Fecal pollution in Mount Lavinia near-shore water

Introduction

Mount Lavinia beach has been fabulous recreational area famous among both local and foreign tourists. North of Mount Lavinia hotel finds a narrow strip of golden sand beach, which is full of people particularly during holidays and weekends. However, this part of the beach is extensively utilized by people, hence, there exits a potential threat for this beach front to be significantly polluted from anthropogenic activities such as domestic wastewater from nearby low-income settlements and Wellawatte Canal etc. These pollutant loads could seriously impair the recreational activities resulting in even health hazards. Hence proper monitoring with a view to reducing such pollutions is of paramount importance. In this context, water quality monitoring program was commenced in 2003 covering the period of high tide.

Designated uses practiced or proposed

The Table 1 manifests the designated uses intended at Mount Lavinia. In other words the Mount Lavinia is intended to be subject to recreational activities throughout the year as it is so close to the Colombo and perhaps the only nearby place available for recreational activities. Hence, it is vital for the beach front in the Mount Lavinia be kept free of pollutants that cause detrimental effects on recreational activities.

Table 1: Designated uses expected in Mount Lavinia Beach Front

Expected water use	Present or not
Protection of aquatic ecosystems	-
Irrigation	-
Agriculture	-
Aquaculture	-
Human consumption of aquatic foods	-
Recreational activities	
Primary contact	x
Secondary contact	x
Visual use	x
Drinking	-
Industrial use	-

Proposed water quality guideline

Based on the types of pollutions and designated uses at Mount Lavinia, it is clear that the guideline developed for recreational activities must be practiced in order to find out the maximum or minimum threshold values for better management of this site.

However, Sri Lanka does not have a fully developed ambient water quality guideline or a standard for recreational activities yet, hence the same developed by Australia and New Zealand will be used in this report.

It is imperative that one has to decide whether the stretch of beachfront in question is subject to all three categories of recreation such as primary, secondary or/and visual etc. For these three categories different water quality parameters will be monitored as given in the Table 3.

Table 2: water quality parameters to be measured for different categories of recreational activities

Characteristics	Primary contact (e.g. swimming)	Secondary contact (e.g. boating)	Visual use (e.g. no contact)
Microbiology	x	x	
Nuisance organisms (e.g. algae)	x	x	x
Aesthetics	x	x	x
Clarity	x	x	x
Colour	x	x	x
pH	x		
Temperature	x		
Toxic chemicals	x	x	
Oil and debris	x	x	x

Primary contact

Water used for primary contact activities, such as swimming, bathing and other direct water-contact sports, must be sufficiently free from faecal contamination, pathogenic organisms and other hazards (e.g. poor visibility or toxic chemicals) to protect the health and safety of the user.

Secondary contact

Water used for secondary contact activities, such as boating or fishing, must satisfy lesser stringent guidelines as opposed to those of primary contact.

Visual use

Surface waters used for visual recreational use should not be altered so as to reduce their ability to support aesthetics. No contact with water is the main criterion on which the guideline values are based.

Considering the above scenarios for the Mount Lavinia the guideline levels in Table 3 could be applied in order to arrest the problems encountered at present.

When studying the different types of pollutions, it is often found that faecal pollution is more prominent compared with other types; hence, one can focus perhaps on the fecal coliforms. Other parameters may not be necessary unless otherwise for an emergency situation where a possible spillage occurs.

Table 3: Water quality guideline values for recreational activities to be practiced

Characteristics	Primary contact (e.g. swimming)	Secondary contact (e.g. boating)	Visual use (e.g. no contact)
Microbiology (faecal coliform level – MPN/100 ml)	150	1000	-
Aesthetics (Natural visual quality – Secchi disk depth – m)	Greater than 1.6	Greater than 1.6	Greater than 1.6
pH	5.0 – 9.0	-	-
Temperature C^0	15 - 35	-	-
Oil and debris	No visible film or debris	No visible film or debris	No visible film or debris

Locations of measurements

It is apparent from the previous studies and visual observations that the north of Mount Lavinia hotel is the key area to be monitored. The shallow depth around 1 m along the near-shore area could be subject to monitoring. At least 1 km stretch north of hotel and 0.5 km south of hotel should be selected for measurements. At least 8 different distant locations on the north stretch and 2 on the south stretch must be selected as shown in the Figure 1.

Figure 1: area along which fecal coliform levels are measured

Results:

The highest temporal variation of the fecal coliform levels of the entire stretch is illustrated in the Table 4.

Table 4: Highest fecal coliform levels reported during the south-west monsoon period

Coliform level (MPN per 100 ml)	When (SW monsoon, with windy condition and at Spring tide)	Condition	Reference
6500	July 2003	Before the new port	CRMP
8500	May 2008	Before the new port	CCD
9100	May 2011	After the new port	Dehiwala Mt. Lavinia UC
2800	July 2013	After the new port	UoM
7000	May 2014	After the Port City	UoM
6350	June 2016	After the port city	UoM

CRMP: Coastal resource management project of CCD; CCD: Coast Conservation Department; UC: Urban Council; UoM: University of Moratuwa

Results manifested that south–west monsoon period highest fecal coliform level are far greater than the guideline levels of 150 MPN/100 ml for contact recreational activities, which indicates that the near-shore area is highly polluted in terms of fecal matter. During the north-east monsoon period the highest fecal coliform levels recorded are greater than 9,000 MPN/100 ml for all years of measurements.

