

CHAPTER 16 PRELIMINARY DESIGN

16.1 General

For the preliminary design of the proposed structures, the design criteria were established referring the following design standards and specifications.

- 1) Manual for River Works in Japan, 2000, Japan River Association
- 2) Cabinet Order concerning Structural Standards for River Management Facilities, 2000, Japan River Association
- 3) Geometric Design of Roads, Sri Lanka Road Development Authority
- 4) Bridge Design Manual, Sri Lanka Road Development Authority

The design criteria cover river channels, dikes, bridges, culverts, sluiceways, gates, retention areas and retention ponds.

16.2 River Channel Design

(1) Channel Alignment

The channel alignment is to be set along the existing channel course as much as possible to minimize the relocation of houses and properties. Present tight bends or meander of the channel course is to be improved with smooth curves or short cut channels.

(2) Channel Profile

The channel profile is to be set so as to keep the present channel profile as much as possible considering stability of channel bed.

(3) Channel Cross Section

The following rectangular or trapezoidal cross sections and bank slopes are to be applied for the channel design cross section.

Channel Type and Bank Slope

| Channel Type | Bank Slope |
|------------------|------------|
| Trapezoidal Type | |
| Earth Channel | 1 : 2.0 |
| Wet Masonry | 1 : 0.5 |
| Rectangular Type | |
| Gabions | Vertical |
| Concrete Lining | Vertical |

The trapezoidal cross section is to be applied for the channels located in places where adequate space is available.

The rectangular cross section is to be applied for the channels located in the urbanized areas and residential areas where many houses will be affected by the channel improvement.

When the height of the channel bank is more than 3 m, a berm is to be provided in the riverbank every 3 to 5 m of height. The minimum width of the berm is to be 3 m.

(4) Freeboard

The freeboard for channel cross sections is to be as below. Minimum freeboard requirement is 0.6 m for a design discharge of less than 200 m³/sec. However, if the design discharge is less than 50 m³/sec and the difference between high water level and ground level along the channel is less than 0.6 m above high water, the freeboard can be reduced to 0.3 m. The freeboards are summarized as follows;

Freeboard for Channel Design

| Design Discharge Q (m ³ /sec) | Freeboard (m) |
|--|---------------|
| Q<50 | 0.3 |
| 50< Q<200 | 0.6 |

Source: Cabinet Order concerning Structural Standards for River Management Facilities, etc., 2000, Japan River Association

(5) Maintenance Road

A maintenance road is to be provided on one side of the channel except in dense housing areas. The width of maintenance road is to be 4 m. If an existing road is located along the channel, it is to be used as a maintenance road.

(6) Flow Capacity of Channel

The flow capacity of channels is calculated by the following Manning's Formula assuming uniform flow.

$$Q = I^{1/2} \times R^{2/3} \times A \times 1/n$$

where,

- Q : discharge (m³/sec)
- I : channel bed slope
- R : hydraulic radius (m)
- A : flow cross sectional area (m²)
- n : Manning's roughness coefficient as shown below

Manning's Roughness Coefficient

| Lining Type | n |
|-----------------|-------|
| Earth Channel | 0.035 |
| Gabion | 0.035 |
| Wet Masonry | 0.030 |
| Concrete Lining | 0.015 |

Note: Value of roughness coefficients were estimated by JICA Study Team

16.3 Structural Design

(1) Dikes

An earth dike is to be applied in the rural area where sufficient space is available. The bank slope is to be 1:2.0. On the other hand, a wet masonry dike is to be applied in the dense housing areas to minimize the relocation of houses. The minimum width of a dike top is to be 3 m. However, if the design discharge is less than 100 m³/sec and the difference between high water level and ground level along the channel is less than 0.6m, the minimum width of dike top can be reduced to 2.5 m for a design discharge from 50 to 100 m³/sec, and 2 m for a design discharge of less than 50 m³/sec. The minimum widths of dike tops are summarized as follows;

Dike Top Width

| Design Discharge Q (m ³ /sec) | Dike Top Width (m) |
|--|--------------------|
| $Q < 50$ | 2.0 |
| $50 \leq Q < 100$ | 2.5 |
| $100 \leq Q < 500$ | 3.0 |

Source: Cabinet Order concerning Structural Standards for River Management Facilities, etc., 2000, Japan River Association

(2) Bridge

An existing bridge shall be reconstructed if the vertical clearance under the superstructure is lower than required or the bridge length is shorter than the improved channel width.

As a crossing structure for river channels, a bridge is adopted when the proposed channel width is more than or equal to 7 m, while a culvert is adopted when the proposed channel width is less than 7 m.

The design criteria for bridges are established as follows;

1) Location and Width

The location of the bridge is basically to be same as the existing bridge site. The width is to be same as the existing road width except if a future widening plan is available.

2) Span Arrangement

The minimum span length is obtained by the following formula.

$$L = 20 + 0.005 \times Q$$

Where,

L : minimum span length (m)

Q : design discharge (m³/sec)

However, if the design discharge is less than 500 m³/sec, the minimum span length can be read from the following table.

Standard Span Length for Small Bridge

| Design Condition | Minimum Span Length (m) |
|-------------------------------------|-------------------------|
| Q < 500m ³ /sec, W < 30m | 12.5 |
| Q < 500m ³ /sec, 30m < W | 15.0 |

Note: Q means Design Discharge, W means Channel Width

Source: Manual for River Works in Japan, 1997, Japan River Association

3) Type of Superstructure

A prestressed concrete girder bridge is to be adopted for the super structure of the bridge in accordance with the design manual of RDA in Sri Lanka. The arrangement of girders is to be made based on the standard design of RDA.

The minimum clearance under the superstructure is to be 1 m referring to the design criteria of RDA.

4) Foundation of Substructure

A cast in-situ concrete pile foundation is to be applied for the foundation of substructure. The diameter of each pile is to be 600 mm, which is normally adopted in Sri Lanka.

(3) Culverts

A culvert is to be applied for a crossing structure instead of a bridge when the width of the channel top is less than 7 m. The culvert is to be designed taking the following into account.

The location of the culvert is to be same as the location of the existing bridge or culvert. The length of the culvert is to be determined based on the existing road width.

A box culvert is to be applied. The dimension of opening is to be determined so as to carry the design discharge with a water depth of 0.8D (D = inner height of culvert).

The bearing pile foundation using precast RC pile is to be applied for the foundation of the culvert to ensure the stability of culvert.

(4) Sluiceways

A sluiceway is to be designed as a reinforced concrete structure with a flap gate and a slide gate as a supplementary gate. The sluiceway is to be planned at the discharge point of storm water retention area or pond. The sluiceway is to be designed taking the following into account.

The dimensions of the opening and culvert must be adequate to carry the design discharge with a water depth of 0.8D (D = inner height of opening). The opening is to be smaller than 3.0 m wide and 3 m high.

The sluiceway is to be equipped with a flap gate on the river side and a slide gate on the inland side.

(5) Flood Gates

The floodgate is to be designed in accordance with the following;

1) Gate Span

The flow section of the gate is to be set at 1.3 times the flow section of the inlet channel under high water level.

The minimum length of gate span is to be 15 m (12.5 m for a wash out gate) for a design discharge of less than 500 m³/sec.

2) Elevation of the Gate Top

The elevation of the gate top is to be same as the elevation of the dike top that connects with the gate

3) Type of Gate

The gate is to be a roller type of gate.

(6) Pumping Stations

Pumping stations are to be planned to guarantee adequate storm water drainage during high water level of the Kelani Ganga. The discharge capacity of the pump facilities is to be determined in accordance with the following;

1) Design Pump Head

The design pump head is to be determined by the following formula;

$$H = (\text{The larger of } H_a \text{ or } H_b) + H_1$$

where,

H: design pump head (m)

Ha: (HWL on the outer side) – (SWL on the inner side)

- HWL on the outer side: Design high water level of river side

- SWL on the inner side: Design High water level of inland side

Hb: ((HWL on the outer side) – (LWL on the inner side)) x 0.75

- LWL on the inner side: Design low water level of inland side

H1: 1.0 m as head loss

2) Pump Types

Pumps are classified into three types depending on the streamline inside the pump impeller, i.e., volute (centrifugal) type, mixed flow type and axial flow type.

The axial flow type of pump is suitable for design heads less than 6m and has been adopted for the Study.

3) Number of Pumps

Two is the minimum number of pumps without a standby pump. The capacity of each pump is to be less than 10 m³/sec. The standard number of pumps is tabulated as follows;

Number of Drainage Pump

| Design Discharge Q (m ³ /sec) | Number of Pump (nos.) |
|--|-----------------------|
| $Q < 30$ | 2 - 4 |
| $30 \leq Q < 100$ | 3 - 5 |

Source: Manual for River Works in Japan, 2000, Japan River Association

(7) Periphery Canal for Storm Water Retention Areas

A periphery canal is to be provided along the boundary of a proposed storm water retention area. The channel is designed as a trapezoidal earth channel with a 2 m wide bed and 1.5 m deep. The bank slope is 1:1.0. An earth dike 0.5 m high is to be constructed on both banks. The width of the dike top is set at 3 m for the dike on the retention area side and 2 m for the dike on the opposite side.

16.4 Preliminary Design of Proposed Storm Water Drainage Facilities

16.4.1 Weras Ganga Scheme

The preliminary design of the Weras Ganga Scheme is shown in Drawings 2 to 7.

The reaches to be improved are divided into two sections of WG1 (Maha Ela confluence to North Bolgoda Lake) and WG2 (Northern end of Weras Ganga Swamp to Maha Ela confluence). The lengths of WG1 and WG2 are 3,400 m and 2,100 m, respectively. The total length is 5,500 m.

The Weras Ganga has sufficient channel width, but depth is very shallow as the channel bed elevation is between 0.5 to 1.5 m below MSL. Dredging of channel bed is proposed along the present channel alignment. The design elevation of dredging is set at 1.5 m below MSL based on the elevation of Bolgoda Lake North located in the downstream of the Weras Ganga.

A wet masonry dike is arranged to protect Ratmalana-Moratuwa urban drainage area from high water level of the Weras Ganga. The dike system is equipped with three sluiceways. One bridge is proposed to be reconstructed.

The design features of the Weras Ganga Scheme are tabulated below.

Design Features of Weras Ganga Scheme

| Item | Design Features |
|------------------------|--|
| 1. Channel Improvement | |
| (1) Design Discharge | WG1: 79 m ³ /sec, WG2: 164 m ³ /sec |
| (2) Channel Length | 5,500 m (WG1: 3,400 m, WG2: 2,100 m) |
| (3) Channel Bed Slope | Level (1.5 m below MSL) |
| (4) Dredging Work | WG1: dredging width: 40 m, bank slope 1:3.0 WG2: dredging width: 19 m (Weras Ganga Swamp) to 40 m, Bank slope 1:3.0 |
| (5) Wet Masonry Dike | Top elevation: 1.2 to 1.4 m above MSL Length: 2,300 m |
| 2. Major Structure | |
| (1) Sluiceway | Kandawala: 2 m (B) x 1.9 m (H) x 2 cells with flap gates Telawala North: 2.5 m(B) x 1.9 m(H) x 2 cells with flap gates Telawala South: 2.5 m (B) x 1.9 m (H) x 2 cells with flap gates |

Note: B: width, H: height

16.4.2 Bolgoda Canal Scheme

The preliminary design of the Bolgoda Canal Scheme is shown in Drawings 8 to 11.

The reaches to be improved are divided into three sections of BC1 (northern end of Weras Ganga Swamp to confluence of Depawa Ela), BC2 (confluence of Depawa Ela to confluence of Rattanapitiya Ela) and BC3 (confluence of Rattanapitiya to Attidiya

Pond). The lengths of BC1, BC2 and BC3 are 1,000 m, 400 m and 1,000 m, respectively. Total length of channel improvement is 2,400 m.

The proposed channel alignment is mostly along the present channel alignment, but the reaches near Ratmalana Airport are shifted to the Boralesgamuwa side taking into account the future extension plan of Ratmalana Airport runway.

The elevation of existing channel bed varies from 0 to 3 m below MSL, but the channel bed is mostly level. Therefore, the channel bed elevation is set at 1.5 m below MSL which is the same as the Weras Ganga.

The design features of the Bolgoda Canal Scheme are tabulated below.

Design Features of Bolgoda Canal Scheme

| Item | Design Features |
|---------------------------|--|
| 1. Channel Improvement | |
| (1) Design Discharge | BC1: 51 m ³ /sec, BC2: 37 m ³ /sec, BC3: 23 m ³ /sec |
| (2) Channel Length | 2,400 m (BC1: 1,000 m, BC2: 400 m, BC3: 1,000 m) |
| (3) Channel Bed Slope | Level (1.5 m below MSL) |
| (4) Channel Cross Section | BC1 and BC2: Channel bed width of 19 m, bank slope of 1:2.0 BC3: Channel bed width of 17 m, bank slope of 1:2.0 |
| (5) Maintenance Road | Length: 2,600 m |
| 2. Major Structure | |
| (1) Bridge | BC1: 30 m (L) x 4.3 m (B) x 2 spans |

Note: L: length, B: width

16.4.3 Nugegoda-Rattanapitiya Scheme

The preliminary design of Nugegoda-Rattanapitiya Scheme is shown in Drawings 12 to 19.

(1) Rattanapitiya Ela

The reaches to be improved are divided into two sections of RE1 (confluence of Bolgoda Canal to boundary of Bellanwila-Attidiya Marsh) and RE2 (boundary of Bellanwila-Attidiya Marsh to confluence of Nugegoda Ela and Delkanda Ela). The lengths of RE1 and RE2 are 890 m and 1,240 m, respectively. The total length of channel improvement is 2,130 m. The upstream end of Rattanapitiya Ela is extended 600 m upstream from the present point because of change of confluence of Nugegoda Ela and Delkanda Ela.

The proposed channel alignment is set along the present one. The proposed channel bed slope of RE1 is set at 1/1,200 against the present slope of 1/1,500, while that of RE2 is set at 1/800 against the present slope of 1/600.

The design features of Rattanapitiya Ela channel improvement are tabulated below.

Design Features of Rattanaipitiya Ela Channel Improvement

| Work Item | Design Features |
|----------------------------|--|
| 1. Channel Improvement | |
| (1) Design Flood Discharge | RE1: 25 m ³ /sec, RE2: 53 m ³ /sec |
| (2) Channel Length | 2,130 m (RE1: 890 m, RE2: 1,240 m) |
| (3) Channel Bed Slope | RE1: Level to 1/1,200, RE2: 1/800 |
| (4) Channel Cross Section | RE1: Channel bed width of 19 m, bank slope of 1:2.0 RE2: Channel bed width of 19 m, Gabion revetment |
| (5) Maintenance Road | Length: 2,130 m |
| 2. Major Structure | |
| (1) Bridge | RE1: 29 m (L) x 7.4 m (B) x 2 spans RE2: 19 m (L) x 22 m (B) x 1 span RE3: 19 m (L) x 4 m (B) x 1 span RE4: 19 m (L) x 5 m (B) x 1 span RE5: 19 m (L) x 5 m (B) x 1 span |

Note: L: length, B: width

(2) Delkanda Ela

The reaches to be improved are divided into three sections of D1 (confluence of Rattanaipitiya to diversion point), D2 (diversion point to Pengiriwatta Road) and D3 (Pengiriwatta Road to upper end point at 150 m downstream of railway crossing). The lengths of D1, D2 and D3 are 280 m, 790 m and 690 m, respectively. Total length of improved section is 1,760 m.

The proposed channel alignment is set along the present one, but a diversion channel to the present Nugegoda Ela is proposed to minimize the relocation of many houses along the lower reach of the present Delkanda Ela.

The proposed channel bed slopes of D1 and D2 are set at 1/700, while that of D3 is 1/300. They are almost same as the present channel bed slope.

The design features of Delkanda Ela channel improvement are tabulated below.

Design Features of Delkanda Ela Channel Improvement

| Item | Design Features |
|----------------------------|--|
| 1. Channel Improvement | |
| (1) Design Flood Discharge | D1: 29 m ³ /sec, D2: 22 m ³ /sec, D3: 14 m ³ /sec |
| (2) Channel Length | 1,760 m (D1: 280 m, D2: 790 m, D3: 690 m) |
| (3) Channel Bed Slope | D1 and D2: 1/700, D3: 1/300 |
| (4) Channel Cross Section | D1: Bed width of 13.5 m, bank slope of 1:2.0 |
| | D2: Bed width of 13.5 m, rectangular with gabion |
| | D3: Bed width of 3.0 m, bank slope of 1:0.5 with wet masonry |
| (5) Maintenance Road | Length: 280 m |
| 2. Major Structure | |
| (1) Bridge | D1: 13.5 m (L) x 7 m (B) x 1 span |
| | D2: 13.5 m (L) x 4.2 m (B) x 1 span |
| | D3: 13.5 m (L) x 3 m (B) x 1 span |
| | D4: 13.5 m (L) x 19.8 m (B) x 1 span |
| | D5: 13.5 m (L) x 6 m (B) x 1 span |
| (2) Culvert | D6: 4.6 m (L) x 3 m (B) x 2.1 m (H) |
| | D7: 5.6 m (L) x 3 m (B) x 1.8 m (H) |

Note: L: length, B: width

(3) Nugegoda Ela

The reaches to be improved are divided into three sections of NE1 (confluence of Rattanapitiya Ela to boundary of Lower Nugegoda Ela Marsh) and NE2 (boundary of Lower Nugegoda Ela Marsh to Pepiliyana Road) and NE3 (Pepiliyana Road to upper end at 200 m downstream of Hospital Road crossing). The lengths of NE1, NE2 and NE3 are 940 m, 280 m and 360 m, respectively. Total length of improved section is 1,580 m.

A diversion channel is proposed for NE2 and NE3, respectively. The diversion channel for NE2 is proposed to improve the present bent alignment. The diversion channel for NE3 is proposed to collect storm water runoff from the residential area located in the lowland area. The proposed alignment of the remaining reaches is set along the present one.

The proposed channel bed slopes of NE1 and NE2 are taken as 1/700 which is the same as at present, while that of NE3 is set at 1/450 against the present slope of 1/300 to lower the channel bed by about 1 m.

The design features of Nugegoda Ela channel improvement are tabulated below.

Design Features of Nugegoda Ela Channel Improvement

| Item | Design Features |
|---------------------------|---|
| 1. Channel Improvement | |
| (1) Design Discharge | NE1: 24 m ³ /sec, NE2: 22 m ³ /sec, NE3: 10 m ³ /sec |
| (2) Channel Length | 1,580 m (NE1: 940 m, NE2: 280 m, NE3: 360 m) |
| (3) Channel Bed Slope | NE1 and NE2: 1/700, NE3: 1/450 |
| (4) Channel Cross Section | NE1: Channel bed width of 13 m, bank slope of 1:2.0 |
| | NE2: Channel bed width of 13 m, rectangular with gabion |
| | NE3: Channel bed width of 5 m, rectangular with gabion |
| (5) Maintenance Road | Length: 1,580 m |
| 2. Major Structure | |
| (1) Bridge | NE1: 18 m (L) x 4.6 m (B) x 1 span |
| | NE2: 13 m (L) x 2.3 m (B) x 1 span (pedestrian bridge) |
| | NE3: 13 m (L) x 4.4 m (B) x 1 span |

Note: L: length, B: width

16.4.4 Ratmalana-Moratuwa Scheme

The preliminary design of Nugegoda-Rattanaipitiya Scheme is shown in Drawings 20 to 22.

In the Ratmalana-Moratuwa Scheme, major drains are to be improved. Considering limited space for construction, a type of concrete flume with cover is largely adopted to effectively use the open space on the concrete flume after construction. A wet masonry channel and a gabion channel is designed where sufficient space is available. An earth channel is applied for the lower reach of Kandawala Tributary and Telawala Tributary. The total length of main drains to be improved is 11,120 m. The widths of drains vary from 0.8 m to 6 m.

At the ends of the drainage system, two ponds are provided to retard storm water. The total pond area is 13 ha and bottom elevation of ponds is taken as 1.0 m below MSL. The pond water is discharged through sluiceways with flap gates.

The design features of Ratmalana-Moratuwa Scheme are tabulated below.

Design Features of Ratmalana-Moratuwa Scheme

| Item | Design Features |
|---|---|
| 1. Main Drain | Total Length: 11,120 m |
| (1) Concrete Flume with Cover | Width: 0.8 m to 2 m, Length: 6,390 m |
| (2) Wet Masonry Channel | Width: 1 m to 1.5 m, Length: 1,150 m |
| (3) Open Channel with Wet Masonry Revetment | Width: 1 m to 3 m, Length: 1,650 m |
| (4) Open Channel with Gabion Revetment | Width: 3 m to 6 m, Length: 790 m |
| (5) Earth Channel | Width: 2 m to 6 m, Length: 1,140 m |
| 2. Retention Pond | |
| (1) Kandawala Pond | Water surface area: 3 ha Bottom level: EL-1.0 m |
| (2) Telawala Pond | Water surface area: 10 ha Bottom level: EL-1.0 m |

16.4.5 Periphery Canal for Storm Water Retention Area

The periphery canal to demarcate the retention area is proposed to be constructed along the boundary of the retention area. The design features of the canals are tabulated below.

Design Features of Periphery Canal

| Item | Design Features |
|-------------------|--|
| (1) Canal Section | Trapezoidal earth channel with bank slope of 1:1.0 Canal bed width: 2 m Channel depth: 1.5 m Embankment on the both bank: Height of 0.5 m, Dike top of 3 (2) m |
| (2) Canal Length | Upper Nugegoda Ela Marsh: L = 1,780 m Lower Nugegoda Ela Marsh: L = 2,110 m Delkanda Ela Marsh: L = 1,800 m Bellanwila-Attidiya Marsh: L = 4,400 m Weras Ganga Swamp: L = 4,400 m Maha Ela Marsh and Lowland: L = 6,000 m |

Note: L: length

CHAPTER 17 INSTITUTIONAL ARRANGEMENT

17.1 Institutional Arrangement for Project Implementation

17.1.1 Ministries and Agencies Related to the Project

The government undertook a restructuring of ministries and government agencies as part of an administrative reform in January 2002. Table 17.1 indicates ministries and agencies directly and indirectly related to the proposed Weras Ganga Basin Storm Water Drainage Project (the Project) in the new administrative setting.

17.1.2 Institutional Arrangement

(1) Overall Institutional Arrangement

Analyzing the functions and responsibilities given to each agency, and observing the institutional arrangements for similar projects, the overall institutional arrangement for implementation of the Project is proposed as shown in Figure 17.1.

SLLRDC is appointed as an executing agency for the Project. Ministry of Housing & Plantation Infrastructure (MHPI) supervises and assists SLLRDC as MHPI is the supervisory ministry of SLLRDC.

In order to make the Project implementation smooth, three committees have been created. They are Inter-Agency Steering Committee (IASC), Utility Diversion Committee (UDC) and HCDC Coordination Committee (HCC). Their functions are outlined below.

(2) SLLRDC

SLLRDC is appointed as an executing agency. The institutional arrangement in SLLRDC is shown in Figure 17.2. Within SLLRDC, Canal Development & Maintenance Division (CDM) is appointed as a primary responsible division for the overall project implementation. CDM supervises all project works to be implemented in the Project with a consultant team. This is the same institutional arrangement as the Greater Colombo Flood Control and Environmental Improvement Project (GCFC&EIP) Phase II and Phase III (under construction). Other divisions will support CDM.

The Project will require land acquisition and resettlement. The activities for resettlement are very important to successfully implement the Project. In SLLRDC, CDM is in charge of resettlement. Usually, CDM will need assistance from National Housing Development Authority (NHDA) as NHDA has various experiences from similar projects including the GCFC&EIP Phase I.

(3) Inter-Agency Steering Committee

Based on experiences from the similar projects such as the GCFC&EIP Phase II and III, IASC is to be established to discuss and solve the major problems and critical constraints encountered during implementation of the Project. IASC is chaired by the Secretary of MHPI and consists of 14 members and 7 ad-hoc members representing relevant agencies proposed in Table 17.2.

The roles and functions of IASC are:

- 1) To provide a proper guideline for the project implementation by deciding policy framework
- 2) To find solutions for problems and critical constraints among member agencies
- 3) To monitor, evaluate and approve progress of the project implementation

(4) Utility Diversion Committee

UDC is to be established to discuss technical issues on relocation and installation of utility facilities in the project area. UDC includes representatives of utility agencies concerned, that is, NWSDB, CEB, SLTL and local authorities. UDC is chaired by the Chairman of SLLRDC.

(5) HCDC Coordination Committee

A Housing and Community Development Committee (HCDC) is to be established in the relevant five local authorities in the project area to hear opinions and requests of the peoples in the project area. In order to coordinate among HCDCs, HCC is established and has the following functions.

- 1) To transfer policy guidelines from SLLRDC (Executing Agency) to HCDCs,
- 2) To provide HCDCs with technical assistance and information,
- 3) To monitor the progress of the Project implementation in local authorities,
- 4) To feed back problems and constraints, which local authorities encountered during project implementation, to SLLRDC and IASC
- 5) To share problems, ideas and experiences among HCDCs

17.2 Institutional Arrangement of Relevant Local Authorities

Table 17.3 shows the current staff allocation in five relevant local authorities, i.e., Dehiwala - Mount Lavinia MC (DMMC), Moratuwa MC (MMC), Kotte MC (KMC), Maharagama UC (MUC) and Kesbewa PS (KPS), focusing on positions related to the Project.

HCDC will play an important role to support the Project implementation in each local authority, in particular, activities related to land acquisition and resettlement. The staffing for HCDC of each local authority is proposed as shown in Figure 17.3. Recognizing different levels of activities of HCDCs among five local authorities, HCDC Coordination Committee (HCC) for the Project to be chaired by the Chairman of SLLRDC is organized as mentioned before. Since there are several NGOs actively working in the areas of community development and resettlement in Sri Lanka, it is proposed to assign these experienced NGOs as an assistant coordinator in HCC and HCDCs.

The followings are the current organizations, staffing, activities of HCDC and O&M activities for canals in five local authorities related to the Project.

17.2.1 Dehiwala - Mount Lavinia MC

The total number of employees of DMMC is 2,217, including one chief engineer, six engineers, 42 technical officers. A Drainage & Sewerage Section exists under the Chief Municipal Engineer, but there are no engineers and technical officers assigned specifically to this Section. The main activities of the Section are construction and O&M activities for minor canals and roadside drains. Since DMMC has no O&M equipment for major canals, DMMC requests SLLRDC for O&M activities of major canals with budget.

HCDC has been established in DMMC, and activities will include the Lunawa Lake Environment Improvement and Community Development Project (hereinafter called the Lunawa Project) to be funded by JBIC. HCDC is chaired by the Mayor with coordination by Community Development Officer (CDO). DMMC has four experienced Health Care Officers in charge of community development, health/hygiene development and social/environmental development, which was initiated by the UNICEF Project for 1984 to 1995.

Although DMMC has a shortage of engineers and technical officers specialized in storm water drainage works, the organization to cooperate with the Project exists in construction, O&M and social aspects.

17.2.2 Moratuwa MC

The total number of employees of MMC is 744, including one engineer and 13 technical officers. Construction of roadside drains and minor canals has been done by Municipal Engineer Department. O&M activities are shared by Municipal Engineer Department and Municipal Health Department. There are no engineers and technical officers undertaking only drainage works. Since MMC has no

equipment for O&M of major canals such as Telawala canal and Bambatuwa canal, MMC requests SLLRDC for O&M activities for these canals with budget.

HCDC has been established in MMC, and activities will include the Lunawa Project. HCDC is chaired by the Mayor and coordinated by four CDOs under Municipal Engineer. Activities of HCDC include data collection of families to be relocated by the Lunawa Project, Community institutional development, training of communities and coordination with NGOs involved in the Lunawa Project.

Although MMC has a serious shortage of engineers and technical staff for storm water drainage works, the organization to cooperate on the Project exists in construction, O&M and social aspects. The capabilities of the organization will be upgraded through joint works with SLLRDC and Urban Settlement Improvement Project Unit (USIP) for the Lunawa Project.

17.2.3 Kotte MC

The O&M work for drainage facilities has been done by Municipal Engineer Department and Municipal Health Department. Since the O&M works for the drainage canals including major canals in KMC area and the minor canals connected to the major canals is undertaken by SLLRDC, KMC undertakes only cleaning of minor facilities such as roadside drains and small urban drains. Therefore, the engineers and technical officers only for drainage works are not available and the O&M equipment is also not sufficient.

HCDC has not been established in KMC. One CDO is working for community related works with some staffs. Municipal Engineer Department will be assigned for community development and resettlement if the Project is implemented.

17.2.4 Maharagama UC

The total number of MUC staff is 237, including five technical officers. No engineer is available in MUC. There is no specific section in charge of drainage, but Department of Water Works is taking care of O&M activities for drainage, mainly for roadside drains. MUC has experiences of land filling of 14 acres in lowlands for use as a playground area. MUC has no experiences of relocation.

HCDC has been established and held every month, chaired by the Chairman and coordinated by one CDO dispatched from Commission of Local Government, Western Provincial Council. The topics are mainly issues for social activities since no housing and relocation projects have been done nor planned in MUC. Planning Section under Department of Water Works will be assigned for community development and resettlement if the Project is implemented.

Since MUC is understaffed in the area of storm water drainage, MUC should focus on O&M activities and social aspects for the Project, with assistance from SLLRDC, NHDA, DMMC and MMC. In addition, NGO should be utilized to strengthen capabilities of staffs in charge of social aspects.

17.2.5 Kesbewa PS

The total number of KPS staff is 168, including four technical officers. No engineer is available in KPS. There is no specific section in charge of drainage, but Department of Water Works is taking care of O&M activities for drainage, mainly for roadside drains. KPS has experience in the relocation of families. The Planning Section of KPS handled the relocation of 30 families living on a proposed dumping site of KPS.

HCDC has not been established in KPS. One CDO was dispatched by the Commission of Local Government, Western Provincial Council and is supervising a number of staff and working on community related works. The Planning Section under the Department of Water Works will be assigned for land acquisition and resettlement if the Project is implemented.

Since KPS is understaffed in the area of storm water drainage, KPS should focus on O&M activities and social aspects of the Project, with assistance from SLLRDC, NHDA, DMMC and MMC. In addition, NGOs should be utilized to strengthen the capabilities of staff in charge of social aspects. It is necessary that KPS first establishes HCDC by initiative of CDO and starts community activities before the Project is commenced.

17.3 Financial Status of SLLRDC and Local Authorities Concerned

17.3.1 SLLRDC

The financial statement of SLLRDC in 1996 to 2000 is shown in Table 17.4. The overall financial status of SLLRDC is sound. However, the financial condition of SLLRDC heavily depends on the interest from fixed deposits, which is 47.1% of the turnover on an average basis for this period. This implies that SLLRDC has been financially managed based on this significant contribution from fixed deposits.

However, the interest and fixed deposits mentioned above cannot be used to fund the O&M of the canals. Since the funding source of O&M works is at present only the budget allocation from the central government, it is important for SLLRDC to make due arrangements to acquire the budget for O&M works.

17.3.2 Local Authorities

The financial statements of five local authorities, Dehiwala - Mount Lavinia MC, Moratuwa MC, Kotte MC, Maharagama UC and Kesbewa PS from 1996 to 2000 are summarized below.

Financial Statuses of Local Authorities Relevant to the Project

| Item | DMMC | MMC | KMC* | MUC | KPS |
|--|-------|-------|-------|-------|--------|
| Revenue (Rs. Million/yr, 1996-2000) | 256 | 166 | 130 | 51 | 69 |
| Recurrence Expenditure (Rs. Million in 2000) | 230 | 147 | 121 | 40 | 46 |
| Average Share (1996-2000) | | | | | |
| Personnel Employment | 61.9% | 45.7% | 57.0% | 49.8% | 35.4% |
| Maintenance of assets | 5.2% | 21.3% | 7.9% | 20.7% | 21.2% |
| Transportation, communication utility & other services | 12.6% | 15.5% | 13.0% | 13.3% | 20.3% |
| supplies & requisite | 11.4% | 10.6% | 10.5% | 7.7% | 13.2% |
| Independent revenue rate | 49.7% | 46.5% | 45.7% | 51.6% | 40.4% |
| Grant revenue rate | 59.0% | 67.0% | 60.0% | 71.5% | 115.0% |

Note: * Based on the data only for 2000 and 2001

For all local authorities, about half of the recurrent expenditure is generated from independent revenue sources such as rates & tax, rents, licenses, services and so on. Meanwhile, more than 59% of the recurrent expenditure is covered by grant revenue from the government. Although capital expenditures exceeded capital receipts, overall revenue-expenditure balance has been slightly surplus in every local authority.

This indicates that the financial structure of five local authorities heavily depends on the grant revenues from central and local governments. For the sustainable O&M of the storm water drainage facilities to be constructed, financial strengthening of the relevant five local authorities is essential.

CHAPTER 18 OPERATION AND MAINTENANCE PLAN

18.1 Organization for O&M

18.1.1 Location of the Project

The area of the proposed Weras Ganga Basin Storm Water Drainage Project (the Project) is situated in the Weras Ganga basin, which extends over the six local authorities, Dehiwala - Mount Lavinia MC, Moratuwa MC, Kotte MC, Maharagama UC, Kesbewa PS and Homagama PS, as shown in Figure 18.1.

