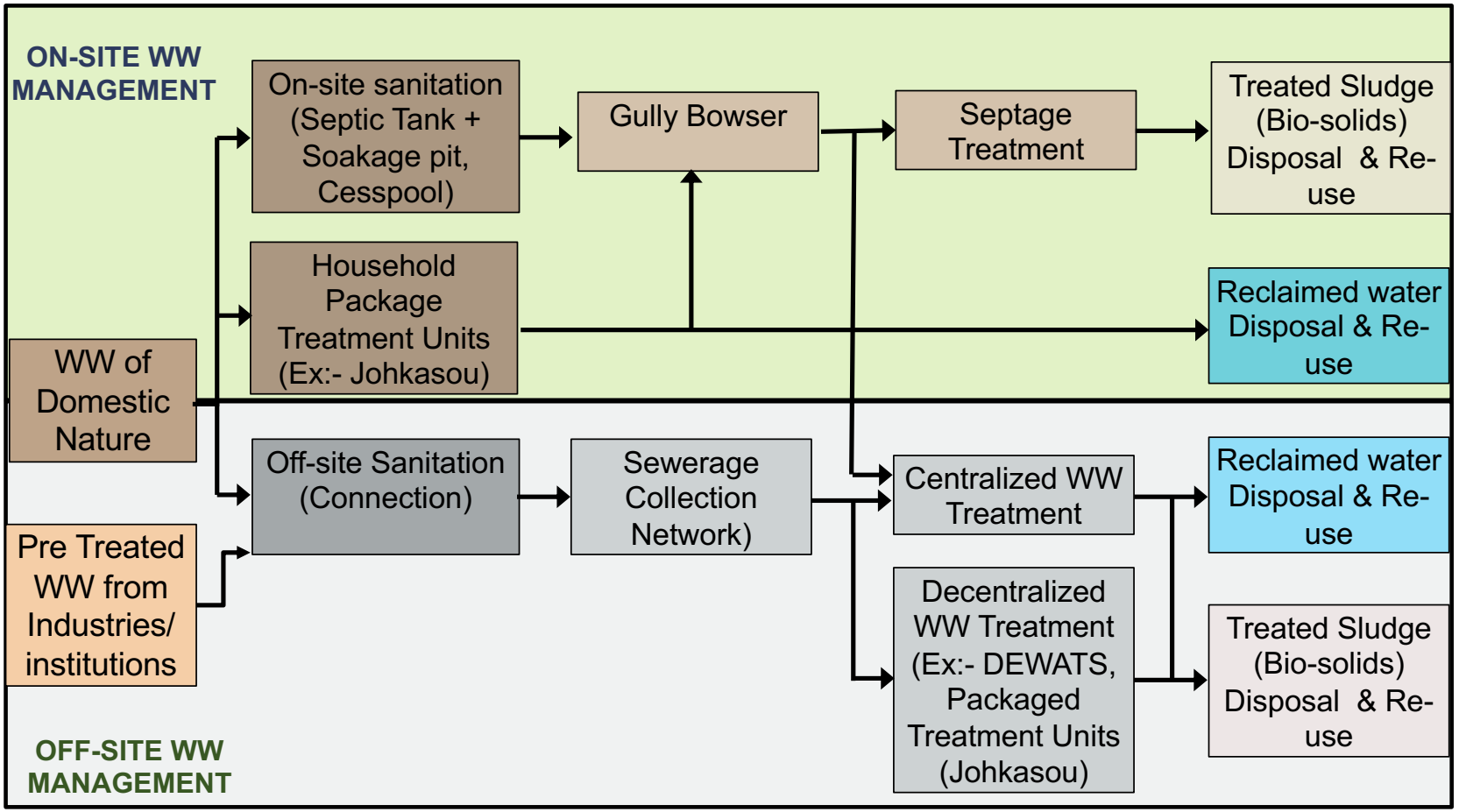
Sri Lanka Sanitation Context

WATER RECLAMATION DIVISION
NATIONAL WATER SUPPLY & DRAINAGE BOARD

Wastewater Management



Storm water and Solid waste are separately managed

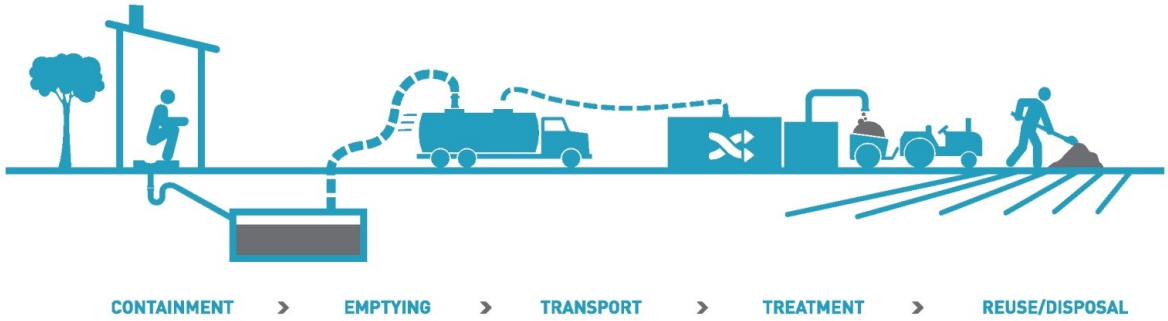
BASIC SANITATION

Having access to **improved sanitation facilities** that are not shared with other households

SAFE SANITATION

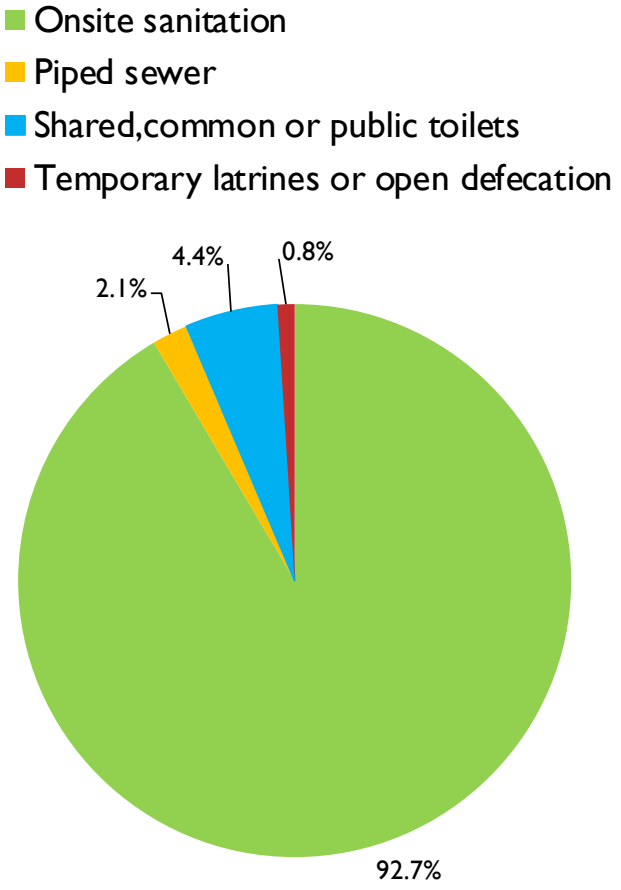
use of an **improved sanitation facility** which is not shared with other households and where excreta is **safely disposed** in-situ or excreta is **transported** and **treated** offsite.

