

# PROACTIVE MEASURES FOR COLOMBO CITY

## FLOOD MITIGATION

### 01. The Globe in Danger

The Global Human Habitat is in danger in face of disastrous situations being aggravated from day to day as a result of **Global Warming** and due **Climate Change** caused by human ill practices such as;

1. Deforestation,
2. Over Urbanization,
3. Over Industrialization &
4. Over Exploitation of natural resources.

The Globe is over heated when the heavy gas emission, resulted by aforesaid malpractices, is accumulated at upper atmospheric layers like a cloud to **retain and reflect back** energy rays to Earth.

Man ought to be the **Caretaker** of the **Global Ecosystem** for **Coexistence** but when the duty is mistaken by dominating over the **Nature**, the precious natural resources such as **Land**, **Water** and **Wind** disguise all at once as disastrous earth quakes, landslides, floods, tsunamis, tornados, hurricanes etc to wipe out the human habitats from the system.

However it is the **Nature** and any natural ecosystem must be recognized as a **Living Being** which possesses a mighty power of **Reaction** and whence **Disturbances** are introduced exceeding the limits of **Resilience** and **Caring Capacity** of the ecosystem, the enormous **Natural Weapons** are aimed to wipe out the **trouble making organ**, mankind, from the system.

Things seem to have gone far enough however by now, to expect **neither excuse nor chances** from **Nature** and man has got to use **Knowledge** more **creatively and proactively** for **survival**.

#### 1.1 Can disasters be mitigated?

Yes, the adverse effects from a natural disaster can be minimized by **early detection, early warning developing safety measures and improving preparedness**.

#### 1.2 Inland Flood- The most probable Danger

Intensity of rain fall is obviously at a growth and that can be considered as the biggest threat against the global human habitats. This certainly is a direct result of global warming and due increment of '**Potential Humidity**' in the bottommost layer of the atmosphere.

**Potential Humidity** in atmosphere possesses much heat energy than the normal humidity and it moreover creates **tornados, cyclones, hurricanes and rainfalls of increased intensity** as a measure of transferring excess heat energy in to the upper atmospheric layers.

## 02. Flood Risk in Colombo

It is the common experience at present that, the city is easily flooded even for a less intensive rainfall. Situations become serious when it happens to spill the Jayawardanapura Parliament lake and Kotte lake of Diyawanna Oya basin. Beyond the level of 2.4m MSL in Diyawanna Oya, even the parliament premises face the risk of being inundated. When it comes to that stage, flood is long lasting for weeks perhaps, because no proper drainage infrastructure has been established as yet, for a quick discharge of the flood flow in to sea.

Water retention capacity of the Diyawannaoya wetlands have been decreasing from day to day due to malpractices by wetland encroachers for settlements.

The best solution to prevent further encroachment is to make the remaining wetlands prominent in the landscape by deepening to fix boundaries, and that endeavor seems successfully been launched at present by the government. Retention capacity of wetlands will be considerably improved through this practice so that a bulk stock of storm water could be stored and released gradually preventing frequent floods upon streets.

But in face of climate change and due aggravated disastrous situations, a quicker Flood Discharge system has to be established for **Colombo** as a timely proactive measure of flood prevention or otherwise it will become another **Bangkok** in near future.