The project is composed of 4 drainage schemes and drainage improvement measures are proposed in each scheme. The locations of the schemes are shown in Figure 18.1.

18.1.2 Organization for O&M

In discussion on the responsible organizations for O&M activity for the Project, the following background of the project should be considered.

- 1) The major project components including river, principal canals and retention areas extend over two or more local authority districts. It is, therefore, practical and effective to execute the O&M works as a basin wide activity.
- 2) Local authorities are to take a responsibility for the O&M of all drainage facilities inside their respective local areas. However, it is not realistic for local authorities to undertake the O&M of the major project components such as dredging and cleaning of major canals/rivers, taking into account the weak organization structure, insufficient management capacity and the equipment available.
- 3) In the Project, storm water retention areas are identified in the lowlands and the conservation of these retention areas is one of the most important O&M activities. Therefore, as proposed in the Master Plan Study, it is a practical and effective way to maintain the retention areas by providing SLLRDC with authority as a sole responsible agency for lowland management/conservation related to storm water drainage works.

It is proposed that SLLRDC be the responsible organization for the O&M of the major project components including river, canals and retention areas by identifying the project area as a declared area under SLLRDC Act.

It is also proposed that the local authorities in the project area be the responsible organization for the O&M of the urban drainage systems which are located inside their respective local areas.

As shown in Figure 18.1, the project area which lies on Homagama PS is so small that no project components are planned in the local area. Therefore, Homagama PS is not considered an objective local authority for O&M planning of the project discussed in the subsequent sections.

18.2 O&M Works Required and the Demarcation

18.2.1 Objective Project Components for O&M

In the proposed drainage project, the following project components are planned in each scheme.

- 1) Weras Ganga Scheme
 - River dredging
 - Construction of flood protection wall and sluiceways with flap gates
 - Conservation works for retention areas
- 2) Nugegoda-Rattanapitiya Scheme
 - Improvement of existing canals and urban drains
 - Conservation works for retention areas
- 3) Bolgoda Canal Scheme
 - River dredging and existing canal improvement
 - Conservation works for retention areas
- 4) Ratmalana-Moratuwa Scheme
 - Improvement of urban drainage system
 - Construction of retention ponds

18.2.2 O&M Works Required

The basic O&M works required for maintaining the project components are shown below.

- 1) Periodical river dredging, cleaning and minor repair of channels, banks, retention areas and other related structures
- 2) Periodical inspection of river, canals, retention areas and other related structures
- 3) Reactive maintenance to deal with incidents and emergencies

18.2.3 Work Demarcation by Executing Organization

In order to execute the O&M works successfully, the work responsibility by each executing organization should be clearly demarcated. Considering the major project

components, present condition of O&M work capacity of responsible organizations and low land management/conservation related to storm water retention areas, it is proposed that SLLRDC undertakes the substantial O&M works of the major project components and the related local authorities undertake the O&M works of the urban drainage system located in their local areas, respectively.

In addition, it is proposed that the local authorities assist SLLRDC's O&M activity through undertaking of the periodical inspection of the project components extended in the respective local areas.

The detailed demarcation of the required O&M works for the project components are illustrated in Figure 18.2.

18.3 Operation and Maintenance Work Plan

18.3.1 Implementation Section of O&M Organization

(1) SLLRDC

It is proposed that the Canal Maintenance (CM) section of the Canal Development and Maintenance (CD&M) Division be the responsible section for the O&M works of the major drainage facilities including Weras Ganga, the drainage canals extending over the local authorities and the retention areas. The existing Attidiya Regional Office and the Kirimandara Mawatha Regional Office are proposed to handle the actual activities under the management of the CM section.

Attidiya Regional Office is located beside the Bolgoda South Canal and the Bellanwilla-Attidiya marsh. The present task of this office is maintenance of the Bolgoda South Canal of which improvement is planned in the Project and other minor canals in the Bolgoda Canal basin. Although both the present workload and number of staff are less than at other regional offices, the office location is considered to be an advantage in undertaking the O&M of the major components in the Project from the view point of the access to the work sites.

Establishment of a new section in the Kirimandara Mawatha Regional Office is proposed for the purpose of undertaking the on-the-job training and lectures in the process of the transfer of urban drainage facilities to the related local authorities.

(2) Local Authorities

1) Dehiwala - Mount Lavinia MC and Moratuwa MC

These two local authorities are responsible for undertaking the O&M for the urban drainage system located in the respective local areas. The drainage facilities will be constructed through the Project and transferred to these local

authorities by means of the step wise transfer proposed in the Master Plan Study. In parallel, on-the-job training and lectures for the purpose of improving O&M capacity of local authorities will be carried out through the transfer process under the leadership of SLLRDC.

The two local authorities do not have substantial O&M implementation systems so it will be difficult to take over the drainage facilities and carry out the proper O&M. Therefore, an exclusive section for storm water drainage in each local authority will be established so that they can undertake the O&M related activities including participation in the training programs and the O&M by themselves after taking over the facilities.

In both MCs, Municipal Engineers Department currently undertakes most of the maintenance of the minor storm water drains. The new separate section for O&M of the storm water drainage in this department will be headed by a chief engineer as shown in Figures 18.4 and 18.5.

2) Kotte MC, Maharagama UC and Kesbewa PS

These three local authorities are to undertake only the periodical inspection of the project components extended in the respective local areas in cooperation with SLLRDC. It is presumed that these local authorities will be able to undertake the task for the Project within the existing organization structure.

However, it is recommended to consider the establishment of a section to handle the O&M works of storm water drainage with a view to future extension of the drainage system as the extension of built-up area continues.

18.3.2 Staffing

(1) SLLRDC

At present the Attidiya Regional Office undertakes the maintenance of only the Bolgoda South Canal (1,800 m stretch) and other minor canals, and the staff structure is insufficient to handle the O&M works for the Project. It is, therefore, proposed to strengthen the O&M staff of the Attidiya Regional Office as shown below, considering increases in responsibilities after completion of both the GCFCEIP Phase III and this Project.

Proposed Staff Strengthening Plan for Attidiya Office of SLLRDC

(Unit: No. of Person)

| Staff | Existing | By year 2004 (GCFC&EIP-III) | By completion of the Project |
|-----------------------|----------|--------------------------------|---------------------------------|
| Chief Engineer(CE) | 0 | 1 | 1 |
| Other Engineer | 0 | 0 | 1 |
| Engineering Assistant | 1 | 1 | 2 |
| Work Supervisor | 2 | 2 | 4 |
| Machine Operator | 0 | P&E Div. | P&E Div. |
| Clerical staff | 4 | 5 | 6 |
| Labor | 31 | 31 | 40 |

For the proposed new section in the Kirimandara Mawatha Regional Office, the staff plan is proposed as below considering the increase in the task in the future for the GCFCEIP Phase III and the Lunawa Lake Project as well as this Project.

The same stepwise staff strengthening plan as applied to the Attidiya Regional Office is proposed taking into account of the completion time of the on-going storm water projects as well as the Project.

Proposed Staffing Plan for Urban Drainage Section in Kirimandara Mawatha Office

(Unit: No. of Person)

| Staff | Existing | By year 2004 (GCFCEIP-III) | By completion of the Project |
|-----------------------|----------|-------------------------------|---------------------------------|
| Chief Engineer(CE) | 0 | 1 | 2 |
| Other Engineer | 0 | 0 | 1 |
| Engineering Assistant | 0 | 1 | 2 |
| Work Supervisor | 0 | 1 | 2 |
| Machine Operator | 0 | P&E Div. | P&E Div. |
| Clerical staff | 0 | 1 | 2 |
| Labor | 0 | Common use | Common use |

(2) Local Authorities

1) Dehiwala - Mount Lavinia MC and Moratuwa MC

Considering necessity of the strengthening of the O&M system with a view of carrying out the proper O&M of urban drainage system to be constructed under the GCFCEIP Phase III and the Lunawa Lake Project as well as the Project, the following staff arrangement will be required.

In these local authorities, exclusive staff engaged in the storm water drainage works are not available, therefore the staffing plan and the timing shown in the table below is proposed so that the overall capacity of the staff for planning and implementation as well as O&M can be developed through engagement in the entire project stage.

**Proposed Staffing Plan for Local Authorities Related to the Project
(Dehiwala - Mount Lavinia MC and Moratuwa MC)**

(Unit: No. of Person)

| Staff | Existing (exclusive for drainage) | By start of the Project implementation | By completion of the Project |
|-------------------|---|--|---------------------------------|
| Manager/ Engineer | 0 | 1 | 1 |
| Other Engineer | 0 | 1 | 1 |
| Technical officer | 0 | 1 | 2 |
| Work Supervisor | 0 | 2 | 3 |
| Machine Operator | 0 | 2 | 3 |
| Clerical staff | 0 | 2 | 2 |
| Labor | 0 | 5 | 10 |

2) Kotte MC, Maharagama UC and Kesbewa PS

For these local authorities, major O&M works for the project components are not planned and their tasks comprise only the periodical inspection of the drainage facilities in cooperation with SLLRDC. It is presumed that the O&M works can be handled by the existing staff. An increase of staff is expected, however, to deal with the future increase in the tasks as extension of urban area continues.

Since the substantial O&M works by these local authorities are not planned in the Project and it is still too early to expect planning and implementation of a storm water project by these local authorities in a short period, the substantial increase in staff numbers is not proposed until near completion time of the Project.

**Proposed Staffing Plan for Local Authorities Related to the Project
(KotteMC, Maharagama UC and Kesbewa PS)**

(Unit: No. of Person)

| Staff | Existing (exclusive for drainage) | By start of the Project implementation | By completion of the Project |
|-------------------|---|--|---------------------------------|
| Manager/ Engineer | 0 | 0 | 1 |
| Other Engineer | 0 | 0 | 0 |
| Technical officer | 0 | 1 | 1 |
| Work Supervisor | 0 | 0 | 2 |
| Machine Operator | 0 | 0 | 1 |
| Clerical staff | 0 | 0 | 1 |
| Labor | 0 | 0 | 5 |

18.3.3 Equipment Plan and Stock Control of Spare Parts

(1) Equipment Plan for SLLRDC

SLLRDC has a number of machines and an amount of equipment for O&M which have been procured under previous drainage projects. In this sub-section, machines and equipment which will be required for executing the O&M works for the Weras

Ganga Basin Storm Water Drainage Project is proposed considering the demarcation of work responsibility, the work features and the stock of equipment discussed in the preceding sections.

Proposed O&M Equipment Plan for the Project (for SLLRDC)

(Unit: Nos.)

| Major Equipment | By completion of the Project |
|---|------------------------------|
| Grab dredger and pontoon (0.5m ³) | 1 |
| Excavator (0.5 m ³) | 2 |
| Dump track (8 m ³) | 2 |
| Skip barge (7 ton) with push boat | 2 |
| Tractor and trailer (45 HP, 3.5 ton) | 3 |
| Diesel engine driven pump (100 mm dia.) | 1 |
| Pick-up track (4WD double cab) | 2 |
| Inspection boat (25 HP) | 1 |

(2) Equipment Plan for Local Authorities

The availability of O&M equipment for the five local authorities is quite insufficient to undertake the O&M works on regular basis. Therefore, the equipment plan is proposed taking the demarcation of work responsibility and the work features into consideration.

1) Dehiwala - Mount Lavinia MC and Moratuwa MC

These two local authorities will undertake the substantial O&M of the urban drainage systems in the respective areas. Light equipment for channel cleaning and minor repair will be required. In selection of the number and type of equipment for the Project, the O&M equipment to be procured and transferred to the local authorities under the GCFCEIP Phase III and the Lunawa Lake Project should be also considered for the effective use of the all equipment.

2) Kotte MC, Maharagama UC and Kesbewa PS

According to the O&M work demarcation, these three local authorities are to undertake only the periodical inspection of the drainage facilities in cooperation with SLLRDC. It is, therefore, proposed to procure one vehicle for inspection for each local authority.

Based on the above consideration, the equipment plan for the Project is proposed below.

Proposed O&M Equipment Plan for the Project (for Related Local Authorities)

(Unit: Nos.)

| Major Equipment | By completion of the Project | | | | |
|---|-----------------------------------|----------------|----------|------------|------------------|
| | Dehiwala - Mount Lavinia MC | Moratuwa MC | Kotte MC | Kesbewa PS | Maharagama PS |
| Excavator (0.4 m ³) | 1 | 1 | 0 | 0 | 0 |
| Tractor and trailer (45HP, 3.5ton) | 1 | 1 | 0 | 0 | 0 |
| Diesel engine driven pump (100mm dia.) | 1 | 1 | 0 | 0 | 0 |
| Pick-up truck (4WD double cab) | 1 | 1 | 1 | 1 | 1 |
| Diesel generator (18 KVA) | 1 | 1 | 0 | 0 | 0 |

(3) Stock Control of Spare Parts

The major resources for the sustainable O&M activities over a long term are manpower and equipment. In particular, O&M equipment should be maintained so as to meet the demands at any time. It is, however, often observed that timely mobilization of O&M equipment to the field fails because spare parts and tools are not available when the need is identified. It is, therefore, proposed to prepare an inventory and to carry out the stock control of spare parts and tools based on the inventory.

In case of SLLRDC, Plant and Equipment (P&E) Division is the responsible section to manage the operation and maintenance of O&M equipment. As SLLRDC has a basic management system of spare parts utilizing printed forms, it is proposed to execute the stock control by P&E Division.

In case of DMMC and MMC, it is clear that the number and type of O&M equipment which these local authorities have to operate with will increase through undertaking the O&M works for the GCFCEIP Phase III and the Lunawa Lake Project as well as the Project. It is, therefore, proposed to establish the stock control procedure.

It is not considered necessary for Kotte MC, Maharagama UC and Kesbewa PS to establish stock control procedures in the short term taking into account the O&M work demarcation and the equipment plan proposed for the Project. Establishment of a stock control procedure should be considered for the future as an increase in O&M equipment use is likely.

18.3.4 Financial Arrangement for O&M

On the basis of the staffing plan, equipment plan and the required O&M works proposed in the above sections, the O&M cost to maintain all the components to be

constructed under the Project is estimated for each responsible organization. Furthermore, the financial arrangement for the cost is also proposed in this section.

(1) Estimate of Annual O&M Cost

The annual O&M cost for the Project components is estimated in terms of the following cost items on the assumption of the preliminary annual work schedule.

1) Cost for Routine Works

- Canal/river dredging and canal cleaning/minor repair including grass cutting of the bank and removal of water surface weeds
- Cleaning of urban drains and the related facilities
- Periodical inspection of canals, retention areas/ponds and O&M road

2) Cost for Reactive Works

- Repair/reconstruction of canal bank and the protection based on the periodical inspection
- Works to deal with incidents and emergencies such as dweller's encroachment, blockage of canal, illegal dumping, accident to person, etc.

The annual O&M cost by SLLRDC and each local authority in the Project area is preliminarily estimated as below based on the work demarcation.

Preliminary Estimate of Annual O&M Cost for the Project

(Unit: Rs. 1,000)

| Item | SLLRDC | Dehiwala - Mount Lavinia MC | Moratuwa MC | Kotte MC | Kesbewa PS | Maharagama PS |
|------------------|--------|-----------------------------------|----------------|----------|------------|------------------|
| 1) Routine Work | | | | | | |
| a) Canal/river | 25,782 | 400 | 1,120 | 0 | 0 | 0 |
| b) Urban drain | 124 | 1,320 | 1,500 | 0 | 0 | 0 |
| c) Inspection | 224 | 96 | 73 | 3 | 147 | 74 |
| 2) Reactive Work | | | | | | |
| a) Repair | 3,886 | 326 | 326 | 0 | 0 | 0 |
| b) Emergencies | 2,052 | 255 | 255 | 0 | 0 | 0 |
| Total | 32,068 | 2,397 | 3,274 | 3 | 147 | 74 |
| Existing Budget | 59,000 | 5,800* | 3,700* | 4,068 | 2,440 | 2,680 |

Note: * Assumed values applying 2.5 % of the total recurrent expenditure in year 2000.

(2) Financial Arrangement for O&M

1) SLLRDC

The financial source for all O&M activities of SLLRDC is provided by the central Government. The estimated annual O&M cost for the Project is about 55% of the current budget for the entire O&M works undertaken by SLLRDC and therefore a considerable increase in the annual budget is required. It is

proposed that SLLRDC makes due arrangement to acquire the budget for the planned O&M works by the completion of the project implementation.

2) Local Authorities

Considering the existing financial status and the O&M work demarcation for the Project of each local authority, a budget arrangement is proposed.

In case of DMMC and MMC, since a considerable increase in the annual budget will be required compared to the existing budget, the realistic budget plan should be prepared considering their substantial undertaking of the O&M works in the near future for the facilities to be constructed under the GCFCEIP Phase III and the Lunawa Lake Project as well as the Project.

In case of Kotte UC, Maharagama UC and Kesbawa PS, the required O&M activity involves only inspection of the facilities in their respective areas and no substantial O&M works are planned for the Project, therefore it will be possible to carry out the works within the present budget arrangement.

18.4 Staff Training Program for SLLRDC and Local Authorities

18.4.1 Purpose of the Staff Training Program

In considering the present management capacity of SLLRDC and local authorities, a staff training program is described below for the purpose of achieving successful O&M works for the proposed drainage project. This program is proposed as a short term objective based on the program concept discussed in the Master Plan Study. The training program is proposed in two categories, O&M Management and Operation of O&M Equipment.

18.4.2 Outline of Program

(1) O&M Management Program

1) Planning and Programming for O&M Works

- Target Group: Managerial staff, Engineer
- Objective: Understand purpose of O&M plan, overview of management principles and learn planning and programming know-how
- Provider: Consultant hired by SLLRDC, SLLRDC, Training institutes

2) Introduction of O&M Activities

- Target Group: Engineering assistant, Technical staff, Work supervisor

- Objective: Understand necessity of O&M works and learn O&M method
- Provider: Consultant hired by SLLRDC, SLLRDC, Training institutes

3) Operation of O&M Equipment Program

- Target Group: Machine operator
- Objective: Understand mechanism of O&M equipment, Learn how to operate equipment
- Provider: CMC technical staff, SLLRDC, others to be arranged by SLLRDC (equipment maker)

The program details are provided in Annex 10 of Supporting Report (2).

CHAPTER 19 ENVIRONMENTAL IMPACT ASSESSMENT

19.1 Environmental Screening and Scoping on the Proposed Schemes

Based on the project components of each proposed scheme, environmental screening and scoping were conducted for four proposed schemes. Table 19.1 summarizes conceivable negative impacts identified by the environmental screening and scoping.

Resulting from the screening and scoping, the following issues on environmental impact are examined as discussed hereunder:

- 1) Resettlement by land acquisition
- 2) Relocation of religious/public facilities
- 3) Temporary traffic disturbance during construction
- 4) Breeding places for mosquitoes in the proposed retention ponds
- 5) Flora & fauna in the Bellanwila-Attidiya Wildlife Sanctuary
- 6) Emission gas and dust during construction
- 7) Noise and vibration during construction
- 8) Offensive odor by disposal of dredged material and removed aquatic weed.

19.2 Environmental Impacts and Mitigation Measures

19.2.1 Social Environment

(1) Resettlement Caused by Land Acquisition

Although minimization of the number of households to be resettled caused by the land acquisition for the proposed schemes was examined as explained in Chapter 20, 158 households require resettlement. In addition, two factories and a community hall are subject to relocation by the land acquisition.

For residential households, just compensation and necessary assistance for the resettlement should be made based on the past similar projects, National Involuntary Resettlement Policy (NIRP) and relevant laws and guidelines which will be effect soon. Based on the NIRP, a resettlement action plan should be prepared by SLLRDC to implement land acquisition, compensation and resettlement prior to the project implementation with technical advice from CEA, Ministry of Lands, NHDA, etc.

(2) Storm Water Drainage Improvement and Poverty Reduction

Low-income people tend to reside in the lowlands of the feasibility study area such as marsh and canal reserve with inexpensive or free rent because such lowland has low demand for economic use due to flood prone characteristic. Damages by the storm water such as property damage and sanitary deterioration cause significant

negative impacts and a heavy burden to livelihoods of the low-income households much more than that of other upper income households.

The proposed schemes for storm water drainage improvement provide an opportunity for a better residential environment especially for the low-income residents by relieving flooding damage relevant to their livelihood and sanitary conditions. The improvement of residential conditions by the storm water drainage improvement can be considered as an aspect of poverty reduction. In the feasibility study area, relative large numbers of the low-income households reside along the right bank of the Weras Ganga in the Ratmalana-Moratuwa area. Those low-income households will benefit by implementing the proposed schemes.

In addition, involvement of the low-income people living in the feasibility study area in the construction activity for the proposed channel and resettlement site development by employment in the project and/or through the community contract system will bring about employment opportunity even it is temporary.

(3) Temporary Traffic Disturbance during Construction

The construction work in the densely populated residential area such as channel improvement will cause temporary traffic disturbance due to the need for space for construction machinery, construction material yard, etc. To minimize such impact, efficient use of the limited space should be planned location by location, and appropriate detour routes and guidance should be prepared.

(4) Breeding of Mosquitoes in the Proposed Retention Ponds

The proposed retention ponds in the Ratmalana-Moratuwa scheme store water in non-flooding period to some extent. The stagnant water in the ponds would provide breeding sites for mosquitoes. To prevent the breeding of mosquitoes, biological control measures such as introducing fish species that feed on mosquito larvae should be taken rather than the use of insecticide that may cause water pollution. In addition, water quality in the pond should be kept at appropriate level for the fish for the mosquito control by preventing both industrial and domestic wastewater from inflowing.

(5) Other Social Issues related to the Project

There are no other social issues to be expected related to the implementation of the proposed schemes such as any loss of production opportunity, losses and decreases in value of ruins and cultural assets, deterioration of sanitary conditions, or disturbance of regional society.

19.2.2 Natural Environment

(1) Bellanwila-Attidiya Wildlife Sanctuary

Under the proposed Weras Ganga and Bolgoda Canal Schemes, Bellanwila-Attidiya marsh area is designated as a storm water retention area. To secure the retention area, it is recommended that all lands for the retention area be acquired. The delineation of the retention area is conducted under real situation of the area because some of the marsh area is already used as residential area and some is already reclaimed for use even within the Sanctuary area. By delineating the retention area, the majority of the Sanctuary will be secured except for the area at the right bank of Bolgoda Canal and Weras Ganga from the Elawella road to downstream including the proposed runway expansion project site of the Ratmalana airport.

Specific measures will not be undertaken in the retention area except for the construction of the peripheral channel and pathway along the boundary of the retention area. This should prevent any development pressure although there is a possibility of a change of water regime of the canal passing through the retention area by implementation of the proposed schemes affecting natural conditions in the Sanctuary area.

Water level of the canal in the sanctuary in non-flood period by implementation of the proposed schemes will not be changed from present conditions of the water level. However, salinity level may be slightly increased by salt intrusion through the Weras Ganga due to dredging of the Weras Ganga and demolition of the gate on the Bolgoda Canal. It is highly probable that it will cause vegetation change mainly along the Weras Ganga and Bolgoda Canal. However, most of the vegetation in the Sanctuary would not be affected widely and drastically because most of the terrestrial vegetation area is not submerged in non-flood period. In addition, the dredging of the Weras Ganga and demolition of the salt intrusion gate should restore the sanctuary area to the natural condition that existed in the past.

Considering the present situation where appropriate management of the Sanctuary area is not initiated, it can be considered that acquisition of the land for use of retention area is one of best ways to conserve the area.

(2) Weras Ganga

The dredging work of the Weras Ganga would change the natural condition of the Weras Ganga to some extent by increasing the salinity level and removing the bottom sediment. These changes are not significant as compared to the case of the Bellanwila-Attidiya Wildlife Sanctuary. However, the change of natural conditions might affect fishery activity from midstream to downstream of the Weras Ganga

though intensive fishery activity does not seem to be conducted at present.

19.2.3 Pollution

(1) Noise and Vibration during Construction

Existing canals and other structures subject to improvement by the proposed schemes mostly pass through residential area. Therefore, noise and vibration caused by construction machinery and equipment during construction would affect residents to some extent. To mitigate the impacts by noise and vibration, low-noise and low-vibration type generators and machinery should be used for the construction work. In addition, construction time should be limited to daytime in the residential area. Affected workers should be provided with appropriate protective equipment such as ear plugs.

(2) Emission Gas and Dust during Construction

Likewise, dust caused by construction machinery and equipment during construction would affect residents in some extent. Emission gas from construction machinery will be negligible in the local atmospheric condition. To mitigate the impacts by dust, sprinkling water in and around the construction site should be conducted during construction. In addition, affected workers should be provided with appropriate protective equipment such as dust-resistant masks.

(3) Wastewater Pertain to the Construction Activities

No specific construction method or machinery discharging wastewater is used during construction. However, temporary toilets should be installed for construction workers at construction sites.

(4) Disposal of Construction Wastes

Dredging of the Bolgoda canal and Weras Ganga is conducted under the proposed schemes at around 140,000 m³ under estimation. In addition, bottom sediment will be excavated at channel improvement section in some volume. The dredged/excavated bottom sediment contains organic matter and water. Offensive odor is expected if the dredged material is disposed of by open dumping without any measures. Therefore, as soon as bottom sediment is dredged, it should be transported to designated temporary dumping site or final disposal site located a certain distance from residential area.

Two disposal sites for the dredged materials are proposed in the feasibility study area from viewpoints of minimization of impact to residential areas by offensive odor as shown in Figure 19.1. One disposal site is located in the proposed land filling site for the airport runway expansion at the right bank of the Weras Ganga near the airport.

Land area for the disposal site will be 36 ha at maximum. It is planned that 80,000 m³ of the dredged materials and 280,000 m³ of the surplus soil from the construction can be deposited. The disposal site is located at least 100 m away from nearest residential area to minimize impact by offensive odor. Another disposal site is located at the lowest reach of the Maha Ela. Land area for the disposal site will be 6 ha at maximum with 60,000 m³ capacity for the dredged material. This site is located in part of proposed retention area. Therefore, shallow filling at most 1 m is planned.

For surplus soil apart from the dredged bottom sediment, there is probably demand for use to fill lowland developed area. There is no other waste for which special disposal measure is required. Most of construction waste such as cement bag would be disposed as general waste.

(5) Removal and Utilization of the Aquatic Weed

In many places in the canals, especially those within the marshland such as the Bolgoda canal, floating, submerged and bottom-rooted vegetation exists. The majority of free-floating plants are Water Hyacinth *Eichornia crassipes* (Japan-jabara), *Saleinia molesta*, and *Monochoria vaginalis*. The submerged and bottom-rooted plants include *Cabomba* sp., *Hydrilla verticillata* and *Nymphaea lotus* (Olu) as the common vegetation profiles to be found. Extraordinary growth of these aquatic weeds caused by the water quality deterioration in the canal blocks storm water passage in many places of the canals.

However, there is a positive effect of the aquatic weed existing in the canal system attributed to bio-filter function of the aquatic weed that absorbs nutrient salts in the canal water with nitrogen and phosphorus. To use this function effectively, regular removal activity and appropriate disposal of the aquatic weed are important.

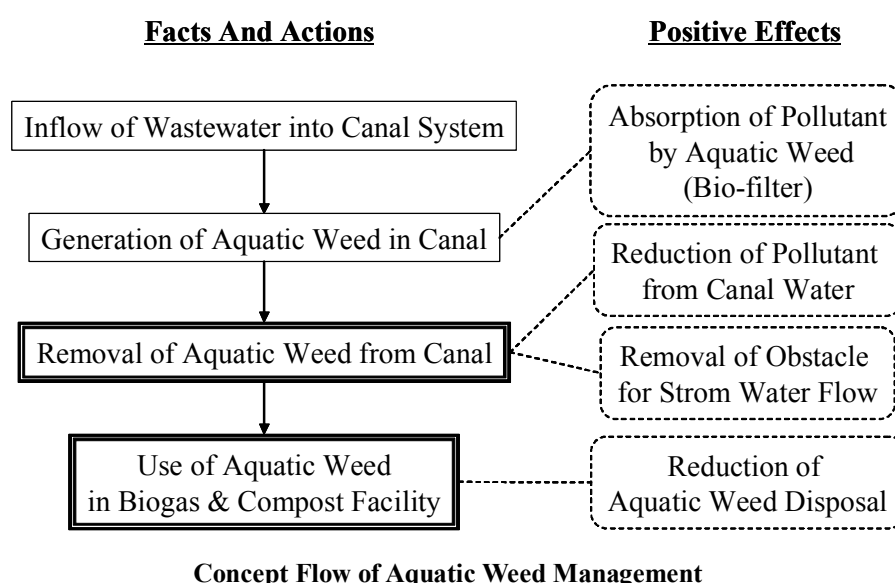
As an alternative to the removal of aquatic weed instead of the direct disposal in the construction and operational stages, anaerobic digestion of waste for energy recovery in the form of methane (biogas) and production of digested organic residue for compost has been initiated by the National Engineering Research Development Center (NERD) using a dry batch reactor system. Feedstock is the source separated green and market waste. On average, 1 m³ of methane is produced per ton of waste per day over the 4-month digestion cycle in the experimental plant of NERD.

Ja Ela PS is now constructing a biogas & composting facility with 16 biogas generators of 40 tons capacity per generator in 42 perches land¹ along the Hamilton Canal under supervision of NERD. Feedstock for the facility is mainly market waste

¹ 42 perches equal approximately 1,050 m².

and green waste including aquatic weed from canals which will be collected from Ja Ela PS and surrounding municipalities. The facility starts its operation from this middle of November. After NERD operates the facility for the first year, Ja Ela PS will take over its operation and maintenance work as primal management organization. The facility might be useful example for application to this project.

Under the present condition that canal water quality has deteriorated, removal of the aquatic weeds would be a more positive solution for water quality improvement as well as storm water drainage improvement. Positive effects related to the aquatic weeds with necessary actions is summarized as shown below.



19.3 Environmental Management and Monitoring Plan

In the construction and operational stages of the proposed schemes, environmental mitigation measures mentioned above should be appropriately implemented. A prime responsible agency for the environmental management is SLLRDC though the environmental mitigation measures are implemented by contractors, local authorities, and/or relevant agencies. To confirm the effectiveness of the mitigation measures, compliance of the environmental requirement and any environmental incidentals, environmental monitoring should be conducted by relevant agencies and SLLRDC.

Monitoring methods on conceivable environmental impacts discussed above are shown in the following table.

Environmental Monitoring and Methods

| Impact Items | Monitoring Items | Monitoring Method | Project Period/Frequency |
|--|--|---|---|
| 1. Resettlement | - Payment of compensation - Implementation of resettlement assistance - Livelihood recovery - Living condition - Sanitary condition - Grievance | - Household survey | Before resettlement: 1 time After resettlement: once a year for three years |
| 2. Temporary traffic disturbance during construction | - Implementation of planned mitigation measure - Grievance | - Inquiry survey to residents living near construction site | Once during construction in each construction site |
| 3. Breeding place for mosquitoes in the proposed retention ponds | - Breeding of the mosquito larvae | - Periodical observation in the ponds | One a month after operation start |
| 4. Flora & fauna in the Bellanwila-Attidiya Sanctuary | - Existing species - Distributions of the species | - Field survey | Before construction: 1 time After operation: to be discussed based on the first survey |
| 5. Emission gas & dust during construction | - Implementation of planned mitigation measure - Grievance | - Inquiry survey to residents living near construction site | Once during construction in each construction site |
| 6. Noise & vibration during construction | - Implementation of planned mitigation measure - Grievance | - Inquiry survey to residents living near construction site | Once during construction in each construction site |
| 7. Offensive odor by disposal dredged materials | - Implementation of planned mitigation measure - Grievance | - Field inspection - Inquiry survey to residents living near disposal site | After operation of the disposal site starts: once half a year for three years |

19.4 Requirements for EIA Approval

The proposed project will be subject to the EIA approval under the Gazettes No.772/22 of 24th June 1993 and No.859/14 of 23rd February 1995 since more than 100 households have to be relocated by the project. As the first step of the EIA procedure, preliminary information on the project should be submitted by SLLRDC to CEA. The form of project preliminary information would be fulfilled based on this F/S report.

After the project preliminary information is reviewed by CEA within 6 days after the submission, CEA decides whether the project is subject to the IEE or EIA. Then a Terms of Reference for the IEE or EIA is set by CEA in 14 days or 30 days respectively.

CHAPTER 20 RESETTLEMENT PLAN

20.1 Necessity of Land Acquisition and Resettlement

20.1.1 Minimization of Resettlement Attribute to Land Acquisition

In principle, the proposed storm water drainage plan mainly employs positive utilization of the vacant lowland as retention area. Because of this, widening of the existing canal and construction of new canals and pumping stations, which tend to cause relocation along with land acquisition for the construction, are minimized. As a result, scale of resettlement caused by land acquisition for the proposed project is minimized.

One of the components for the proposed schemes is improvement of existing canals. In the case of canals in residential area, houses and building structures have to be relocated in some extent as the existing canals are widened. Relocation and land acquisition can be minimized by utilizing a rectangular cross section for the canal instead of a trapezoidal cross section.

In the upper Nugegoda Ela and lower Delkanda Ela areas, vacant land is available near the existing canal so branch channel and diversion channel are proposed respectively to minimize resettlement.