Sanitation Service Chain



Sanitation Coverage

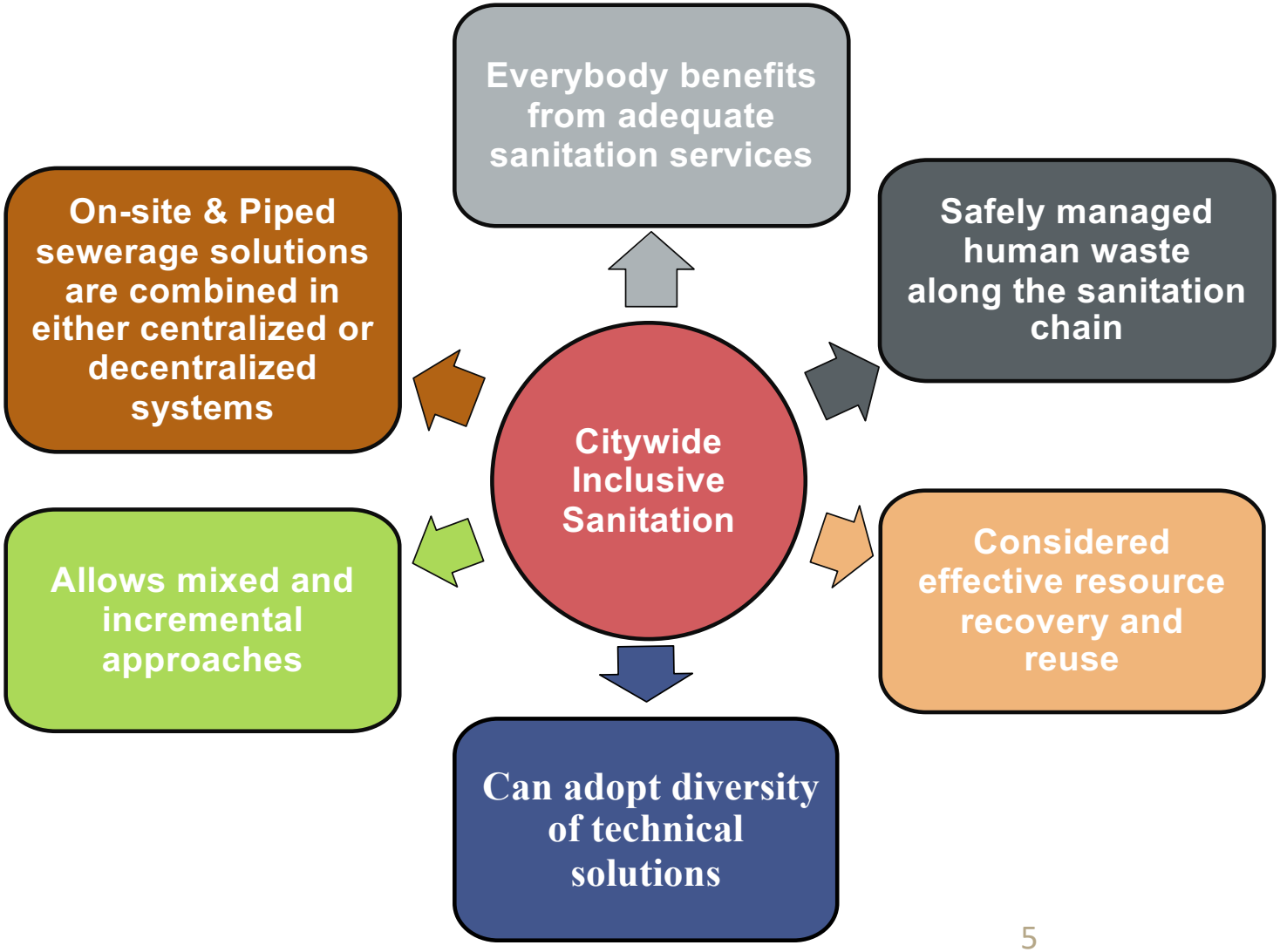
Graphical presentation of present sanitation scenario(End of 2025)



EXPECTED SANITATION COVERAGE

Year	2020	2025	2025 Actual	2030
Connected to sewer networks	2.1%	3%	2.1%	4.4%
Access to onsite sanitation	91.5%	94.3%	92.7%	95.6%
Total Basic Sanitation coverage	**93.6%**	**97.3%**	**94.8%**	**100%**
Improved onsite sanitation + Faecal Sludge Management	9.0%	38%	11.9%	53.0%
Total Safe Sanitation coverage	**11.1%**	**41%**	**14.0%**	**57.4%**

Citywide Inclusive Sanitation



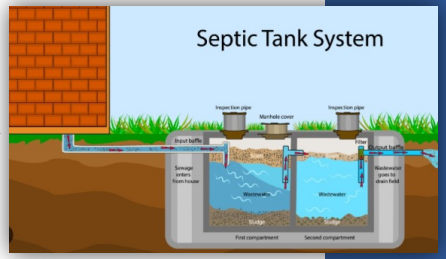
Sustainable Solutions for Sanitation

Technical approach	Applicability	Remarks
Improved On-Site Sanitation Systems/ improvements	Rural or sub urban areas (scattered houses)/Space available/ good soaking capacity of soil/ Isolated individual houses in cities	Septic Tank + Soakage pits Packaged treatment units Faecal Sludge Management Facilities
Decentralized Wastewater Treatment Systems (DEWATS)	House clusters located away from existing schemes, Schools, Hospitals, Institutions	Nature Based Solutions (low cost) Conventional treatment systems Packaged treatment units
Existing Schemes		
Direct connections to existing scheme	For households in existing sewer area	Utilize spare capacity of existing schemes/with augmentation of existing system
Simplified sewer extensions to existing scheme	Adjacent to existing sewer and possible for gravity sewer connection	
Simplified sewer extensions with pumping	House clusters close to existing sewer area where impossible for gravity connection	
New Schemes		
New Sewer Reticulation system + Centralized Treatment	Highly urbanized compact areas.	New WWTP + Network + PS

Types of Sanitation Solutions

1. Onsite Systems – to meet 100% Basic sanitation target & increase safe containment of faecal sludge

Scattered housing units, institutions, etc.
- Construction of New Latrines
- Improving existing septic tanks



2. Faecal Sludge Management – to meet 53% Safe Sanitation by facilitating safe disposal of faecal sludge from septic tanks

Required FSTP identified based on
- Gully bowser operations
- MC/UC Area
- Pollution Map

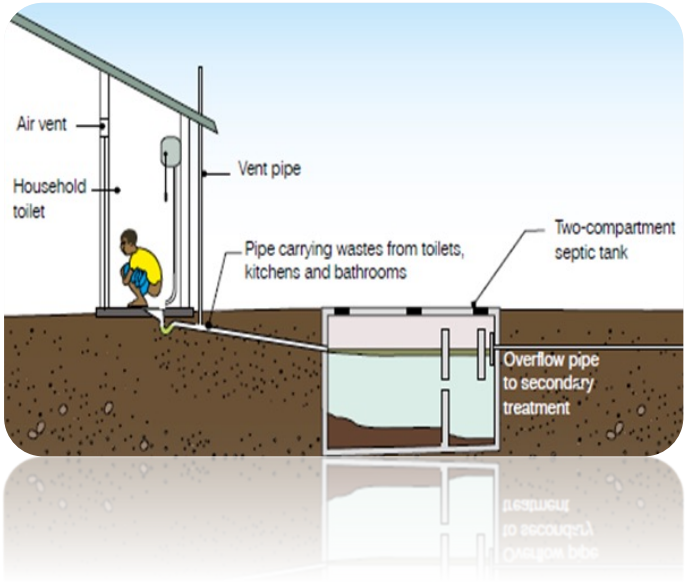
3. Decentralized Wastewater Treatment (DEWATS) systems - to minimize point source pollution

Identified point pollution sources
- Hospitals
- Schools and Educational Institutes
- Prisons and Housing schemes
- Industrial Zones
- Major cities for public toilets

4. Centralized Wastewater Treatment Systems - to meet 4.4 % piped sewer coverage

For highly urbanized compact areas where limited space for onsite WW treatment and significantly large amount of wastewater generation.

