

# AYUBOWAN



# Urbanization and Water Quality Control for the Source of Water in Colombo city, Sri Lanka

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# Democratic Socialist Republic of Sri Lanka

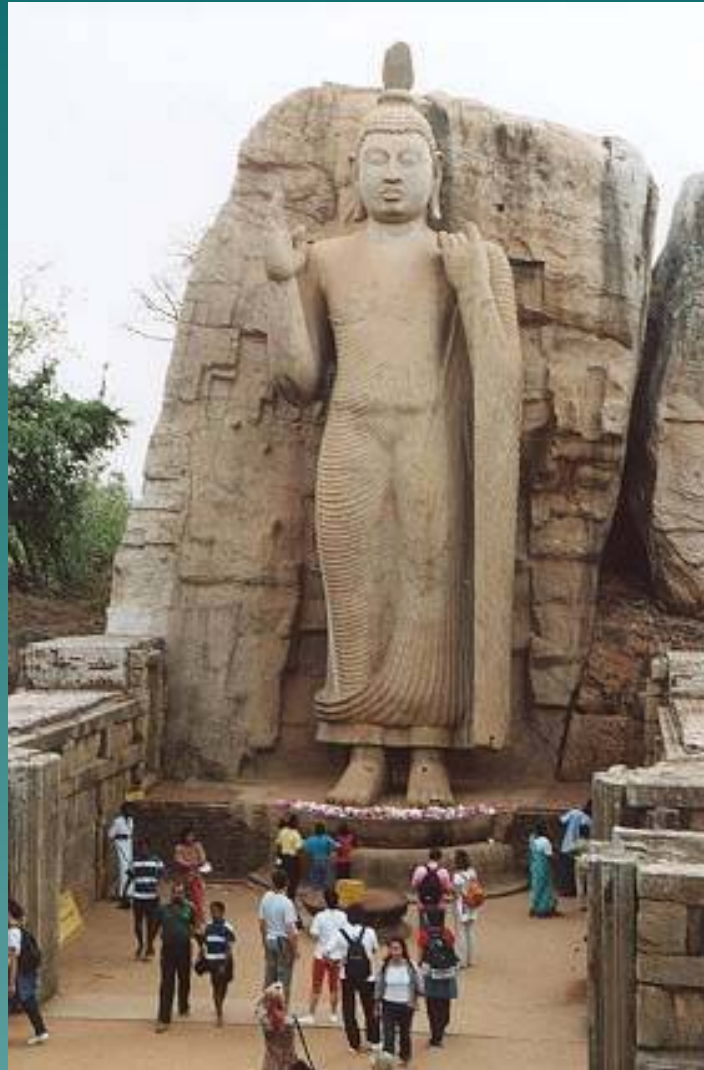


# Beauty of Sri Lanka

## SIHARAJA FOREST



# AVUKANA STATUE



# WATERFALLS IN SRI LANKA



# KNUCKLES



# LEAPORD





# a. Introduction

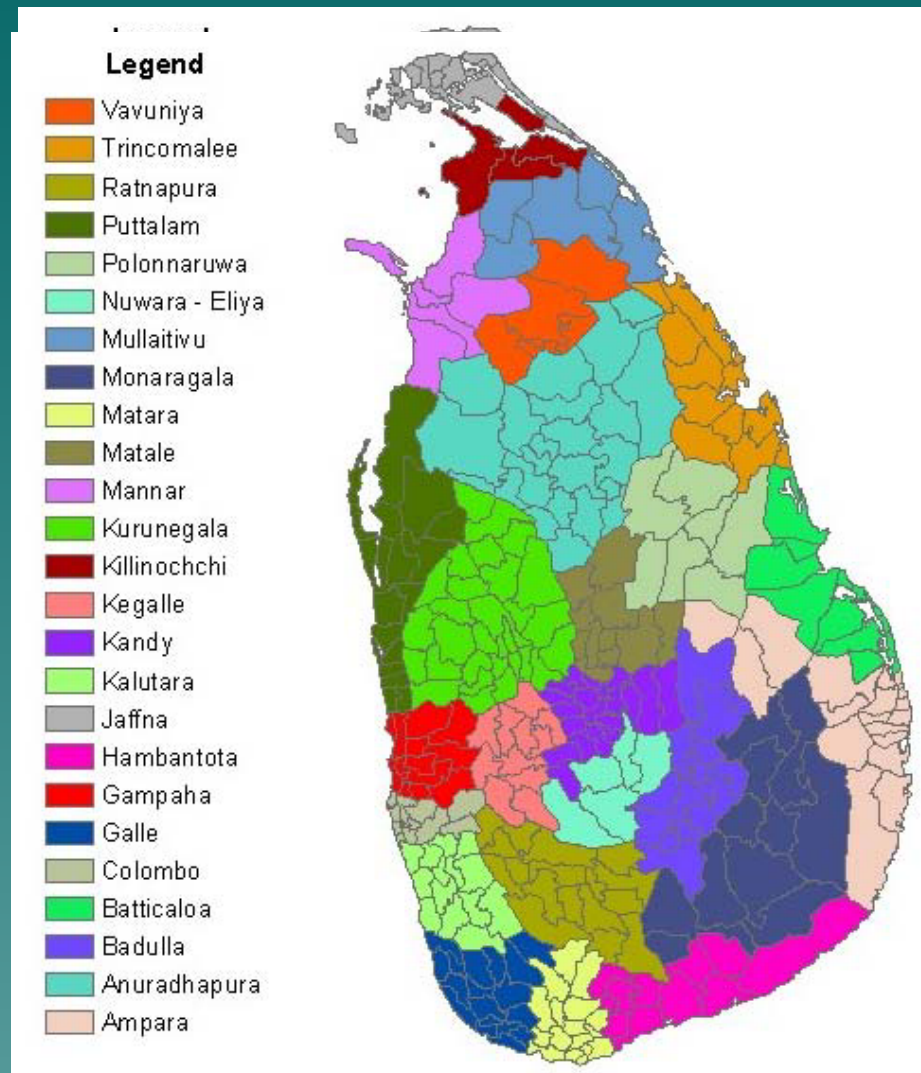
## ◆ About Sri Lanka

- Rich in Natural Resources
- 103 Rivers Cover All Island
- 9 Provinces and 25 Districts
- Capital is Sri Jayawardenapura Kotte in Colombo District
- 65610 Km<sup>2</sup> of Total Land Area
- 20 Million Population
- 2000 mm of Annual Average Rainfall Provides 131230 Millions m<sup>3</sup> of Fresh Water Annually

## b. Reason for Selection of the Target Area

- ◆ Colombo is the main commercial and industrial city in the island
- ◆ Highest industrial and population densities
- ◆ Pollution loads to the water resources are high
- ◆ Drinking water demand is high due to population increase

# 25 Administrative Districts of Sri Lanka



# 1. Socio-economical and Natural Conditions of Colombo City

## ◆ Population

Population	1981	2001	2007
Colombo	1699241 (11.4%)	2251274 (12.0%)	2456000 (12.3%)
Island	14846750	18797257	20010000

## ◆ Population Density

- Total Area 699 km<sup>2</sup> (~1% from island)
- Population Density 3513/ km<sup>2</sup>
- Island Pop. Density 320/ km<sup>2</sup>

# Socio-economical....

- ◆ Gross Domestic Products is \$ 40.7 billion
- ◆ 50% of GDP contribution is from Western Province
- ◆ Annual Average Precipitation- 2400 mm
- ◆ Accessibility to Tap Water System ~65% in Colombo District
- ◆ Rest are from other sources, well water (31%), tube wells (1%) etc.
- ◆ Domestic Wastewater System
  - Colombo is the only city in Sri Lanka with sewage system
  - 80% of the Colombo city area has access to the sewer system
  - Collected sewage discharge into the sea outfall without any treatment (two places, approximately 1km and 1.5km)
  - Rest of the people have individual septic tank/soakage pit systems for sewage or domestic wastewater
  - Piped sewage facility in SL is 4% from population, site sanitation or septic tanks is 80% and 16% is without proper sanitation

