,000	1,000	1,000	1,000	1,000
	23	Hg, total		µg/L, max	1	1	1	1	2	2
	24	Ni, total		µg/L, max	70	100	100	100	200	100
	25	Se, total		µg/L, max	10	10	5	10	-	-
	26	Zn, total		µg/L, max	1,000	-	1,000	1,000	2,000	24,000
	27	B, total		µg/L, max	-	-	-	-	500	-
	28	As, total		µg/L, max	50	50	50	50	50	50
	29	Al, total		µg/L, max	200	-	-	-	5,000	5,000
Organic Micro Pollutant	30	Phenolic compounds		µg/L, max	2	5	2	5	5	5
	31	Oil/Grease		µg/L, max	100	-	100	100	-	300
	32	Anionic surfactants as MBAS		µg/L, max	1,000	1,000	1,000	1,000	1,000	1,000
	33	MCPA		µg/L, max	2	-	-	20	-	-
	34	Pendimethalin		µg/L, max	2	-	-	20	-	-
Microbes	35	Total Coliform		MPN/100mL, max	10,000	10,000	-	10,000	-	-
	36	Fecal Coliform		MPN/100mL	500 des 1,000 max	500 des 1,000 max	-	-	-	-

Note: 'des' means desirable and 'max' means maximum.

(Source: Government of Sri Lanka, 2019)

b. Water quality monitoring framework

The CEA is authorized to conduct water quality monitoring, which is carried out by the environmental pollution control unit and water quality monitoring laboratory. The CEA possesses a main laboratory at the head office, and nine provincial and district laboratories as well as private laboratories are also registered once every two years to cater for the environmental monitoring needs. The National Water Supply and Drainage Board (NWSDB) conducts water quality monitoring at water intake points for drinking water purification, in total 340, including 70 groundwater intake points. The CEA conducts regular water quality monitoring in 12 main water bodies, with additional or random monitoring in other areas conducted on an as-needed basis. Ambient water quality monitoring projects are in place in different river basins, as shown in Table 2.11.11. The first water sampling took place in the Kelani River, which is a major source of water supply, in 2013. Online water quality monitoring commenced in 2017. In the same year, monitoring expanded to 16 water bodies (rivers, tanks, reservoirs), and in 2020 is now conducted on a comprehensive basis.

The Sri Lanka Land Reclamation & Development Agency carries out canal water quality monitoring in the Colombo area at 23 locations, while agencies such as the Water Resources Board and International Water Management Institute are also involved in groundwater monitoring.

Table 2.11.11 Water quality monitoring in major water bodies

Name of the water body	Monitoring Points	Frequency	Parameters
Kelani River	17	Once a month	pH, TSS, BOD, COD, Coliform, Phosphate, Nitrate, Heavy metals
Ma Oya	8		
Diyawanna Oya	8		
Bolgoda Oya	6		
Attanagalu Oya	6		
Gregory Lake	7		
Kandy Lake	5		
Mahaveli- upper stream	8		
Kantale Tank	5		
Mahaveli- down stream	8		
Nuwara Wewa	6		
Tissa Wewa	4		
Badulu Oya	7		
Kumbukkan Oya	3		
Menik Ganga	5		
Nilwala Ganga	8		
Kalu Ganga	12		
Kurunagala Tank	4		
Wennaruwa Tank	3		
Mee Oya	6		
Deduru Oya	8		
Kala Oya	4		

(Source: CEA 2023)

(4) Effluent standards

a. Effluent discharge standards

The standards for discharge of wastewater into the environment are published in Gazette Notification No. 2264/17, dated 27.01.2022, as amended National Environmental (Protection & Quality) Regulations No. 01 of 2008.

The standards are based on the point of discharge and the type of effluents identified. Tolerance limits and values for industrial and domestic wastewater as well as modes of discharge into coastal, marine sea outfalls (long and short) or nearshore waters, inland surface water, land for irrigation purpose, and sewer discharges exist. Further, specific tolerance limits and values are prescribed for discharges of leachates from landfill sites.