20.1.2 Land to be Acquired for the Proposed Project

An estimated 31 ha of the lands have to be acquired for the structural measures of the proposed schemes as shown in the following table. As most of the land is in non-residential areas such as marshy lands the percentage of residential lands in total is rather low (8.9% in total).

Land Area to be Acquired and Residential Area to be Relocated

(Unit: m²)

| Scheme | Estimated Land Area to be Acquired | Surveyed Residential Area* | (%) |
|---|------------------------------------|----------------------------|---------|
| 1. Weras Ganga - Flood protection wall | 9,500 | 3,853 | (40.6%) |
| 2. Bolgoda Canal - Channel improvement | 31,600 | 339 | (1.1%) |
| 3. Nugegoda-Rattanaipitiya - Channel improvement | 67,975 | 21,338 | (31.4%) |
| 4. Ratmalana-Moratuwa - Urban drainage and ponds | 201,600 | 2,105 | (1.0%) |
| Total | 310,675 | 27,635 | (8.9%) |

Note: * The data is based on the Inventory Survey on Households to be Resettled as explained in the following section.

20.1.3 Identification of Houses and Structures to be Relocated

Based on proposed project boundaries drawn on the topographic map with a scale of 1:2,000, houses and building structures to be relocated by the proposed schemes are identified. The latest information on these houses and structures was confirmed in the field through the Inventory Survey on Households to be Resettled undertaken by a local consultant. Land survey was not conducted in the survey. Therefore, the numbers of houses and structures to be relocated is subject to change in further detailed study stage.

The number of houses and structures to be relocated are shown in the following table. Out of total 158 houses to be relocated, most are located in the Weras Ganga Scheme area (36 houses) and Nugegoda-Rattapitiya Scheme (98 houses). A small number are expected for the Bolgoda Canal Scheme (3 houses). In addition, 2 factories and a community hall are subject to relocation by the land acquisition.

Number of Houses and Structures to be Relocated

(Unit: nos.)

| Scheme | House/Structure to be Relocated | | |
|-------------------------|---------------------------------|---------|----------------|
| | House | Factory | Community Hall |
| 1. Weras Ganga | 36 | 0 | 0 |
| 2. Bolgoda Canal | 3 | 0 | 0 |
| 3. Nugegoda-Rattapitiya | 98 | 2 | 1 |
| 4. Ratmalana-Moratuwa | 16 | 0 | 0 |
| Total | 158 | 2 | 1 |

Source: EIA Study on Weras Ganga Basin Storm Water Drainage Plan, JICA Study Team, 2002

20.2 Results of the Inventory Survey on Households to be Resettled

20.2.1 Number of Households Surveyed and to be Relocated

As mentioned above, the households to be relocated are identified from the surveyed households. The remainder of the surveyed households which will not be relocated can be considered as project beneficiaries because they are residing close to the project site of proposed schemes and will be protected from storm water damage by implementation of the proposed schemes. The number of beneficiaries is 1,386 households as shown in the following table.

Number of Households Surveyed and to be Relocated

(Unit: nos.)

| Scheme | Households surveyed and to be Relocated | | |
|---|---|--------------------------------|--|
| | Households Surveyed (a) | Households to be Relocated (b) | Households to be Benefited (c)=(a)-(b) |
| 1. Weras Ganga | | | |
| - Dredging and flood protection wall const. | 626 | 36 | 590 |
| - Weras Ganga Swamp Retention Area | 57 | 0 | 57 |
| - Maha Ela Retention Area | 100 | 0 | 100 |
| 2. Bolgoda Canal | | | |
| - Dredging and channel improvement | 3 | 3 | 0 |
| - Bellanwila-Attidiya Retention Area | 291 | 0 | 291 |
| 3. Nugegoda-Rattanapitiya | 406 | 98 | 308 |
| 4. Ratmalana-Moratuwa | 56 | 16 | 40 |
| Total | 1,539 | *153 | 1,386 |

Note: 5 households to be resettled were not able to be surveyed due to absences during the survey period.

Source: EIA Study on Weras Ganga Basin Storm Water Drainage Plan, JICA Study Team, 2002

20.2.2 Intention on Resettlement

(1) Acceptability of Resettlement

The Inventory Survey on Households to be Resettled was conducted before the boundary of the proposed schemes was finally determined. Therefore, boundary of the survey area was set wider than the boundary of land acquisition for the proposed schemes. In the survey, intention on resettlement caused by the storm water drainage project was asked to all surveyed households as potential resettlers in terms of acceptability of the resettlement.

More than half of the total surveyed households were not willing to accept the resettlement at all. However, tendency of the intention varies location to location. For example, more than half of the surveyed households living in the Weras Ganga dredging and flood protection wall construction section and Ratmalana-Moratuwa Scheme area answered that the resettlement could be accepted with some conditions.

Regarding the households to be resettled based on the project boundaries, half of the total households to be resettled answered that the resettlement can be fully accepted or accepted with some conditions. This is because most of these households living near the canal system are illegal occupants as mentioned above and it is expected that they cannot insist on staying. They also prefer better living condition in the resettlement sites.

Since the household survey was conducted in the early stage of the feasibility study preparation, the surveyed households were informed of the very limited information on the proposed schemes and the almost lack of information on the resettlement and related-assistance which was available to them during the survey. Therefore,

households who answered that they “do not accept resettlement” may not necessarily have a rigid intention to refuse resettlement, though some 55% of the surveyed households replied they would “not accept”.

Acceptability of Resettlement

| Scheme | Acceptability of Resettlement | | | | |
|---|-------------------------------|-----------------------|------------|-----------|-------------|
| | Fully accept | Accept with condition | Not accept | No answer | Total |
| 1. Weras Ganga | | | | | |
| - Dredging and flood protection wall const. | 8 (1) | 315 (18) | 291 (9) | 12 (1) | 626 (29) |
| - Weras Ganga Swamp Retention Area | 1 (-) | 18 (-) | 37 (-) | 1 (-) | 57 (-) |
| - Maha Ela Retention Area | 4 (-) | 27 (-) | 66 (-) | 3 (-) | 100 (-) |
| Sub-total | 13 (1) | 360 (18) | 394 (9) | 16 (-) | 783 (29) |
| 2. Bolgoda Canal | | | | | |
| - Dredging and channel improvement | 0 (0) | 2 (2) | 1 (1) | 0 (0) | 3 (3) |
| - Bellanwila-Attidiya Retention Area | 7 (-) | 57 (-) | 218 (-) | 9 (-) | 291 (-) |
| Sub-total | 7 (0) | 59 (2) | 219 (1) | 9 (0) | 294 (3) |
| 3. Nugegoda-Rattapitiya | 9 (2) | 133 (33) | 212 (36) | 52 (17) | 406 (88) |
| 4. Ratmalana-Moratuwa | 2 (1) | 32 (10) | 21 (4) | 1 (0) | 56 (15) |
| Total | 31 (4) | 584 (63) | 846 (50) | 78 (18) | 1,539 (135) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Basin Storm Water Drainage Plan, JICA Study Team, 2002

(2) Preference of Compensation Method

As shown in the following table, most of the total surveyed households (88%) prefer to receive compensation in the form of land and house rather than cash, in the case of resettlement. This characteristic is stronger for the households to be resettled (93%).

Preference of Compensation Method in Case of Resettlement

| Scheme | Preference of Compensation Method in Case of Resettlement | | |
|---|---|--|-------------|
| | Cash Compensation Only | Land & House (or Money to Construct House) | Total |
| 1. Weras Ganga | | | |
| - Dredging and flood protection wall const. | 58 (2) | 534 (26) | 592 (28) |
| - Weras Ganga Swamp Retention Area | 6 (-) | 51 (-) | 57 (-) |
| - Maha Ela Retention Area | 16 (-) | 82 (-) | 98 (-) |
| 2. Bolgoda Canal | | | |
| - Dredging and channel improvement | 0 (0) | 3 (3) | 3 (3) |
| - Bellanwila-Attidiya Retention Area | 32 (-) | 254 (-) | 286 (-) |
| 3. Nugegoda-Rattapitiya | 50 (5) | 304 (68) | 354 (73) |
| 4. Ratmalana-Moratuwa | 6 (1) | 48 (14) | 54 (15) |
| Total | 168 (8) | 1,276 (111) | 1,444 (119) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Basin Storm Water Drainage Plan, JICA Study Team, 2002

(3) Preferable Location for Resettlement Site

Regarding the preferable location for resettlement site, while a large percentage of the total surveyed households (40%) prefer to remain near their present location, more than half of the households (53%) do not clarify their preference by withholding an answer.

Preferable Location for Resettlement Site in Case of Resettlement

| Scheme | Ranking of Preferable Location for Resettlement Site | | | | | Total |
|---|--|--------|--------|----------|--|-------------|
| | (a) | (b) | (c) | (d) | | |
| 1. Weras Ganga | | | | | | |
| - Dredging and flood protection wall const. | 285 (17) | 47 (2) | 5 (0) | 289 (10) | | 626 (29) |
| - Weras Ganga Swamp Retention Area | 27 (-) | 0 (-) | 0 (-) | 30 (-) | | 57 (-) |
| - Maha Ela Retention Area | 43 (-) | 0 (-) | 0 (-) | 57 (-) | | 100 (-) |
| 2. Bolgoda Canal | | | | | | |
| - Dredging and channel improvement | 2 (2) | 0 (0) | 0 (0) | 1 (1) | | 3 (3) |
| - Bellanwila-Attidiya Retention Area | 101 (-) | 5 (-) | 3 (-) | 182 (-) | | 291 (-) |
| 3. Nugegoda-Rattanapitiya | 142 (25) | 18 (5) | 12 (3) | 234 (55) | | 406 (88) |
| 4. Ratmalana-Moratuwa | 21 (8) | 8 (0) | 1 (0) | 26 (7) | | 56 (15) |
| Total | 621 (52) | 78 (7) | 21 (3) | 819 (73) | | 1,539 (135) |

Note: (a): Nearby present location, (b): Does not matter,
(c): Any location, but preferably to apply public housing scheme, (d): Not willing to answer now
The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Basin Storm Water Drainage Plan, JICA Study Team, 2002

20.2.3 Finding and Feedback from Surveyors

In addition to the direct inquiry to the households, some items which would provide supplementary information on the surveyed households were observed by the interviewers as shown below.

The majority of the total surveyed households (86%) answered the questions of the survey frankly. Around 14% of the households showed some cautiousness to the survey. This is usual behavior because the proposed project had not yet been realized. It is reported that a small number of households in the study refused to answer the questionnaire. This was also expected in this kind of the survey.

Attitude of Answer to the Questions

| Scheme | Attitude of Answer to the Questions | | | |
|---|-------------------------------------|---------|----------|---------|
| | Frank/Straightforward | | Cautious | |
| 1. Weras Ganga | | | | |
| - Dredging and flood protection wall const. | 87.2% | (82.8%) | 12.8% | (17.2%) |
| - Weras Ganga Swamp Retention Area | 87.7% | (-) | 12.3% | (-) |
| - Maha Ela Retention Area | 75.8% | (-) | 24.2% | (-) |
| 2. Bolgoda Canal | | | | |
| - Dredging and channel improvement | 66.6% | (66.6%) | 33.3% | (33.3%) |
| - Bellanwila-Attidiya Retention Area | 83.9% | (-) | 15.7% | (-) |
| 3. Nugegoda-Rattanapitiya | 87.7% | (90.4%) | 12.3% | (9.6%) |
| 4. Ratmalana-Moratuwa | 80.4% | (73.3%) | 19.6% | (26.7%) |
| Total | 85.6% | (85.8%) | 14.4% | (14.2%) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

Regarding the concern on the resettlement caused by the proposed projects, more than half of the total surveyed households showed low interest on the resettlement (52%). On the other, more than half of the households to be resettled show rather high interest in the resettlement. This is probably because the households to be resettled who live nearby existing canal system might be more conscious that the canal improvement will be implemented causing resettlement in the near future.

Degree of Concern on Resettlement

| Scheme | Degree of Concern on Resettlement | | | |
|---|-----------------------------------|---------|-------|---------|
| | High | | Low | |
| 1. Weras Ganga | | | | |
| - Dredging and flood protection wall const. | 58.7% | (79.3%) | 41.2% | (20.7%) |
| - Weras Ganga Swamp Retention Area | 59.6% | (-) | 40.4% | (-) |
| - Maha Ela Retention Area | 32.3% | (-) | 67.7% | (-) |
| 2. Bolgoda Canal | | | | |
| - Dredging and channel improvement | 66.6% | (66.6%) | 33.3% | (33.3%) |
| - Bellanwila-Attidiya Retention Area | 31.5% | (-) | 68.5% | (-) |
| 3. Nugegoda-Rattanapitiya | 44.4% | (41.1%) | 55.6% | (58.9%) |
| 4. Ratmalana-Moratuwa | 66.1% | (66.7%) | 33.9% | (33.3%) |
| Total | 48.5% | (54.2%) | 51.5% | (45.8%) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

20.2.4 Overall Analysis

Among the total households surveyed in the Inventory Survey on Households to be Resettled, a relative large number of illegal occupants were identified (337 households), especially areas for proposed Weras Ganga flood protection wall construction (253 households) and Nugegoda-Rattanapitiya Scheme (50 households).

A wide range of land occupations were observed among the surveyed households, ranging from 3 m² to 6,000 m², as well as various income levels in the feasibility

study area. These tendencies were observed for the households to be resettled as well. Therefore, appropriate and fair assistances should be considered for various socioeconomic characteristic of the households in preparation of the resettlement.

20.3 Organizational Responsibilities

In SLLRDC as a project executing agency, Canal Development & Maintenance Division (CDM) is in charge of the land acquisition and resettlement with assistance of NHDA, which has many experiences on resettlement from similar projects. CDM is responsible for the preparation and implementation of the Resettlement Action Plan (RAP) under the National Involuntary Resettlement Policy (NIRP). For the land acquisition process, acquiring officers in relevant five local authorities conduct legal communication with landowners (such as property survey and price negotiations) under official request from SLLRDC for the acquisition of designated lands for the proposed schemes.

For the resettlement, relevant five local authorities undertake official procedures and activities related to the resettlement by direct communication with the households to be resettled. In each local authority, Housing and Community Development Committee (HCDC) is organized to resolve social issue including the resettlement-related matters such as opinion and grievances from households to be resettled. Since five local authorities are related to the project, a HCDC coordination committee (HCC) should be established under SLLRDC as recommended in Chapter 17. HCC instructs relevant HCDCs to implement appropriate assistance to the households to be resettled at same level. Organizational structure for HCDC and HCC is shown in Chapter 17.

20.4 Assistance for Resettlement

20.4.1 Necessity of Preparation of the Resettlement Action Plan

According to the Sri Lanka National Involuntary Resettlement Policy (NIRP), which was approved by the Cabinet of Ministers on May 24, 2001, a comprehensive Resettlement Action Plan (RAP) has to be prepared for the proposed project if 20 or more families are affected (resettled) by the project.

Under the existing Land Acquisition Act No.9 of 1950 (LAA), compensation is made only for loss of properties such as land and house, however, there is no legal assistance and compensation of losses caused by the resettlement. At present, revision of relevant laws on resettlement such as LAA and National Environmental Act and preparation of relevant guidelines have been underway for proper

implementation of the NIRP by Ministry of Lands and Ministry of Environment and Natural Resources. These revised laws and guidelines are supposed to take effect within a few years.

In line with these requirements, a RAP for the proposed scheme is prepared in this chapter. Based on items of the RAP mentioned below, more updated and detailed RAP should be elaborated to realize smooth implementation of the resettlement-related activities for the proposed schemes.

20.4.2 Entitlement of Compensation and Resettlement Assistance

According to the NIRP, “Affected persons who do not have documented title to land should receive fair and just treatment.” This means low-income households, even illegal occupants, are eligible for some assistance on resettlement. To determine the households who are eligible for compensation and resettlement assistance, a cut-off date should be fixed as soon as the project implementation is decided to avoid an unnecessary influx of ineligible people to the project area for compensation and land speculation.

20.4.3 Resettlement Assistance

For smooth land acquisition and successful resettlement, assistances by local authorities and relevant agencies to the households to be resettled are required from preparation stage before the resettlement to settlement stage after the resettlement. Examples of the resettlement assistances are shown in the following table. Some of the assistance should be decided and provided based on consultation process.

Example of Resettlement Assistances

| Items of Resettlement Assistances |
|---|
| 1. Assistance of resettlement site selection such as information on housing scheme nearby |
| 2. Assistance of house-moving such as provision of low cost truck |
| 3. Special assistance to vulnerable groups such as disabled and elder persons |
| 4. Consultation on secure of employment in resettlement location in the case where affected household member have to change his/her job due to the resettlement |
| 5. Consultation on livelihood issue after resettlement |
| 6. Consultation on educational matters for children such as availability of school in the resettlement location |
| 7. Consultation on any opinion and grievance related to compensation and resettlement issue |

20.4.4 Preparation of Resettlement Sites

The households to be resettled are generally located scatteredly except for the Delkanda Ela area. Therefore, community-based resettlement, as for past similar projects, is not applied for the proposed schemes. Based on consultation with each household, resettlement location for each household to be resettled should be secured appropriately with assistance of the HCDC, NHDA and SLLRDC.

According to the Inventory Survey on Households to be Resettled, most of the households to be resettled prefer a resettlement location near the current location. However, difficulties are expected in securing resettlement location for each household in the Delkanda Ela area where population density is high, with relative large number of the households to be resettled (60 households). In this situation, part of proposed retention area at the downstream of the Nugegoda Ela would be a candidate site for the resettlement site by appropriate land preparation and installation of necessary infrastructure as shown in Figure 20.1.

In the case where all 60 households to be resettled prefer to move to the proposed resettlement site, some 10,000 m² of the lands, which are almost same area with lands presently occupied by the households to be resettled, are required at maximum based on replacement method which compensate same area of land as before under NIRP and to be amended in the Land Acquisition Act. The data on required land area was obtained from results of the Inventory Survey on Households to be Resettled.

20.5 Public Involvement

20.5.1 Public Involvement

Up to F/S stage, technical study was mainly conducted to prepare the base of the storm water drainage plan from a civil engineering viewpoint. During this stage, information on the present condition on storm water damage, opinion and preference on storm water drainage improvement and possibility of the resettlement were collected from relevant households through the inventory survey as preliminary public involvement for the planning.

In a further stage of the project, explanation meetings on the project and resettlement should be held with the households to be resettled as earlier as possible. In addition, consultation with the households to be resettled should be conducted by relevant organizations such as local authorities, NHDA and SLLRDC to obtain requirements of the households to be resettled on resettlement-related matters such as preference of the resettlement location and requirement of assistance for livelihood recovery in the post-resettlement. The RAP should be elaborated to meet demand of the households to be resettled. Thus, the public involvement on the resettlement should be undertaken at the earliest stage of the project as possible.

20.5.2 Community Contract System

The community contract system was introduced as new approach under the Million Houses Program in 1980s¹. Under the system, community infrastructure and amenities such as footpaths, drain, toilet and community center is constructed by communities themselves as contractor under supervision of relevant agency. Under the system, only communities registered as Community Development Council (CDC) can be eligible for the contract system. The CDC is generally established through the CDC Formation Workshop, which is a part of workshop modules in the Community Action Planning (CAP) method dealing with specific aspects and needs of the communities².

The community contracted work is implemented by community under supervision of NHDA. Through the work, the community members can learn relevant skills by technical instruction by NHDA. In addition, sustainable operation and maintenance of the community infrastructure such as community drains can be expected by

¹ Community Contracts System Guidelines. NHDA. 1988

² Community Action Planning: Making Micro Plans for Community Improvement - CAP Workshop Module Guidelines Series. UNCHS/DANIDA, 1994 (The CAP method was established in NHDA under assistance of UNCHS and DANIDA in 1984 as community-level participatory planning methods.)

enhancement of the awareness of the necessity of the maintenance through the technical understanding.

Regarding the proposed schemes, it is recommended to apply the community contract system for the construction work, even for small parts of the construction, to allocate a part of project profit to the community and also to enhance public awareness on necessity of maintenance of the storm water drains by local communities. Among the proposed schemes, the community contract system will probably be applied to the drainage channel improvement work in the Ratmalana-Moratuwa Scheme.

In addition to the community contract, it is proposed to establish a system to employ the people affected by the Project as a labor-force with priority as much as possible taking into account the low-income level of the households affected by the Project.

20.6 Monitoring and Evaluation

The resettlement assistances planned in the RAP should be monitored to confirm appropriate implementation and expected effectiveness. Based on the evaluation of monitoring results, countermeasure should be considered and executed promptly to implement the resettlement smoothly.

The households to be resettled need to recover their livelihood after the resettlement, to at least the same the previous livelihood level. The condition of the livelihood recovery of the households to be resettled should be monitored regularly after the resettlement. Where the livelihood recovery for the household is not achieving targets, additional assistance by the project should be examined and executed promptly. In addition to the planned items related to the resettlement activity, unexpected incidence and/or grievance from the households might occur and the monitoring activity should cover these matters. Example of monitoring items for resettlement are shown in the following table. In further study, a monitoring plan covering monitoring items, monitoring methods, frequency, organization and staff, necessary equipment, cost and budget arrangement should be prepared based on the implementation schedule of the proposed project.

Example of Monitoring Items for Resettlement

| Monitoring Items |
|---|
| 1. Payment of compensation such as amount of paid compensation and period of payment |
| 2. Provision of planned assistances such as consultation before resettlement and arrangement of move to resettlement site |
| 3. Livelihood recovery such as employment status, and income and expenditure |
| 4. Living condition such as installation of necessary infrastructures |
| 5. Any opinion and grievance |

CHAPTER 21 CONSTRUCTION PLAN AND COST ESTIMATE

21.1 Construction Plan

21.1.1 Construction Schedule

Monthly progress rates or unit construction periods of the major work items were assumed referring to the actual results of similar works such as GCFC&EIP. Construction period of each scheme in the proposed project was estimated taking into account work volumes of each scheme and also construction periods of the past similar projects. Viability of this construction period was confirmed by comparing the required work progress rates of major works with typical rates prevailing in Sri Lanka.

Based on the above, the estimated construction period of each scheme is listed below:

- | | |
|----------------------------------|-------------|
| 1) Weras Ganaga Scheme | : 21 months |
| 2) Bolgoda Canal Scheme | : 19 months |
| 3) Nugegoda-Rattanapitiya Scheme | : 32 months |
| 4) Ratmalana-Moratuwa Scheme | : 31 months |

An overall construction schedule is shown in Figure 21.1. The overall construction period is planned to be 36 months.

21.1.2 Mode of Construction and Contract Package

The major construction works will be executed by contractors selected through international competitive bidding (ICB) complying with the regulations of the Government of Sri Lanka and the guideline of the international financing organizations.

It is proposed to divide the proposed project works into two packages, i.e., main civil works and procurement of O&M equipment, taking into account the sort of work. The selection of the contractors for both packages will be made through international competitive bidding. The contractors to be selected should have an enough capabilities to successfully execute the scheduled works and rich experience in international business.

21.2 Project Cost Estimate

21.2.1 Basic Conditions

(1) Composition of Project Cost

The financial project cost comprises the following cost items.

- 1) Construction cost
- 2) Land acquisition and compensation cost
- 3) Cost for procurement of O/M equipment
- 4) Engineering service cost
- 5) Administration cost
- 6) Price escalation
- 7) Physical contingency
- 8) Tax

(2) Price Level and Foreign Exchange Rate

All costs are estimated at the price level on August 30, 2002.

The exchange rate is set as follows:

$$\text{US\$1.0} = \text{Rs. 96.26} = \text{¥118.94}$$

(3) Foreign and Local Currency Portion

All costs are estimated by separating the foreign currency portion (FC) and local currency portion (LC) based on the ratio of the imported and local materials and equipment and also by referring to similar projects such as GCFC&EIP Phase III.

(4) Construction Cost

The construction cost comprises direct construction cost and preparatory work cost. The direct construction cost is estimated on the unit cost basis. The unit costs are estimated based on the current prices of construction resources and the construction plan. The unit construction cost for the urban drainage is based on the data of current similar projects such as GCFC&EIP Phase III.

The preparatory work cost is estimated at 10 % of the direct construction cost.

(5) Land Acquisition and Compensation Cost

1) Land Acquisition

The land acquisition cost is estimated by the required land area and its unit cost. The unit cost of land is estimated based on the data from the Chief Valuer's Department of Ministry of Finance.

The applied unit costs of lands are as follows:

Unit Cost of Land

| DS Division | Residential | | Rural (Paddy, etc.) |
|------------------------|---------------|----------------|------------------------|
| | Ordinary area | Low grade area | |
| Kesbewa | 1,190 | 540 | 200 |
| Moratuwa | 2,620 | 940 | 200 |
| Dehiwela-Mount Lavinia | 3,110 | 1,380 | 200 |

2) Compensation

The compensation cost for relocation is estimated by the number of houses/facilities to be relocated and their unit values. The number of the houses to be relocated is determined based on the river channel design and the community inventory survey. The unit values of the houses or buildings are determine as follows, based on the data from the local authorities:

Value of Houses/Buildings

| Floor Area (m ²) | Value (Rs./house) |
|------------------------------|-------------------|
| < 70 | 675,000 |
| 70 - 100 | 840,000 |
| 100< | 1,500,000 |
| Factory, etc. | 3,000,000 |

(6) Cost for Procurement of O/M Equipment

The cost for procurement of O/M equipment is estimated according to the amount of equipment to be procured and the current prices of the equipment. The equipment to be procured is based on the proposed operation and maintenance plan described in Chapter 18.

(7) Engineering Service Cost

The engineering service cost includes cost for field investigation, basic and detailed design including preparation of pre-qualification documents and tender documents, assistance for pre-qualification and tendering, and construction supervision.

(8) Administration Cost

The Government's administration cost for the project implementation is assumed to be 2% of the total of the construction cost, engineering service cost, and land acquisition and compensation cost. The rate is referred to the "JBIC SAPROF for Lunawa Lake Environment Improvement and Community Development Project, February 2001 (the Lunawa Project)".

(9) Price Escalation

The following price escalation rates were applied to the SAPROF study for the Lunawa Project.

- 1) 0.8% per annum for foreign currency (FC)
- 2) 2.8% per annum for local currency (LC)

The above price escalation rate for local currency was determined based on the following price index data up to the year 1999.

Colombo Consumer's Price Index (1997-1999)

| Year | 1997 | 1998 | 1999 |
|--|------|------|------|
| Colombo Consumer's Price Index (CCPI) (% change) | 9.6 | 9.4 | 4.7 |

Source: Central Bank of Sri Lanka Annual Report - 2001

The future price index is projected by Central Bank of Sri Lanka as follows:

Projected Colombo Consumer's Price Index (2002-2006)

| Year | 2002 | 2003 | 2004 | 2005 | 2006 |
|-----------------|------|------|------|------|------|
| CCPI (% change) | 9.0 | 6.0 | 5.5 | 4.5 | 3.8 |

Source: Central Bank of Sri Lanka Annual Report - 2001

According to the above projections, the long-term escalation rate may be presumed to decline to below 3.0%.

Consequently, the price escalation rates to be applied to the present Study are set at the same rates as those of the SAPROF study for the Lunawa Project.

(10) Physical Contingency

Physical contingency is set as follows referring to the SAPROF study for Lunawa Project:

- 1) 10% of the construction cost, land acquisition and compensation cost
- 2) 5% of the equipment procurement cost, engineering service cost, and administration cost

(11) Tax

Tax is estimated as follows based on the current tax system of Sri Lanka:

- 1) 30% for the construction cost
- 2) 40% for the equipment procurement cost
- 3) 20% for the engineering service cost

21.2.2 Project Cost

(1) Direct Construction Cost

The direct construction cost is estimated by the unit construction cost and scheduled work quantities. The estimated direct construction costs of the proposed schemes are shown summarized below:

Direct Construction Cost

| Scheme | Cost (million Rs.) |
|-----------------------------------|--------------------|
| 1. Weras Ganga Scheme | 307 |
| 2. Nugegoda-Rattanaipitiya Scheme | 675 |
| 3. Bolgoda Canal Scheme | 113 |
| 4. Ratmalama-Moratuwa Scheme | 639 |
| Total Project | 1,734 |

(2) Land Acquisition and Compensation Cost

The land acquisition cost is estimated from the required land areas and its unit costs. The total land area to be acquired is 326 ha, including 31 ha for the channel improvement works and 295 ha for the storm water retention areas. The land acquisition cost amounts to Rs. 658 million.

The number of the houses to be relocated is 158 houses. The compensation cost is estimated based on the different unit values by the floor areas of the houses. The compensation cost amounts to Rs. 182 million.

(3) Cost for Procurement of O&M equipment

The cost for procurement of O&M equipment proposed in Chapter 18 is estimated by the current prices (CIF values) of such equipment. The procurement cost is estimated to be Rs. 113 million.

(4) Engineering Service Cost

It is assumed that engineering services will be provided throughout the period of project implementation. Estimated total inputs comprise foreign experts (95 M/M) and Sri Lanka experts (200 M/M). Based on the assumed input of foreign experts and Sri Lanka experts and the required direct costs, the engineering service cost is estimated to be Rs. 382 million.

(5) Total Project Cost

The estimated total project cost is estimated at 4,389 million Rs. as shown in Table 21.2 and summarized below:

Summary of the Project Cost

| Item | Project Cost (million Rs.) |
|---|-------------------------------|
| 1. Construction Cost | 1,908 |
| 2. Land Acquisition and Compensation Cost | 840 |
| 3. Cost for Procurement of O/M Equipment | 113 |
| 4. Engineering Service Cost | 382 |
| 5. Administration Cost | 62 |
| (1+2+3+4+5) | 3,305 |
| 6. Price Escalation | 88 |
| 7. Physical Contingency | 302 |
| 8. Tax | 694 |
| Total Project Cost | 4,389 |

21.3 Operation and Maintenance Cost

Operation and Maintenance (O&M) cost of the Project is estimated based on the proposed O&M plan described in Chapter 18 and the unit rates of the O&M works.

The annual O&M cost estimated by the proposed scheme is summarized below.

Annual O&M Cost

| Scheme | Annual O&M Cost (million Rs.) |
|----------------------------|----------------------------------|
| 1. Weras Ganga | 16 |
| 2. Nugegoda-Rattanaipitiya | 10 |
| 3. Bolgoda Canal | 8 |
| 4. Ratmalana-Moratuwa | 6 |
| Total | 40 |

CHAPTER 22 PROJECT EVALUATION

22.1 Economic Evaluation

22.1.1 Methodology

The economic viability of the project is evaluated based on the estimated project cost and flood control benefit. The economic cost is obtained by deducting the transfer payment from the financial cost and multiplying conversion factors to some local costs. The economic benefit is defined as the impact of flood control measures which is composed of the flood damage reduction impact and the efficient land utilization by the flood free condition. The economic evaluation is conducted by calculating the Economic Internal Rate of Return (EIRR) and cost benefit analysis (B/C and B-C) on the basis of the economic cost and the estimated flood control benefit.

22.1.2 Economic Cost

For the economic evaluation, the project cost of the proposed storm water drainage plan, which is estimated in financial cost, is converted to the economic cost. In order to derive the economic cost from the financial cost, transfer payments such as taxes, compensation, and price escalation are deducted. In addition to subtracting transfer payments, the local portion of financial costs are adjusted due to foreign exchange premium, overvalued labor costs, and land acquisition cost, etc. The conversion factors are taken from the Phase III of Greater Colombo Flood Control and Environmental Improvement Project and applied to this study. Conversion factors applied for calculation of economic cost is shown below.

| | |
|--------------------------|------|
| 1) Construction cost | 0.90 |
| 2) Engineering service | 0.90 |
| 3) Land acquisition cost | 0.90 |
| 4) Administration cost | 0.90 |

22.1.3 Economic Benefit

Three types of project benefits are estimated: 1) flood damage reduction benefit, 2) land enhancement benefit, and 3) economic activity acceleration benefit.

- 1) Flood damage reduction benefit is characterized as flood damage reduced by implementation of the storm water drainage plan, which includes damage to property, damage to infrastructure and disturbance to economic activities.

- 2) Land enhancement benefit is characterized as a value added and efficient utilization of the land generated from the flood free environment. The Weras Ganga Basin plays an important role in the development of CMR, and shortage of land is one of the major constraints of the development. Converting the flood prone area to the flood free area will accelerate utilization of the land for residential, commercial and recreational use. The land enhancement benefit is measured in terms of increase of the land value.
- 3) Economic activity acceleration benefit is characterized as impact of the drainage project to the economic activity of the basin. Since storm water drainage is important infrastructure for the development, implementation of the drainage project will attract more investment and promote economic activities.

(1) Flood Damage Reduction Benefit

The flood damage reduction benefit expected from the storm water drainage project is estimated by the following procedure.

1) Estimation of unit value of assets

The expected flood damage is estimated by analyzing values of the assets by land use in the flood prone area. The value of the assets is estimated for the unit building value and goods value. Paddy area is measured by the productivity of paddy.

The method of estimating the values of assets is summarized below.

- a) The values of assets are estimated based mainly on the survey to the Local Authorities and DS Divisions in Weras Ganga Basin. The value is converted for each sub-basin.
- b) Average size of the buildings in the Weras Ganga Basin is estimated to be 192 m² from aerial photograph and GIS analysis, except for shanty which is estimated to be 77 m².
- c) Unit value of the asset is estimated based by selected category of land use in 2010 such as high density area, homestead area, garden/grassland area, shanty, and factory, which is determined by building intensity and analysis of aerial photograph.
- d) The table below shows the estimated land use distribution in 2010. The flood damage is estimated based on the property value and the land use distribution for each sub-basin.