## 2. Situation of Quantity and Quality of the Water Source

- ◆ 3 Production Centres in Greater Colombo Water Supply System
  - Kelani River Intake at Ambatale
  - Labugama Compounding Reservoir
  - Kalatuwawa Compounding Reservoir
- ◆ Systems Provide 18 Million m<sup>3</sup>/day
- ◆ Total Consumers 2.0 Million
- ◆ 65% of the Colombo District Requirement

# Situation of Quantity and...

Name	Volume of available Water	Volume of abstracted Water (m <sup>3</sup> )
Kalani River Ambatale	~ 15 MCM/day (Average runoff)	512000
Labugama Reservoir	15.4 MCM	62000
Kalatuwawa Reservoir	8.9 MCM	37000

# Situation of Quantity and...

## ◆ Water quality of intakes

Intake	BOD	COD	TSS	Heavy metals	pH
Kalani river	2	18	20	Pb .06 Cr <.01	8.0
Labugama	3	19	10	Pb - Cr <.01	7.5
Lalatuwawa	2	17	12	Pb - Cr <.01	7.3



# 3. Effluent Load to the Sources

- ◆ ~30% from total industries are in Colombo
- ◆ More than 10% Of the population is in Colombo
- ◆ Pollution of water resources in the area are highly threatened by pollution
- ◆ Industrial effluents of the area can be managed
- ◆ Domestic effluents and other non point sources are difficult to control
- ◆ Stagnated water sources are highly threatened by nutrient pollution,  $\text{NO}_3^-$  and  $\text{PO}_4^-$

# Effluent Load to...

- ◆ Main wastewater receiving water bodies in Colombo area
  - Kalani river
  - Beira lake (stagnated water body connected to the sea)
  - Sea
- ◆ Wastewater could result from industrial and domestic
  - Industrial effluents discharge directly or indirectly into the Kalani river or its tributaries
  - Domestic wastewater including sewage
    - ◆ Discharge into the sea outfall through sewer network
    - ◆ Directly discharge into the Kelani river or Beira lake
    - ◆ 18000 households in the beira lake catchment's area are discharging sewage into the lake

# Effluent Load to.....

- ◆ Industrial effluent loads into Kelani river
  - Two common TP s in main industrial zones
    - ◆ ~15000 m<sup>3</sup>/day (25% is sewage)
    - ◆ ~10000 m<sup>3</sup>/day (25% is sewage)
    - ◆ Treated effluents are conform to CEA stds
  - Other industries
    - ◆ Textile - ~35000 m<sup>3</sup>/day
    - ◆ Food & beverages - ~35000 m<sup>3</sup>/day
    - ◆ Chemical industries - ~15000 m<sup>3</sup>/day

# Effluent Load to....

- ◆ COD loads from major industrial sectors
  - 2 common treatment plants- ~6250 kg/day
  - Textile industries- ~8750 kg/day
  - Food & beverage industries- ~8750 kg/day
  - Chemical industries- ~3750 kg/day

# 4. Current Measures on Quality Control for the Water Resource

- ◆ Sources of Water Pollution in Colombo Area
  - Non Point Sources
  - Point Sources
- ◆ Non Point Sources
  - Mainly from Domestic wastewater, agricultural runoffs etc.
  - Difficult to apply laws and regulations directly
  - Difficult to control
  - Controlled by applying better land use pattern, local government planning laws, awareness
  - Main responsibility is with local government authorities (13 in Colombo, 4 MC, 5 UC, 4 PS)

# Current Measures on Quality...

## Laws on control of non point sources

### – NEA

- ◆ May require local authority to comply with recommendations relating to the prohibition of the unauthorized discharge, emission or deposit of sewage and the prevention of the discharge of untreated sewage into soil, canals or water ways.