- Major Cities/Urban Centers
- Coastal belt
- Tourist areas



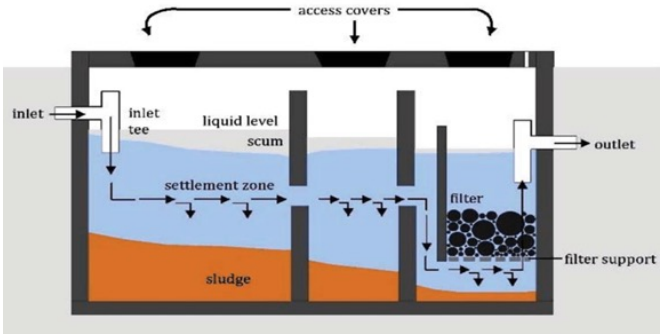
1. Onsite systems improvements

2. Septage Treatment plants (STP)

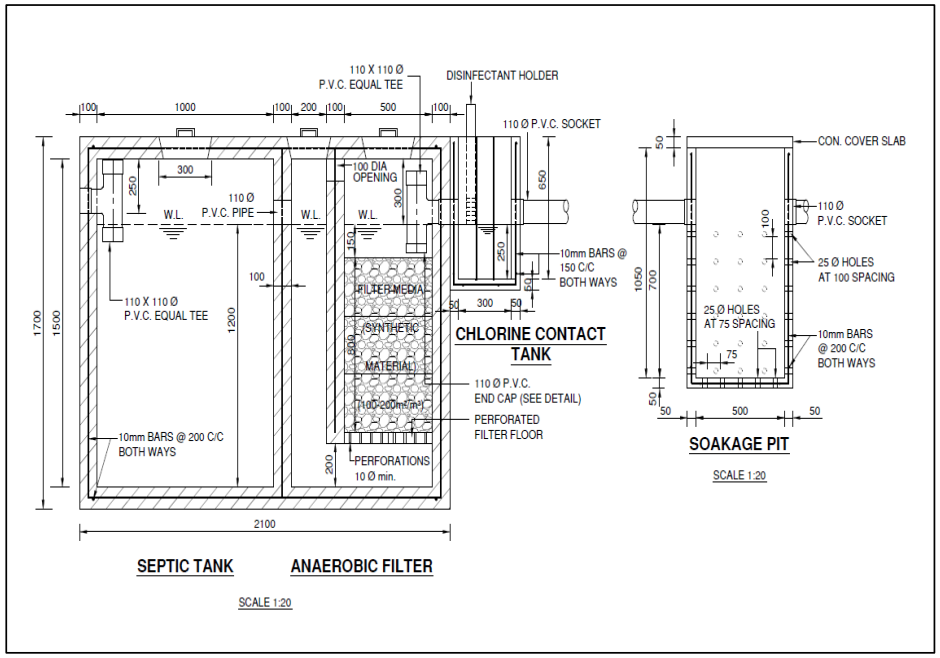
3. Decentralized Wastewater treatment Systems (DEWATS)

4. Centralized City Sewerage Projects

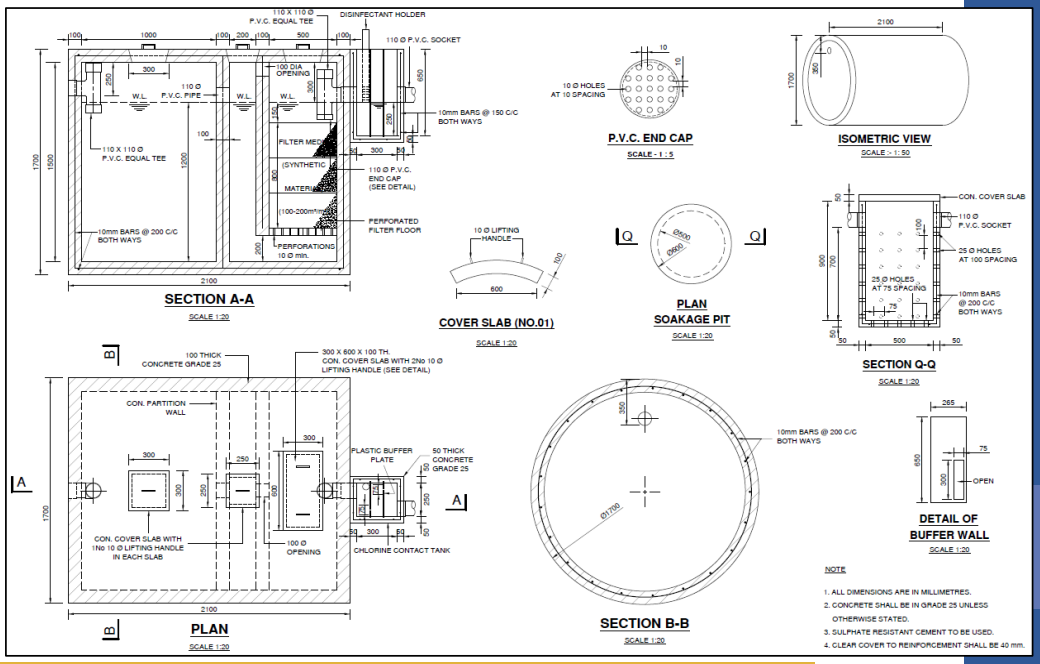
Options for Improved Onsite Treatment system



Rectangular Onsite system for In-situ construction



Circular Onsite system for Pre-cast construction



Sri Lankan Standard for Septic Tank Design and Associated Effluent Disposal **SLS 747 Part I & Part II**

1. Onsite systems improvements

2. Faecal Sludge Treatment plants (FSTP)

3. Decentralized Wastewater treatment Systems (DEWATS)

4. Centralized City Sewerage Projects

Existing Faecal Sludge treatment Plants in Sri lanka

Waste Stabilization Pond Systems (Nature Based Solutions)

Mullaitivu Faecal Sludge Treatment Plant (25m^3/day)

Kilinochchi Faecal Sludge Treatment Plant (25m^3/day)

Chilaw Faecal Sludge Treatment Plant (25m^3/day)

Existing Faecal Sludge treatment Plants in Sri lanka

Mechanized Faecal Sludge Treatment Plants(FSTPs)

WELIGEPOLA FAECAL SLUDGE TREATMENT PLANT (25m^3/day)

THALAWAKELE FAECAL SLUDGE TREATMENT PLANT (25m^3/day)

RUWANWELLA FAECAL SLUDGE TREATMENT PLANT (25m^3/day)

1. Onsite systems improvements

2. Septage Treatment plants (STP)

3. Decentralized Wastewater treatment Systems (DEWATS)

4. Centralized City Sewerage Projects

De-Centralized Wastewater Treatment Systems (DEWATS)

- Bridging the gap between conventional and onsite systems,
- DEWATS will be considered for concentrated population pockets where high risk for pollution, contamination and area of national economic interest,
- This solution is specially for locations that generate high quantity of wastewater daily that cannot be managed by conventional onsite septic tank systems.
- Create opportunities for PPPs.

The following locations were identified as major contributors of ground/surface water pollutions

- Hospitals
- Schools/Educational institutes
- Prisons/rehabilitation centers
- Condominiums/Housing Schemes
- Public toilets in townships/pilgrim places
- Industrial Estates

1424 Hospitals & Medical Institutes

10156 Schools

89 Higher Educational and technical Training institutes

17 Prison and Rehabilitation Centers

21 Housing schemes & condominiums

65 Public toilets in Major Townships

61 Major tourist and Pilgrim attraction locations

22 Industrial Estates

Existing Decentralized Wastewater Treatment Systems (DEWATS)

Defense Headquarters

Seethawaka BOI Zone

Kegalle Hospital

Lunawa Hosing Scheme

Sri Padasthanaya

DEWATS at Ratmalana Tsunami Housing Scheme

1. Onsite systems improvements

2. Septage Treatment plants (STP)

3. Decentralized Wastewater treatment Systems (DEWATS)

4. Centralized City Sewerage Projects

Existing Centralized Wastewater Treatment Systems/Urban Sewerage Systems in Sri Lanka

Kandy City WWMP- (Oxidation Ditch)
Capacity – 14,000 m3/day
Population Coverage– 55,000 (Domestic)

Ja Ela Ekala WWMP - (A2O)
Capacity – 7,500 m3/day
Population Coverage– 8,000(Domestic) + Industrial/ 73,500 PE

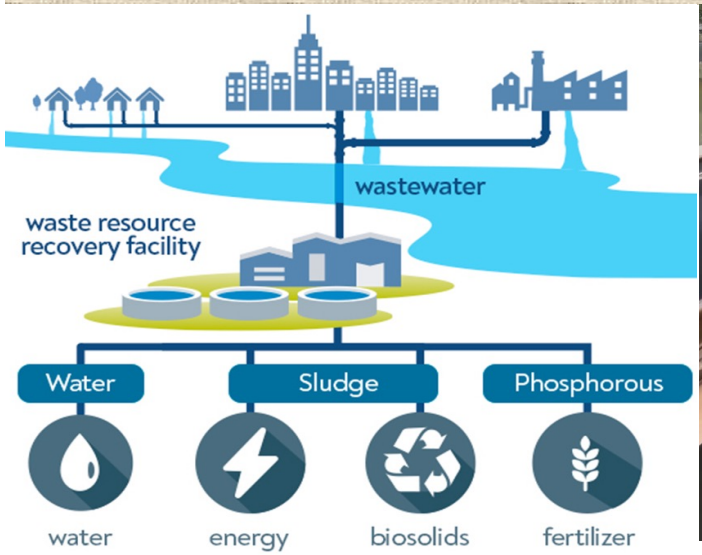
Greater Kurunagala WMMP- (AO)
Capacity – 4,500 m^3/day
Population Coverage– 25,000(Domestic)