- e) The value of paddy is estimated separately based on the productivity and price of rice. The productivity of 3,856 kg/ha and the rice price of Rs. 27/kg were applied for estimation of the value of paddy.

2) Estimation of flood damage by inundation depth

The relationship between inundation depth and damage rate prepared by the Ministry of Land, Infrastructure and Transport, Japan is utilized for estimation of the flood damage by inundation depth. The flood damage per hectare of inundation area for the respective land uses (high density, homestead, grassland/garden, shanty, factory and paddy) is calculated from the value of assets per hectare and the flood damage rate. The inundation area and depth by land use of high density, homestead, grassland/garden, shanty, factory and paddy are given by hydrological analysis.

3) Estimation of probable flood damage

The probable flood damage, which includes direct damage (damage to property), interruption to business operation and damage to infrastructure, is calculated under the various magnitude of flood events. The inundation area and the flood probabilities of 2, 5, 10, 25 and 50 years are set for calculating the probable flood damages.

Damage to interruption to business operation and infrastructure is estimated based on the ratio set by the Ministry of Land, Infrastructure and Transport, Japan. The interruption to business operation is estimated at 6% of the property value, and the damage to infrastructure (roads, bridges) is estimated at 28% of the property value.

The estimated probable damages for the sub-basins are shown in Table 22.1 and summarized below:

Probable Flood Damage by Sub-basin

(Unit: million Rs.)

| Return Period (years) | 1. Nugegoda -Rattanapitiya | 2. Boralessgamuwa North | 3. Boralessgamuwa South | 4. Maha Ela | 5. Thumbowila | 6. Bolgoda Canal | 7. Ratmalana -Moratuwa* |
|-----------------------|----------------------------|-------------------------|-------------------------|-------------|---------------|------------------|-------------------------|
| 2 | 47 | 17 | 10 | 79 | 6 | 34 | 27/138 |
| 5 | 65 | 23 | 12 | 96 | 12 | 155 | 37/195 |
| 10 | 73 | 26 | 14 | 103 | 13 | 169 | 46/202 |
| 25 | 87 | 31 | 19 | 113 | 23 | 203 | 61/197 |
| 50 | 97 | 33 | 20 | 121 | 22 | 223 | 69/165 |

Note: * Left: damage caused from Weras Ganga, Right: damage caused by insufficient urban drainage

4) Conversion of probable flood damage to annual average flood damage

Based on the probable flood damage, the annual average flood damage is calculated by applying average occurrence probability to the corresponding probable flood damage. The table below shows the annual average flood damage for seven sub-basins. The estimated annual average flood damage is considered as a base for the flood reduction benefits.

The estimated annual damages for the sub-basins are shown in Table 22.2 and summarized below:

Annual Average Flood Damage by Sub-basin

(Unit: million Rs.)

| Return Period (years) | 1. Nugegoda -Rattanapitiya | 2. Boralesgamuwa North | 3. Boralesgamuwa South | 4. Maha Ela | 5. Thumbowila | 6. Bolgoda Canal | 7. Ratmalana -Moratuwa* | Weras Ganga Basin** |
|-----------------------|----------------------------|------------------------|------------------------|-------------|---------------|------------------|-------------------------|---------------------|
| 2 | 12 | 4 | 2 | 20 | 2 | 9 | 7/35 | 67/102 |
| 5 | 17 | 6 | 3 | 26 | 3 | 28 | 10/50 | 101/151 |
| 10 | 7 | 2 | 1 | 10 | 1 | 16 | 4/20 | 42/62 |
| 25 | 5 | 2 | 1 | 6 | 1 | 11 | 3/12 | 29/41 |
| 50 | 2 | 1 | 0 | 2 | 0 | 4 | 1/3 | 11/14 |
| Annual Damage | 42 | 15 | 9 | 65 | 7 | 69 | 25/120 | 251/371 |

Note: * Left: damage caused from Weras Ganga, Right: damage caused by insufficient urban drainage

** The number on right includes the damage caused by insufficient urban drainage

4) Calculation of flood damage reduction benefit

The flood damage reduction benefit is derived from the annual average flood damage and the effect of the flood control measures measured by the difference of flood damage with and without the project, which is calculated for seven sub-basins plus Weras Ganga Scheme alone. Since Thumbowila sub-basin does not have any measures, the benefit is the impact of Weras Ganga scheme and Bolgoda Canal.

The estimated flood damage reduction benefits by proposed scheme are shown in Table 22.3 and summarized below:

Flood Damage Reduction Benefit by Proposed Scheme

(Unit: million Rs.)

| Return Period (years) | 1. Nugegoda -Rattanaipitiya | 2. Boralesgamuwa North | 3. Boralesgamuwa South | 4. Maha Ela | 5. Tumbowila | 6. Bolgoda Canal | 7. Ratmalana -Moratuwa* | 8. Weras Ganga** |
|-----------------------|-----------------------------|------------------------|------------------------|-------------|--------------|------------------|-------------------------|------------------|
| 2 | 6.83 | 1.30 | 0.77 | 2.44 | 0.08 | 0.82 | 3.98/23.80 | 3.85/27.65 |
| 5 | 10.07 | 1.80 | 1.11 | 9.74 | 0.54 | 1.84 | 3.92/23.37 | 6.41/29.78 |
| 10 | 4.22 | 0.75 | 0.49 | 5.60 | 0.24 | 0.45 | 1.11/4.06 | 2.18/6.24 |
| 25 | 1.92 | 0.41 | 0.38 | 2.42 | 0.28 | 0.16 | 0.93/2.40 | 1.95/4.35 |
| 50 | 0.39 | 0.12 | 0.14 | 0.48 | 0.12 | 0.11 | 0.42/0.73 | 0.93/1.66 |
| Annual Benefit | 23.44 | 4.83 | 2.89 | 20.68 | 1.26 | 3.37 | 10.35/51.35 | 15.32/66.67 |

Note: * Left: damage caused from Weras Ganga, Right: damage caused by insufficient urban drainage

** The number on right includes the damage caused by insufficient urban drainage

(2) Land Enhancement Benefit

The land enhancement benefit is estimated as increase of land value by the flood free condition created from the storm water drainage project. The flood free condition is expected to contribute to the high utilization of the flood prone areas.

The conditions for estimating the land enhancement benefit are set as follows.

- 1) The land enhancement benefit is produced by intensive utilization of the flood prone areas.
- 2) The rent value is applied to measure the land enhancement benefits assuming that the rent represents the economic activities of the land based on the fact that the value of the land is usually determined by the productivity or projected profit of the land.
- 3) Difference of the price in high value area and low value area is considered as incremental value of the project assuming that the flood free condition will increase the value of land.
- 4) Marsh, paddy, water areas designated in the future land use are left untouched, that is, no utilization of those areas is expected.

The area to be utilized with the flood free condition is estimated from the future land use. Reduced inundation area is the difference of inundation area with and without project for 10 year return period, except for Weras Ganga Scheme for which 50 year return period is applied. The available land for development is sum of high density, homestead, garden/grassland, shanty and factory, which is considered as potential area for development. The table below shows the area available for development.

Percentage of Potential Area to be Developed in Open Area

| Sub-Basin/Scheme* | Reduced Inundation Area (ha) | Available Land for Development (ha) | Availability Ratio (%) |
|-------------------------|------------------------------|-------------------------------------|------------------------|
| Nugedoda-Rattanaipitiya | 54.7 | 44.2 | 80.7 |
| Boralesgamuwa North | 39.5 | 9.8 | 24.7 |
| Boralesgamuwa South | 35.7 | 7.3 | 20.3 |
| Maha Ela | 105.5 | 71.3 | 67.6 |
| Tumbowila | 1.4 | 1.2 | 84.9 |
| Bolgoda Canal | 1.0 | 0.0 | 0.0 |
| Ratmalana-Moratuwa | 18.6 | 14.7 | 79.2 |
| Weras Ganga Scheme* | 48.4 | 27.7 | 57.2 |

Note: Estimated by JICA Study Team

The economic value of the land is measured by the difference in the land price (rent value) between high value area and low value area by sub-basin assuming that the value of land increases after the flood is controlled. The estimated value is shown in the table below.

Rent Price by Sub-Basin

(Unit: Rs./m²/year)

| Sub-Basin/Scheme* | Incremental Rent Value |
|-------------------------|------------------------|
| Nugedoda-Rattanaipitiya | 409.4 |
| Boralesgamuwa North | 409.4 |
| Boralesgamuwa South | 200.5 |
| Maha Ela | 140.4 |
| Tumbowila | 120.3 |
| Bolgoda Canal | 604.5 |
| Weras Ganga Scheme* | 298.1 |

Note: Estimated by JICA Study Team

Based on the estimated area to be utilized under the flood free condition and respective rent price, the land enhancement benefit is calculated for each sub-basin. The land enhancement benefit is shown in the table below.

Land Enhancement Benefit

(Unit: million Rs.)

| Sub-Basin/Scheme* | Land Enhancement Benefit |
|-------------------------|--------------------------|
| Nugedoda-Rattanaipitiya | 180.9 |
| Boralesgamuwa North | 40.0 |
| Boralesgamuwa South | 14.5 |
| Maha Ela | 100.2 |
| Tumbowila | 1.4 |
| Bolgoda Canal | 0.0 |
| Ratmalana-Moratuwa | 33.6 |
| Weras Ganga Scheme* | 82.4 |

Note: Estimated by JICA Study Team

(3) Economic Activity Acceleration Benefit

Flood condition is causing some investors to hesitate to invest in Weras Ganga Basin. Since the storm water drainage project is considered as basic infrastructure needed

for development of Weras Ganga Basin, implementation of the drainage project will promote development of the area. Recreational activities, housing development, commercial development are among the developments expected. For economic activity acceleration benefit, the expected impact of recreational development and housing development for Weras Ganga Basin as a whole is assessed.

1) Recreational development

Impact of recreational development is assessed by construction of recreational facility and tourist expenditure in the area. The UDA is planning a Theme Park Boralesgamuwa by the bank of Weras Ganga. The facility includes restaurants, museum, community hall, and open area. Flood control condition will promote the interests of investor. The expected cost of the Theme Park Boralesgamuwa is Rs. 200 million to Rs. 400 million, which is considered as construction aspect of recreational development.

The number of tourists (visitors) is expected to increase after the recreational facility is available, and they will consume in the area. Tourism expenditure, created by new consumption, is estimated based on following condition.

- a) Tourist expenditure per person per visit is estimated to be Rs. 40 (targeting local tourists only).
- b) The target of average number of visitors per day is estimated to be 2,000 persons.
- c) Total tourism expenditure in Weras Ganga Basin is estimated to be Rs. 29.2 million a year ($\text{Rs. } 40 \text{ a day} \times 2,000 \text{ people} \times 365 \text{ days}$).

The impact of tourism development in Weras Ganga Basin is estimated to be Rs. 200 million to Rs. 400 million for construction of facilities and Rs. 29.2 million a year from tourism expenditure.

2) Housing development

Impact of housing development is assessed by demand for new houses based on the difference of 2010 population with and without the project. Basic assumption of estimating the housing development is shown below.

- a) The population growth rate of 2.3% used for population framework will be achieved with the project. Trend population growth rate of 2.1% (average population growth rate of Weras Ganga Basin), which is lower than planned population, will continue without the project.
- b) The difference of the population in 2010 between two growth rates is 12,448 persons.

- c) Assuming that the number of family members for a household is 4.6, and half of the demand of houses needs to be newly built to accommodate new families, the new housing construction potential is estimated to be 1,347 houses.
- d) Average cost of a house is Rs. 1.2 million based on average construction cost and the size of houses.
- e) Based on assumption mentioned above, housing development potential is estimated to be Rs. 1,616 million after the project is implemented.

22.1.4 Intangible Benefit

In addition to the quantitative benefits discussed and estimated in the previous sections, it should be noted that the proposed storm water drainage project will produce a lot of intangible benefits that can not be measured quantitatively. The following intangible benefits can be expected through the implementation of the storm water drainage projects.

- 1) Promotion of economic development
- 2) Improvement of people's living conditions
- 3) Alleviation of inconvenience of people's life
- 4) Improvement of hygienic environment
- 5) Elimination of menace of flooding
- 6) Improvement of water environment
- 7) Contribution to poverty reduction

22.1.5 Economic Evaluation for Proposed Project

(1) Basic Conditions

On the basis of the estimated construction cost, operation and maintenance cost (O&M cost) and estimated economic benefit, the Economic Internal Rate of Return (EIRR), B-C and B/C are calculated on the following assumptions.

- 1) Project life of 40 years
- 2) Discount rate of 10%
- 3) Project cost is disbursed for five years as follows:
 - Year 1: 10% (detailed design)
 - Year 2: 8% (procurement)
 - Year 3: 28% (construction)
 - Year 4: 30% (construction)
 - Year 5: 24% (construction)

- 4) The O&M cost is assumed to be disbursed for the entire project life time from the year following completion of the project works.
- 5) Benefit is produced from the entire project life from the year following completion of the project works.
- 6) The benefit is expected to increase by 5% per annum based on the economic growth and change in life style.

(2) Economic Evaluation for Proposed Project

The proposed project in Weras Ganga Basin consists of Nugedoda-Rattanapitiya Scheme, Bolgoda Canal Scheme, Urban Drainage part of Ratmalana-Moratuwa Scheme and, Weras Ganga Scheme. The flood control benefit for the project is composed of the flood damage reduction benefit and land enhancement benefit, and is calculated based on the annual average flood damage and the impact of the project measured by the difference of inundation area with and without the project. The impact of the project is calculated by the size of reduction of the expected inundation area with the project.

The result of economic evaluation shows that EIRR is 18.9%, B-C Rs. 3,032 million, and B/C is 2.09, which is considered above the feasible level. Cost benefit stream for proposed project is shown in Table 22.4.

Economic Evaluation for Proposed Storm Water Drainage Plans

| Proposed Storm Water Drainage Plan | Project Cost (million Rs.) | Annual Benefit (million Rs.) | B-C (million Rs.) | B/C | EIRR (%) |
|------------------------------------|-------------------------------|---------------------------------|----------------------|------|-------------|
| Priority Project (4 Schemes) | 4,389 | 761 | 3,043 | 2.09 | 18.8 |

(3) Sensitivity Analysis

Sensitivity analysis is conducted to analyze the effect of slow urbanization process and slow economic growth, which will decrease the project benefit by reducing the value of assets and reducing the value of land, and an increase in project cost. Sensitivity analysis is conducted for three cases.

Case 1: Decrease of benefit by 10%

Case 2: Increase of cost by 10%

Case 3: Combination of Case 1 and Case 2

The table below shows the result of the sensitivity analysis.

Results of Sensitivity Analysis

| Case | B-C (million Rs.) | B/C | EIRR (%) |
|--------|----------------------|------|----------|
| Base | 3,043 | 2.09 | 18.8 |
| Case 1 | 2,459 | 1.88 | 17.2 |
| Case 2 | 2,764 | 1.90 | 17.4 |
| Case 3 | 2,180 | 1.71 | 16.0 |

22.2 Technical Evaluation

The proposed Weras Ganga Basin Storm Water Drainage Project includes dredging, channel excavation, construction of dike, revetment, bridge, culvert and sluiceway. No constraint for implementation of the Project is found from the technical viewpoint such as design, construction and O&M since no special technology is needed for the construction and O&M work. All the construction works can be done by Sri Lanka Side in technical level although participation of the international contractors in bidding for the Project is expected to employ the capable contractor.

22.3 Environmental Evaluation

Based on the environmental screening and scoping for the proposed schemes, following environmental impacts are examined: resettlement by land acquisition and relocation of religious/public facilities, temporary traffic disturbance during construction, breeding places for mosquitoes in the proposed retention ponds, flora & fauna in the Bellanwila-Attidiya Wildlife Sanctuary, emission gas and dust during construction, noise and vibration during construction, and offensive odor by disposal of dredged material including removal of aquatic weeds.

Among the potential environmental impact items, the resettlement caused by the land acquisition is most significant issue to be carefully treated. Any critical factor which hampers the resettlement has not been identified so far.

Regarding ecological impact to the Bellanwila-Attidiya Wildlife Sanctuary, most of the Sanctuary is conserved by delineation as a storm water detention area. Although the dredging of the Weras Ganga and demolition of the gate for saline water intrusion protection on the Bolgoda Canal may slightly increase salinity level of the Weras Ganga and Bolgoda canal, it would cause recovery to the original environment as the past in relatively long term.

On the whole, environmental impacts potentially caused by the proposed project can be avoided or mitigated by appropriate implementation of the mitigation measures.

22.4 Social Evaluation

The proposed schemes for storm water drainage improvement provide an opportunity of better residential environment especially for the low-income residents by relieving flooding damage relevant to their livelihood and sanitary conditions. The improvement of residential conditions by the storm water drainage improvement can be considered as an aspect of poverty reduction. In the feasibility study area, relative large numbers of the low-income households reside along the right bank of the Weras Ganga in the Ratmalana-Moratuwa area. Those low-income households will be benefited by implementing the proposed schemes.

In addition, involvement of the low-income people living in the feasibility study area in the construction activity for the proposed channel and resettlement site development by employing in the project and/or through the community contract system will bring about employment opportunity even it is temporary.

Regarding the resettlement caused by the land acquisition for the proposed schemes, as a result which minimization of the number of households to be resettled caused by the land acquisition for the proposed schemes was examined, 158 households are identified to resettle in total. Any critical factor which hampers the resettlement has not been identified so far. Just compensation and necessary assistance on the resettlement should be provided to the both legal and illegal occupants to be resettled under the National Involuntary Resettlement Policy.

22.5 Overall Evaluation

The proposed Project primarily aims at reducing the flood damages in the Weras Ganga basin, but it will produce various benefits such as land enhancement benefits, acceleration of economic activities and intangible benefits. Also, the Project includes acquisition of the storm water retention areas. Most of the retention areas extend in the marsh areas. The acquisition of retention area may contribute to conservation of the marsh and lowland areas in the Weras Ganga basin.

Based on the above economic, technical, environmental and social evaluation, it is concluded that the proposed Weras Ganga Basin Storm Water Drainage Project has enough necessity for implementation and is economically, technically and socio-economically viable although sufficient care for the peoples to be relocated by the Project is necessary.

CHAPTER 23 PROJECT IMPLEMENTATION PLAN

23.1 Executing Agency

The proposed organization for implementation of the Weras Ganga Basin Storm Water Drainage Project (the Project) is shown in Figure 17.1. Sri Lanka Land Reclamation & Development Corporation (SLLRDC) is assigned as an executing agency of the Project.

Ministry of Housing and Plantation Infrastructure (MHPI) will supervise SLLRDC through an Inter-Agency Steering Committee, the chairman of which is the secretary of MHPI.

23.2 Implementation Schedule

Figure 23.1 shows the implementation schedule of the Weras Ganga Basin Storm Water Drainage Project. The implementation schedule is prepared for the following major components.

- 1) Fund arrangement for the Project
- 2) Procurement of Consulting Services
- 3) Main Civil Work Contract
- 4) Procurement of O&M equipment
- 5) Land Acquisition and Resettlement

The funding arrangement for the Project is assumed to start immediately after completion of the feasibility study. It will take five months.

The procurement of consulting services is largely divided into consultants selection stage, detailed design stage and construction supervision stage. The consultants selection stage will take nine months and the detailed design stage including basic design and related surveys and investigations will require about one and half years. The construction supervision stage including pre-construction stage will require about 4 years.

The main civil works contract is divided into procurement of contractor and construction work. The procurement of contractor through international competitive bidding will take about one year and construction work three years.

The procurement of O&M equipment will require 2 years consisting of one year for procurement of contractor and one year for manufacturing and delivery.

The land acquisition and resettlement process are scheduled to be commenced after the finish of basic design of the Project. The time for land acquisition and

resettlement for the structural sites is assumed to be 2.5 years. It is proposed to acquire the proposed storm water retention areas although it may involve large cost and long time periods.

23.3 Financial Arrangement

The project cost is estimated at Rs. 4,389 million with a breakdown as follows:

| Cost Item | Amount (million Rs.) |
|---|----------------------|
| 1) Construction cost | 1,908 |
| 2) Land acquisition and compensation cost | 840 |
| 3) O&M equipment procurement | 113 |
| 4) Engineering services cost | 382 |
| 5) Administration cost | 62 |
| 6) Price escalation | 88 |
| 7) Physical contingency | 302 |
| 8) Tax | 694 |
| Total | 4,389 |

Considering the present severe financial position of the Sri Lanka Government, it is proposed to procure soft loan for the Project from the international funding agencies. The loan amount will come to Rs. 2,793 million excluding land acquisition and compensation cost, administration cost and tax which will be not eligible for loan. The Sri Lanka Government has to bear Rs. 1,596 million for the non-eligible cost for loan.

CHAPTER 24 CONCLUSION AND RECOMMENDATIONS ON FEASIBILITY STUDY

24.1 Conclusion

The proposed Weras Ganga Basin Storm Water Drainage Project is economically and technically viable and there are no serious environmental and social problems which hamper implementation.

The Weras Ganga basin is expected to become highly developed as a part of the Greater Colombo area. It is essential to implement the proposed storm water drainage project for the sound development of the basin and to avoid causing serious storm water drainage problems in the future.

The proposed project includes the storm water retention area as a structural measure. The retention area is important not only for the proposed storm water drainage plan, but also for the environmental aspect as securing of the retention area will result in conservation of the lowland and marsh areas.

The proposed project will contribute to poverty alleviation. According to the household inventory survey carried out in the Study, a half (49%) of the people to benefit by the Project are classified into the low-income group of which monthly income is less than Rs. 5,000/month. 42% of them are under poverty line of monthly income of Rs. 3,000. The proposed Project could improve their living conditions and consequently contribute to poverty alleviation. Further, the Project may promote economic development in the project area and poverty will be indirectly alleviated by upgrading of the people's living standard through economic development.

Also, the proposed project will yield various benefits other than the above such as economic activity acceleration, improvement of peoples' living environment and inconvenience of daily life, improvement of hygiene, improvement of water environment, etc.

Based on the above consideration, it is concluded that the proposed project should be implemented.

24.2 Recommendations

For the smooth and successful implementation of the proposed project, it is recommended that the following issues be settled as early as possible.

1) Conservation policy of Bellanwila-Attidiya wildlife sanctuary

Bellanwila-Attidiya marsh area is expected to function as a storm water retention area in the proposed storm water drainage plan. It was designated as a wildlife sanctuary (372 ha including surrounding lowlands) in 1990 and for conservation. However, no clear policy concerning the conservation of the Bellanwila-Attidiya wildlife sanctuary has been made by the responsible agency (Wildlife Conservation Department). The policy to conserve the sanctuary should be discussed among the relevant government agencies and stakeholders and made clear as early as possible.

2) Conservation of storm water retention area

In the proposed project, it is planned that all the proposed storm water retention areas (295 ha) be acquired so as to improve the conservation and management. However, most of the proposed retention areas are private lands (abandoned paddy fields) and therefore it may not be so easy to acquire all the proposed retention areas. The method or measures to conserve the proposed retention areas should be determined as early as possible through discussion among the agencies concerned and stakeholders.

3) Saline water intrusion protection gates

There exist old gates (1.83 m×1.83 m×6 nos.) for saline water intrusion protection on the Bolgoda Canal which is presently managed by the Irrigation Department. The gates were constructed to protect paddy fields upstream from saline water (already diluted). However, almost all the paddy fields have been abandoned and from the viewpoint of storm water drainage, demolition of the gates is preferred. (In the Study, the gates are tentatively planned to be demolished for smooth storm water flow.) The necessity for the gates should be discussed among the relevant government agencies.

4) Resettlement

The households to be relocated are estimated at 158 nos. and 50% of them may agree to move with conditions which are uncertain at present according to the household inventory survey carried out in the Study. For the smooth resettlement, an explanation on the proposed project and conditions for resettlement should be made by Executing Agency to the people affected by the Project immediately after implementation of the Project is officially decided in order to acquire their understanding and cooperation.

5) Demarcation of the responsibilities for the storm water drainage works

As mentioned in the master plan study, demarcation of the responsibilities for the storm water drainage works in Sri Lanka is unclear at present. As the conservation of the storm water retention areas are essential for the storm water drainage plan, demarcation of responsibilities should be made clear as early as possible. It may be difficult to properly manage and conserve the proposed retention areas without clear demarcation of responsibilities among the relevant agencies. The lowland management should be made by a sole agency (SLLRDC) as proposed in the master plan.

6) Water quality improvement

The water qualities of the Weras Ganga and major tributaries are contaminated by domestic and industrial wastewater from the surrounding urbanized areas. In the Study, the lowland of the Weras Ganga basin is designated as a storm water retention area and further retention areas are included in the Bellanwila-Attidiya wildlife sanctuary. In order to maintain better environmental conditions of the sanctuary and retention areas, a sewerage treatment system in the areas densely populated and urbanized to treat the wastewater should be considered.

Tables

Table 2.1 DS Division and Population in the Study Area

| District | DS Division | Area (ha) | Population (2001) | Study Area Coverage (%) | Estimated Population in the SA | Estimated Area in the SA (ha) | Population Share | Population Share (SA) | Population Density (per./ha) | Population Density of SA (per./ha) |
|-------------------|---------------------------|----------------|-------------------|-------------------------|--------------------------------|-------------------------------|------------------|-----------------------|------------------------------|------------------------------------|
| 1 Colombo | | 67,524 | 2,231,655 | 89.0% | 1,985,381 | 39,019 | 41.7% | 57.7% | 33 | 51 |
| 1) | Colombo | 1,550 | 383,878 | 100 | 383,878 | 1,550 | 7.2% | 11.2% | 248 | 248 |
| 2) | Dehiwala-Mount Lavinia | 2,320 | 209,783 | 100 | 209,783 | 2,320 | 3.9% | 6.1% | 90 | 90 |
| 3) | Hanwella | 22,800 | 93,662 | 0 | 0 | 0 | 1.7% | 0.0% | 4 | |
| 4) | Homagama | 14,050 | 184,552 | 75 | 138,414 | 10,538 | 3.4% | 4.0% | 13 | 13 |
| 5) | Kaduwela | 8,770 | 209,241 | 75 | 156,931 | 6,578 | 3.9% | 4.6% | 24 | 24 |
| 6) | Kesbewa | 5,500 | 208,674 | 100 | 208,674 | 5,500 | 3.9% | 6.1% | 38 | 38 |
| 7) | Kolonnawa | 2,730 | 160,442 | 100 | 160,442 | 2,730 | 3.0% | 4.7% | 59 | 59 |
| 8) | Maharagama | 3,020 | 180,829 | 100 | 180,829 | 3,020 | 3.4% | 5.3% | 60 | 60 |
| 9) | Moratuwa | 2,350 | 176,838 | 100 | 176,838 | 2,350 | 3.3% | 5.1% | 75 | 75 |
| 10) | Sri Jayawardenapura Kotte | 2,210 | 115,605 | 100 | 115,605 | 2,210 | 2.2% | 3.4% | 52 | 52 |
| 11) | Padukka * | | 54,164 | 0 | 0 | 0 | 1.0% | 0.0% | | |
| 12) | Thimbirigasyaya | 2,224 | 253,987 | 100 | 253,987 | 2,224 | 4.7% | 7.4% | 114 | 114 |
| 2 Gampaha | | 139,870 | 2,064,651 | 48.8% | 1,008,143 | 37,278 | 38.5% | 29.3% | 15 | 27 |
| 1) | Attanagalla | 15,390 | 153,734 | 0 | 0 | 0 | 2.9% | 0.0% | 10 | |
| 2) | Biyagama | 6,190 | 161,236 | 100 | 161,236 | 6,190 | 3.0% | 4.7% | 26 | 26 |
| 3) | Divulapitiya | 19,840 | 127,876 | 0 | 0 | 0 | 2.4% | 0.0% | 6 | |
| 4) | Dompe | 17,590 | 130,195 | 0 | 0 | 0 | 2.4% | 0.0% | 7 | |
| 5) | Gampaha | 9,450 | 170,289 | 75 | 127,717 | 7,088 | 3.2% | 3.7% | 18 | 18 |
| 6) | Ja Ela | 7,920 | 185,403 | 100 | 185,403 | 7,920 | 3.5% | 5.4% | 23 | 23 |
| 7) | Katana | 2,260 | 223,050 | 50 | 111,525 | 1,130 | 4.2% | 3.2% | 99 | 99 |
| 8) | Kelaniya | 2,220 | 134,169 | 100 | 134,169 | 2,220 | 2.5% | 3.9% | 60 | 60 |
| 9) | Mahara | 9,580 | 176,816 | 50 | 88,408 | 4,790 | 3.3% | 2.6% | 18 | 18 |
| 10) | Minuwangoda | 13,280 | 152,164 | 25 | 38,041 | 3,320 | 2.8% | 1.1% | 11 | 11 |
| 11) | Mirigama | 18,740 | 143,744 | 0 | 0 | 0 | 2.7% | 0.0% | 8 | |
| 12) | Negombo | 12,790 | 144,331 | 0 | 0 | 0 | 2.7% | 0.0% | 11 | |
| 13) | Wattala | 4,620 | 161,644 | 100 | 161,644 | 4,620 | 3.0% | 4.7% | 35 | 35 |
| 3 Kalutara | | 160,765 | 1,060,137 | 41.9% | 444,685 | 31,530 | 19.8% | 12.9% | 7 | 14 |
| 1) | Agalawatta | 9,223 | 33,876 | 0 | 0 | 0 | 0.6% | 0.0% | 4 | |
| 2) | Bandaragama | 5,522 | 86,418 | 75 | 64,814 | 4,142 | 1.6% | 1.9% | 16 | 16 |
| 3) | Beruwala | 7,300 | 144,812 | 0 | 0 | 0 | 2.7% | 0.0% | 20 | |
| 4) | Bulathsinhala | 20,764 | 59,231 | 0 | 0 | 0 | 1.1% | 0.0% | 3 | |
| 5) | Dodangoda | 10,700 | 54,091 | 25 | 13,523 | 2,675 | 1.0% | 0.4% | 5 | 5 |
| 6) | Horana | 10,717 | 90,485 | 50 | 45,243 | 5,359 | 1.7% | 1.3% | 8 | 8 |
| 7) | Ingiriya | 9,204 | 45,347 | 0 | 0 | 0 | 0.8% | 0.0% | 5 | |
| 8) | Kalutara | 7,790 | 141,725 | 75 | 106,294 | 5,843 | 2.6% | 3.1% | 18 | 18 |
| 9) | Madurawela | 6,274 | 29,600 | 25 | 7,400 | 1,569 | 0.6% | 0.2% | 5 | 5 |
| 10) | Mathugama | 13,410 | 71,910 | 0 | 0 | 0 | 1.3% | 0.0% | 5 | |
| 11) | Millaniya | 7,227 | 44,271 | 100 | 44,271 | 7,227 | 0.8% | 1.3% | 6 | 6 |
| 12) | Palindanuwara | 26,907 | 44,875 | 0 | 0 | 0 | 0.8% | 0.0% | 2 | |
| 13) | Panadura | 4,717 | 163,141 | 100 | 163,141 | 4,717 | 3.0% | 4.7% | 35 | 35 |
| 14) | Walallavita | 21,010 | 50,355 | 0 | 0 | 0 | 0.9% | 0.0% | 2 | |
| Total | | 368,159 | 5,356,443 | 64.2% | 3,438,208 | 107,827 | 100.0% | 100.0% | 15 | 32 |

Source: Local Government, Western Province

Note: For analysis of socio economic conditions of the Study Area, DS Divisions in the Study Area are estimated. Since the basin boundary and administrative boundary do not always match, the share of the DS Divisions that are in the Study area is taken by estimate. For simplicity, the area covered is estimated by three scales, 25%, 50%, and 75% of DS Division.

Due to regular administrative changes, the area for DS Divisions has not been updated.

* Paduka is a part of Hanwella and Homagama, and the area for Paduka has not been identified.