### – LGA laws

- ◆ The Government or any Municipal Council may, from time to time, cause to be made, altered, or extended such public main or other drains, sewers and watercourses necessary for the effectual draining of the Municipality – MC 97
- ◆ Prevent obstruction of discharge of rain-water and drainage to any natural watercourse, channel, lake or swamp recognized for such purpose by resolution – MC 101
- ◆ Connection of private drain with any public drain without authority is an offence – MC 103

# Current Measures on Quality...

## Options for discharge of sewage in Colombo

- Individual systems (within the premises)
- Sewage network (discharge into sea out fall without any treatment)
- Common treatment systems (condominiums and schemes)
- Illegal direct discharges to the water bodies (specially from unauthorized houses/buildings)

# Current Measures on Quality...

## ◆ Point Sources

- Mainly from Industrial Activities
- Points of sources can be identified
- Can be minimized and controlled by laws and different strategies

## ◆ Control measures/strategies on point sources

- Laws and regulations
- Monitoring
- Education and awareness



# Current Measures on Quality...

- ◆ Laws and regulations on point sources
  - Mainly controlled by National Environmental Act (NEA) of 1980
    - ◆ Central Environmental Authority (CEA) established in 1981 for implementation of the NEA
    - ◆ Five main sections and section IV is on environment management and protection
  - Two legal tools and discharge standards
    - ◆ Environment Impact Assessment (EIA) - Section IV C approving procedure for prescribed projects, due to sensitivity or scale
    - ◆ Environmental Protection Licence (EPL) - Section IV A all prescribed activities/industries need EPL for discharge their wastes
    - ◆ Wastewater Discharge Standards - Section IV B discharging effluents shall be conform to the stipulated standards

# Current Measures on Quality...

- ◆ EPL process for waste discharging activities
  - 133 prescribed activities including wastewater generating activities
  - EPL is a legal requirement to discharge waste into the environment
  - EPL issued only after conforming to the standards
  - Operation of an industry without an EPL is a punishable offence
- ◆ Wastewater discharge standards
  - Two types of standards
  - Receiving environment- inland surface waters, irrigation, coastal area, common TP
  - Type of activity- textile, rubber, tanning

# Some Important Water Quality Parameters

	TSS	BOD	Oil & Grease	COD	Pesticide	Faecal Coli form
Inland surface	50	30	10	250	0.005	40
Irrigation	2100	250	10	400	-	40
Marine coastal	150	100	20	250	0.005	40
Common TP	500	350	30	850	0.2	-
Rubber- latex	100	60	-	400	-	-
std.	100	50	-	400	-	-
Textile	50	60	10	250	-	-
Tanning- ISW	100	60	10	250	-	-
MC	150	100	20	300	-	-

## 5. Current Issues on Quality Control for the Water Source

- ◆ Unavailability of zoning plan
- ◆ Unlimited discharges to the water sources
- ◆ Economical and technological issues on pollution control
- ◆ Encroachments and illegal constructions at reservations of the water sources
- ◆ Inadequacy of the existing laws and regulations

# Current Issues on Quality....

- ◆ Unavailability of zoning plan
  - Zoning plans are available only for 3 LGA s in Colombo district
  - Not demarcated industrial zones
  - Difficult to control environmental pollution
- ◆ Unlimited industrial discharges to the water sources
  - Gradually increase industries in major cities due to infrastructure developments

# Current Issues on Quality....

- Waste loads to the water sources gradually increasing in Colombo area
- Receiving capacities of wastes on water sources are limited
- ◆ Economical and technological issues on pollution control
  - Financial barriers on pollution control activities
  - Inadequacy of the available technology

# Current Issues on Quality....

- ◆ Encroachments and illegal constructions at reservations of the water sources
  - Most of the reservations/catchments are encroach by people and discharge their waste into the water sources
  - Difficulties on application of laws on them
  - Unauthorized constructions at the river banks
  - No reservations are demarcated

# Current Issues on Quality....

- ◆ Inadequacy of the existing laws and regulations
  - Existing law on waste emission is a command and controlled system
  - No system to control the pollution loads of industries
  - Existing laws on domestic wastewater discharge are weak
  - Inadequacy of land policy to control encroachments
  - Laws are not sufficient to control illegal industrial activities within a short period



Thank You