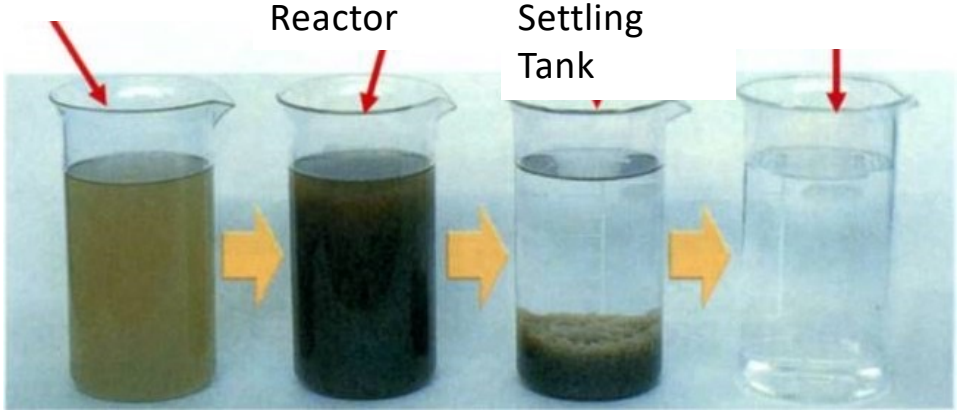
Kataragama WMMP- (Aerated Lagoons)
3,000 m^3/day
Population Coverage– 12,000 (Domestic)

No	WW Management System	Ownership	Capacity (m^3/day)
1	Colombo City	CMC	379,470
2	Dehiwala -Mt.Lavinia	NWSDB	32,660
3	Kolonnawa	NWSDB	19,870
4	Moratuwa/ Ratmalana	NWSDB	17,000
5	Ja Ela/Ekala	NWSDB	7,500
6	Kurunegala	NWSDB/ Kurunagala MC	4,500
7	Kandy	NWSDB/ Kandy MC	14000
8	Kataragama Sacred City	NWSDB	3,000
9	Hikkaduwa	NWSDB	970
10	Raddolugama Housing Scheme	NWSDB	3,000
11	Jayawadanagama Housing Scheme	NWSDB	1,000
12	Mattegoda Housing scheme	NWSDB	1,000
13	Hantana Housing scheme	NHDA	360

Appropriate Technology Selection for Centralized Wastewater Treatment Systems

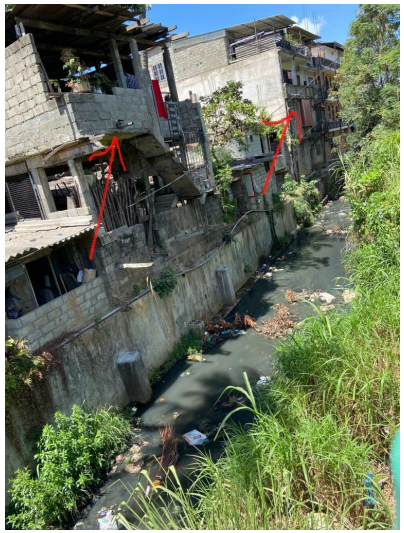
Reclaimed Water / Resource Recovery & Reuse



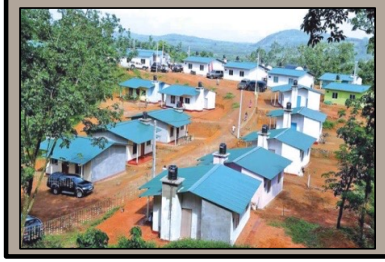


Reclaimed Water / Resource Recovery & Reuse

Progressive Water Quality Improvement of Meda Ela after Implementation of KCWWDP



Actors & Roles in the Sanitation

Sector	Methodology	Responsibility	Input
Rural 	On-site (Toilets + Water Sealed Septic Tanks	Local Authority NHDA	LA, Health Dept. Provincial Councils, NGOs
	Faecal Sludge Management (STP)	Local Authority NWSDB	Local Authority NWSDB Private Sector
Peri-Urban/ Populated Pockets 	Decentralized Wastewater Treatment Systems (DEWATS)	NWSDB Local Authority NHDA UDA/CMA MoH BoI/MoI MoE	NWSDB Local Authority BOI/MoI Private Sector
Urban 	Sewerage System with Centralized Treatment	NWSDB Local Authority	RSC / NWSDB Municipalities/LAs

Regulatory requirements – CEA discharge standards to Marine Waters

NATIONAL ENVIRONMENTAL ACT, NO. 47 OF 1980

1. Tolerance limit values for the discharge of wastewaters or effluents (industrial and / or domestic) from a prescribed activity into the Marine waters

Cont....

No.	*Parameter*	*Unit, type of limit*	*Tolerance limit values for an outfall leading up to near-shore water*	*Tolerance limit values for a short sea outfall*	*Tolerance limit values for a long sea outfall*
1.	Total suspended solids	mg/1, max.	30	50	250
2.	Total dissolved solids	mg/1, max.	2100	-	-
3.	pH value at ambient temperature	-	6.0 – 8.5	5.5 – 9.0	5.5 – 9.0
4.	Biochemical Oxygen demand (BOD_5 in 5 days at 20°C)	mg/1,max.	15	75	400
5.	Temperature at the point of discharge	°C, max	Ambient water temperature +/- 5 or 35 whichever is lesser	Ambient water temperature +/- 5 or 35 whichever is lesser	Ambient water temperature +/- 5 or 35 whichever is lesser
6.	Oils and greases	mg/1,max.	5	12	15
7.	Phenols (as C_6H_5OH)	mg/1,max.	1	1	5
8.	Chemical oxygen demand (COD)	mg/1,max.	50	400	800
9.	Dissolved phosphates (as P)	mg/1,max.	1	5	10
10.	Ammoniacal nitrogen (as N)	mg/1,max.	15	50	150
11.	Cyanides (as CN)	mg/1,max.	0.1	0.2	0.4
12.	Total residual chlorine (as Cl_2)	mg/1,max.	0.5	0.5	1.0
13.	Fluorides (as F)	mg/1,max.	2	2	5
14.	Sulphides (as S)	mg/1,max.	2	2	5
15.	Arsenic, total (as As)	mg/1,max.	0.08	0.1	0.2
16.	Cadmium, total (as Cd)	mg/1,max.	0.02	0.05	0.10
17.	Chromium, total (as Cr)	mg/1,max.	0.05	0.05	0.10
18.	Chromium, hexavalent (as Cr^{6+})	mg/1,max.	0.01	0.01	0.05
19.	Copper, total (as Cu)	mg/1,max.	1.0	1.0	1.0
20.	Lead, total (as Pb)	mg/1,max.	0.05	0.10	0.10
21.	Mercury, total (as Hg)	mg/1,max.	0.001	0.002	0.01
22.	Nickel, total (as Ni)	mg/1,max.	0.1	0.2	1.0
23.	Selenium, total (as Se)	mg/1,max.	0.01	0.05	0.10
24.	Zinc, total (as Zn)	mg/1,max.	3	3	5
25.	Silver, total (as Ag)	mg/1,max.	0.005	0.035	0.35
26.	Pesticides (Total)	mg/1,max.	0.005	0.005	0.05
27.	Surfactants (Total)	mg/l, max.	1	5	10
28.	Faecal Coliform	MPN/100ml,max	150	1500	10^7
29.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5	0.5	0.5
30.	Radioactivity Gross beta activity +	Bq/l maximum	1.0	1.0	1.0

Regulatory requirements – CEA discharge standards to Inland Waters

NATIONAL ENVIRONMENTAL ACT, NO. 47 OF 1980

2. Tolerance limit values for the discharge of wastewaters or effluents (industrial / domestic) from a prescribed activity into the inland surface waters

Note : These limit values are based on the premise that for inland surface water. The dilution factor may be at least 1:8. In an event where the dilution factor is found to be less, the limit values in the Schedule should be adjusted on a proportional basis so as to give rise to more stringent limit values.

Cont….