SA: Study Area

Table 2.2 Local Authorities in the Study Area and Population

| District | MC, UC, PS | DS Division | Area (km ²) | Population (1999) |
|-------------------|--------------------------------|-------------------------|-------------------------|-------------------|
| 1 Colombo | | | 670.78 | 2,195,084 |
| 1) | MC: Colombo* | Colombo | 37.21 | 642,000 |
| 2) | MC: Dehiwala Mt Lavinia* | Dehiwala-Mount Lavinia | 21.17 | 234,582 |
| 3) | MC: Sri Jayawardenapura Kotte* | Nugegoda | 17.04 | 134,114 |
| 4) | MC: Moratuwa* | Moratuwa | 23.34 | 177,100 |
| 5) | UC: Kolonnawa* | Kolonnawa | 10.06 | 61,000 |
| 6) | UC: Seethawakapura | Hanwella | 19.40 | 32,299 |
| 7) | PS: Homagama* | Homagama | 140.08 | 183,782 |
| 8) | PS: Kaduwela* | Kaduwela | 87.69 | 192,614 |
| 9) | PS: Kesbewa* | Kesbewa | 55.00 | 197,433 |
| 10) | PS: Kotikawatte/Mulleriyawa* | Kolonnawa | 29.63 | 113,296 |
| 11) | PS: Maharagama* | Maharagama | 21.86 | 111,091 |
| 12) | PS: Seethawaka | Hanwella | 208.30 | 115,773 |
| 2 Gampaha | | | 1,420.02 | 2,087,991 |
| 1) | MC: Negombo/Kochikade | Negombo | 30.08 | 171,004 |
| 2) | UC: Gampaha* | Gampaha | 2.59 | 57,429 |
| 3) | UC: Ja Ela* | Ja Ela | 9.07 | 30,910 |
| 4) | UC: Seeduwa-Katunayake | Negombo | 10.36 | 49,895 |
| 5) | UC: Minuwangoda | Minuwangoda | 4.40 | 9,071 |
| 6) | UC: Peliyagoda* | Kelaniya | 1.94 | 33,187 |
| 7) | UC: Wattala-Mobole* | Wattala | 9.84 | 26,000 |
| 8) | PS: Attanagalla | Attanagalle | 151.08 | 138,229 |
| 9) | PS: Biyagama* | Biyagama | 64.00 | 142,623 |
| 10) | PS: Divulapitiya | Divulapitiya | 193.67 | 130,341 |
| 11) | PS: Dompe | Weke | 178.50 | 130,195 |
| 12) | PS: Gampaha* | Gampaha | 134.11 | 112,860 |
| 13) | PS: Ja Ela* | Ja Ela | 63.08 | 153,606 |
| 14) | PS: Katana* | Katana | 65.00 | 149,734 |
| 15) | PS: Kelaniya* | Kelaniya | 21.90 | 143,851 |
| 16) | PS: Mahara* | Mahara | 98.80 | 178,589 |
| 17) | PS: Minuwangoda* | Minuwangoda | 135.00 | 139,978 |
| 18) | PS: Mirigama | Mirigama | 186.60 | 130,712 |
| 19) | PS: Wattala* | Wattala/Negombo | 60.00 | 159,777 |
| 3 Kalutara | | | 1,535.30 | 1,022,736 |
| 1) | UC: Beruwala | Beruwala | 5.18 | 32,300 |
| 2) | UC: Horana* | Horana | 4.53 | 18,080 |
| 3) | UC: Kalutara | Kalutara | 12.94 | 40,000 |
| 4) | UC: Panadura* | Panadura | 5.80 | 40,501 |
| 5) | PS: Agalawatta | Agalawatta | 361.00 | 92,050 |
| 6) | PS: Bandaragama* | Bandaragama | 93.20 | 105,055 |
| 7) | PS: Beruwala | Beruwala | 65.78 | 111,198 |
| 8) | PS: Bulathsinhala | Bulathsihala/Madurawela | 278.40 | 94,880 |
| 9) | PS: Dodangoda* | Dodangoda | 115.03 | 61,010 |
| 10) | PS: Horana* | Horana | 90.62 | 81,377 |
| 11) | PS: Kalutara* | Kalutara | 98.50 | 88,920 |
| 12) | PS: Mathugama | Mathugama | 134.10 | 72,872 |
| 13) | PS: Panadura* | Panadura | 59.62 | 129,547 |
| 14) | PS: Walallavita | Walallavita | 210.60 | 54,946 |

Source: Local Government, Western Province

Note: MC: Municipal Council, UC: Urban Council,

PS: Pradeshiya Sabhas (former Town Councils and Village Councils considered as rural area)

* Study Area

Population of Colombo is in 2001

Table 2.3 Gross Domestic Product at Constant at 1996 Price(Unit: x 10³ Rs.)

| | Item | 1996 | 1997 | 1998 | 1999 | 2000 |
|-----------|---|----------------|----------------|----------------|----------------|----------------|
| 1 | Agriculture, Forestry and Fishery | 156,108 | 160,753 | 164,804 | 172,238 | 175,317 |
| 1) | Agriculture | 122,594 | 126,107 | 128,337 | 133,952 | 136,212 |
| | Tea | 10,332 | 11,069 | 11,195 | 11,341 | 12,226 |
| | Rubber | 4,011 | 3,795 | 3,452 | 3,487 | 3,149 |
| | Coconut | 12,838 | 13,258 | 12,829 | 13,996 | 15,116 |
| | Paddy | 19,892 | 22,122 | 26,165 | 27,892 | 27,808 |
| | Others | 75,521 | 75,863 | 74,696 | 77,236 | 77,913 |
| 2) | Forestry | 14,751 | 14,942 | 15,122 | 15,319 | 15,564 |
| 3) | Fishery | 18,763 | 19,704 | 21,345 | 22,967 | 23,541 |
| 2 | Mining and Quarrying | 13,927 | 14,460 | 13,677 | 14,238 | 14,921 |
| 3 | Manufacturing | 112,724 | 122,929 | 130,702 | 136,498 | 149,115 |
| | Agro processing | 16,203 | 16,771 | 16,575 | 17,205 | 17,928 |
| | Factory industry | 87,771 | 96,795 | 104,151 | 108,838 | 120,157 |
| | Small industry | 8,750 | 9,363 | 9,976 | 10,455 | 11,030 |
| 4 | Construction | 48,234 | 50,842 | 54,461 | 57,075 | 59,815 |
| 5 | Electricity, Gas, Water and Sanitary Services | 9,171 | 9,918 | 10,921 | 11,958 | 12,496 |
| 6 | Transport, Storage, Communication | 73,784 | 80,268 | 86,442 | 93,444 | 100,706 |
| 7 | Wholesale and Retail Trade | 155,316 | 165,132 | 172,486 | 174,160 | 189,366 |
| | Imports | 64,629 | 70,833 | 76,609 | 75,536 | 85,280 |
| | Exports | 16,365 | 18,323 | 18,346 | 19,465 | 23,027 |
| | Domestic | 74,322 | 75,976 | 77,531 | 79,159 | 81,059 |
| 8 | Banking, Insurance, and Real Estate | 49,675 | 54,767 | 58,247 | 60,926 | 64,810 |
| 9 | Ownership of Dwellings | 14,232 | 14,416 | 14,592 | 14,767 | 15,018 |
| 10 | Public Administration and Defense | 35,215 | 37,055 | 38,170 | 39,773 | 41,443 |
| 11 | Services | 27,548 | 29,223 | 30,294 | 33,263 | 34,028 |
| 12 | GDP | 695,934 | 739,763 | 774,796 | 808,340 | 857,035 |
| 13 | Net Factor Income from Abroad | (11,258) | (8,816) | (9,888) | (14,000) | (16,750) |
| 14 | GNP | 684,676 | 730,947 | 764,908 | 794,340 | 840,285 |

Source: Annual Report 2000, Central Government of Sri Lanka

Table 2.4 Gross Regional Domestic Product of Western Province at 1990 Price

| Item | | GRDP for Western Province (million Rs.) | | | | | | Western Province Share in the National GDP | | | | | |
|------|--|---|---------|---------|---------|---------|---------|--|------|------|------|------|------|
| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
| 1 | Agriculture | 6,189 | 6,199 | 6,109 | 6,202 | 6,393 | 6,638 | 8.5 | 8.4 | 8.4 | 8.0 | 8.0 | 8.0 |
| 1.1 | Tea | 278 | 197 | 147 | 190 | 199 | 202 | 2.8 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 1.2 | Rubber | 569 | 535 | 548 | 528 | 545 | 544 | 34.3 | 35.1 | 35.2 | 34.5 | 35.3 | 35.0 |
| 1.3 | Coconuts | 1,111 | 853 | 894 | 839 | 1,018 | 1,089 | 18.9 | 16.6 | 16.6 | 16.5 | 16.7 | 17.0 |
| 1.4 | Paddy | 1,204 | 945 | 891 | 973 | 929 | 980 | 8.3 | 6.6 | 6.6 | 6.5 | 6.0 | 6.0 |
| 1.5 | Tobacco | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.6 | Betel and Areca Nuts | 67 | 61 | 80 | 81 | 80 | 77 | 8.3 | 6.3 | 7.2 | 8.2 | 7.9 | 7.6 |
| 1.7 | Other Food Crops | 1,519 | 1,213 | 956 | 927 | 905 | 939 | 6.9 | 5.4 | 4.3 | 3.9 | 3.8 | 3.8 |
| 1.8 | Minor Exported Crop | 233 | 416 | 394 | 381 | 373 | 391 | 8.3 | 12.3 | 12.2 | 11.3 | 11.0 | 11.6 |
| 1.9 | Plantation Development | 238 | 375 | 472 | 523 | 539 | 544 | 12.7 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 |
| 1.10 | Firewood and Forestry | 74 | 87 | 66 | 56 | 61 | 57 | 2.5 | 2.9 | 2.1 | 1.7 | 2.0 | 1.9 |
| 1.11 | Livestock | 441 | 434 | 408 | 409 | 423 | 423 | 13.1 | 13.0 | 13.0 | 12.8 | 13.1 | 13.0 |
| 1.12 | Fisheries | 264 | 1,035 | 1,136 | 1,218 | 1,221 | 1,281 | 4.5 | 16.2 | 17.0 | 17.0 | 16.8 | 16.8 |
| 1.13 | Miscellaneous | 193 | 47 | 116 | 77 | 101 | 110 | 17.9 | 4.9 | 6.3 | 5.6 | 6.2 | 6.0 |
| 2 | Mining | 740 | 551 | 535 | 615 | 725 | 778 | 16.2 | 16.2 | 16.8 | 16.9 | 17.5 | 17.8 |
| 3 | Manufacture | 39,119 | 42,856 | 46,707 | 51,140 | 55,484 | 60,043 | 71.2 | 72.4 | 72.4 | 72.4 | 72.4 | 72.4 |
| 3.1 | Manufacture of Food, Beverages, and Tobacco | 19,098 | 20,922 | 22,802 | 24,966 | 27,087 | 29,313 | 63.1 | 64.5 | 64.5 | 64.5 | 64.5 | 64.5 |
| 3.2 | Textile Wearing Apparel and Leather | 10,949 | 11,995 | 13,073 | 14,313 | 15,529 | 16,805 | 81.7 | 82.3 | 82.2 | 82.2 | 82.2 | 82.2 |
| 3.3 | Manufacturing of Wood and Wood Products Including Furniture | 602 | 660 | 719 | 787 | 854 | 924 | 76.8 | 79.9 | 79.9 | 79.9 | 79.9 | 79.9 |
| 3.4 | Manufacture of Paper and Paper Products Printing and Publishing | 258 | 283 | 308 | 337 | 366 | 396 | 96.4 | 96.9 | 96.9 | 96.9 | 96.9 | 96.9 |
| 3.5 | Manufacture of Chemical and Petroleum, Coal, Rubber, and Plastic Product | 3,145 | 3,445 | 3,755 | 4,111 | 4,461 | 4,827 | 92.1 | 92.1 | 92.1 | 92.1 | 92.1 | 92.1 |
| 3.6 | Products Except Products of Petroleum and Coal | 363 | 398 | 433 | 475 | 515 | 557 | 24.9 | 26.3 | 26.2 | 26.2 | 26.2 | 26.2 |
| 3.7 | Basic Metal Industries | 258 | 283 | 308 | 338 | 366 | 396 | 89.5 | 91.4 | 91.4 | 91.4 | 91.4 | 91.4 |
| 3.8 | Manufacture of Fabricated Metal Products Machinery, and Equipment | 3,474 | 3,806 | 4,148 | 4,541 | 4,927 | 5,332 | 86.2 | 86.6 | 86.6 | 86.6 | 86.6 | 86.6 |
| 3.9 | Other Manufacturing Industries | 972 | 1,065 | 1,161 | 1,271 | 1,379 | 1,492 | 93.2 | 94.4 | 94.4 | 94.4 | 94.4 | 94.4 |
| 4 | Electricity and Gas | 3,464 | 3,811 | 4,007 | 4,492 | 4,848 | 5,259 | 61.5 | 63.3 | 63.3 | 63.0 | 62.1 | 61.1 |
| 4.1 | Electricity and Gas | 3,359 | 3,700 | 3,894 | 4,374 | 4,728 | 5,138 | 61.6 | 63.5 | 63.5 | 63.1 | 62.2 | 61.2 |
| 4.2 | Water Distribution | 105 | 112 | 113 | 118 | 120 | 121 | 58.1 | 58.1 | 58.1 | 58.1 | 58.1 | 58.1 |
| 5 | Trade | 32,866 | 32,375 | 35,871 | 38,539 | 41,669 | 44,017 | 53.2 | 49.7 | 50.1 | 50.4 | 51.3 | 51.7 |
| 5.1 | Trade | 32,343 | 31,878 | 35,227 | 37,931 | 41,033 | 43,308 | 53.2 | 49.7 | 50.1 | 50.4 | 51.3 | 51.7 |
| 5.2 | Hotels and Restaurants | 523 | 497 | 644 | 608 | 636 | 709 | 52.9 | 47.7 | 50.0 | 49.7 | 50.0 | 52.4 |
| 6 | Transport and Communication | 13,783 | 14,376 | 15,209 | 15,810 | 16,389 | 17,910 | 46.5 | 46.1 | 46.2 | 45.7 | 45.4 | 47.6 |
| 6.1 | Air Transport | 343 | 365 | 369 | 370 | 565 | 635 | 96.6 | 97.7 | 97.4 | 97.3 | 97.0 | 97.3 |
| 6.2 | Water Transport | 1,985 | 2,139 | 2,238 | 2,402 | 2,111 | 2,403 | 83.8 | 85.8 | 85.0 | 85.8 | 86.0 | 86.2 |
| 6.3 | Road Transport | 9,642 | 9,874 | 10,525 | 10,796 | 11,270 | 12,460 | 44.6 | 43.4 | 43.6 | 43.1 | 43.2 | 45.4 |
| 6.4 | Rail Transport | 1,384 | 1,554 | 1,622 | 1,735 | 1,825 | 1,712 | 32.9 | 35.1 | 35.2 | 35.1 | 34.4 | 34.7 |
| 6.5 | Telecommunication | 302 | 315 | 323 | 331 | 409 | 471 | 63.7 | 63.2 | 63.2 | 63.1 | 62.9 | 62.5 |
| 6.6 | Postal Service | 127 | 127 | 132 | 177 | 209 | 229 | 21.5 | 20.4 | 20.5 | 20.5 | 20.7 | 21.0 |
| 7 | Construction | 7,796 | 7,917 | 8,325 | 9,064 | 9,762 | 10,867 | 36.1 | 36.1 | 35.7 | 35.7 | 35.9 | 36.9 |
| 7.1 | Residential | 3,601 | 3,657 | 3,735 | 4,167 | 4,637 | 5,112 | 48.2 | 48.2 | 48.7 | 47.9 | 47.8 | 47.4 |
| 7.2 | Non residential | 1,526 | 1,550 | 1,788 | 1,878 | 1,929 | 2,037 | 33.5 | 33.5 | 33.5 | 33.5 | 33.1 | 33.7 |
| 7.3 | Others | 2,669 | 2,710 | 2,802 | 3,019 | 3,196 | 3,718 | 27.9 | 27.9 | 27.2 | 27.3 | 27.4 | 29.4 |
| 8 | Bank, Insurance, Real Estate, Business | 8,539 | 7,961 | 8,384 | 9,259 | 10,194 | 11,136 | 49.5 | 43.7 | 43.7 | 44.2 | 44.9 | 44.9 |
| 8.1 | Banking Institution and Business | 5,823 | 4,921 | 5,066 | 5,521 | 6,316 | 6,692 | 58.8 | 47.0 | 47.0 | 47.8 | 49.0 | 48.9 |
| 8.2 | Real Estate | 228 | 241 | 322 | 366 | 391 | 446 | 60.0 | 60.0 | 60.0 | 60.2 | 62.0 | 64.3 |
| 8.3 | Private Dwelling | 2,488 | 2,800 | 2,996 | 3,372 | 3,487 | 3,998 | 35.7 | 38.0 | 38.1 | 38.3 | 38.0 | 38.4 |
| 9 | Government Services | 8,521 | 9,059 | 9,146 | 9,457 | 9,787 | 10,292 | 35.3 | 35.3 | 35.3 | 35.3 | 35.4 | 35.5 |
| 9.1 | Public Administration and Defense | 6,696 | 7,119 | 7,133 | 7,400 | 7,642 | 8,068 | 36.7 | 36.7 | 36.7 | 36.7 | 36.7 | 36.7 |
| 9.2 | Health and Hospital Services | 215 | 228 | 231 | 234 | 240 | 245 | 38.3 | 38.3 | 38.1 | 38.2 | 38.2 | 37.9 |
| 9.3 | Education Services | 1,610 | 1,712 | 1,782 | 1,823 | 1,904 | 1,979 | 30.3 | 30.3 | 30.5 | 30.5 | 30.8 | 31.0 |
| 10 | Private Services | 3,269 | 3,576 | 4,118 | 3,813 | 4,138 | 4,266 | 40.5 | 41.9 | 44.9 | 40.3 | 42.6 | 42.7 |
| 11 | Import Duty | 7,258 | 8,141 | 7,994 | 8,071 | 8,313 | 8,515 | 41.4 | 41.1 | 42.1 | 42.1 | 42.7 | 43.3 |
| | Gross Regional Domestic Product | 131,544 | 136,823 | 146,405 | 156,462 | 167,701 | 179,720 | 41.4 | 41.1 | 42.1 | 42.1 | 42.7 | 43.3 |

Source: Macro Division, National Planning Department, Ministry of Finance and Planning

Table 2.5 Summary of Government Fiscal Operations

(Unit: million Rs.)

| Item | 1996 | 1997 | 1998 | 1999 | 2000 (Approved Estimates) | 2000 (Provisional) | 2001 (Approved Estimates) |
|---|----------------|----------------|----------------|----------------|---------------------------------|-----------------------|---------------------------------|
| Total Revenue | 146,279 | 165,036 | 175,032 | 195,905 | 233,974 | 211,282 | 264,479 |
| Tax Revenue | 130,202 | 142,512 | 147,368 | 166,028 | 201,766 | 182,392 | 234,113 |
| Non Tax Revenue | 16,077 | 22,524 | 27,664 | 29,877 | 32,208 | 28,890 | 30,366 |
| Expenditure and lending minus repayments | 221,119 | 235,739 | 267,926 | 278,708 | 337,034 | 335,238 | 408,309 |
| Current expenditure | 175,147 | 184,478 | 199,649 | 207,271 | 225,750 | 254,280 | 290,264 |
| General public services | 53,915 | 58,926 | 66,158 | 63,220 | 70,762 | 82,645 | 79,115 |
| Civil administration | 10,207 | 13,956 | 15,196 | 14,513 | 20,234 | 13,418 | 18,030 |
| Defense | 38,117 | 37,062 | 42,496 | 40,071 | 38,442 | 56,915 | 48,161 |
| Public order and safety | 5,591 | 7,908 | 8,466 | 8,636 | 12,086 | 12,312 | 12,924 |
| Social services | 59,293 | 59,742 | 63,595 | 66,319 | 73,614 | 77,160 | 94,718 |
| Economic services | 8,807 | 7,148 | 10,547 | 10,075 | 11,113 | 12,103 | 12,828 |
| Others | 53,132 | 58,662 | 59,349 | 67,657 | 70,261 | 82,372 | 103,603 |
| (of which interest) | 48,923 | 55,246 | 54,897 | 62,123 | 69,048 | 71,200 | 90,611 |
| Capital expenditure and lending | 45,972 | 51,261 | 68,277 | 71,437 | 111,284 | 80,958 | 118,045 |
| General public services | 3,161 | 3,442 | 6,243 | 6,345 | 8,234 | 7,157 | 7,057 |
| Civil administration | 1,935 | 3,442 | 6,243 | 6,345 | 7,614 | 5,610 | 5,224 |
| Defense | 1,226 | | | | 620 | 1,547 | 1,833 |
| Social services | 10,323 | 11,552 | 15,528 | 17,493 | 20,210 | 16,471 | 21,659 |
| Economic services | 31,409 | 32,479 | 44,677 | 45,234 | 79,723 | 54,650 | 83,410 |
| Others | 1,079 | 3,788 | 1,829 | 2,365 | 3,117 | 2,680 | 5,919 |
| Current account surplus/deficit | -28,868 | -19,442 | -24,617 | -11,366 | 8,224 | -42,998 | -25,785 |
| Primary account surplus/deficit | -23,457 | -14,815 | -38,250 | -21,132 | -26,809 | -53,341 | -32,447 |
| Overall deficit | -74,840 | -70,703 | -92,894 | -82,803 | -103,060 | -123,956 | -143,830 |
| Financing | 72,381 | 70,062 | 93,148 | 83,254 | 95,857 | 124,540 | 123,058 |
| Foreign financing | 17,899 | 17,287 | 17,397 | 8,245 | 22,166 | 5,640 | 28,963 |
| Net borrowing | 10,160 | 9,958 | 10,197 | 1,484 | 14,166 | 495 | 21,463 |
| Grants | 7,739 | 7,329 | 7,200 | 6,761 | 8,000 | 5,145 | 7,500 |
| Domestic financing | 54,482 | 52,775 | 75,751 | 75,009 | 73,691 | 118,900 | 94,095 |
| Market borrowing | 49,754 | 30,276 | 71,362 | 74,875 | 43,691 | 118,499 | 69,095 |
| Non bank | 26,301 | 41,816 | 53,338 | 49,722 | 43,691 | 61,935 | 68,515 |
| Bank | 13,090 | -2,171 | 18,954 | 25,995 | 0 | 53,389 | 580 |
| Monetary authority | 9,873 | -13,991 | 5,609 | 20,807 | | 44,840 | |
| Commercial bank | 3,217 | 11,820 | 13,345 | 5,188 | | 8,549 | 580 |
| Other borrowing | 10,363 | -9,369 | -930 | -842 | | 3,175 | |
| Privatization proceeds | 4,728 | 22,499 | 4,389 | 134 | 30,000 | 401 | 25,000 |
| Percentage in GDP (%) | | | | | | | |
| Total Revenue | 19.0 | 18.5 | 17.2 | 17.7 | 18.7 | 16.8 | 18.3 |
| Expenditure and lending minus repayments | 28.5 | 26.4 | 26.3 | 25.2 | 26.3 | 26.7 | 26.9 |
| Current expenditure | 22.8 | 20.8 | 19.6 | 18.7 | 18.1 | 20.3 | 19.5 |
| Capital expenditure and lending | 5.7 | 5.7 | 6.7 | 6.5 | 8.2 | 6.5 | 7.4 |
| Current account surplus/deficit | 3.8 | 2.2 | 2.4 | 1.0 | 0.6 | 3.4 | 1.2 |
| Primary account surplus/deficit | 3.1 | 1.7 | 3.8 | 1.9 | 2.1 | 4.2 | 2.2 |
| Overall deficit | 9.4 | 7.9 | 9.2 | 7.5 | 7.6 | 9.9 | 8.5 |
| Financing | 9.4 | 7.9 | 9.2 | 7.5 | 7.6 | 9.9 | 8.5 |
| Foreign financing | 2.3 | 1.9 | 1.7 | 0.7 | 1.8 | 0.4 | 2.0 |
| Domestic financing | 6.5 | 3.4 | 7.0 | 6.8 | 3.5 | 9.4 | 4.8 |
| Privatization proceeds | 0.6 | 2.5 | 0.4 | | 2.4 | | 1.7 |

Source: Annual Report 2000, Central Bank of Sri Lanka

Table 2.6 Potential Population Directly Affected by Storm Water Drainage Plan

| Proposed Measures | Total HH/Population Affected | | Illegal Occupants | | | | Under Poverty Line | | | | Houses Located in Riverside Land | | Houses Frequently Inundated in Storm Season | |
|---|------------------------------|----------------|-------------------|------------|---------------|------------|--------------------|------------|---------------|------------|----------------------------------|-----------|---|------------|
| | Number of HHs | Population | Number of HHs | % | Population | % | Number of HHs | % | Population | % | Number of HHs | % | Number of HHs | % |
| | (a) | (b) | (c) | (c)/(a) | (d) | (d)/(b) | (e) | (e)/(a) | (f) | (f)/(b) | (g) | (g)/(a) | (h) | (h)/(a) |
| 1) Ja Ela Basin Storm Water Drainage Plan | | | | | | | | | | | | | | |
| a) Ja Ela channel improvement | 2,381 | 12,085 | 65 | 3% | 335 | 3% | 1,038 | 44% | 5,125 | 42% | 260 | 11% | 647 | 27% |
| b) Dandungam Oya channel improvement | 640 | 2,499 | 0 | 0% | 0 | 0% | 300 | 47% | 1,400 | 56% | 180 | 28% | 275 | 43% |
| c) Ja Ela retention area conservation | 3,080 | 15,219 | 57 | 2% | 152 | 1% | 1,230 | 40% | 5,750 | 38% | 133 | 4% | 322 | 10% |
| d) Muthurajawela marsh conservation | 0 | 0 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| Sub-total | 6,101 | 29,803 | 122 | 2% | 487 | 2% | 2,568 | 42% | 12,275 | 41% | 573 | 9% | 1,244 | 20% |
| 2) Kalu Oya Basin Storm Water Drainage Plan | | | | | | | | | | | | | | |
| a) Kalu Oya channel improvement | 2,110 | 20,850 | 219 | 10% | 1,110 | 5% | 705 | 33% | 3,868 | 19% | 80 | 4% | 300 | 14% |
| b) Old Negombo canal improvement | 10,384 | 60,576 | 1,597 | 15% | 8,241 | 14% | 3,306 | 32% | 17,763 | 29% | 648 | 6% | 2,707 | 26% |
| c) Kalu Oya retention area conservation | 0 | 0 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| d) Muthurajawela marsh buffer zone conservation | 0 | 0 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| Sub-total | 12,494 | 81,426 | 1,816 | 15% | 9,351 | 11% | 4,011 | 32% | 21,631 | 27% | 728 | 6% | 3,007 | 24% |
| 3) Greater Colombo Basin Storm Water Drainage Plan | | | | | | | | | | | | | | |
| a) Madiwela South diversion canal construction | 2,570 | 11,070 | 50 | 2% | 290 | 3% | 605 | 24% | 2,905 | 26% | 60 | 2% | 120 | 5% |
| b) Mutwal Tunnel (existing) restoration | 9,566 | 44,589 | 1,675 | 18% | 8,083 | 18% | 2,750 | 29% | 12,680 | 28% | 770 | 8% | 1,950 | 20% |
| c) New Mutwal Tunnel Construction Project | 3,368 | 17,266 | 600 | 18% | 2,812 | 16% | 526 | 16% | 2,114 | 12% | 125 | 4% | 250 | 7% |
| d) Kolonnawa marsh retention area conservation | 0 | 0 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| e) Kotte Marsh retention area conservation | 5,062 | 23,103 | 160 | 3% | 905 | 4% | 660 | 13% | 3,685 | 16% | 105 | 2% | 210 | 4% |
| f) Heen Marsh retention area conservation | 0 | 0 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| Sub-total | 20,566 | 96,028 | 2,485 | 12% | 12,090 | 13% | 4,541 | 22% | 21,384 | 22% | 1,060 | 5% | 2,530 | 12% |
| 4) Bolgoda Basin Storm Water Drainage Plan | | | | | | | | | | | | | | |
| a) Weras Ganga improvement | 9,835 | 49,977 | 783 | 8% | 3,986 | 8% | 2,508 | 26% | 12,345 | 25% | 491 | 5% | 1,310 | 13% |
| b) Bolgoda lake north retention area conservation | 8,885 | 46,640 | 351 | 4% | 2,338 | 5% | 3,670 | 41% | 17,790 | 38% | 442 | 5% | 440 | 5% |
| c) Bolgoda lake south retention area conservation | 2,097 | 8,109 | 12 | 1% | 38 | - | 1,255 | 60% | 4,560 | 56% | 239 | 11% | 276 | 13% |
| Sub-total | 20,817 | 104,726 | 1,146 | 6% | 6,362 | 6% | 7,433 | 36% | 34,695 | 33% | 1,172 | 6% | 2,026 | 10% |
| Total | 59,978 | 311,983 | 5,569 | 9% | 28,290 | 9% | 18,553 | 31% | 89,985 | 29% | 3,533 | 6% | 8,807 | 15% |

Note: HH - Household

Source: Community Inventory Survey, JICA Study Team, 2002 (Data from GN offices)

Table 2.7 Major Drainage Canals Improvement under GCFC&EIP Phase-I

| Name of Canal | Length (m) | Type of Work | Width (m) | Cross Section | Bank Protection |
|--|------------|--------------|-----------|--------------------------|-----------------|
| Northern System | | | | | |
| 1. Kolonnawa Ela South | 658 | R | 30 | Trapezoidal | T |
| 2. Kolonnawa Ela | 1,367 | R | 20 | Trapezoidal | T |
| 3. Kolonnawa Ela North | 1,571 | R | 20 | Trapezoidal | T |
| 4. Mahawatta Ela | 1,775 | R | 10-12 | Rectangular, Trapezoidal | G, T |
| 5. Dematagoda | 3,400 | R | 20 | Rectangular | G, T, SHP |
| 6. St. Sebastian South | 1,918 | R | 10 | Rectangular | G |
| 7. St. Sebastian North | 1,954 | R | 5-9 | Rectangular, Trapezoidal | G, T |
| 8. St. Sebastian East | 1,252 | R | 3-7 | Rectangular, Trapezoidal | G, T |
| 9. Main Drain | 1,698 | R | 6-8 | Rectangular | C, G, SHP |
| 10. Connection Main Drain & Bloemndhal Marsh | 305 | R | 4 | Trapezoidal | T |
| 11. Connection Mahawatta Ela & Heen Ela | 295 | N | 10 | Rectangular | G |
| Southern System | | | | | |
| 12. Kotte Ela North | 1,603 | R | 30-40 | Rectangular, Trapezoidal | T, G |
| 13. Kotte Ela South | 929 | R | 30 | Trapezoidal | T |
| 14. Kirillapone | 2,708 | R | 30 | Rectangular, Trapezoidal | SHP, G, T |
| 15. Welawatta | 1,886 | R | 25 | Rectangular, Trapezoidal | SHP, G |
| 16. Dehiwala | 3,836 | R | 10 | Rectangular | G |
| 17. Bolgoda | 1,977 | R | 3 | Trapezoidal | T |
| 18. Connection Kotte Ela North & Heen Ela | 1,750 | N | 20 | Rectangular, Trapezoidal | T, G |
| Western System | | | | | |
| 19. Torrington South | 775 | R | 5-7 | Rectangular | C, G |
| 20. Torrington North | 889 | R | 7 | Rectangular | G, SHP |
| 21. Torrington | 840 | R | 9-12 | Rectangular, Trapezoidal | T, G |
| 22. Heen Ela | 2,783 | R | 15-20 | Rectangular, Trapezoidal | T, G |
| Eastern System | | | | | |
| 23. Madiwela East Diversion | 7,520 | N | 8-25 | Trapezoidal | T, WM |
| 24. Link Canal | 306 | N | 5 | Rectangular, Trapezoidal | T |
| Total Length | 43,995 | | | | |

Note: Type of Work: R (Rehabilitation), N (New Construction)

Bank Protection: T (Turfing), G (Gabion), SHP (Steel Sheet Piling), C (Concrete Lining), WM (Wet Masonry)

Table 2.8 Principal Features of GCFC&EIP Phase-II Schemes (1/2)

| Item | Description |
|--|-------------------------------------|
| 1. Unity Place Scheme | |
| Drainage Area of Scheme | 1.09 km ² |
| Max. Discharge at Downstream End | 8.5 m ³ /sec |
| Total Length of Drainage | 835 m |
| Major Drainage Facilities | |
| (1) Tunnel | |
| Diameter | 2400 mm |
| Total Length | 835 m |
| (2) Access Shaft / Manhole | 5 nos. |
| (3) Sea Outfall Structure | Reinforced Concrete |
| 2. Torrington West Scheme | |
| Drainage Area of Scheme | 1.72 km ² |
| Max. Discharge at Downstream End | 12.7 m ³ /sec |
| Total Length of Drainage | 2,149 m |
| Major Drainage Facilities | |
| (1) Hume Pipe Culvert | |
| Size and Length | 750 mm dia. 237 m |
| | 1050 mm dia. 190 m |
| | 1200 mm dia. 146 + 210 m |
| (2) Box Culvert | |
| Size and Length | 1.20 m (W) x 1.00 m (H) 52 m |
| | 1.50 m (W) x 1.35 m (H) 444 m |
| | 2.00 m (W) x 1.75 m (H) 756 m |
| | 4.00 m (W) x 2.20 m (H) 114 m |
| (3) Access Shaft / Manhole | 39 nos. |
| (4) Outfall to Torrington South Canal | Gabions |
| 3. St. Sebastian-2 Scheme | |
| Drainage Area of Scheme | 0.38 km ² |
| Max. Discharge at Downstream End | 3.2 m ³ /sec |
| Total Length of Drainage | 1,464 m |
| Major Facilities | |
| (1) Drain with Cover Slabs | |
| Size and Length | 0.40 m (W) x 1.00 m (H) 296 m |
| | 1.00 m (W) x 1.00 m (H) 280 + 195 m |
| (2) Box Culvert | |
| Size and Length | 0.90 m (W) x 0.75 m (H) 195 m |
| | 1.50 m (W) x 1.35 m (H) 444 m |
| (3) Access Shaft / Manhole | 13 nos. |
| (4) Outfall to St. Sebastian South Canal | Gabions |