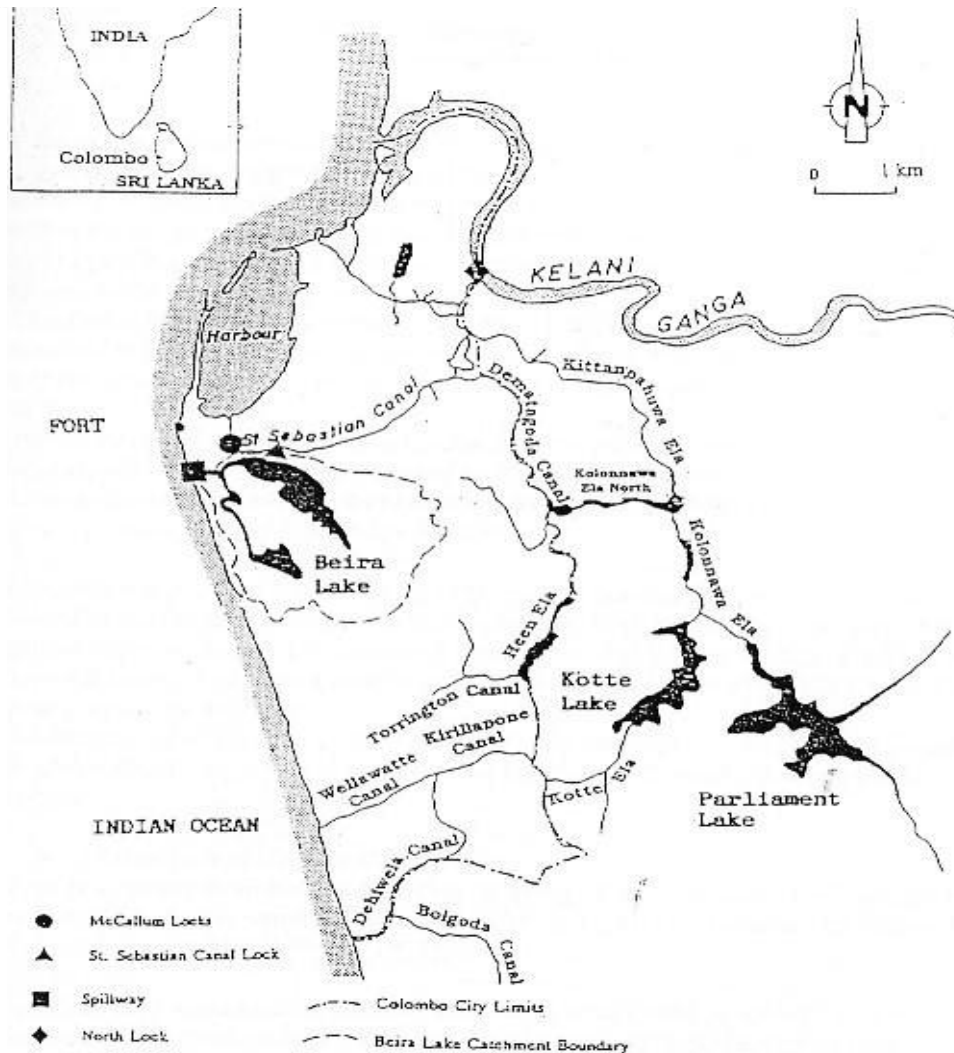
Even though Colombo belongs to Kelani river basin, there is no help could be expected at all from the river, because it's flow level is always above the city flood level under stormy conditions. Therefore hydrologists in strategic planning scenarios have to pay their special attention on Diyawannaoya storm bulk discharge through **improved Wellawatta, Dehiwala, Dematagoda** and **Kittampahuwa** canals.

Besides that a percentage of **collected storm water bulk** from **Parliament lake** and **Kotte lake** is suggested to be fed in to **Beira lake** through improved St Sebastian canal or at a closest vicinity by means of a conduit siphon stretched from Kolonnawa Ela in order to convert that stagnant water body in to a **sediment flushable live storage of freshwater**.

### 1.2 Beira Lake Restoration and Colombo Flood Mitigation should be Integrated

Beira lake, the **identical land mark** of the city of Colombo which has been abandoned at present as an **untreatable stabilization pond of waste disposal**, has to be integrated in **Flood Mitigation Strategies**. Though several projects of million dollars have been implemented up to now the water body exhibits no sign of recovery as yet and future planning scenarios on **Lake Restoration** have to address not only **Biology** but also **Water Science, Hydrology** and **Scio Economic Culture** of the peripheral life.

Origin of the lake dates back to the year **1554**, with construction of a dam by **Portuguese regime** and it was developed as an important inland **navigational system** during **Dutch regime**. It is also known that, prince **Tikiri**, son of the **King Mayadunne**, has secretly drained this lake twice in to the sea in his war strategies against Portuguese.



**FIGURE-1**[the simplest sketch which describes Colombo hydrological system)

However according to available records, water quality in the lake had remained good enough until the latter part of 19<sup>th</sup> century and ever since it has been converted gradually in to a green water body of **high biological productivity** wherein fish life is almost lost.

The lake of **65 Ha** in **present extend**, bears a big **hydrological potentiality** and it ought to be used in correct methodology for **Colombo Flood Mitigation**. Storm water retention capacity of the lake can be easily improved to be **1 MCM** (million cubic meters) by keeping a free board of just **1.5m** and then, the lake can store the bulk storm water runoff from its catchment of **448Ha** without allowing for a flood upon streets against any intensive rainfall below **250mm**.