No.	*Parameter*	*Unit, type of limit*	*Tolerance limit values for Inland surface waters*
1.	Total suspended solids	mg/1, max.	50
2.	Total dissolved solids	mg/1, max.	1000
3.	pH at ambient temperature	-	6.0 – 8.5
4.	Biochemical oxygen demand (BOD_5 in 5 days at 20° C)	mg/1,max.	30
5.	Temperature at the point of discharge	°C, max.	Ambient water temperature ± 5 or 40 whichever is lesser
6.	Oils and greases	mg/1,max.	10
7.	Phenols (as C_6H_5OH)	mg/1,max.	1.0
8.	Chemical oxygen demand (COD)	mg/1,max.	250
9.	Dissolved phosphates (as P)	mg/1,max.	5
10.	Total Kjeldhal nitrogen (as N)	mg/1,max.	150
11.	Ammoniacal nitrogen (as N)	mg/1,max.	50
12.	Nitrate (as N)	mg/1,max.	10
13.	Cyanide (as CN)	mg/1,max.	0.05
14.	Total residual chlorine (as Cl_2)	mg/1,max.	0.5
15.	Chlorides (as Cl)	mg/1,max.	400
16.	Fluorides (as F)	mg/1,max.	2.0
17.	Sulphides (as S)	mg/1,max.	0.5
18.	Arsenic, total (as As)	mg/1,max.	0.05
19.	Cadmium, total (as Cd)	mg/1,max.	0.03
20.	Chromium, total (as Cr)	mg/1,max.	0.05
21.	Chromium, hexavalent (as Cr^{6+})	mg/1,max.	0.01
22.	Copper, total (as Cu)	mg/1,max.	0.05
23.	Iron, total (as Fe)	mg/1,max.	3.0
24.	Lead, total (as Pb)	mg/1,max.	0.05
25.	Mercury, total (as Hg)	mg/1,max.	0.001
26.	Nickel, total (as Ni)	mg/1,max.	0.2
27.	Selenium, total(as Se)	mg/1,max.	0.05
28.	Zinc, total (as Zn)	mg/1,max.	2.0
29.	Silver, total (as Ag)	mg/1,max.	0.035
30.	Pesticides (Total)	mg/1,max.	0.005
31.	Surfactants (Total)	mg/l, max.	5.0
32.	Faecal coliform	MPN/100ml, max.	150
33.	Sulphates (as S)	mg/l, max.	250
34.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5
35.	Radioactivity Gross beta activity +	Bq/l maximum	1.0

Regulatory requirements – CEA discharge standards

NATIONAL ENVIRONMENTAL ACT, NO. 47 OF 1980

3. Tolerance limits for the discharge of wastewaters or effluents (industrial and / or domestic) from a prescribed activity on land for agriculture purposes

No.	*Parameter*	*Unit, type of limit*	*Tolerance limit values for on land disposal*
1.	Total dissolved solids	mg/1, max.	2000
2.	pH at ambient temperature	-	6.5 – 8.5
3.	Biochemical oxygen demand (BOD_5 in 5 days at 20^0C)	mg/1,max.	250
4.	Oils and greases	mg/1,max.	10
5.	Chemical oxygen demand (COD)	mg/1,max.	400
6.	Chlorides (as Cl)	mg/1,max.	300
7.	Sulphates (as S)	mg/1,max.	350
8.	Boron (as B)	mg/1,max.	2.0
9.	Arsenic, total (as As)	mg/1,max.	0.01
10.	Cadmium, total (as Cd)	mg/1,max.	0.003
11.	Chromium, total (as Cr)	mg/1,max.	0.05
12.	Lead, total (as Pb)	mg/1,max.	0.01
13.	Mercury, total (as Hg)	mg/1,max.	0.001
14.	Sodium adsorption ratio (SAR)	max	10
15.	Residual Sodium carbonate (RSC)	miliequivalant / l, max.	1.25
16.	Nitrate (as N)	mg/1,max.	10
17.	Electrical conductivity	µS/cm, max	2500
18.	Faecal coliform	MPN/100ml, max.	1000
19.	Copper total (as Cu)	mg/1,max.	0.2
20.	Cyanide (as CN)	mg/1,max.	0.05
21.	Nickel total (as Ni)	mg/1,max.	0.02
22.	Selenium total (as Se)	mg/1,max.	0.01
23.	Zinc total (as Zn)	mg/1,max.	1.0
24.	Discharge rate Hydrolic loading rate	m3/hectare/day	as decided in accordance with the notes given herein below
25.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5
26.	Radioactivity Gross beta activity +	Bq/l maximum	1.0

Regulatory requirements – CEA discharge standards

4. 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

NATIONAL ENVIRONMENTAL ACT, NO. 47 OF 1980

No.	*Parameter*	*Unit, type of limit*	*Tolerance limit values*
1.	Total suspended solids	mg/1, max.	500
2.	Total dissolved solids	mg/1, max.	3000
3.	pH at the ambient temperature	-	5.5 – 9.0
4.	Biochemical oxygen demand (BOD_5 in 5 days at 20^0 C)	mg/1,max.	400
5.	Temperature at the discharge point	^{0}C, max	45
6.	Oils and greases	mg/1, max.	20
7.	Phenols (as C_6H_5OH)	mg/1, max.	5.0
8.	Chemical oxygen demand (COD)	mg/1, max.	800
9.	Total Phosphorous (as P)	mg/1, max.	3.5
10.	Total Kjeldhal nitrogen (as N)	mg/1, max.	350
11.	Free ammonia (as N)	mg/1, max.	50
12.	Ammoniacal nitrogen (as N)	mg/1, max.	50

Location of Final Disposal

Disposal Location		Limiting Factor
Ground/Soil (soaking)		Quantity (wastewater of domestic nature) Seasonal high ground water table Soil absorption capacity
Flowing water body		Adequate dilution (1/8 dilution) otherwise more stringent discharge standards based on dilution factor in driest months
Marine waters	Near-shore water	No dilution – Stringent discharge standards
	Short sea outfall	1:10 dilution
	Long sea outfall	1:100 dilution

In addition, based on sensitivity of receiving water body and nature of industry (hazardous materials and products) zero discharge strategy is enforced

Sludge Disposal

- Sludge of domestic nature – Soil conditioner or co-composting
- Industrial sludge - Incineration

Industrial Siting Policy

- Policy established to prevent contamination of drinking water sources by industrial effluent discharges (by NWSDB/CEA)
- Describes limitations for siting of High Polluting Industries (**Type A & Type B**) upstream of drinking water intakes
- **Type A Industries** (**effluent that are toxic and harmful for human health**)
  - Not permitted to locate upstream of drinking water abstraction points (applicable for individual industry or industrial zone operated by BOI/MoI)
  - Not permitted to discharge effluent directly or indirectly (through a tributary or otherwise)
  - Permitted only discharge downstream of last water abstraction point/ or source that is not used for drinking purposes based on regulatory requirement of CEA and EIA approval

Industrial Siting Policy

- **Type B Industries** (effluent with high pollutant loads)
  - permitted to locate upstream of drinking water abstraction points provided that safe distance are maintained from downstream intake point (minimum 1 km)
  - Treatment process capable of meeting CEA discharge standards
  - Competent plant operators
  - In-house testing facilities, continues monitoring of water quality, record keeping and third party quality verification are required

Environmental Protection License (EPL)

- The Environmental Protection License (EPL) is a regulatory/legal tool under the provisions of the National Environmental Act No: 47 of 1980.

Validity Period of an EPL

- Prescribed activities coming under List A & B- Maximum of one years from effective date of the License.

Reference : CEA website (https://www.cea.lk/web/en/2013-05-07-07-51-07/environmental-pollution-contorl-division)