Table 2.8 Principal Features of GCFC&EIP Phase-II Schemes (2/2)

| Item | Description |
|--------------------------------------|-------------------------------|
| 4. Dematagoda Scheme | |
| Drainage Area of Scheme | 0.25 km ² |
| Max. Discharge at Downstream End | 3.2 m ³ /sec |
| Total Length of Drainage | 533 m |
| Major Facilities | |
| (1) Box Culvert | |
| Size and Length | 1.50 m (W) x 1.35 m (H) 533 m |
| (2) Access Shaft / Manhole | 7 nos. |
| (3) Outfall to Dematagoda Ela | Gabions |
| 5. Serpentine Scheme | |
| Drainage Area of Scheme | 2.16 km ² |
| Max. Discharge at Downstream End | 14.2 m ³ /sec |
| Total Length of Drainage | 1,877 m |
| Major Facilities | |
| (1) Open Drain (Serpentine Canal) | |
| Size and Length | Concrete Flume |
| | 4.00 m (W) x 1.60 m (H) 359 m |
| | Improvement of Existing Drain |
| | 4.50 m (W) x 1.60 m (H) 536 m |
| | 5.50 m (W) x 1.80 m (H) 185 m |
| | Gabion & Steel Sheet Pile |
| | 7.00 m (W) x 2.30 m (H) 354 m |
| (2) Box Culvert | |
| (Serpentine Canal Diversion Culvert) | |
| Size and Length | 2.00 m (W) x 1.75 m (H) 352 m |
| (3) Outfall to Dematagoda Ela | Gabion & Steel Sheet Pile |
| | 3.00 m (W) x 3.00 m (H) 91 m |

Table 2.9 Principal Features of GCFC&EIP Phase-III Schemes

| Item | Description |
|----------------------------------|--|
| 1. Kawdana Scheme | |
| Drainage Area of Scheme | |
| (1) Kawdana A | 0.960 km ² |
| (2) Kawdana B | 0.427 km ² |
| Kawdana C | 0.022 km ² |
| Max. Discharge at Downstream End | |
| (1) Kawdana A – Drainage K1 | 8.45 m ³ /sec |
| (2) Kawdana B – Drainage K2 | 1.66 m ³ /sec |
| (3) Kawdana B – Drainage K4 | 3.61 m ³ /sec |
| (4) Kawdana C – Drainage K3 | 0.38 m ³ /sec |
| Major Drainage Facilities | |
| (1) Open Channel Improvement | Masonry Wall Protection: 421 m |
| (2) Concrete Flume | 1,512 m |
| (3) Pipe Drains | 249 m, 750 – 1,500 mm dia. |
| (4) Side Drains | 5,538 m |
| (5) Manholes / Access Shafts | 8 nos. |
| (6) Improvement of Road Culverts | 4 nos. |
| (7) Improvement of Bridges | 3 nos. |
| (8) Penetration Macadam | 19,973 m ² |
| (9) Laterite Filling | 40,000 m ² |
| 2. Attidiya Scheme | |
| Drainage Area of Scheme | |
| (1) Attidiya A | 1.244 km ² |
| (2) Attidiya B | 0.061 km ² |
| (3) Attidiya C | 0.161 km ² |
| (4) Attidiya D | 0.502 km ² |
| (5) Attidiya E | 0.057 km ² |
| (6) Attidiya F | 0.067 km ² |
| (7) Attidiya G | 0.616 km ² |
| Max. Discharge at Downstream End | |
| (1) Attidiya A – Drainage A1 | 11.85 m ³ /sec |
| (2) Attidiya B – Drainage A2 | 0.79 m ³ /sec |
| (3) Attidiya C – Drainage A3 | 2.21 m ³ /sec |
| (4) Attidiya D – Drainage A4 | 5.92 m ³ /sec |
| (5) Attidiya E – Drainage A5 | 0.76 m ³ /sec |
| (6) Attidiya F – Drainage A6 | 10.83 m ³ /sec |
| (7) Attidiya G – Drainage A7 | 5.99 m ³ /sec |
| Major Drainage Facilities | |
| (1) Open Channel Improvement | Steel Sheet Pile Protection: 906 m Wet Masonry: 470 m |
| (2) Concrete Flume and Trough | 2,331 m |
| (3) Pipe Drains | 2,354 m, 750–1,500 mm dia. |
| (4) Side Drains | 18,820 m |
| (5) Box Culverts | 1,578 m 1,500 mm (H) x 1,500 mm (W) – 1,750 mm (H) x 3,750 mm (W) |
| (6) Manholes / Access Shafts | 84 nos. |
| (7) Improvement of Road Culverts | 2 nos. |
| (8) Improvement of Road Bridges | 8 nos. |
| (9) Improvement of Foot Bridges | 5 nos. |
| (10) Asphaltting | 3,698 m ² |
| (11) Penetration Macadam | 79,909 m ² |
| (12) Laterite Filling | 33,960 m ² |

Table 2.10 Principal Features of Lunawa Lake Environment Improvement and Community Development Project (1/2)

Component-I: Storm Water Drainage Improvement Component

| Item | Quantity & Description |
|--|--|
| (a) Storm Water Drainage Improvement Main/Secondary/Tertiary Drains Improvement (1) Length of Drainage Improvement <ul style="list-style-type: none"> Main Canals Secondary Canals Tertiary Drains Total | 6.7 km 4.2 km 76.4 km 87.3 km |
| (2) Major Work Item <ul style="list-style-type: none"> Earth canal Concrete channel Box culverts Steel sheet pile Flume with cover slab Side drains Contingency Reconstruction of bridges Rehabilitation of existing diversion Estimated dredging volume | 4.4 km (Main/Secondary) 5.4 km (Main/Secondary) 0.5 km (Secondary[diversion]) 0.6 km (Main/Secondary) 15.7 km (Tertiary) 48.7 km (Tertiary) 12.0 km (Tertiary) 11 bridges 1 L.S. (about 70,000m ³) |
| Lunawa Lake Dredging <ul style="list-style-type: none"> Location <ul style="list-style-type: none"> Estimated dredging volume Disposal area Work road | Outlets of Lunawa Ela (N1) and outlets of two main canals flowing into north lake (S1 &S2) About 35,000 m ³ Filling at southern most corner of the Lake L = About 700m |
| Sea Outfall Improvement <ul style="list-style-type: none"> Sand bar breaching: <ul style="list-style-type: none"> Provision of excavator | Maintain top of sand bars at about +1m (above MSL) on constant basis and excavate a flood release channel when heavy rains occur One unit of backhoe, long-arm type with dozer blade |
| Non-structural Measures | Dissemination of remaining flooding risks by hazard map etc. |
| (b) Construction of Resettlement Sites (1) No. of Relocates <ul style="list-style-type: none"> Households along downstream of Lunawa Ela and around Lake (USIP Survey) Extra assumed for other parts of main canals and secondary canals Total | 384 households 66 households (approximate estimate) 450 households |

Table 2.10 Principal Features of Lunawa Lake Environment Improvement and Community Development Project (2/2)

| Item | Quantity & Description |
|---|--|
| (2) Resettlement Sites <ul style="list-style-type: none"> Resettlement site No.1 (Badu Watte) Resettlement site No.2 (Dewata Mawatha) Resettlement site No.3 (Father's Land) Resettlement site No.4 (Mahajana Watte) Total | 2.0 acres for 90 houses 1.5 acres for 65 houses 1.5 acres for 65 houses 6.0 acres for 270 houses 11.0 acres for 470 houses |
| (c) Procurement of O/M Equipment | O/M equipments Survey equipments Vehicles |
| (d) Additional Field Survey and Investigations by SLLRDC | 1 L.S. |

Component-II: Community Development Component

| Item | Quantity & Description |
|--|--|
| (a) Resettlement Works | Survey House foundation Utility works |
| (b) Upgrading of Under-Served Settlements and Resettlement Sites No. of families subject to Upgrading Program <ul style="list-style-type: none"> Resettled communities: On-site upgrading Total | 450 families 441 families in selected 11 settlements 891 families |
| Infrastructure Development <ul style="list-style-type: none"> Drainage systems Solid waste management Wastewater disposal system Sewage disposal system Rehabilitation of internal roads | Construction of micro drains Provisions of waste disposal bins, composting barrels Construction of connections Construction of connections Repair of damaged roads |
| Procurement of equipments | |
| Institutional building | |

Note : Quantity & descriptions above will be revised at detail design stage

Source : JBIC ODA Special Assistance for Project Formation (SAPROF) for Lunawa Lake Environment Improvement and Community Development Project, 2001

Table 2.11 Responsibilities of Government Agencies Related to the Storm Water Drainage

| Related Agencies | | Planning | Land Reclamation | Dredging Canal Development | Land Acquisition | Shanty Relocation | Flooding Countermeasure | | | | | | | | | | | | | | |
|---|--|----------|-------------------|----------------------------|------------------|-------------------|-------------------------|------------------|------------------|-----------------|------------------|-------------------|----------|--------------|-----------------------------|----------------------------|------------|-------------------|---------------|----------------|-------------------------|
| | | Mapping | Physical Planning | Specific Planning | Approval | Construction | Operation & Management | Cadastral Survey | Land Acquisition | Land Alienation | Price Estimation | Land Registration | Planning | Coordination | Relocation Site Development | Infrastructure Development | Relocation | Flood Forecasting | Flood Warning | Flood Fighting | Flood Disaster Recovery |
| I. Central Government Agencies | | | | | | | | | | | | | | | | | | | | | |
| 1. Geographic Survey Agencies | | | | | | | | | | | | | | | | | | | | | |
| Survey Department, Min. of Land | | SVD | x | | | | | | | | | | | | | | | | | | |
| Land Use Policy Planning Div., Min. of Land | | LUPPD | x | | | | | | | | | | | | | | | | | | |
| 2. Planning Agencies | | | | | | | | | | | | | | | | | | | | | |
| National Physical Planning Department, Min. of Western Regional Development | | NPPD | x | x | | | | | | | | | | | | | | | | | |
| Urban Development Authority, Min. of Western Regional Development | | UDA | x | x | | x | x | | | | | | | | | | | | | | |
| 3. Executing Agencies for Water Management | | | | | | | | | | | | | | | | | | | | | |
| Sri Lanka Land Reclamation and Development Corporation, Min. of Housing and Plantation Infrastructure | | SLLRDC | | x | | x | x | x | | | | | | | | | | | | | |
| National Water Supply and Drainage Board, Min. of Housing and Plantation Infrastructure | | NWSDB | | x | | | | | | | | | | | | | | | | | |
| Irrigation Department, Min. of Irrigation and Water Management | | IRD | | x | | | | | | | | | | | | | | | | | |
| 4. Resettlement Agencies | | | | | | | | | | | | | | | | | | | | | |
| Urban Settlement Improvement Project, Min. of Urban Public Utilities | | USIP | | | | | | | | | | | | | | | | | | | |
| Urban Housing Division, NHDA, Min. of Housing and Plantation Infrastructure | | UHD | | | | | | | | | | | | | | | | | | | |
| 5. Regulatory Agencies | | | | | | | | | | | | | | | | | | | | | |
| Agrarian Development Department, Min. of Agriculture and Livestock | | ADD | | | | | | | | | | | | | | | | | | | |
| Central Environmental Agency, Min. of Environment and Natural Resources | | CEA | x | | | | | | | | | | | | | | | | | | |
| Coastal Conservation Department, Min. of Fisheries & Ocean Resources | | CCD | | x | | | | | | | | | | | | | | | | | |
| 6. Land Acquisition Related Agencies | | | | | | | | | | | | | | | | | | | | | |
| Min. of Land | | MOL | | | | | | | | | | | | | | | | | | | |
| 7. Other Related Agencies | | | | | | | | | | | | | | | | | | | | | |
| Road Development Authority, Min. of Highways | | RDA | | x | | | | | | | | | | | | | | | | | |
| Ceylon Electricity Board, Min. of Power and Energy | | CEB | | x | | | | | | | | | | | | | | | | | |
| Sri Lanka Railways, Min. of Transportation, Highway and Aviation | | SLR | | x | | | | | | | | | | | | | | | | | |
| Meteorological Department | | MLD | | | | | | | | | | | | | | | | | | | |
| II. Local Authorities, Min. of Home Affairs, Provincial Councils and Local Government | | | | | | | | | | | | | | | | | | | | | |
| Western Provincial Council | | WPC | | x | | | | | | | | | | | | | | | | | |
| Municipal Councils (Colombo, Dehiwala-Mt. Lavinia, Kotte, Moratuwa) | | MC | | x | | x | | | | | | | | | | | | | | | |
| Urban Councils | | UC | | x | | x | | | | | | | | | | | | | | | |
| Pradeshiva Sabha | | PS | | x | | x | | | | | | | | | | | | | | | |

Table 2.12 Local Authorities in Western Province and in the Study Area

| District | MC, UC, PS | Location | Area (km ²) | Population (1999) |
|-----------------|-------------------------------|-----------------------|-------------------------|-------------------|
| Colombo | | | 670.78 | 2,195,084 |
| 1) | MC: Colombo | Study Area | 37.21 | 642,000 |
| 2) | MC: Dehiwala Mt Lavinia | Study Area | 21.17 | 234,582 |
| 3) | MC: Sri Jayawardenapura Kotte | Study Area | 17.04 | 134,114 |
| 4) | MC: Moratuwa | Study Area | 23.34 | 177,100 |
| 5) | UC: Kolonnawa | Study Area | 10.06 | 61,000 |
| 6) | PS: Homagama | Study Area (a part) | 140.08 | 183,782 |
| 7) | PS: Kaduwela | Study Area (a part) | 87.69 | 192,614 |
| 8) | PS: Kesbewa | Study Area | 55.00 | 197,433 |
| 9) | PS: Kotikawatte/Mulleriyawa | Study Area | 29.63 | 113,296 |
| 10) | PS: Maharagama | Study Area | 21.86 | 111,091 |
| 11) | UC: Seethawakapura | Outside of Study Area | 19.40 | 32,299 |
| 12) | PS: Seethawaka | Outside of Study Area | 208.30 | 115,773 |
| Gampaha | | | 1,420.02 | 2,087,991 |
| 1) | UC: Gampaha | Study Area (a part) | 2.59 | 57,429 |
| 2) | UC: Ja-Ela | Study Area | 9.07 | 30,910 |
| 3) | UC: Peliyagoda | Study Area | 1.94 | 33,187 |
| 4) | UC: Wattala-Mobole | Study Area | 9.84 | 26,000 |
| 5) | PS: Biyagama | Study Area (a part) | 64.00 | 142,623 |
| 6) | PS: Gampaha | Study Area (a part) | 134.11 | 112,860 |
| 7) | PS: Minuwangoda | Study Area (a part) | 135.00 | 139,978 |
| 8) | PS: Katana | Study Area (a part) | 65.00 | 149,734 |
| 9) | PS: Ja Ela | Study Area | 63.08 | 153,606 |
| 10) | PS: Wattala | Study Area | 60.00 | 159,777 |
| 11) | PS: Kelaniya | Study Area | 21.90 | 143,851 |
| 12) | PS: Mahara | Study Area (a part) | 98.80 | 178,589 |
| 13) | MC: Negombo/Kochikade | Outside of Study Area | 30.08 | 171,004 |
| 14) | UC: Minuwangoda | Outside of Study Area | 4.40 | 9,071 |
| 15) | UC: Seeduwa-Katunayake | Outside of Study Area | 10.36 | 49,895 |
| 16) | PS: Attangagalla | Outside of Study Area | 151.08 | 138,229 |
| 17) | PS: Divulapitiya | Outside of Study Area | 193.67 | 130,341 |
| 18) | PS: Dompe | Outside of Study Area | 178.50 | 130,195 |
| 19) | PS: Mirigama | Outside of Study Area | 186.60 | 130,712 |
| Kalutara | | | 1,535.30 | 1,022,736 |
| 1) | UC: Horana | Study Area (a part) | 4.53 | 18,080 |
| 2) | UC: Panadura | Study Area | 5.80 | 40,501 |
| 3) | PS: Panadura | Study Area | 59.62 | 129,547 |
| 4) | PS: Horana | Study Area (a part) | 90.62 | 81,377 |
| 5) | PS: Bandaragama | Study Area (a part) | 93.20 | 105,055 |
| 6) | PS: Kalutara | Study Area (a part) | 98.50 | 88,920 |
| 7) | PS: Dodangoda | Study Area (a part) | 115.03 | 61,010 |
| 8) | UC: Kalutara | Outside of Study Area | 12.94 | 40,000 |
| 9) | UC: Beruwala | Outside of Study Area | 5.18 | 32,300 |
| 10) | PS: Beruwala | Outside of Study Area | 65.78 | 111,198 |
| 11) | PS: Mathugama | Outside of Study Area | 134.10 | 72,872 |
| 12) | PS: Bulathsinhala | Outside of Study Area | 278.40 | 94,880 |
| 13) | PS: Agalawatta | Outside of Study Area | 361.00 | 92,050 |
| 14) | PS: Walallawita | Outside of Study Area | 210.60 | 54,946 |

Note:

MC: Municipal Council, UC: Urban Council,
 PS: Pradeshiya Sabhas (former Town Council and Village Council considered as rural area)
 Area and Population are indicated for the entire area of each local government.

Source: Local Authority, Western Provincial Council

Table 2.13 List of Statutes on Storm Water Drainage Sector and Relevant Agencies

| Acts, Law and Ordinances | Relevant Agencies | Main Objectives |
|---|-------------------|--|
| Land Tenure | | |
| 1) State Lands Encroachments Ordinance | MOL | Regulation to protect all State land from encroachment by unauthorized possession or occupation |
| 2) State Lands Ordinance | MOL | Regulation to preserve and use all State lands for public purposes |
| 3) State Land (Recovery of Possession) Act | MOL | Recovery of all State lands from parties in unauthorized possession or occupation |
| 4) Land Acquisition Act | MOL | Acquisition of any lands for the public purposes |
| Land Use | | |
| 1) National Environment Act | CEA | Regulation of land use to preserve environment in any declared areas |
| 2) Agrarian Services Act | ADD | Regulation for maximum utilization of agricultural land for agricultural production |
| Water Management | | |
| 1) Colombo District (Low-lying Areas) Reclamation and Development Board Act | SLLRDC | Reclamation and development of a low-lying, marshy, waste or swampy area |
| 2) Irrigation Ordinance | IRD | Responsibility to undertake irrigation and drainage works and conservation of catchments of rivers |
| 3) Flood Protection Ordinance | IRD | Flood protection for the areas declared as flooding areas |
| Urban Development | | |
| 1) Urban Development Authority Law | UDA | Development and implementation of the physical plan of urban development areas |
| Local Authority | | |
| 1) Municipal Councils Ordinance | MC | Functions and operations of Municipal Council |
| 2) Urban Council Ordinance | UC | Functions and operations of Urban Council |
| 3) Pradeshiya Sabhas Act | PS | Functions and operations of Pradeshiya Sabha |

Table 2.14 Regional Offices of SLLRDC

| Name of Regional Office | Region Covered | Canals in the Coverage |
|-------------------------------|--|--|
| Colombo North Office | Northern Colombo canals Hamilton Canal area | St. Sebastian, Kolonnawa Ela North, Dematagoda, Main Drain, Mahawatta Ela, Dematagoda scheme, St. Sebastian scheme, Serpentine scheme |
| Kirimandara Mawatha Office | Central Colombo canals, Kotte and Parliament lake areas, Madiwela East | Kolonnawa Ela South, Kotte North and South, Heen Ela, Torrington, Torrington North and South, Parliament lake, Torrington West |
| Colombo South Office | Southern Colombo canals, part of Bolgoda canal | Dehiwala, Wellawatta, Kirillapone, Bolgoda canal north, Bhatiya Mawatha canal, Unity Place scheme |
| Attidiya Office | New development area at Attidiya, part of Bolgoda canal | Bolgoda canal south |

Note :

Scheme : Storm water drainage system in CMC constructed under GCFC&EIP-Phase 2

Source : GCFC&EIP Phase II, O&M Manual

Table 2.15 Summary of Aid Disbursements by Donor/Creditor 2000**(Unit: million Rs)**

| Donor | Capital Aid | | | | | | | | | | | | Technical Aid | Total | Percent (%) |
|---------------------|-------------|---------|-----------|--------|-----------|--------|-------|--------|-----------------|--------|----------|---------|---------------|----------|-------------|
| | Project | | Programme | | Commodity | | Food | | Good & Services | | Total | | | | |
| | Loans | Grants | Loans | Grants | Loans | Grants | Loans | Grants | Loans | Grants | Loans | Grants | | | |
| 01.Bilateral | 16,604.8 | 2,683.8 | 0.0 | 218.8 | 5.4 | 34.8 | 385.4 | 0.0 | 0.0 | 549.8 | 16,995.6 | 3,487.2 | 1,063.5 | 21,546.3 | 64.8 |
| Australia | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.0 | 18.1 | 27.1 | 0.1 |
| Canada | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 42.5 | 42.5 | 0.1 |
| China | 27.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 27.6 | 0.0 | 0.0 | 27.6 | 0.1 |
| France | 181.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 181.4 | 0.0 | 0.0 | 181.4 | 0.5 |
| Germany | 1,604.3 | 256.4 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1,608.7 | 256.4 | 312.4 | 2,177.5 | 6.6 |
| Japan | 13,861.8 | 2,052.8 | 0.0 | 0.0 | 0.0 | 34.8 | 0.0 | 0.0 | 0.0 | 549.8 | 13,861.8 | 2,637.4 | 0.0 | 16,499.2 | 49.6 |
| Kuwait Fund | 106.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 106.0 | 0.0 | 0.0 | 106.0 | 0.3 |
| Korea | 766.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 766.0 | 0.0 | 0.0 | 766.0 | 2.3 |
| Netherlands | 0.0 | 86.6 | 0.0 | 110.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 196.7 | 0.0 | 196.7 | 0.6 |
| New Zealand | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 16.0 | 16.0 | 0.0 |
| Norway | 0.0 | 150.2 | 0.0 | 82.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 232.8 | 60.6 | 293.4 | 0.9 |
| Sweden | 0.0 | 37.5 | 0.0 | 26.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 63.6 | 177.4 | 241.0 | 0.7 |
| Saudi Fund | 57.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 57.7 | 0.0 | 0.0 | 57.7 | 0.2 |
| U.K. | 0.0 | 12.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.8 | 300.7 | 313.5 | 0.9 |
| U.S.A. | 0.0 | 78.5 | 0.0 | 0.0 | 0.0 | 0.0 | 385.4 | 0.0 | 0.0 | 0.0 | 385.4 | 78.5 | 135.8 | 599.7 | 1.8 |
| India | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| 02.Multilateral | 9,715.0 | 163.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 66.2 | 0.0 | 0.0 | 9,715.0 | 229.2 | 883.1 | 10,827.3 | 32.6 |
| ADB | 5,757.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5,757.1 | 0.0 | 451.2 | 6,208.3 | 18.7 |
| IDA | 3,576.9 | 95.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3,576.9 | 95.8 | 0.8 | 3,673.5 | 11.1 |
| IBRD | 0.0 | 67.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 67.2 | 22.4 | 89.6 | 0.3 |
| IFAD | 332.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 332.0 | 0.0 | 0.8 | 332.8 | 1.0 |
| WFP | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 66.2 | 0.0 | 0.0 | 0.0 | 66.2 | 0.0 | 66.2 | 0.2 |
| UNDP | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 403.3 | 403.3 | 1.2 |
| NORDIC Fund | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FAO | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.6 | 4.6 | 0.0 |
| OPEC | 49.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 49.0 | 0.0 | 0.0 | 49.0 | 0.1 |
| 03.Commercial Banks | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 04.Export Credit | 863.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 863.9 | 0.0 | 0.0 | 863.9 | 2.6 |
| Total | 27,183.7 | 2,846.8 | 0.0 | 218.8 | 5.4 | 34.8 | 385.4 | 66.2 | 0.0 | 549.8 | 27,574.5 | 3,716.4 | 1,946.6 | 33,237.5 | 100.0 |

Note: *USD equivalents are calculated at year-end rate.

*1 US\$ = Rs 80.0098

Source: Foreign Aid Review Sri Lanka 2000, External Resources Department, Ministry of Finance and Planning

Table 2.16 Aid Disbursements by Sector

(Unit: million US\$)

| Sector | 1996 | 1997 | 1998 | 1999 | 2000 | Average | Percent(%) |
|-------------------------------------|-------|-------|-------|-------|-------|---------|------------|
| 01. Agriculture | 89.9 | 98.8 | 107.0 | 83.1 | 65.1 | 88.8 | 15.8 |
| 1.1 Agriculture | 29.8 | 19.8 | 12.6 | 14.8 | 11.5 | 17.7 | 3.2 |
| 1.2 Forestry | 8.9 | 5.6 | 2.7 | 4.5 | 0.7 | 4.5 | 0.8 |
| 1.3 Fisheries & Aquatics Resources | 4.6 | 6.2 | 5.1 | 5.6 | 3.9 | 5.1 | 0.9 |
| 1.4 Livestock Development | 1.3 | 0.3 | 0.6 | 0.4 | 0.0 | 0.5 | 0.1 |
| 1.5 Land & Irrigation | 17.5 | 22.6 | 38.4 | 13.8 | 8.1 | 20.1 | 3.6 |
| 1.6 Plantation | 11.0 | 23.0 | 24.0 | 26.7 | 23.8 | 21.7 | 3.9 |
| 1.7 Rural Development | 16.8 | 21.3 | 23.6 | 17.3 | 17.1 | 19.2 | 3.4 |
| | | | | | | | |
| 02. Economic Infrastructure | 204.6 | 162.9 | 243.3 | 167.2 | 189.1 | 193.4 | 34.5 |
| 2.1 Air Transport | 0.0 | 0.0 | 0.0 | 0.5 | 1.8 | 0.5 | 0.1 |
| 2.2 Communication | 43.7 | 21.7 | 47.6 | 50.9 | 55.6 | 43.9 | 7.8 |
| 2.3 Ground Transport | 60.7 | 58.0 | 53.8 | 42.1 | 43.7 | 51.7 | 9.2 |
| 2.4 Ports & Shipping | 49.0 | 16.1 | 49.8 | 4.8 | 9.1 | 25.8 | 4.6 |
| 2.5 Power & Energy | 51.2 | 67.1 | 92.1 | 68.9 | 78.9 | 71.6 | 12.8 |
| | | | | | | | |
| 03. Social Infrastructure | 133.6 | 128.1 | 118.2 | 105.7 | 68.4 | 110.8 | 19.8 |
| 3.1 Education & Vocational Training | 35.9 | 28.7 | 41.5 | 40.4 | 32.7 | 35.8 | 6.4 |
| 3.2 Health | 11.4 | 13.1 | 32.8 | 17.1 | 10.2 | 16.9 | 3.0 |
| 3.3 Housing & Urban Dev. | 19.9 | 24.1 | 10.1 | 4.5 | 2.1 | 12.1 | 2.2 |
| 3.4 Rehabilitation | 10.2 | 15.0 | 6.0 | 9.2 | 2.1 | 8.5 | 1.5 |
| 3.5 Social Welfare | 9.6 | 9.4 | 0.5 | 0.5 | 0.6 | 4.1 | 0.7 |
| 3.6 Water Supply & Sewerage | 46.6 | 37.8 | 27.3 | 34.0 | 20.7 | 33.3 | 5.9 |
| | | | | | | | |
| 04. Finance & Planning | 70.2 | 43.0 | 134.6 | 13.8 | 103.6 | 73.0 | 13.0 |
| 4.1 Balance of Payment | 29.0 | 20.2 | 115.5 | 6.6 | 101.9 | 54.6 | 9.7 |
| 4.2 Finance & Banking | 41.2 | 22.8 | 19.1 | 7.2 | 1.7 | 18.4 | 3.3 |
| | | | | | | | |
| 05. Industrial Development | 25.3 | 8.8 | 13.9 | 6.3 | 2.5 | 11.4 | 2.0 |
| | | | | | | | |
| 06. Private Sector Development | 7.0 | 54.3 | 24.6 | 26.2 | 39.9 | 30.4 | 5.4 |
| | | | | | | | |
| 07. Cultural Activities | 1.5 | 0.0 | 0.0 | 0.4 | 0.1 | 0.4 | 0.1 |
| | | | | | | | |
| 08. Defense | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 |
| | | | | | | | |
| 09. Environment | 20.2 | 30.7 | 29.1 | 33.7 | 23.6 | 27.5 | 4.9 |
| | | | | | | | |
| 10. General | 38.6 | 12.5 | 7.0 | 12.2 | 10.2 | 16.1 | 2.9 |
| | | | | | | | |
| 11. Others | 7.9 | 3.8 | 15.1 | 8.4 | 9.7 | 9.0 | 1.6 |
| | | | | | | | |
| Total | 599.7 | 542.9 | 692.9 | 457.0 | 512.2 | 560.9 | 100.0 |

Source: Foreign Aid Review Sri Lanka 2000, External Resources Department, Ministry of Finance and Planning

Table 2.17 Basic Principles for Aid of Major Donors

| Donor (Agency) | Basic Principle for Aid |
|-----------------------|--|
| Japan (JBIC, JICA) | (JBIC's) - Economic and social infrastructure development - Human resources development - Industrial development - Project targeting improvement of poverty population (JICA's) - Human resources development - Improving health and medical services - Building and improving economic infrastructure - Development of manufacturing industries - Development of agriculture, forestry and fisheries |
| ADB | - Policy and institutional reforms to promote private sector development and improved public sector management - Human development to address the gap in marketable skills and thereby improve employment and income levels - Enhancement of the country's infrastructure endowment through public and private investment - Preservation of the country's natural resource base - Measures to mitigate the social and environmental impact of the transition to a higher growth path |
| WB | - Ending the conflict - Protecting human development achievements - Improving government effectiveness - Making way for the private sector - Reforming the financial sector - Boosting agricultural productivity - Protecting Natural Resources - Engaging communities for improved results |
| Germany (GTZ) | - Regional development - Social welfare targeted to plantation sector - Environmental protection - Private sector development - Promotion of peace, reconciliation and democracy |
| USA (USAID) | - Policy and regulatory reforms in financial markets and trade and investment systems - Building democracy, addressing local government issue and better protection of citizens rights in law and practice - Humanitarian assistance - Food assistance |
| EC | - Rehabilitation of medium size irrigation schemes - Women and development - Training and institutional building - Protection of human rights - Rural employment generation - Environment and natural resources improvement - Rural electrification - Community water supply - Humanitarian and emergency assistance |
| Sweden (SIDA) | - Rural development through regional business and enterprise development - Research cooperation - Support to development of information technology facilities in Universities - Infrastructure development - Private sector development - Humanitarian assistance - Human resources development |

Source: Foreign Assistance towards Rapid Development in Sri Lanka 1995-1999, Ministry of Finance and Planning

Table 3.1 Flood Inundation Area by Land Use Category**1. Attanagalu Oya Basin**

(Unit : ha)

| Return Period | Land Use Condition | Land Use Category | | | | | Total |
|---------------|--------------------|-------------------|----------------|-------|-------|-------------|--------------|
| | | Urbanized | Semi-urbanized | Rural | Paddy | Marsh/Water | |
| 2-year | Present | 4 | 0 | 340 | 769 | 1,205 | 2,317 |
| | Future | 0 | 0 | 324 | 681 | 1,205 | 2,210 |
| 5-year | Present | 14 | 1 | 514 | 1,080 | 1,205 | 2,814 |
| | Future | 14 | 1 | 500 | 993 | 1,205 | 2,712 |
| 10-year | Present | 15 | 1 | 656 | 1,266 | 1,213 | 3,150 |
| | Future | 14 | 1 | 637 | 1,177 | 1,213 | 3,041 |
| 25-year | Present | 15 | 2 | 892 | 1,846 | 1,213 | 3,968 |
| | Future | 15 | 3 | 876 | 1,750 | 1,213 | 3,856 |
| 50-year | Present | 21 | 3 | 1,095 | 2,271 | 1,213 | 4,602 |
| | Future | 21 | 3 | 1,070 | 2,150 | 1,213 | 4,456 |

2. Kalu Oya Basin

(Unit : ha)

| Return Period | Land Use Condition | Land Use Category | | | | | Total |
|---------------|--------------------|-------------------|----------------|-------|-------|-------------|------------|
| | | Urbanized | Semi-urbanized | Rural | Paddy | Marsh/Water | |
| 2-year | Present | 8 | 4 | 61 | 210 | 137 | 419 |
| | Future | 29 | 16 | 64 | 176 | 73 | 357 |
| 5-year | Present | 26 | 9 | 88 | 261 | 137 | 522 |
| | Future | 31 | 18 | 74 | 208 | 73 | 404 |
| 10-year | Present | 26 | 15 | 106 | 302 | 137 | 585 |
| | Future | 38 | 20 | 84 | 233 | 73 | 448 |
| 25-year | Present | 26 | 15 | 116 | 339 | 137 | 634 |
| | Future | 55 | 25 | 97 | 278 | 73 | 528 |
| 50-year | Present | 28 | 18 | 133 | 379 | 137 | 694 |
| | Future | 55 | 28 | 115 | 306 | 73 | 577 |