The free board can be more improved by provision of a **flood dischargeable gate** at the old parliament outlet and a **zigzag type spill structure** as the outlet at harbor. When the lake is restored with **filtered storm water intakes** from the city and a **gate operated bed sediment flush off system**, it is certain to be converted in to a **pleasant live storage of freshwater**. But at the beginning it has to be **restored** by establishment of the **ecosystem friendly practices** such as;

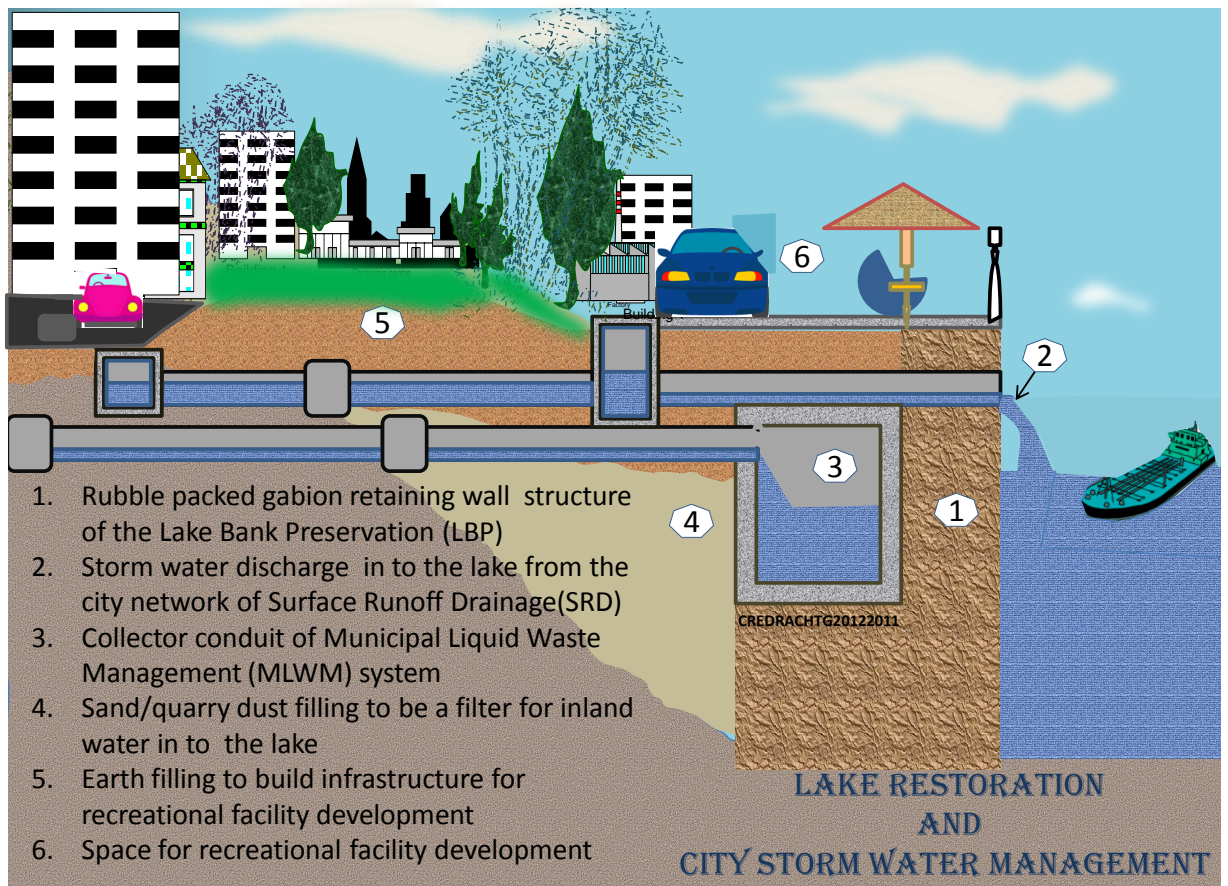
1. Sustainable **Bank Preservation** under **Lake Restoration**
2. Rotten **Biomass and Bed Sediment removal** under **Lake Restoration**
3. Construction of gate operated **Flood Dischargeable Outlets** under **Integrated Colombo Flood Mitigation and Beira Lake Restoration**.