The Prescribed Activities for Which a License is Required – Part A & B

36. Animal feed manufacturing industries having a production capacity of 25 or more metric tons per day.
37. Foundries with furnaces having 5 or more workers are employed.
38. Metal fabricating industries or machinery, machinery parts or hardware items or electrical and electronic goods and equipment manufacturing or assembling industries.
39. Machinery repairing industries where 25 or more workers are employed.
40. Lathe workshops or welding workshops or spray painting industries where 25 or more workers are employed.
41. Concrete batching plants having a production capacity of 50 or more cubic meters per day.
42. Mechanized mining activities with single bore hole blasting having production capacity of 500 or more cubic meters per month.
43. Crushing or processing of non-metallic minerals (i.e. limestone, dolomite, apatite, rock phosphate, sand stone, feldspar, quartz, ilmenite, rutile, zircon, mica, graphite, kaolin etc.) excluding lime shell and granite crushing activities.
44. Granite boulders making or processing industries (extracting, blasting, slicing, polishing).
45. Granite crushing industries having a production capacity of 25 or more cubic meters per day.
46. Common wastewater (industrial or sewage) treatment plant.
47. Incinerators having a feeding capacity of 5 or more metric tons per day.
48. Drinking water treatment plants having a treatment capacity of 10000 or more cubic meters per day.
49. Municipal solid waste and other solid waste composting plants having a daily input capacity of 10 or more metric tons.
50. Solid waste recycling (including plastic wastes) or recovery or processing plants having a daily input capacity of 10 or more metric tons.
51. Solid waste disposal facility or sites having a daily disposal capacity of 10 or more metric tons.
52. All toxic and scheduled waste disposal or recycling or recovering or storage facilities.
53. Industries involved in chemical treatment and preservation of wood excluding Boron treatment.
54. Saw mills having a milling capacity of 50 or more cubic meters per day or wood based industries where 25 or more workers are employed.
55. All plywood manufacturing industries.
56. Residential hotels or restaurant or guest houses or rest houses having 20 or more rooms.
57. Hotels without residential facilities or restaurants or reception halls where 25 or more workers are employed or food preparing places or catering services where 50 or more workers are employed.
58. Hostels or similar dwelling places where occupancy level in a day is 200 or more persons
59. Medical laboratories or hospitals or medical research centers.
60. Automobile or three wheeler or motor bicycles or bicycles assembling industries.
61. Vehicle service stations or container yards having vehicle servicing activities excluding three wheeler and motor cycle services and interior cleaning.
62. All bus depots where servicing activities take place or railway workshops or aeroplane maintenance yards.
63. All vehicular emission testing centers.
64. All hydroelectricity power stations or wind power plants having a gross electricity generation capacity of 3MW or more.
65. Printing press with lead melting or newspaper printing or printing process which generates wastewater.
66. Paper products or corrugated cartons manufacturing industries.
67. Zoological gardens or animal hospitals or animal exhibiting centers.
68. Transmission towers providing facilities for telecommunication or broadcasting or telecasting.
69. Pest control services.
70. Any activity/industry not included in the Part B of the Schedule, where 200 or more workers per shift are employed.
71. Any activity/ industry not included in the Part B of the Schedule, which discharges wastewater capacity of 10 cubic meters or more and less than 40 cubic meters per day in its production process.

Environmental Protection License (EPL)

Legal proceedings against industries/institutions are adopted under part IV A of the National Environmental Act when;

1. An industrial activity/ process acts in violation of any terms, conditions and standards stipulated in the license.

2. The prescribed industries who do not obtain an Environmental Protection License (EPL)

3. A prescribed activity emits waste to the environment without conforming to the stipulated standards.

If the industrialist /Institutions continues to violate the conditions legal action will be initiated. Legal Procedure includes following cause of actions

1.Cancellation /suspension of EPL
2.Rejection of application for EPL
3.Hearing of appeals by the secretary of the Ministry of Environment
4.Sending Legal Notices
5.Filing Cases.

Environmental Impact Assessment (EIA)/ Initial Environmental Examination (IEE)

- An "IEE" is a preliminary assessment of a project's potential environmental impacts, used to determine if a full "EIA" is necessary, while ;
- An EIA is a more comprehensive analysis that examines all significant environmental impacts of a project in detail, including mitigation strategies, to inform decision-making about its approval.

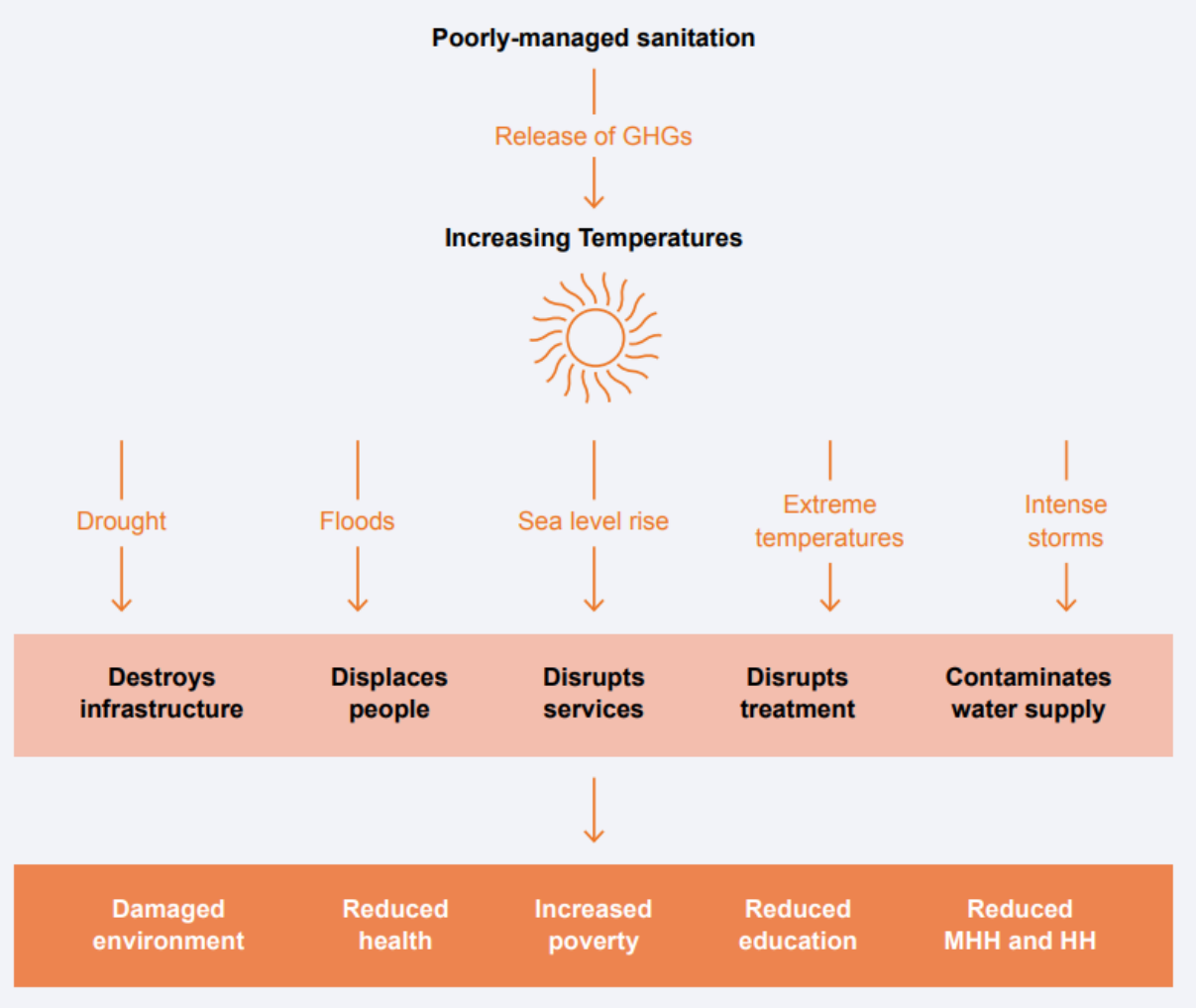
Environmental Impact Assessment (EIA)

- EIA become a mandatory requirement for establishment of development projects in Sri Lanka under the National Environmental Act.
- Effective tool for the purpose of integrating environmental considerations into development project planning and one of the key techniques to achieve sustainable development.
- It helps to identify the likely effects of a particular project on the environment, at an early stage.
- EIA also finds ways to reduce unacceptable impacts and to shape the project so that it suits the local environment.
- It helps officials make decisions about a project and helps the project proponent achieve his aims more successfully.

Climate resilient wastewater management

- Focuses on building infrastructure and systems that can withstand and adapt to the impacts of climate change, such as increased rainfall, droughts, and extreme weather events and sea level rising.

- Addressing the physical aspects of wastewater treatment by integrating social, economic, and environmental considerations.



Source: Technical Brief, WASH Climate-Resilient Development

Best Approaches

- Adaptation - minimizing the impacts of climate events on sanitation service delivery
- Mitigation - reducing the emission

Key aspects of climate-resilient wastewater management

- **Infrastructure upgrades**

Investing in robust and flexible infrastructure that can handle increased flows, extreme weather events, and changing water quality.