The spatial variation of fecal coliform levels recorded done for CCD is shown in Figure 2.

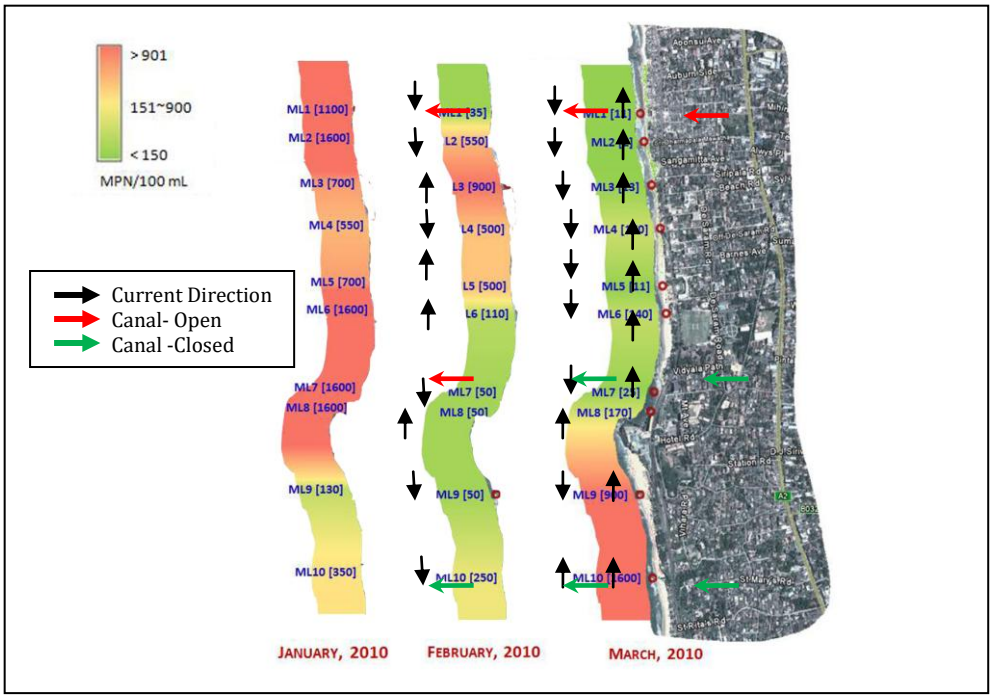

Figure 2: spatial variation of fecal coliform levels in the Mt. Lavinia (Source: CCD)

This scenario summarizes the data from January to March 2010 for Mount Lavinia Coastal Water Quality Monitoring. This includes water quality data collected from 10 locations. Each of the locations in Mount Lavinia (ML) was sampled once in a month. Month of January 2010 due to wet weather flow the main point sources were canals represented by ML-01 & ML-07, which were opened & ML-10, which was closed. Current directions recorded were in irregular pattern. In the ML-01 (1100 MPN/100 ml) current direction was towards south & current velocity was high and pollutant loads were towards south direction. This load of pollutants was however, diluted up to ML-04 (550 MPN/100 ml). ML-07 recorded very high level, 1600 MPN/100 ml (Maximum Detection Level) and the current direction recorded was towards south direction. ML-08 recorded that of ML-7. ML-09 & ML-10 recorded 130 and 150 MPN/100 ml due to pollutant load being diluted towards south direction.

In the month of February, canal was opened and ML-1 recorded 35 MPN/100 ml and ML-02 recoded 550 MPN/100 ml. Ml-03 recorded considerably highest value of 900 MPN/100 ml. Both ML-04 and ML-05 recorded 500 MPN/100 ml. With the current direction towards south & ML-06 to ML-08 recorded 110, 50, 50 MPN/100 ml & suitable for primary contact activities. ML-10 recorded 250MPN/100 ml & not suitable for Primary contact activities.

In the month of March due to dry weather flow, ML-01 to ML-07 recorded values under 150 MPN/100 ml & within the category of primary contact activities (0-150 MPN/100 ml), but the canal representing ML-10 was closed and ML-10 recorded 1600 MPN/100 ml & current direction was observed towards north direction & ML-09 recorded 900 MPN/100 ml; hence, coastal stretch covering ML-9 and ML-10 was not suitable for primary contact activities.

Both temporal and spatial variations of fecal coliform levels indicated that the Mt. Lavinia near-shore area is badly polluted in terms of fecal matter. Hence, this project is of paramount importance to reduce the fecal pollutant loads entering this famous beachfront.