3. Greater Colombo Basin

(Unit : ha)

| Return Period | Land Use Condition | Land Use Category | | | | | Total |
|---------------|--------------------|-------------------|----------------|-------|-------|-------------|--------------|
| | | Urbanized | Semi-urbanized | Rural | Paddy | Marsh/Water | |
| 2-year | Present | 14 | 10 | 93 | 36 | 278 | 430 |
| | Future | 15 | 32 | 90 | 40 | 292 | 469 |
| 5-year | Present | 22 | 20 | 158 | 88 | 343 | 631 |
| | Future | 43 | 45 | 156 | 122 | 373 | 739 |
| 10-year | Present | 34 | 27 | 215 | 132 | 407 | 814 |
| | Future | 68 | 54 | 225 | 150 | 436 | 932 |
| 25-year | Present | 67 | 38 | 302 | 174 | 470 | 1,050 |
| | Future | 103 | 66 | 307 | 196 | 510 | 1,181 |
| 50-year | Present | 110 | 54 | 401 | 209 | 528 | 1,302 |
| | Future | 150 | 83 | 405 | 231 | 542 | 1,411 |

4. Bolgoda Basin

(Unit : ha)

| Return Period | Land Use Condition | Land Use Category | | | | | Total |
|---------------|--------------------|-------------------|----------------|-------|-------|-------------|--------------|
| | | Urbanized | Semi-urbanized | Rural | Paddy | Marsh/Water | |
| 2-year | Present | 0 | 4 | 527 | 1,888 | 1,302 | 3,720 |
| | Future | 6 | 11 | 555 | 1,897 | 1,301 | 3,769 |
| 5-year | Present | 0 | 5 | 629 | 2,295 | 1,311 | 4,240 |
| | Future | 17 | 19 | 698 | 2,270 | 1,309 | 4,314 |
| 10-year | Present | 6 | 9 | 698 | 2,565 | 1,317 | 4,595 |
| | Future | 20 | 24 | 782 | 2,503 | 1,318 | 4,647 |
| 25-year | Present | 7 | 16 | 787 | 2,835 | 1,321 | 4,965 |
| | Future | 24 | 31 | 876 | 2,712 | 1,325 | 4,966 |
| 50-year | Present | 7 | 20 | 867 | 3,019 | 1,328 | 5,241 |
| | Future | 27 | 34 | 948 | 2,882 | 1,334 | 5,224 |

Table 4.1 Estimated Urban Population of the CMR Based on Assumed Growth Rate (1996-2010)

| Urban Centers | Area (ha) | Population (1996) (person) | | | Growth Rate (%) | Projected Population (person) | | |
|------------------------|-----------|----------------------------|----------------|-------------------|-----------------|-------------------------------|------------------|------------------|
| | | Core Area | Growth Area | Other Urban Areas | | 2000 | 2005 | 2010 |
| Colombo (15) | | | | | | | | |
| Avissawella | 2,237 | | | 75,300 | 3.38 | 86,008 | 101,560 | 119,924 |
| Hanwella | 330 | | | 1,100 | 1.88 | 1,185 | 1,301 | 1,428 |
| Colombo | 4,020 | 638,700 | | | 1.38 | 674,693 | 722,549 | 773,800 |
| Homagama | 1,000 | | 175,000 | | 3.02 | 197,117 | 228,735 | 265,424 |
| Padukka | | | | | | | | |
| Battaramulla-Talangama | 3,195 | 122,546 | | | 2.68 | 136,221 | 155,479 | 177,460 |
| Kaduwela | | | | | | | | |
| Piliyandala | 3,817 | 97,225 | | | 2.68 | 108,074 | 123,353 | 140,793 |
| Kolonnawa | 2,440 | 65,000 | | | 1.68 | 69,479 | 75,515 | 82,075 |
| Kotikawatta | | 60,400 | | | 1.68 | 64,562 | 70,171 | 76,267 |
| Mulleriyawa | | 44,000 | | | 1.68 | 47,032 | 51,118 | 55,558 |
| Moratuwa | 1,990 | | | 190,400 | 2.38 | 209,184 | 235,290 | 264,654 |
| Dehiwala Mt Lavinia | 2,107 | | | 225,000 | 1.88 | 242,403 | 266,062 | 292,030 |
| Kotte | 5,990 | 125,000 | | | 2.68 | 138,948 | 158,593 | 181,014 |
| Maharagama | | 75,000 | | | 2.68 | 83,369 | 95,156 | 108,608 |
| Gampaha (22) | | | | | | | | |
| Veyangoda/Nittambuwa | | | | | | | | |
| Biyagama | 1,000 | | 200,000 | | 3.02 | 225,277 | 261,411 | 303,341 |
| Divulapitiya | 522 | | | 6,025 | 1.68 | 6,440 | 7,000 | 7,608 |
| Kotadeniyawa | 200 | | | 2,330 | 1.68 | 2,491 | 2,707 | 2,942 |
| Gampaha | 9,500 | | 150,000 | | 4.30 | 177,512 | 219,104 | 270,440 |
| Ja-Ela | 7,920 | | | 50,000 | 1.88 | 53,867 | 59,125 | 64,896 |
| Ekala | 305 | | | 4,290 | 1.88 | 4,622 | 5,073 | 5,568 |
| Kandana | | | | 44,500 | 1.68 | 47,567 | 51,699 | 56,190 |
| Regama | | | | 47,000 | 1.68 | 50,239 | 54,603 | 59,347 |
| Seeduwa-Katunayake | | | | | | | | |
| Peliyagoda | 2,220 | | | 29,700 | 1.48 | 31,498 | 33,899 | 36,482 |
| Dalugama | | | | 57,000 | 1.88 | 61,409 | 67,402 | 73,981 |
| Kelaniya | | | | 43,000 | 1.88 | 46,326 | 50,847 | 55,810 |
| Kadawatha | | | | | | | | |
| Minuwangoda | 990 | | | 13,930 | 1.88 | 15,007 | 16,472 | 18,080 |
| Mirigama | | | | | | | | |
| Negombo | 10,500 | | 275,000 | | 4.18 | 323,944 | 397,550 | 487,881 |
| Kochikade | | | | | | | | |
| Wattala-Mobole | 4,620 | | | 35,300 | 1.38 | 37,289 | 39,934 | 42,767 |
| Hendala | | | | 55,500 | 1.38 | 58,628 | 62,786 | 67,240 |
| Welisara | | | | 37,500 | 1.38 | 39,613 | 42,423 | 45,432 |
| Pugoda | 401 | | | 6,027 | 1.38 | 6,367 | 6,818 | 7,302 |
| Kirindiwela | 575 | | | 8,046 | 1.88 | 8,668 | 9,514 | 10,443 |
| Kalutara (13) | | | | | | | | |
| Agalawatta | 138 | | | 3,040 | 1.54 | 3,232 | 3,488 | 3,765 |
| Bandaragama | | | | | | | | |
| Beruwala | 4,107 | | | 75,000 | 1.38 | 79,226 | 84,846 | 90,864 |
| Aluthgama | | | | 24,000 | 1.38 | 25,352 | 27,151 | 29,077 |
| Dharga Town | | | | 30,000 | 1.38 | 31,691 | 33,938 | 36,346 |
| Bulathsinhala | 250 | | | 2,990 | 1.68 | 3,196 | 3,474 | 3,775 |
| Horana | 7,500 | | 75,000 | | 3.45 | 85,898 | 101,774 | 120,584 |
| Ingiriya | 190 | | | 2,290 | 1.88 | 2,467 | 2,708 | 2,972 |
| Kalutara | 2,520 | | | 84,202 | 1.38 | 88,947 | 95,256 | 102,013 |
| Matugama | 652 | | | 17,138 | 1.88 | 18,464 | 20,266 | 22,244 |
| Panadura | 2,100 | | | 55,000 | 1.38 | 58,099 | 62,220 | 66,634 |
| Keselwatte | | | | 60,000 | 1.38 | 63,381 | 67,877 | 72,691 |
| Wadduwa | | | | 26,200 | 1.38 | 27,676 | 29,640 | 31,742 |
| Total | | 1,227,871 | 875,000 | 1,311,808 | | 3,742,669 | 4,205,886 | 4,737,491 |

Source: CMR Structural Plan

Table 4.2 List of Current UDA Declared Area

| |
|--|
| 1. Colombo District |
| 1) All the Colombo district declared under UDA |
| 2. Gampaha District |
| 1) Negombo Municipal Council |
| 2) Gampaha Urban Council |
| 3) Minuwangoda Urban Council |
| 4) Ja Ela Urban Council |
| 5) Part of Gampaha Pradeshiya Sabha (all the villages of Indigolla, Weediyawatta, Kehelwatugoda, Galthorummulla, Henpitamulla, Miriswatta, Kahadamulla, Bandarawatta. Falling within parts of GN Divisions of Mahipalagoda (230), Yakkala (231), Henarathgoda (232), Bendiyamulla (234), and Gampaha Aluthgama (225/227) |
| 6) Part of Ja Ela Pradeshiya Sabha (Ragama T.C.) |
| 7) Part of Mirigama Pradeshiya Sabha |
| 8) Part of Divulapitiya Pradeshiya Sabha |
| 9) Dankotuwa |
| 10) GN Division of 246- Kendaliyadda Palua of Mahara Divisional Secretary |
| 11) Dandugamperuwa |
| 12) Part of Wattala Pradeshiya Sabha |
| 3. Kalutara District |
| 1) Kalutara Urban Council |
| 2) Beruwala Urban Council |
| 3) Panadura Urban Council |
| 4) Horana Urban Council |
| 5) Coastal zone covered the following sub units (Kalutara, Bedda, Malewana, Payagala, Wskaduwa, Keselwatta, Aluthgama, Wadduwa) |
| 6) Matugama |
| 7) Dodangoda |

Note: Number in parenthesis indicates the number of DN Division

Source: Redefining Urban Centers and Urbanization in Sri Lanka 2001

Table 4.3 Extent of Retention Area and Water Level in Ja Ela Basin (1/3)

Planning Scale: 50-year Return Period

Retention Area 1,357+376 ha
Delimitation Level 4.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0 | 1.65 | 1.58 | 3.51 |
| J1 | 1.47 | 1.47 | 3.40 |
| J2 | 1.35 | 1.46 | 3.35 |
| J3 | 1.30 | 1.45 | 3.31 |
| J4 | 1.49 | 1.55 | 3.19 |
| J5 | 1.26 | 1.44 | 3.28 |
| J6 | 1.17 | 1.40 | 3.21 |

Retention Area 948+376 ha
Delimitation Level 3.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-a | 1.69 | 1.65 | 3.61 |
| J1-a | 1.51 | 1.53 | 3.49 |
| J2-a | 1.39 | 1.52 | 3.44 |
| J3-a | 1.34 | 1.50 | 3.40 |
| J4-a | 1.52 | 1.60 | 3.25 |
| J5-a | 1.29 | 1.49 | 3.36 |
| J6-a | 1.19 | 1.46 | 3.29 |

Retention Area 572+376 ha
Delimitation Level 2.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-b | 1.76 | 1.73 | 3.70 |
| J1-b | 1.57 | 1.61 | 3.57 |
| J2-b | 1.44 | 1.59 | 3.52 |
| J3-b | 1.38 | 1.58 | 3.47 |
| J4-b | 1.58 | 1.66 | 3.31 |
| J5-b | 1.33 | 1.58 | 3.46 |
| J6-b | 1.23 | 1.52 | 3.35 |

Retention Area 237+376 ha
Delimitation Level 1.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-c | 1.82 | 1.84 | 3.79 |
| J1-c | 1.62 | 1.70 | 3.65 |
| J2-c | 1.49 | 1.68 | 3.59 |
| J3-c | 1.43 | 1.66 | 3.53 |
| J4-c | 1.62 | 1.73 | 3.36 |
| J5-c | 1.38 | 1.64 | 3.49 |
| J6-c | 1.28 | 1.60 | 3.40 |

Table 4.3 Extent of Retention Area and Water Level in Ja Ela Basin (2/3)

Planning Scale: 25-year Return Period

Retention Area 1,357+376 ha
Delimitation Level 4.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0 | 1.47 | 1.43 | 3.24 |
| J1 | 1.36 | 1.40 | 3.19 |
| J2 | 1.34 | 1.40 | 3.18 |
| J3 | 1.33 | 1.39 | 3.17 |
| J4 | 1.37 | 1.48 | 2.98 |
| J5 | 1.31 | 1.39 | 3.17 |
| J6 | 1.25 | 1.37 | 3.14 |

Retention Area 948+376 ha
Delimitation Level 3.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-a | 1.50 | 1.47 | 3.31 |
| J1-a | 1.38 | 1.44 | 3.26 |
| J2-a | 1.36 | 1.44 | 3.26 |
| J3-a | 1.35 | 1.43 | 3.24 |
| J4-a | 1.39 | 1.51 | 3.03 |
| J5-a | 1.33 | 1.43 | 3.23 |
| J6-a | 1.38 | 1.49 | 3.30 |

Retention Area 572+376 ha
Delimitation Level 2.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-b | 1.56 | 1.54 | 3.39 |
| J1-b | 1.43 | 1.51 | 3.33 |
| J2-b | 1.41 | 1.50 | 3.32 |
| J3-b | 1.39 | 1.49 | 3.31 |
| J4-b | 1.44 | 1.56 | 3.08 |
| J5-b | 1.38 | 1.49 | 3.30 |
| J6-b | 1.31 | 1.46 | 3.27 |

Retention Area 237+376 ha
Delimitation Level 1.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-c | 1.63 | 1.64 | 3.48 |
| J1-c | 1.48 | 1.59 | 3.41 |
| J2-c | 1.46 | 1.58 | 3.39 |
| J3-c | 1.44 | 1.58 | 3.38 |
| J4-c | 1.48 | 1.62 | 3.13 |
| J5-c | 1.38 | 1.49 | 3.30 |
| J6-c | 1.36 | 1.54 | 3.33 |

Table 4.3 Extent of Retention Area and Water Level in Ja Ela Basin (3/3)

Planning Scale: 10-year Return Period

Retention Area 1,357+376 ha
Delimitation Level 4.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0 | 1.25 | 1.22 | 2.83 |
| J1 | 1.17 | 1.20 | 2.80 |
| J2 | 1.15 | 1.20 | 2.79 |
| J3 | 1.14 | 1.19 | 2.79 |
| J4 | 1.18 | 1.25 | 2.61 |
| J5 | 1.13 | 1.19 | 2.78 |
| J6 | 1.08 | 1.17 | 2.76 |

Retention Area 948+376 ha
Delimitation Level 3.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-a | 1.26 | 1.24 | 2.87 |
| J1-a | 1.17 | 1.21 | 2.83 |
| J2-a | 1.16 | 1.21 | 2.83 |
| J3-a | 1.15 | 1.21 | 2.82 |
| J4-a | 1.18 | 1.26 | 2.63 |
| J5-a | 1.14 | 1.20 | 2.81 |
| J6-a | 1.09 | 1.19 | 2.79 |

Retention Area 572+376 ha
Delimitation Level 2.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-b | 1.29 | 1.28 | 2.94 |
| J1-b | 1.20 | 1.26 | 2.90 |
| J2-b | 1.19 | 1.25 | 2.89 |
| J3-b | 1.18 | 1.25 | 2.88 |
| J4-b | 1.21 | 1.30 | 2.67 |
| J5-b | 1.17 | 1.24 | 2.88 |
| J6-b | 1.11 | 1.22 | 2.85 |

Retention Area 237+376 ha
Delimitation Level 1.0 m above MSL

| Case | Water Level (above MSL) | | |
|------|-------------------------|--------------|----------------|
| | Ja Ela | Dandugam Oya | Retention Area |
| J0-c | 1.34 | 1.37 | 3.02 |
| J1-c | 1.24 | 1.34 | 2.97 |
| J2-c | 1.23 | 1.33 | 2.96 |
| J3-c | 1.21 | 1.32 | 2.96 |
| J4-c | 1.24 | 1.35 | 2.72 |
| J5-c | 1.20 | 1.32 | 2.95 |
| J6-c | 1.15 | 1.30 | 2.92 |

Table 4.4 Extent of Retention Area and Water Level in Kalu Oya Basin

Planning Scale: 50-year Return Period

| Case | Retention Area 434+89 ha | Retention Area 357+89 ha | Retention Area 250+89 ha | Retention Area 131+89 ha |
|------|---|-----------------------------|-----------------------------|-----------------------------|
| | Average Water Level in Retention Area (above MSL) | | | |
| K0 | 2.15 | 2.05 | 2.16 | 2.42 |
| K11 | 1.72 | 1.77 | 1.85 | 2.07 |
| K12 | 1.67 | 1.72 | 1.79 | 1.99 |
| K13 | 1.64 | 1.68 | 1.74 | 1.92 |
| K14 | 1.59 | 1.63 | 1.70 | 1.88 |
| K15 | 1.58 | 1.65 | 1.80 | 2.06 |
| K16 | 1.62 | 1.66 | 1.75 | 1.94 |
| K17 | 1.70 | 1.75 | 1.83 | 2.04 |
| K18 | 1.69 | 1.73 | 1.81 | 2.02 |
| K19 | 1.52 | 1.56 | 1.61 | 1.74 |
| K20 | 1.34 | 1.41 | 1.50 | 1.72 |

Note: K0 indicates the case under present drainage system.

Planning Scale: 25-year Return Period

| Case | Retention Area 434+89 ha | Retention Area 357+89 ha | Retention Area 250+89 ha | Retention Area 131+89 ha |
|------|---|-----------------------------|-----------------------------|-----------------------------|
| | Average Water Level in Retention Area (above MSL) | | | |
| K0 | 1.85 | 1.92 | 2.03 | 2.25 |
| K11 | 1.63 | 1.67 | 1.74 | 1.92 |
| K12 | 1.59 | 1.63 | 1.69 | 1.85 |
| K13 | 1.55 | 1.59 | 1.65 | 1.80 |
| K14 | 1.52 | 1.55 | 1.60 | 1.76 |
| K15 | 1.40 | 1.46 | 1.59 | 1.88 |
| K16 | 1.54 | 1.58 | 1.64 | 1.81 |
| K17 | 1.61 | 1.65 | 1.72 | 1.90 |
| K18 | 1.58 | 1.63 | 1.70 | 1.87 |
| K19 | 1.44 | 1.48 | 1.53 | 1.65 |

Note: K0 indicates the case under present drainage system.

Planning Scale: 10-year Return Period

| Case | Retention Area 434+89 ha | Retention Area 357+89 ha | Retention Area 250+89 ha | Retention Area 131+89 ha |
|------|---|-----------------------------|-----------------------------|-----------------------------|
| | Average Water Level in Retention Area (above MSL) | | | |
| K0 | 1.68 | 1.73 | 1.83 | 2.02 |
| K11 | 1.50 | 1.54 | 1.60 | 1.72 |
| K12 | 1.44 | 1.48 | 1.55 | 1.66 |
| K13 | 1.38 | 1.43 | 1.50 | 1.62 |
| K14 | 1.39 | 1.43 | 1.48 | 1.59 |
| K15 | 1.15 | 1.20 | 1.29 | 1.56 |
| K16 | 1.46 | 1.50 | 1.53 | 1.64 |
| K17 | 1.44 | 1.49 | 1.56 | 1.69 |
| K18 | 1.39 | 1.44 | 1.53 | 1.67 |

Note: K0 indicates the case under present drainage system.

Table 4.5 Extent of Retention Area and Water Level in Greater Colombo Basin**Planning Scale: 50-year Return Period**

| Case | Retention Area 435 ha | Retention Area 380 ha | Retention Area 284 ha | Retention Area 171 ha |
|------|---|--------------------------|--------------------------|--------------------------|
| | Average Water Level in Retention Area (above MSL) | | | |
| G0 | 2.07 | 2.09 | 2.20 | 2.69 |
| G17 | 1.76 | 1.77 | 1.83 | 2.27 |
| G18 | 1.76 | 1.77 | 1.83 | 2.28 |
| G19 | 1.74 | 1.74 | 1.81 | 2.23 |
| G20 | 1.74 | 1.75 | 1.81 | 2.24 |
| G21 | 1.71 | 1.72 | 1.78 | 2.20 |
| G22 | 1.69 | 1.69 | 1.76 | 2.15 |
| G23 | 1.68 | 1.68 | 1.74 | 2.14 |
| G24 | 1.58 | 1.58 | 1.62 | 1.92 |

Note: G23 = G7+G8+G10+G11

G24 = G4+G7+G8+G10+G11

Planning Scale: 25-year Return Period

| Case | Retention Area 435 ha | Retention Area 380 ha | Retention Area 284 ha | Retention Area 171 ha |
|------|---|--------------------------|--------------------------|--------------------------|
| | Average Water Level in Retention Area (above MSL) | | | |
| G0 | 1.86 | 1.87 | 1.93 | 2.27 |
| G7 | 1.59 | 1.59 | 1.64 | 2.02 |
| G8 | 1.71 | 1.72 | 1.78 | 2.20 |
| G9 | 1.57 | 1.57 | 1.62 | 1.99 |
| G10 | 1.54 | 1.54 | 1.58 | 1.94 |
| G12 | 1.52 | 1.52 | 1.56 | 1.90 |
| G13 | 1.73 | 1.73 | 1.80 | 2.22 |
| G14 | 1.71 | 1.71 | 1.77 | 2.18 |

Planning Scale: 10-year Return Period

| Case | Retention Area 435 ha | Retention Area 380 ha | Retention Area 284 ha | Retention Area 171 ha |
|------|---|--------------------------|--------------------------|--------------------------|
| | Average Water Level in Retention Area (above MSL) | | | |
| G0 | 1.48 | 1.48 | 1.52 | 1.85 |
| G8 | 1.46 | 1.46 | 1.49 | 1.82 |
| G9 | 1.42 | 1.43 | 1.46 | 1.77 |
| G10 | 1.41 | 1.41 | 1.44 | 1.73 |

**Table 4.6 O&M Equipment to be Procured by SLLRDC under JBIC Fund Project
(Lunawa Lake Environment Improvement Project) (1/2)**

| No. | Equipment | Quantity | Purpose of Use | Where it Works | Who Bears O/M Cost |
|----------------------|--|----------|--|----------------|--------------------|
| Machinery Equipment: | | | | | |
| 1 | Sucker Machine | 1 No. | Cleaning of gullies | DMMC | DMMC |
| 2 | Winching Machine sets | 2 Nos. | Cleaning of underground pipes more than 600 mm dia. and underground culvert | DMMC | DMMC |
| 3 | Winching Buckets set | 2 Nos. | Cleaning of underground pipes more than 600 mm dia. and underground culvert | DMMC | DMMC |
| 4 | Water Pump | 1 No. | To drain the water inside of underground pipes, culverts and manhole | DMMC | DMMC |
| 5 | Tractor with tipper trailer | 3 Nos. | To haul sediments and garbage collected from cleaning of canals and drains | DMMC | DMMC |
| 6 | Jetting/Suction Machine | 1 No. | Cleaning of underground pipes less than 600 mm dia. | DMMC | DMMC |
| 7 | 150mm sludge pump with suction(2 nos.) and delivery hoses(30m) | 1 No. | Cleaning of manholes | DMMC | DMMC |
| 8 | 100, 150, 225 and 300mm drain plug set | 2 Nos. | In replacement of damaged underground pipes, the plug set is used to tentatively stop the drain water. | DMMC | DMMC |
| 9 | 450 and 600 mm drainplug set | 2 Nos. | In replacement of damaged underground pipes, the plug set is used to tentatively stop the drain water. | DMMC | DMMC |
| 10 | Man entry sewer trolleys | 1 No. | For the visual inspection of silting condition of pipes and culverts | DMMC | DMMC |
| 11 | Survey Equipment set | 1 No. | Ground survey works related | DMMC | DMMC |
| 12 | Tipper Lorry (Commercial, 10 ton, with HIAB type integral crane) | 1 No. | To lift and transport the maintenance equipment | DMMC | DMMC |
| 13 | Bach hoe/shovels - skid steering | 1 No. | Cleaning of canals | DMMC | DMMC |
| 14 | Baby shovels - skid steering | 2 Nos. | Cleaning of drainage channel | DMMC | DMMC |
| 15 | Floating grab - shovel | 1 No. | Canal dredging | DMMC | DMMC |
| 16 | Floating working platforms | 1 lot | Canal dredging | DMMC | DMMC |
| Vehicles: | | | | | |
| 17 | 4WD - double cab | 1 No. | To transport the manpower to working site | DMMC | DMMC |

Note : Spare Parts are included.

Source: GCFC&EIP-Phase3 Project Office

**Table 4.6 O&M Equipment to be Procured by SLLRDC under JBIC Fund Project
(Lunawa Lake Environment Improvement Project) (2/2)**

| No. | Equipment | Quantity | Purpose of Use | Where it Works | Who Bears O/M Cost |
|-----------------------------|--|----------|---|----------------------------------|--------------------|
| Machinery Equipment: | | | | | |
| 1 | Backhoe with dozer, 0.35 m ³ , long arm type, wheel type | 1 No. | To maintain sea outfall sand bar at about MSL +1m on constant basis, and excavate flood release channel when the lake water level tends to rise | MMC | MMC |
| 2 | Amphibious Soft Terrain Crawler Type Excavator, 0.4 m ³ | 1 No. | Dredging in lake and main canals where floating type equipment is required. (Maintenance dredging work to be carried out by SLLRDC on behalf of ULAs) | SLLRDC | SLLRDC |
| 3 | Mini Excavating Equipment, with attachment of backhoe and shovel, 0.35-0.4 m ³ | 2 Nos. | Cleaning of open drains (secondary and tertiary drains) | DMMC & MMC (1 unit for each ULA) | DMMC & MMC |
| 4 | Hoist Unit and Gantry, 1 ton | 1 Nos. | To lift up at the shaft sediments collected from underground man-entry culverts and conduits | DMMC | DMMC |
| 5 | 4--Wheel Agriculture Tractor, 33 kW | 2 Nos. | To haul sediments and garbage collected from cleaning of canals and drains | DMMC & MMC (1 unit for each ULA) | DMMC & MMC |
| 6 | Trailer for 4 Wheel Tractor, Tipping Type, 2.5 M3 in spatial volume and 3.5 ton in capacity | 2 Nos. | To haul sediments and garbage collected from cleaning of canals and drains, in combination with 4 above | DMMC & MMC (1 unit for each ULA) | DMMC & MMC |
| 7 | 2-Wheel Agriculture Tractor, 7.5 kW, with trailer 1.2m wide x 1.8m long x 0.4m height | 2 Nos. | To haul sediments and garbage collected from cleaning of canals and drains | DMMC & MMC (1 unit for each ULA) | DMMC & MMC |
| 8 | Diesel Engine Driven Self Priming Pump, 100 mm dia. | 2 Nos. | For dewatering of maintenance work area | DMMC & MMC (1 unit for each ULA) | DMMC & MMC |
| 9 | Diesel Generator, 18 kVA, trailer mounted | 2 Nos. | For supply of power for concrete mixer, lighting and ventilation | DMMC & MMC (1 unit for each ULA) | DMMC & MMC |
| 10 | Portable Concrete Mixer, 0.4 m ³ , trailer mounted | 2 Nos. | For production of concrete for repair of damages and construction of additional drainage structures where required | DMMC & MMC (1 unit for each ULA) | DMMC & MMC |
| 11 | Safety Equipment, such as Emergency Breathing, Gas Detector, Safety Ropes, etc | 1 Nos. | Ensure safety of works in man-entry culverts and conduits | DMMC | DMMC |
| 12 | Inspection Flood Lamps, 18 W, Battery Supported | 4 Nos. | For lighting work area in culverts and conduits | DMMC | DMMC |
| 13 | Portable Ventilation Blower Package, driven by Petrol Engine,, Duct Hose 200mm, 8 m long x 2 | 1 Nos. | Ventilation during works in man-entry underground structures | DMMC | DMMC |
| 14 | Hand Tool Kits | 2 Nos. | For repair of equipment | DMMC & MMC (1 unit for each) | DMMC & MMC |
| 15 | Survey Equipment | 2 Nos. | To measure the angle of the alignment of the storm water systems | DMMC & MMC | DMMC & MMC |
| Vehicles: | | | | | |
| 16 | Pick-up Truck (Twin Cab, 4 WD) | 2 Nos. | To transport the maintenance equipment and materials | DMMC & MMC | DMMC & MMC |
| 17 | Cabs (Light, not Tipping) | 2 Nos. | To transport the light maintenance equipment | DMMC & MMC | DMMC & MMC |
| 18 | Tipper Lorry (Commercial, 2-3 ton, with Integral Crane) | 2 Nos. | To lift and transport the maintenance equipment | DMMC & MMC | DMMC & MMC |
| 19 | 4 WD Dumper, 5 ton | 2 Nos. | To transport the dredging materials to disposal site | DMMC & MMC | DMMC & MMC |
| 20 | 8 Man Mini-bus | 2 Nos. | To transport the manpower to working site | DMMC & MMC | DMMC & MMC |

Note : Spare Parts are included

Source: SAPROF Report for Lunawa Lake Environment Improvement Project

Table 4.7 List of O&M Equipment Owned by CMC

| Item | Capacity | No |
|---------------------------------------|-------------------------------|----|
| Jetting machine | | 3 |
| Sucker machine | | 3 |
| Rodding machine (mobile type) | | 3 |
| Winching machine set | | 2 |
| Heavy duty rodding machine | | 5 |
| Winching bucket | | 5 |
| Water pump | 6" dia. | 5 |
| Tractor with tipper trailer (4WD) | | 14 |
| CCTV camera/monitor/etc. equipment | | * |
| Generator | 50, 175, 350, 400, 750 kVA | 5 |
| Rural single tractor (2WD) | | 15 |
| Compressor | | 2 |
| Drain plug set (100,150,225 & 300 mm) | | 7 |
| Drain plug set (450 & 600 mm) | | 3 |
| Excavator (JCB) | 2 ft ³ | 1 |
| Excavator (HITACHI) | 4 ft ³ | 1 |
| Track mounted crane | 35 ton | 1 |
| Vehicles | | - |
| Pick-up truck | | 3 |
| Tipper lorry | | 7 |

Note : CCTV camera set is owned by the Project Division of CMC, not by
Drainage Division.