## 03. Lake Restoration

### 3.1 Sustainable Bank Preservation

**Sustainability** is the term which stands for;

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| <ol style="list-style-type: none"> <li>1. <b>Affordability,</b></li> <li>2. <b>Maintainability,</b></li> </ol> | <ol style="list-style-type: none"> <li>3. <b>Renewability &amp;</b></li> <li>4. <b>Resilience Against Disturbances.</b></li> </ol> |
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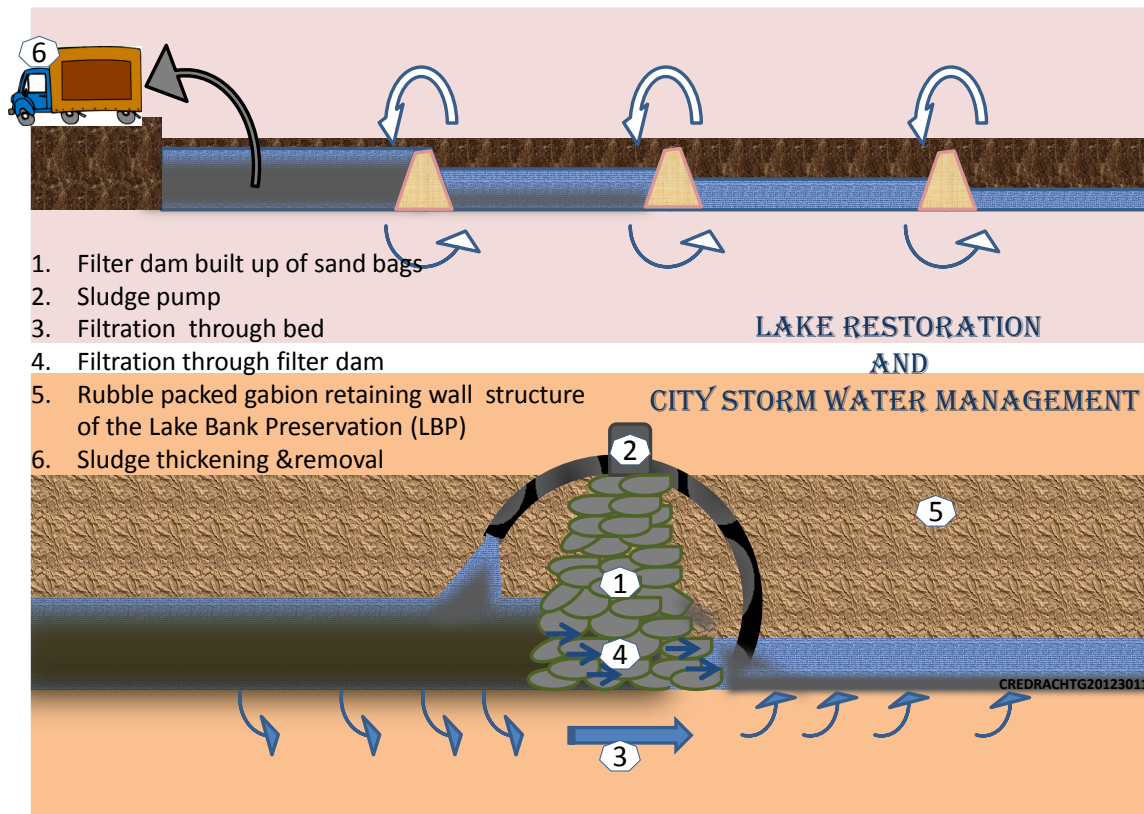


**FIGURE-2[Bank Preservation of an Urban Lake]**

*It is not like in the industrial age but today, any development activity has to be double checked for Environment Friendliness and Sustainability. Also the local community has to be treated as an essential stakeholder in the development activity, through a proper strategic participatory approach.*

The bank preservation is aimed to stop further contamination of the water body in the first place by cutting off the waste disposal in to the lake. As shown in the figure-2, sewer and liquid waste intakes from the surrounding are collected in to a conduit which is also supported by the same retaining structure and directed to the Municipal Liquid Waste Management System (MLWM). Secondly the storm water runoff over the streets are screened and fed to the lake. Thirdly the peripheral belt is improved with recreational facility development.