The regulation has a provision for imposing more stringent standards if necessary in accordance with the need to protect the water environment.

b. Effluent inspection procedure

In principle, effluent quality is self-monitored by the discharging industry concerned or laboratory assigned by the CEA. Effluent quality reports are submitted based on the pollution potential of respective industries on a quarterly basis or at least once a year, to the CEA.

Industries are also required to submit effluent quality reports from third-party laboratories recognized by the CEA. However, the CEA occasionally monitors/inspects effluent discharging industries and obtains samples, as well as investigates suspected cases of non-compliance such as those based on complaints received from the general public.

c. Measures against non-compliance

There are several enforcement instruments for the water environment, including environmental impact assessments (EIA), environmental protection licensing (EPL), scheduled waste management licenses (SWML), environmental protected areas, directives to local Government authorities on solid waste management, and environmental recommendations (ER).

The EPL scheme, which started in 1990, applies to all entities in the country that discharge wastes into the environment, as prescribed by a regulation published under the NEA, with licenses varying according to the pollution potential of the industry (from types A to D). Additional enforcement arrangements are made by other agencies, such as the Water Resource Board, which grants approval for groundwater withdrawals for commercial uses, MEPA, which requires discharge permits for discharging wastewater to the sea, and Mahweli Authority, which protects reservoirs under their purview.

Non-compliance or violation results in suspension or cancellation of the EPL license and filing of cases, as well as minimum fines of 10,000 LKR, imprisonment, or both, as determined by the NEA.

6 | Recent Developments in Water Environmental Management

In 2023, existing river water monitoring programs (implemented along 25 main rivers) were expanded by increasing the number of river monitoring points.

Urban waterbodies and related trends in pollution projections were highlighted during 2022 and 2023 due to the increase of domestic wastewater discharges into urban lakes in Colombo city. Thereafter, the CEA established continuous water quality monitoring in Diyawanna Lake, an urban water body. Monitoring points were selected covering the lake catchment area, and industries within the area were also monitored to check for non-compliance or operating without EPLs. Ultimately, the goal expressed is to control water pollution, restore and manage ecosystem functions and realize the maximum beneficial use from such waterbodies.

The proposed NEA amendments to be finalized in 2024 are to include new regulations on environmental damage compensation, introduction of 'the polluter pays' principle, legalization of environmental clearance, and control over groundwater pollution with the aim of protecting the country's water environment.

7 | Challenges and Future Plans

The lack of proper institutional coordination is a major challenge, as water sector management is divided into several sections under different ministries or agencies. Similarly, several disparate functions of water management are represented through various laws and regulations, meaning compliance monitoring and enforcement thereof remain an ongoing challenge.

There is also a need for considerable improvement as regards resources allocation from the national budget, such as for hiring staff for field monitoring and inspection and laboratory analysis. The lack of baseline data as well as limited sharing of available data are further barriers to improvements in water environmental governance. The lack of financial and technical resources often hampers regular monitoring as well as the establishment of new monitoring stations.

Failure to self-report by industries is another prominent challenge as some industries lack the resources and capacity to monitor and report their compliance. Industries, in particular SMEs, lack the financial resources such as for treating wastewater. Further, the high costs of constructing and operating centralized WWTP as well as public resentment and protests over WWTP establishment remain as challenges for wastewater treatment in cities.

The National Environmental Action Plan (2022–2030) has identified water environment management as a key sector, while the Nationally Determined Contributions (NDCs) implementation plan (2021–2023) has identified the water sector as an adaptation category. Each of the agencies related to the above needs to identify relevant sectors and categories and develop its own comprehensive action plans in line with its mandates and institutional framework. In this process the CEA plays a pivotal role and executes its strategies and actions according to the corporate plan for the years 2021 to 2025.