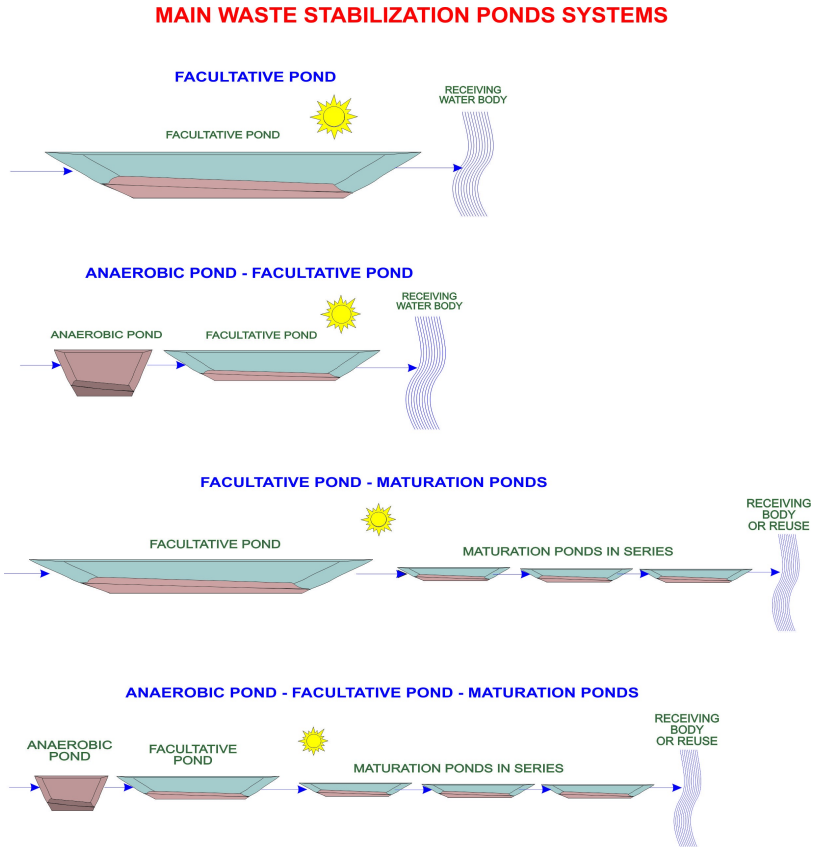
- **Nature-based solutions**

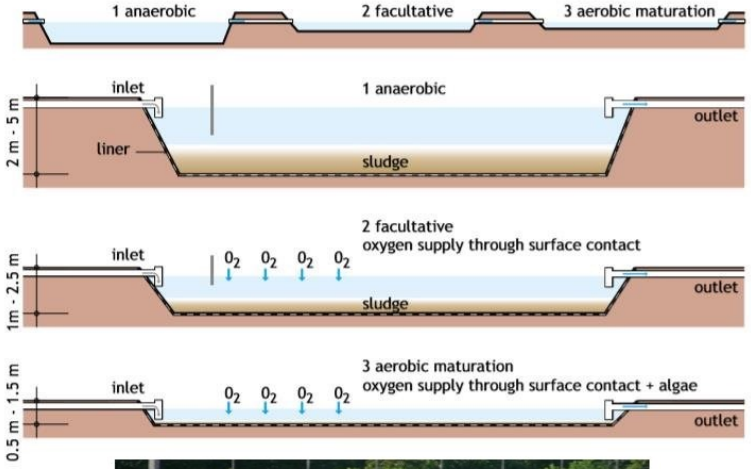
Utilizing natural systems like wetlands and green infrastructure to manage wastewater, stormwater and improve water quality, while also providing other environmental benefits.

- **Water reuse and resource recovery:**

Treating wastewater to a standard suitable for reuse in agriculture, industry, or even for potable water, and recovering valuable resources like nutrients and energy (bio-gas) from wastewater.

Waste Stabilization Pond Systems (Natural)





Hikkaduwa WSP

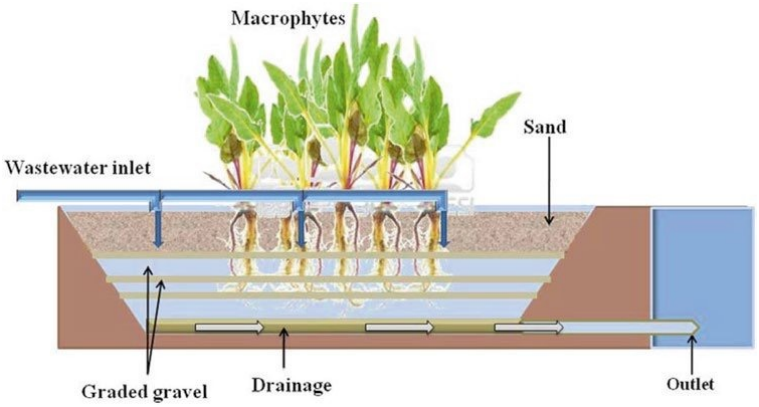
Wastewater are treated by natural occurring processes and the influence of solar light, wind, microorganisms and algae

Hikkaduwa WSP System

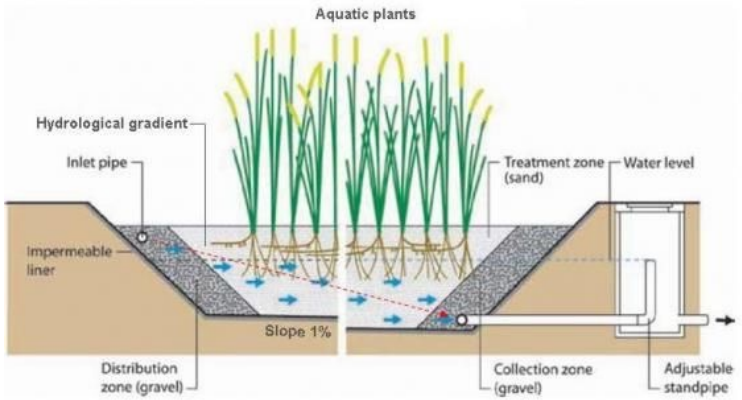
Facultative Ponds + Maturation Ponds + Floating Wetlands

Wetlands (Natural)

Wetlands for polishing treated effluent (Nutrient Removal)

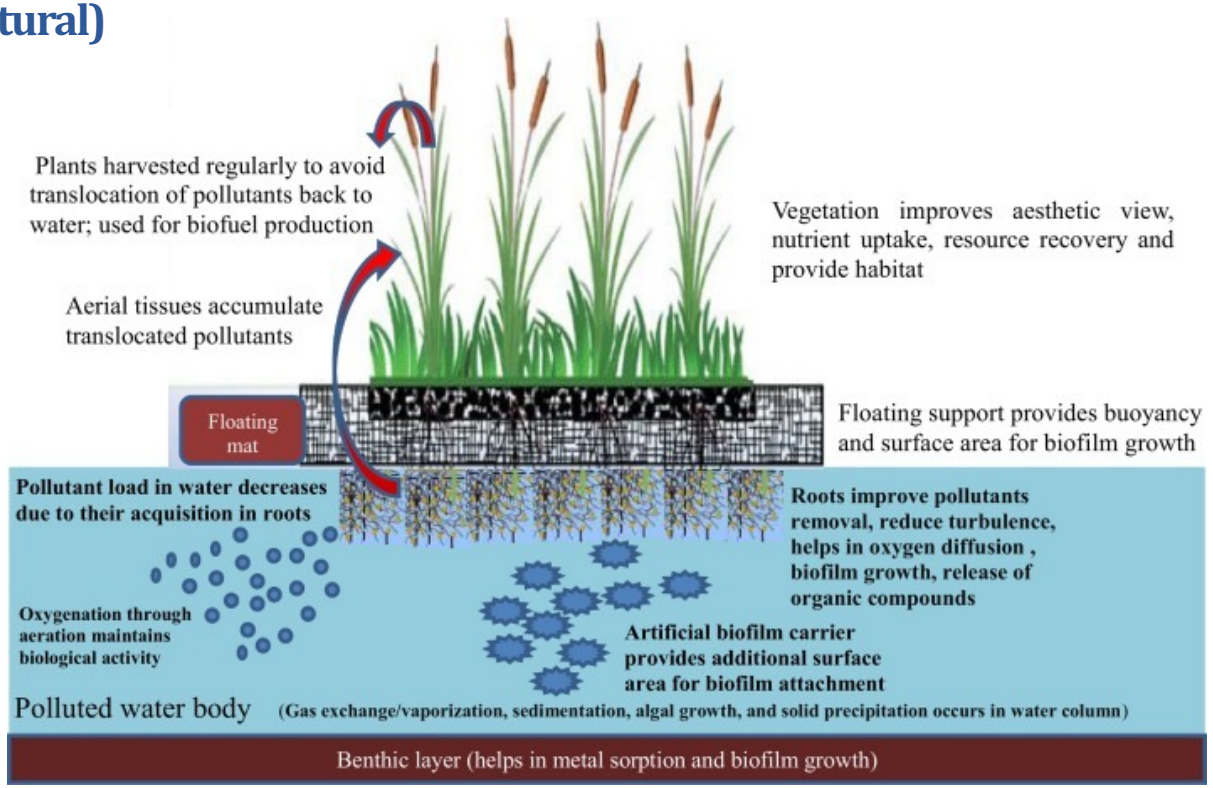


Sub-Surface Flow (SSF) constructed Wetland



Free Water Surface Flow (FWSF) Constructed Wetlands

Floating Wetlands (Natural)



- **Improved monitoring and forecasting**

Utilizing data and technology to monitor water quality, predict potential issues, and optimize system operations.