### 3.2 Biomass and Bed Sediment Removal in Lake Restoration



**FIGURE-3[sand filter dam technique for sludge thickening and removal]**

Billions of money is wasted upon polluted lake restoration all over the world without selecting the proper technology of doing that. **Dredging** by means of pontoon dredgers is known as a **never ending practice** of very high cost. It is not cost effective at all because the process doesn't have a

methodology for **sludge thickening within the lake** and the cleared area is again occupied by the sludge flowed by the surrounding. This blind game is continued always till the entire project fund is drained in vain, ultimately with no significant difference to be observed in water quality.

Figure-3 explains the most cost effective technique of sludge thickening within the lake and removing by **step pumping method**. This is so simple that the lake is divided in to several sections by the sand filter dams, just built up by placing sand bags. By starting from one end water is disturbed and the sludge mixed water is pumped in to the adjacent section. Then the dense sludge in that section is disturbed and pumped again to the next section. On that way, the sludge of the lake is gradually thickened in to one corner for removal. Already finished sections are always back filled by automatically filtered water through the sand dams and the bed floor. By repeating this simplest process twice or thrice, the water body will become crystal clear and the rest of the process must be completed by creating of a **balanced aquatic ecosystem** within the lake and the periphery. Water quality in the lake has to be assured through **bio manipulation** by improved co-interact between plants, fish species and human beings.