- **Community engagement and capacity building**

Involving local communities in planning and decision-making, and building their capacity to manage and adapt to climate change impacts.

- **Integrated water resources management**

Coordinating wastewater management with other water-related sectors like stormwater management, water supply, and flood control to create a more holistic and resilient system.

- **Financial sustainability**

Exploring innovative financing mechanisms and cost-effective solutions to ensure the long-term viability of climate-resilient wastewater management.

Benefits of climate-resilient wastewater management:

- **Reduced risk of waterborne diseases**

By improving water quality and sanitation, climate-resilient wastewater management can help prevent the spread of diseases.

- **Improved water security**

Ensuring access to safe and reliable water supplies, even during droughts and other climate-related events.

- **Reduced greenhouse gas emissions**

Utilizing renewable energy sources and optimizing treatment processes can help reduce the carbon footprint of wastewater management.

- **Enhanced ecosystem health**

Protecting natural water bodies from pollution and restoring degraded ecosystems.

- **Economic development:**

Creating green jobs in the wastewater sector and promoting sustainable development.

Challenges

- **High upfront costs**

Implementing climate-resilient wastewater management can require significant upfront investments in infrastructure and technology.

- **Technical expertise**

Implementing nature-based solutions and advanced treatment technologies requires specialized knowledge and expertise.

- **Institutional coordination**

Effective climate-resilient wastewater management requires coordination and collaboration among various government agencies and stakeholders.

- **Public awareness and acceptance**

Raising public awareness about the importance of climate-resilient wastewater management and promoting behavioral changes can be challenging.

Social & Environmental Challenges in Sanitation Sector

- Quality deterioration of inland surface and ground waters, wetlands and marine and coastal waters
- Deterioration of living conditions in urban and peri-urban areas
- Pollution of drinking water of sources including dug wells
- Increasing risk of micro plastic & antibiotic resistance
- Incidence to health hazards
- Increment in water treatment cost
- Decline in land value
- Hinders government driven development programs (Tourism, Property Development)
- Affects flora and fauna in the ecosystem

Social & Environmental Challenges on Sanitation Sector continue..

- Deterioration of living conditions in urban and peri-urban areas
- Pollution of drinking water sources including dug wells

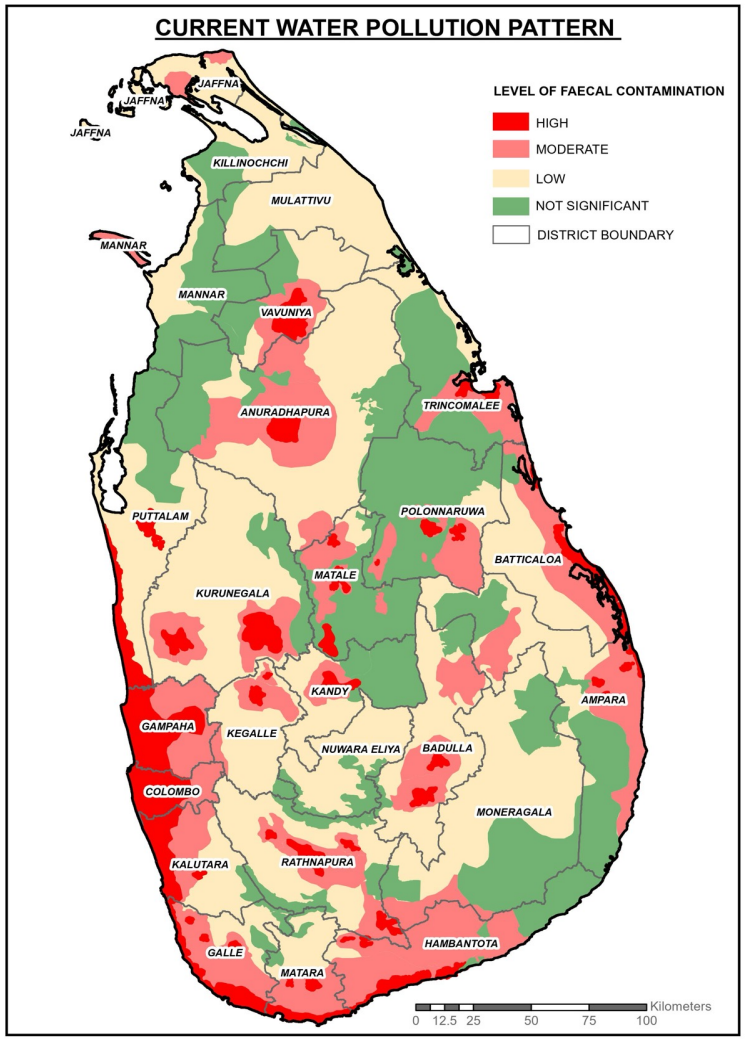
Social & Environmental Challenges on Sanitation Sector continue..

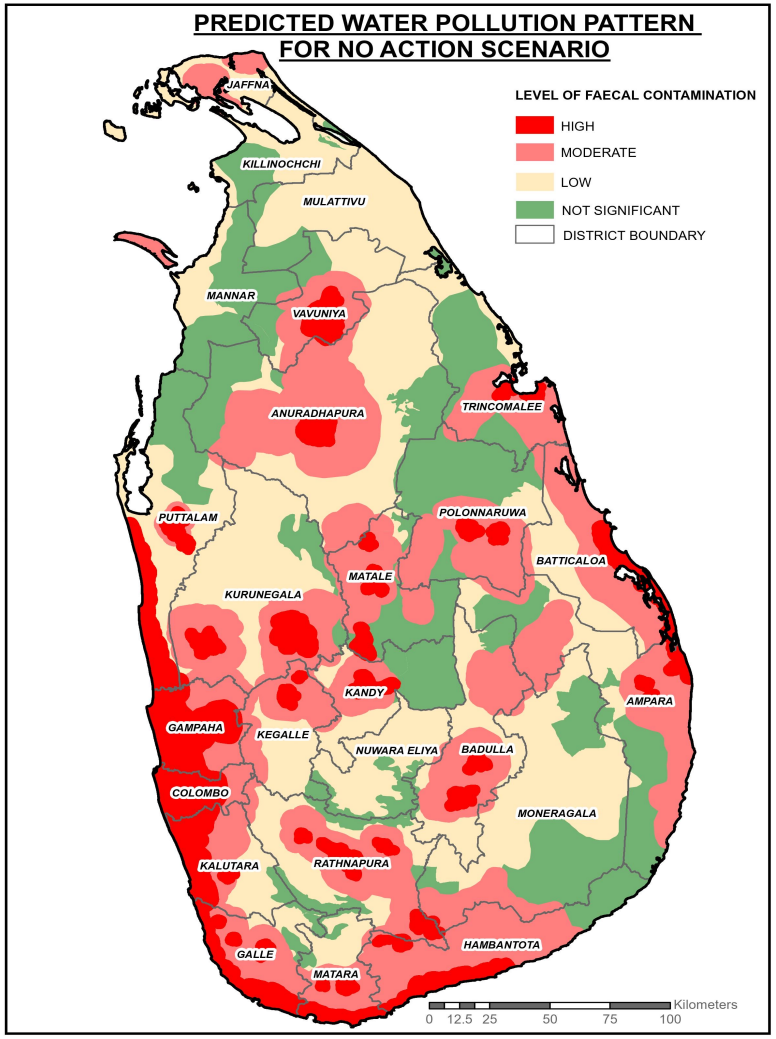
- Quality deterioration of inland surface and ground waters, wetlands and marine coastal waters

Social & Environmental Challenges on Sanitation Sector continue..

- Incidence of health hazards
- Increment in water treatment cost
- Decline in land value

Ground Water Pollution Pattern In Sri Lanka






Population Density
1km cells (roughly) - the big squares are 100km x 100km at the equator

Common Issues associated with WWT and Effluent Disposal

- Poor technology selection
- Competency of consultants
- Lack of competent/qualified plant operators
- High cost for O&M (energy, chemicals & sludge disposal)
- Illegal discharges
- Lack of facilities to monitor illegal discharges and law enforcement
- Plant capacity issues
- Lack of plant performance monitoring (by operator and regulator)
- No emergency preparedness and risk mitigation plan
- Limited locations for sludge/ hazardous waste disposal, deactivation and incineration


Thank You