### 3.3 Establishment of a Balanced Aquatic Ecosystem to assure Water Quality in the Lake

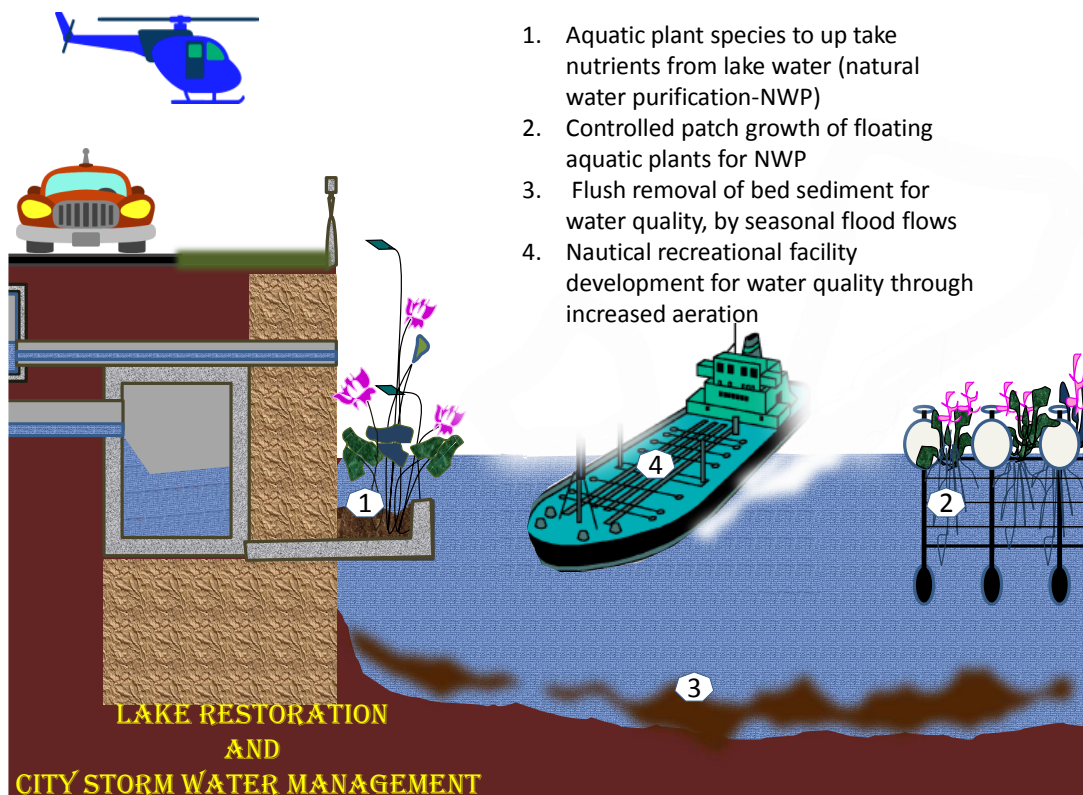
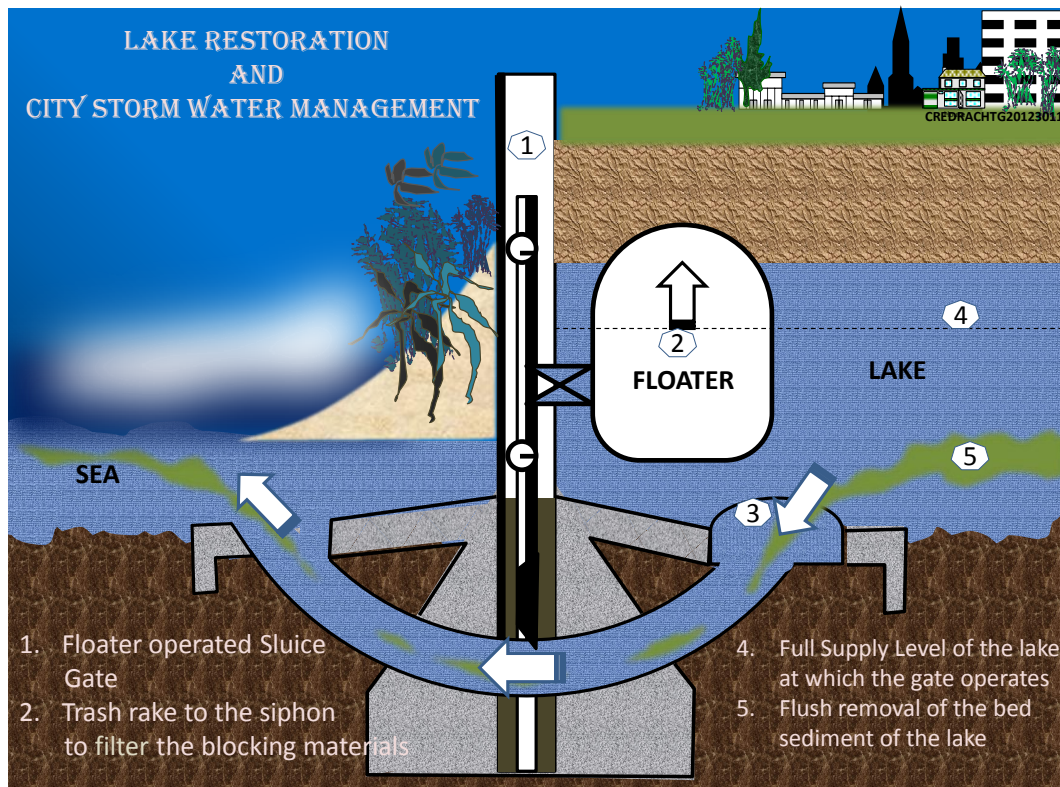


FIGURE-4 [Establishment of a Balanced Aquatic Ecosystem for Water Quality]

Beira lake had become a stagnant **dead storage** ever since the weir at old parliament was built. A dead storage can easily be polluted and very difficult to restore once it is contaminated. Therefore the best **hydrological strategy** in lake restoration is to convert the water body in to a **live storage** of which water can be released and refilled with seasonal rainwater runoff.

### 3.4 Sediment Flushable Auto Operated Water Gates at Sea Outfalls

Therefore the need of construction of sediment flushable gates at each sea outfalls of coastal lakes is emphasized herein, as shown in figure-5, for sustainability of the process of lake restoration.



**FIGURE-5[Auto operated Sediment Flushable Gates at each Sea Outfalls]**

Saline back water effect upwards along coastal canals can also be stopped by the same technique.

## 04. Advantageous Effects upon Integration of Beira Lake Restoration and Colombo Flood Mitigation

1. Storm water Retention Capacity in Colombo hydrological system is immensely improved
2. The stagnant green water body can be converted in to a live storage of a pleasant fresh water aquatic ecosystem

3. Scenic beauty of the capital city is significantly improved and a lot of opportunities are generated for the peripheral local community (through established community based organizations) in lake restoration processes, recreational facility development and after construction maintenance activities as well
4. Flood threat upon the coastal left bank basin of Kelani river is minimized through establishment of a quicker storm water discharge system

**END**

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