Source : Interview at CMC office

Table 4.8 Training Participants of SLLRDC for Storm Water Drainage Work

| Section | Current Staff Allocation | | | Target Training Participants | | |
|--|--------------------------|-------|--------|------------------------------|-------|--------|
| | Senior Manager | Staff | Others | Senior Manager | Staff | Others |
| 1 Secretary to the Board | 1 | 1 | 8 | | | |
| 2 Chief Internal Auditor | 1 | 1 | 21 | | | |
| 3 Legal Section | 1 | 2 | 4 | | | |
| 4 Security Management Section | 1 | 1 | 137 | | | |
| 5 Human Resources Development & Administration | 1 | 10 | 111 | 1 | 2 | |
| 6 Finance | 1 | 8 | 65 | 1 | 2 | |
| 7 Lands & Marketing | 1 | 4 | 22 | 1 | 2 | |
| 8 Stores & Supplies | 1 | 7 | 21 | | | |
| 9 Canal Development & Maintenance | 1 | 18 | 119 | 1 | 18 | 6 |
| 10 Reclamation Development & Planning | 1 | 10 | 73 | 1 | 3 | 4 |
| 11 Research & Design | 1 | 20 | 32 | 1 | 20 | 8 |
| 12 Construction | 1 | 12 | 97 | | | |
| 13 Plant & Equipment | 1 | 9 | 311 | 1 | 9 | 16 |
| Total | 13 | 103 | 1,021 | 7 | 56 | 33 |

Table 4.9 Proposed Staff Allocation in Local Authorities for Storm Water Drainage Works

(Participants/year)

| Number of LA | CMC | Other MCs | UC | PS | Total |
|--|-----|-----------|----|----|----------|
| | 1 | 4 | 12 | 28 | Trainees |
| 1 Senior Manager | 1 | 1 | 1 | 0 | 17 |
| 2 Engineer/Middle Manager/Superintendent | 14 | 2 | 1 | 1 | 62 |
| 3 Technical/Health Officer | 21 | 2 | 1 | 1 | 69 |
| 4 Administrator | 5 | 2 | 1 | 0 | 25 |
| Total | 41 | 7 | 4 | 2 | 173 |

Table 4.10 Framework of Human Resources Development Program

| Target Group | Training Subject | Proposed Training Institute |
|------------------------------------|---|------------------------------------|
| Engineer | 1) Planning 2) Hydrological analysis 3) Mapping 4) Civil design 5) Information technology 6) Environmental management 7) Environmental analysis | CHPB |
| Technicians/ Technical Officers | 1) Productivity improvement 2) Quality control 3) Work scheduling 4) Cost estimation skills 5) Basic civil works 6) O&M of dredging machine 7) O&M of machinery | CHPB PTU/WP |
| Manager | 1) General management 2) Financial management 3) Management information system 4) Human resource management 5) Project management 6) Problem solving and decision making 7) Disaster management 8) Community development | SLIDA |
| General Staff | 1) General administration 2) Communication skills 3) Information management 4) Accounting 5) Computer literacy 6) Secretarial and clerical skills 8) Purchasing and stores management | NIBM |

Note:

SLIDA: Sri Lanka Institute of Development and Administration (Min. of Public Administration)

NIBM: National Institute of Business Management (Min. of Enterprise Development and Industrial Policy)

CHPB: Center of Housing Planning and Building (Min. of Development and Rehabilitation, Reconstruction of East and Rural Housing)

PTU/WP: Provincial Training Unit (Western Provincial Council)

Table 4.11 Training Modules and Candidates of Training Providers

| Training Modules | Lecture (L), Practice (P) or Workshop (W) | Duration (days) | Prerequisite | Candidates of Training Providers | | | | | | |
|--|---|-----------------|-----------------|----------------------------------|------|------|-------|--------|--------|------|
| | | | | SLIDA | NIBM | CHPB | SLILG | PTU/WP | SLLRDC | NGOs |
| I Managerial and administrative training course | | | | | | | | | | |
| 1 General management and administration | | | | | | | | | | |
| I-1-a Certificate in project management | L | 15 | | x | x | | x | x | | |
| I-1-b Effective communication | L | 5 | | x | x | | x | x | | |
| I-1-c Problem solving and decision making | L | 5 | | x | x | | x | x | | |
| I-1-d Local government finance | L | 5 | | x | x | | x | x | | |
| 2 Computer literacy | | | | | | | | | | |
| I-2-a Certificate in computer application | P | 20 | | x | x | | x | x | | |
| I-2-b Computer applications for beginners | P | 5 | | x | x | | x | x | | |
| I-2-c Word processing using MS Word | P | 5 | I-2-b | x | x | | x | x | | |
| I-2-d Spread sheet processing using MS Excel | P | 5 | I-2-b | x | x | | x | x | | |
| 3 Information management | | | | | | | | | | |
| I-3-a Database management | P | 5 | I-2-a or I-2-d | x | x | | | | | |
| I-3-b Office administration | L | 5 | | x | x | | | | | |
| I-3-c Computerized accounting systems | P | 5 | | x | x | | | | | |
| I-3-d Introduction of management information systems | L | 3 | I-2-a or I-2-d | x | x | | | | | |
| II Technological and technical training courses | | | | | | | | | | |
| 1 Planning | | | | | | | | | | |
| Theory and practice of planning and implementation for | | | | | | | | | | |
| II-1-a storm water system | L | 30 | | x | | | | | | |
| II-1-b Public procurement management | L | 5 | | x | | | | | | |
| II-1-c Sustainable urban environmental management | L | 5 | | x | | | | | | |
| II-1-d Disaster management | L | 5 | | x | | | | | | |
| II-1-e Natural disaster mitigation | W | 6 | | | | x | | | | |
| II-1-f Construction consideration in flood prone areas | W | 3 | | | | x | | | | |
| 2 Design and drawing | | | | | | | | | | |
| Basic skills for design and drawing for storm water | | | | | | | | | | |
| II-2-a drainage system | P | 30 | | | | x | x | x | | |
| II-2-b Introduction of auto CAD | P | 15 | I-2-a or I-2-b | | | x | | | | |
| 3 Construction management | | | | | | | | | | |
| II-3-a Construction planning & progress control | L | 3 | | | | x | x | | | |
| II-3-b Financial planning & cost control | L | 3 | II-3-a | | | x | x | | | |
| II-3-c Supervision of construction works on site | L | 3 | II-3-b | | | x | x | | | |
| III Social development training courses | | | | | | | | | | |
| 1 Land management | | | | | | | | | | |
| III-1-a Legal procedures of land acquisition | W | 5 | | | | | x | x | | |
| III-1-b GIS and EMIS for storm water drainage system | P | 30 | | | | | x | x | | |
| 2 Community development | | | | | | | | | | |
| III-2-a Research and survey methodology | L | 15 | | x | | | | | | |
| III-2-b Introduction of participatory approach | W | 3 | | | | | x | | | x |
| III-2-c Community institutional building | W | 3 | III-2-b | | | | x | | | x |
| III-2-d Community based disaster management for flood and health hazard | W | 5 | III-2-c | | | x | x | | | x |
| 3 Awareness campaign | | | | | | | | | | |
| III-3-a Public awareness | W | 3 | | x | | | x | | | x |
| 4 Relocation of settlements | | | | | | | | | | |
| III-4-a Relocation procedure of settlement | W | 3 | III-1-a | | | x | x | | | x |
| IV O&M training courses | | | | | | | | | | |
| 1 Operation of O&M equipment | | | | | | | | | | |
| IV-1-a Operation of O&M equipment for open canal | P | 10 | Driving license | | | | | | x | |
| IV-1-b Operation of O&M equipment for storm water drainage | P | 10 | Driving license | | | | | | x | |
| 2 O&M management | | | | | | | | | | |
| IV-2-a Planning and programming for O&M works | L | 3 | | | | | | | x | |
| IV-2-b Introduction of O&M activities | L | 5 | | | | | | | x | |

Source: The JICA Study Team

Table 6.1 Environmental Legislations in Sri Lanka (1/2)

| |
|--|
| <p>1. Cross-Sectoral Issues</p> <ul style="list-style-type: none"> - National Environmental Act, No.47 of 1980, Amendment Act No.56 of 1988 |
| <p>2. Natural Resources</p> <p>A. Property rights in natural resources: Wildlife & Nature Protection Society Act No.29 of 1968</p> <p>B. Use of natural resources of public domain: Industrial Development Act, No.36 of 1969</p> |
| <p>3. Fresh Waters</p> <p>A. Water resource management: Water Resources Board Act, No.29 of 1964</p> <p>B. Regime of public/private waters</p> <ul style="list-style-type: none"> - National Water Supply and Drainage Board Law, No.02 of 1974, Amendment Act No.13 of 1992 <p>C. Water administration</p> <ul style="list-style-type: none"> - Municipal Council Ordinance, No.16 of 1949, No. 48 of 1983 - Predeshiya Sabhas Act, No.15 of 1987, Amendment No.34 of 1993 - Urban Council Ordinances, No.61 of 1993, No.48 of 1984 <p>D. Water Uses: Mahaweli Authority of Sri Lanka No.23 of 1979, Amendment Act No.59 of 1993</p> <p>E. Water quality standards</p> <ul style="list-style-type: none"> - Sri Lanka Standards SLS 652: 1984 - Tolerance limits for industrial waste water discharged into Inland Surface Waters - Sri Lanka Standards SLS 722: 1985 - Tolerance limits for Inland surface waters for use as raw water for public water supply - Sri Lanka Standards SLS 721: 1985 - Tolerance limits for industrial waste water discharged into Marine coastal waters - Sri Lanka Standards SLS 614: 1983/84 - Sri Lanka standard specification for potable water - Tolerance limits for industrial waste water discharged into public (common) sewer for further treatment (Interim standard) <p>F. Water pollution: control and monitoring</p> <ul style="list-style-type: none"> - Marine Pollution Prevention Act, No.59 of 1981 - Sri Lanka Ports Authority Act, No.51 of 1979, No.2 of 1992 <p>G Water works</p> <ul style="list-style-type: none"> - Colombo Water Works Ordinance No.18 of 1907, No. 29 of 1947 - Irrigation Ordinance No.32 of 1946, No.3 of 1994 |
| <p>4. Flora</p> <p>A. Flora: Protection of species</p> <ul style="list-style-type: none"> - Felling of Trees (control) Act, No.9 of 1951, Amendment Act No.30 of 1953 - Fauna and Flora Protection Ordinance, No.2 of 1937, Amendment Act No.49 of 1993 - Plant Protection Ordinance, No.10 of 1924, Amendment Act No.20 of 1986 - Water Hyacinth Ordinance, No.4 of 1909 |
| <p>5. Fauna</p> <p>A. Protected areas for sustainable management of faunal resources: National Heritage Wilderness Areas Act, No.3 of 1988</p> <p>B. Management of resources: Fauna and Flora Protection Ordinance, No.2 of 1937, Amendment Act No.49 of 1993</p> <p>C. Regulation of activities with impact on conservation objectives</p> <ul style="list-style-type: none"> - Fauna and Flora Protection Ordinance, No.2 of 1937, Amendment Act No.49 of 1993 - Wildlife & Nature Protection Society Act No.29 of 1968 - National Heritage Wilderness Areas Act, No.3 of 1988 |
| <p>6. Places of Natural and Architectural Beauty: Historical and Archaeological Sites and Monuments</p> <p>A. Protection of landscapes formed by natural or cultivated resources</p> <ul style="list-style-type: none"> - Irrigation Ordinance No.32 of 1946, No.3 of 1994 - National Heritage Wilderness Areas Act, No.3 of 1988 <p>B. Protection of architectural landscapes</p> <ul style="list-style-type: none"> - Town and Country Planning Ordinance, No.13 of 1946, Amendment Act No.57 of 1981 - Urban Development Authority Law, No.41 of 1978, No.41 of 1988 <p>C. Protection of historic and archaeological sites and monuments: Antiquities Ordinance No.9 of 1940, No.22 of 1955</p> |

Table 6.1 Environmental Legislations in Sri Lanka (2/2)

| |
|---|
| <p>7. Noise, Vibrations and Odors</p> <p>A. Standards on noise, vibrations and odors: Typical Noise Level Criteria - Interim Standards</p> <p>B. Prevention and control of noise, vibrations and odors</p> <ul style="list-style-type: none"> - Municipal Council Ordinance, No.16 of 1949, No. 48 of 1983 - Predeshiya Sabhas Act, No.15 of 1987, Amendment No.34 of 1993 - Urban Council Ordinances, No.61 of 1993, No.48 of 1984 |
| <p>8. Hazardous and Solid Wastes</p> <p>A. Hazardous and solid wastes policy/management</p> <ul style="list-style-type: none"> - Industrial Products Act, No.18 of 1949, Amendment Act No.69 of 1961 - Factories Ordinance No.45 of 1942, Amendment Act No.32 of 1984 - Predeshiya Sabhas Act, No.15 of 1987, Amendment No.34 of 1993 <p>B. Recovery treatment and disposal operations</p> <ul style="list-style-type: none"> - Industrial Dispute Act, No.43 of 1950, Law No.53 of 1973 - Industrial Promotion Act, No.46 of 1990 - Industrial Products Act, No.18 of 1949, Amendment Act No.69 of 1961 - Predeshiya Sabhas Act, No.15 of 1987, Amendment No.34 of 1993 |
| <p>9. Prevention and Control of the Environmental Effects of Public Works</p> <ul style="list-style-type: none"> - National Dangerous Drugs (Control) Board Act, No.11 of 1984, Amendment Act No.21 of 1990 - Nuisances Ordinance, No.15 of 1862, No.57 of 1946 - Wells and Pits Ordinance, No.27 of 1884, No.3 of 1946 - Municipal Council Ordinance, No.16 of 1949, No. 48 of 1983 - Predeshiya Sabhas Act, No.15 of 1987, Amendment No.34 of 1993 - Urban Council Ordinances, No.61 of 1993, No.48 of 1984 |
| <p>10. Settlement of Disputes</p> <p>A. Ombudsman: Ombudsman Act, No.17 of 1981</p> <p>B. Arbitration: Arbitration Ordinance, No.15 of 1866, Amendment Ordinance No.2 of 1889</p> |
| <p>11. Environmental Impact Assessment System</p> <ul style="list-style-type: none"> - National Environmental Act, No.47 of 1980, Amendment Act No.56 of 1988 - Government gazettes (Extra-ordinary) No. 772/22 of 24th June 1993 and No. 859/14 23rd Feb. 1995 - A Guide for Implementing the EIA Process, No.1, 1998 - A Guide for Implementing the EIA Process, No.2, 1995 - Guidelines for conducting environmental scoping |

Source: Index to Environmental Legislations in Sri Lanka, 1995 and A Guide for Implementing the EIA Process, No.1, 1998

Table 6.2 Check List of Resettlement and Prescribed Undertakings on the Proposed Plans

| Proposed Measures | Items | Possibility of Resettlement | Possible Project Type Prescribed for IEE/EIA * |
|---|-------|-----------------------------|--|
| 1. Ja Ela Basin Storm Water Drainage Plan | | | |
| 1) Ja Ela Channel Improvement | | ○ | A, B, C, D, F |
| 2) Dandugam Oya Channel Improvement | | △ | A, B, C, D, F |
| 3) Ja Ela Retention Area Conservation | | △ | A, B, C, D, F |
| 4) Muthurajawela Marsh Flood Plain Conservation | | △ | A, B, C, D, F |
| 2. Kalu Oya Basin Storm Water Drainage Plan | | | |
| 1) Kalu Oya Channel Improvement | | ○ | A, B, C, D, F |
| 2) Old Negombo Canal Improvement | | △ | A, B, C, D, F |
| 3) Urbanized Area Storm Water Retention Facilities Construction | | × | A, B, C, F |
| 4) Kalu Oya Retention Area Conservation | | △ | A, B, C, D, F |
| 5) Muthurajawela Marsh Buffer Zone Conservation | | △ | A, B, C, D, F |
| 3. Greater Colombo Basin Storm Water Drainage Plan | | | |
| 1) Madiwela South Diversion Construction | | △ | A, B, C, D, F |
| 2) Mutwal Tunnel (Existing) Restoration | | ○ | A, D, E, F |
| 3) New Mutwal Tunnel Construction Project | | ○ | A, D, E, F |
| 4) Urbanized Area Storm Water Retention Facilities Construction | | × | A, B, C, F |
| 5) Kolonnawa Marsh Retention Area Conservation | | △ | A, B, C, D, F |
| 6) Kotte Marsh Retention Area Conservation | | △ | A, B, C, D, F |
| 7) Heen Marsh Retention Area Conservation | | △ | A, B, C, D, F |
| 4. Bolgoda Basin Storm Water Drainage Plan | | | |
| 1) Weras Ganga Improvement | | △ | A, B, C, D, F |
| 2) Urbanized Area Storm Water Retention Facilities Construction | | × | A, B, C, F |
| 3) Bolgoda Lake North Retention Area Conservation | | △ | A, B, C, D, F |
| 4) Bolgoda Lake South Retention Area Conservation | | △ | A, B, C, D, F |

Note: Possibility of Resettlement - ○: high possibility due to existence of settlements in the proposed site,
△: low possibility
×: no resettlement occur.

*: Government gazettes No.772/22 of 24th June 1993 and No.859/14 of 23rd Feb.1995

Prescribed project types and locations relevant to the proposed plans based on the above gazettes

A: All river basin development and irrigation projects excluding minor irrigation works

B: Conversion of forests covering an area exceeding 1 hectare into non-forest uses

C: Clearing of land areas exceeding 50 hectares

D: Resettlement

E: All tunneling projects

F: Following areas

a. Within 100m from the boundaries of or within any area declared under

- the National Heritage Wilderness Act No.3 of 1988;

- the Forest Ordinance;

b. Within the following areas whether or not the areas are wholly or partly within the Coastal Zone:

i. any erodible area declared under the Soil Conservation Act.

ii. any Flood Area declared under the Flood Protection Ordinance and any flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act, 15 of 1968 as amended by Act, No.52 of 1982.

iii. 60 meters from the bank of a public stream as defined in the Crown Lands Ordinance and having a width of more than 25 meters at any point of its course.

iv. any reservation beyond the full supply level of a reservoir.

v. any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance.

vi. any area declared under the Botanic Gardens Ordinance.

vii. within 100 meters from the boundaries of, or within, any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance.

viii. within 100 meters from the high flood level contour of, or within, a public lake as defined in the Crown Lands Ordinance including those declared under section 71 of the said Ordinance.

Table 8.1 Probable Flood Damage

(Unit: Rs.)

| Basin | Return Period | General Assets | | | | Total of Direct Damage | Disturbance to Business Activities | Damage to Infrastructure | Total of Probable Damage |
|-----------------|---------------|----------------|-------------|---------------|------------|------------------------|------------------------------------|--------------------------|--------------------------|
| | | Urban 1 | Urban 2 | Rural | Paddy | | | | |
| Ja Ela | 2 | 0 | 1,260,522 | 164,707,584 | 1,190,310 | 167,158,415 | 9,958,086 | 46,471,069 | 223,587,571 |
| | 5 | 0 | 3,878,764 | 670,075,025 | 3,083,394 | 677,037,183 | 40,437,227 | 188,707,061 | 906,181,471 |
| | 10 | 0 | 4,190,654 | 1,208,587,274 | 8,513,021 | 1,221,290,950 | 72,766,676 | 339,577,820 | 1,633,635,445 |
| | 25 | 2,424,941 | 7,629,919 | 1,981,028,413 | 17,744,243 | 2,008,827,516 | 119,464,996 | 557,503,316 | 2,685,795,828 |
| | 50 | 4,947,643 | 11,465,742 | 2,603,117,126 | 25,801,209 | 2,645,331,721 | 157,171,831 | 733,468,543 | 3,535,972,094 |
| Kalu Oya | 2 | 117,303,166 | 86,222,526 | 187,192,998 | 3,654,924 | 394,373,613 | 23,443,121 | 109,401,233 | 527,217,968 |
| | 5 | 179,116,516 | 108,030,459 | 230,032,352 | 4,190,584 | 521,369,911 | 31,030,760 | 144,810,212 | 697,210,882 |
| | 10 | 229,477,146 | 126,793,703 | 261,730,059 | 4,620,577 | 622,621,485 | 37,080,054 | 173,040,254 | 832,741,794 |
| | 25 | 309,832,120 | 157,797,497 | 329,479,180 | 5,488,644 | 802,597,441 | 47,826,528 | 223,190,463 | 1,073,614,432 |
| | 50 | 377,631,289 | 184,657,482 | 386,207,729 | 6,214,177 | 954,710,677 | 56,909,790 | 265,579,020 | 1,277,199,487 |
| Greater Colombo | 2 | 103,321,593 | 143,662,215 | 262,897,699 | 713,752 | 510,595,258 | 30,592,890 | 142,766,822 | 683,954,970 |
| | 5 | 209,029,103 | 234,201,770 | 515,615,467 | 1,183,583 | 960,029,923 | 57,530,780 | 268,476,975 | 1,286,037,679 |
| | 10 | 314,445,801 | 298,667,247 | 740,538,388 | 1,627,804 | 1,355,279,239 | 81,219,086 | 379,022,402 | 1,815,520,727 |
| | 25 | 549,342,815 | 438,605,442 | 1,122,826,427 | 2,342,420 | 2,113,117,103 | 126,646,481 | 591,016,911 | 2,830,780,496 |
| | 50 | 840,234,495 | 577,481,651 | 1,526,845,813 | 3,047,059 | 2,947,609,018 | 176,673,718 | 824,477,349 | 3,948,760,084 |
| Bolgoda | 2 | 13,307,101 | 6,708,791 | 107,900,254 | 4,659,359 | 132,575,505 | 7,674,969 | 35,816,521 | 176,066,994 |
| | 5 | 38,317,954 | 17,520,827 | 245,507,145 | 6,001,784 | 307,347,710 | 18,080,756 | 84,376,859 | 409,805,325 |
| | 10 | 56,850,530 | 28,135,747 | 321,539,854 | 6,769,390 | 413,295,520 | 24,391,568 | 113,827,317 | 551,514,404 |
| | 25 | 122,866,218 | 47,520,667 | 401,156,975 | 7,592,706 | 579,136,567 | 34,292,632 | 160,032,281 | 773,461,479 |
| | 50 | 187,828,611 | 64,710,805 | 451,400,051 | 8,120,538 | 712,060,004 | 42,236,368 | 197,103,051 | 951,399,423 |
| Project area | 2 | 233,931,859 | 237,854,053 | 722,698,534 | 10,218,344 | 1,204,702,791 | 71,669,067 | 334,455,645 | 1,610,827,503 |
| Total | 5 | 426,463,574 | 363,631,820 | 1,661,229,989 | 14,459,344 | 2,465,784,727 | 147,079,523 | 686,371,107 | 3,299,235,357 |
| | 10 | 600,773,476 | 457,787,351 | 2,532,395,574 | 21,530,792 | 3,612,487,193 | 215,457,384 | 1,005,467,792 | 4,833,412,370 |
| | 25 | 984,466,094 | 651,553,524 | 3,834,490,995 | 33,168,013 | 5,503,678,626 | 328,230,637 | 1,531,742,972 | 7,363,652,235 |
| | 50 | 1,410,642,038 | 838,315,681 | 4,967,570,718 | 43,182,984 | 7,259,711,420 | 432,991,706 | 2,020,627,962 | 9,713,331,088 |

Table 8.2 Annual Average Flood Damage

| Basin | Return Period | Exceedance | Difference of Exceedance | Damage (million Rs.) | | Annual Damage (million Rs.) | |
|--------------------|---------------|------------|--------------------------|----------------------|---------|-----------------------------|------------|
| | | | | Amount | Average | Segment | Cumulative |
| Ja Ela | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 224 | 112 | 56 | 56 |
| | 5 | 0.20 | 0.30 | 906 | 565 | 169 | 225 |
| | 10 | 0.10 | 0.10 | 1,634 | 1,270 | 127 | 352 |
| | 25 | 0.04 | 0.06 | 2,686 | 2,160 | 130 | 482 |
| | 50 | 0.02 | 0.02 | 3,536 | 3,111 | 62 | 544 |
| Kalu Oya | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 527 | 264 | 132 | 132 |
| | 5 | 0.20 | 0.30 | 697 | 612 | 184 | 315 |
| | 10 | 0.10 | 0.10 | 833 | 765 | 76 | 392 |
| | 25 | 0.04 | 0.06 | 1,074 | 953 | 57 | 449 |
| | 50 | 0.02 | 0.02 | 1,277 | 1,175 | 24 | 473 |
| Greater Colombo | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 684 | 342 | 171 | 171 |
| | 5 | 0.20 | 0.30 | 1,286 | 985 | 295 | 466 |
| | 10 | 0.10 | 0.10 | 1,816 | 1,551 | 155 | 622 |
| | 25 | 0.04 | 0.06 | 2,831 | 2,323 | 139 | 761 |
| | 50 | 0.02 | 0.02 | 3,949 | 3,390 | 68 | 829 |
| Bolgoda | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 176 | 88 | 44 | 44 |
| | 5 | 0.20 | 0.30 | 410 | 293 | 88 | 132 |
| | 10 | 0.10 | 0.10 | 552 | 481 | 48 | 180 |
| | 25 | 0.04 | 0.06 | 773 | 662 | 40 | 220 |
| | 50 | 0.02 | 0.02 | 951 | 862 | 17 | 237 |
| Project Area Total | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 1,611 | 805 | 403 | 403 |
| | 5 | 0.20 | 0.30 | 3,299 | 2,455 | 737 | 1,139 |
| | 10 | 0.10 | 0.10 | 4,833 | 4,066 | 407 | 1,546 |
| | 25 | 0.04 | 0.06 | 7,364 | 6,099 | 366 | 1,912 |
| | 50 | 0.02 | 0.02 | 9,713 | 8,538 | 171 | 2,083 |

Table 8.3 Estimation of Economic Benefit and Evaluation: 50-year Return Period (1/4)

Ja Ela Basin

| | | Flood Damage Reduction Benefit (million Rs.) | Land Enhancement Benefit (million Rs.) | Total Flood Control Benefit (million Rs.) | Project Cost (million Rs.) | Economic Cost (Construction) (million Rs.) | O&M Cost (million Rs.) | B-C (million Rs.) | B/C | EIRR |
|-----------|--|---|---|--|-------------------------------|--|---------------------------|------------------------------|-------------|--------------|
| J1 | Channel Improvement: Ja Ela (B= 45 m), Dandugam Oya (B= 65 m) | 24 | 43 | 66 | 2,785 | 2,113 | 14 | -1,118 | 0.31 | - |
| J2 | Channel Improvement: Ja Ela (B= 50 m), Dandugam Oya (B= 70 m) | 29 | 52 | 82 | 3,163 | 2,402 | 16 | -1,219 | 0.34 | 3.0% |
| J3 | Channel Improvement: Ja Ela (B= 55 m), Dandugam Oya (B= 75 m) | 33 | 59 | 93 | 3,729 | 2,834 | 19 | -1,468 | 0.33 | 2.8% |
| J4 | J1+ Kotugoda-Seeduwa Diversion | 75 | 120 | 195 | 3,087 | 2,343 | 15 | -284 | 0.84 | 8.7% |
| J5 | Channel Improvement: Ja Ela (B= 60 m), Dandugam Oya (B= 80 m) | 52 | 88 | 140 | 3,919 | 2,978 | 20 | -1,210 | 0.47 | 4.9% |
| J6 | Channel Improvement: Ja Ela (B= 80 m), Dandugam Oya (B= 100 m) | 70 | 113 | 183 | 4,687 | 3,563 | 25 | -1,329 | 0.52 | 5.4% |
| J1 | J1(Retention Area 920+376 ha) | 24 | 240 | 264 | 2,663 | 2,022 | 14 | 149 | 1.10 | 10.9% |
| J2 | J2 (Retention Area 650+376 ha) | 29 | 320 | 349 | 2,965 | 2,254 | 16 | 513 | 1.30 | 12.6% |
| J3 | J3 (Retention Area 560+376 ha) | 33 | 361 | 394 | 3,507 | 2,668 | 19 | 484 | 1.24 | 12.1% |
| J4 | J4 (Retention Area 1,150+376 ha) | 75 | 116 | 191 | 3,029 | 2,300 | 15 | -278 | 0.84 | 8.7% |
| J5 | J5 (Retention Area 500+376 ha) | 52 | 388 | 440 | 3,679 | 3,349 | 20 | 741 | 1.34 | 12.9% |
| J6 | J6 (Retention Area 330+376 ha) | 70 | 575 | 645 | 4,400 | 3,349 | 25 | 1,631 | 1.63 | 15.2% |

Table 8.3 Estimation of Economic Benefit and Evaluation: 50-year Return Period (2/4)

Kalu Oya Basin

| | | Flood Damage Reduction Benefit (million Rs.) | Land Enhancement Benefit (million Rs.) | Total Flood Control Benefit (million Rs.) | Project Cost (million Rs.) | Economic Cost (Construction) (million Rs.) | O&M Cost (million Rs.) | B-C (million Rs.) | B/C | EIRR |
|------------|---|---|---|--|-------------------------------|--|---------------------------|----------------------|------|-------|
| K1 | Channel Improvement of Kalu Oya mainstream (B= 40 m) | 24 | 83 | 108 | 1,476 | 1,124 | 7 | -99 | 0.88 | 9.0% |
| K2 | Channel Improvement of Kalu Oya mainstream (B= 45 m) | 30 | 104 | 134 | 1,658 | 1,263 | 8 | -19 | 0.98 | 9.8% |
| K3 | Channel Improvement of Kalu Oya mainstream (B= 50 m) | 35 | 118 | 153 | 1,856 | 1,414 | 9 | -3 | 1.00 | 10.0% |
| K4 | Wattala Pumping Station (Q= 10 m ³ /s) | 2 | 4 | 6 | 2,276 | 1,680 | 23 | -1,318 | 0.03 | - |
| K5 | Wattala Pumping Station (Q= 20 m ³ /s) | 7 | 16 | 23 | 3,792 | 2,797 | 41 | -2,119 | 0.07 | - |
| K6 | Wattala Pumping Station (Q= 30 m ³ /s) | 20 | 63 | 83 | 4,484 | 3,307 | 50 | -2,123 | 0.22 | - |
| K7 | Kalu Oya-Old Negombo Diversion + Improvement of Old Negombo Canal (B= 30 m) | 44 | 141 | 185 | 1,345 | 1,019 | 6 | 539 | 1.69 | 15.3% |
| K8 | Improvement of Old Negombo Canal (B= 30 m) | 24 | 81 | 105 | 816 | 616 | 3 | 277 | 1.59 | 14.6% |
| K9 | Improvement of Old Negombo Canal (B= 35 m) | 28 | 96 | 123 | 890 | 672 | 3 | 364 | 1.72 | 15.4% |
| K10 | Improvement of Old Negombo Canal (B= 40 m) | 30 | 105 | 135 | 1,025 | 775 | 4 | 366 | 1.62 | 14.8% |
| K11 | K1+K8 | 37 | 124 | 162 | 1,927 | 1,467 | 9 | 23 | 1.02 | 10.2% |
| K12 | K2+K9 | 47 | 145 | 192 | 2,182 | 1,662 | 11 | 99 | 1.08 | 10.7% |
| K13 | K3+K10 | 56 | 160 | 215 | 2,515 | 1,917 | 13 | 79 | 1.05 | 10.5% |
| K14 | K1+K7+K8 | 73 | 181 | 254 | 2,906 | 2,213 | 15 | 161 | 1.09 | 10.8% |
| K15 | K1+K6+K8 | 74 | 183 | 257 | 6,045 | 4,501 | 59 | -1,746 | 0.52 | 5.1% |
| K16 | K1+K7 | 62 | 168 | 231 | 2,456 | 1,870 | 12 | 240 | 1.17 | 11.4% |
| K17 | K1+K9 | 41 | 133 | 173 | 2,001 | 1,523 | 10 | 61 | 1.05 | 10.4% |
| K18 | K1+K10 | 44 | 139 | 182 | 2,136 | 1,626 | 10 | 55 | 1.04 | 10.4% |
| K19 | K3+K7+K10 | 97 | 210 | 307 | 3,495 | 2,662 | 18 | 241 | 1.12 | 11.0% |
| K20 | K3+K6+K7+K10 | 139 | 210 | 349 | 7,529 | 5,780 | 68 | -1,885 | 0.59 | 6.2% |
| K13 | K3+K10 (Retention Area 360+89 ha) | 56 | 366 | 422 | 2,463 | 1,878 | 13 | 1,360 | 1.94 | 17.4% |
| K14 | K1+K7+K8 (Retention Area 290+89 ha) | 73 | 582 | 655 | 2,806 | 2,138 | 15 | 2,652 | 2.61 | 21.9% |
| K15 | K1+K6+K8 (Retention Area 340+89 ha) | 74 | 445 | 519 | 5,896 | 4,536 | 59 | -181 | 0.95 | 9.5% |
| K16 | K1+K7 (Retention Area 340+89 ha) | 62 | 430 | 493 | 2,390 | 1,821 | 12 | 1,866 | 2.33 | 20.0% |
| K19 | K3+K7+K10 (Retention Area 200+89 ha) | 97 | 791 | 888 | 3,331 | 2,540 | 18 | 3,857 | 2.97 | 24.1% |

Table 8.3 Estimation of Economic Benefit and Evaluation: 50-year Return Period (3/4)

Greater Colombo Basin

| | | Flood Damage Reduction Benefit (million Rs.) | Land Enhancement Benefit (million Rs.) | Total Flood Control Benefit (million Rs.) | Project Cost (million Rs.) | Economic Cost (Construction) (million Rs.) | O&M Cost (million Rs.) | B-C (million Rs.) | B/C | EIRR |
|------------|---|---|---|--|-------------------------------|--|---------------------------|----------------------|------|-------|
| G1 | Maradana P/S (5 m ³ /s) and Improvement of Galle Face Outfall | 4 | 75 | 79 | 1,325 | 981 | 6 | -257 | 0.66 | 6.5% |
| G2 | Maradana P/S (10 m ³ /s) and Improvement of Galle Face Outfall | 9 | 145 | 153 | 2,304 | 1,703 | 12 | -342 | 0.74 | 7.4% |
| G3 | North Lock Pumping Station (10 m ³ /s) | 9 | 145 | 153 | 2,199 | 1,623 | 11 | -278 | 0.78 | 7.8% |
| G4 | North Lock Pumping Station (15 m ³ /s) | 14 | 205 | 219 | 2,908 | 2,146 | 16 | -269 | 0.84 | 8.4% |
| G5 | Gotatuwa Pumping Station (30 m ³ /s) | 27 | 335 | 362 | 4,592 | 3,390 | 26 | -307 | 0.88 | 8.9% |
| G6 | Gotatuwa Pumping Station (40 m ³ /s) | 34 | 385 | 418 | 5,977 | 4,412 | 50 | -827 | 0.76 | 7.6% |
| G7 | Madiwela South Diversion Canal | 47 | 477 | 524 | 3,565 | 2,707 | 19 | 743 | 1.36 | 13.1% |
| G8 | Restoration of Existing Mutwal Tunnel | 2 | 43 | 45 | 361 | 271 | 1 | 80 | 1.39 | 13.4% |
| G9 | New Mutwal Tunnel (D= 3 m) | 7 | 120 | 127 | 1,022 | 773 | 4 | 217 | 1.37 | 13.2% |
| G10 | New Mutwal Tunnel (D= 4 m) | 12 | 185 | 197 | 1,092 | 826 | 5 | 618 | 1.98 | 17.9% |
| G11 | Improvement of Welawatta (B= 30 m) and Kirillapone Canal (B= 25 m) | 9 | 152 | 161 | 2,066 | 1,562 | 9 | -170 | 0.86 | 8.6% |
| G17 | G7+G11 | 70 | 608 | 678 | 5,393 | 4,091 | 28 | 1,273 | 1.40 | 13.5% |
| G18 | G7+G8+G9 | 70 | 611 | 681 | 4,473 | 3,395 | 24 | 1,829 | 1.70 | 15.7% |
| G19 | G7+G8+G10 | 78 | 651 | 729 | 4,543 | 3,449 | 24 | 2,115 | 1.80 | 16.4% |
| G20 | G7+G8+G11 | 76 | 642 | 718 | 5,516 | 4,185 | 28 | 1,479 | 1.46 | 13.9% |
| G21 | G7+G9+G11 | 88 | 697 | 785 | 6,177 | 4,687 | 32 | 1,546 | 1.43 | 13.6% |
| G22 | G7+G10+G11 | 97 | 738 | 835 | 6,247 | 4,740 | 32 | 1,857 | 1.51 | 14.3% |
| G19 | G7+G8+G10 (Retention Area 380 ha) | 78 | 808 | 886 | 4,389 | 3,334 | 24 | 3,154 | 2.23 | 19.5% |
| G20 | G7+G8+G11(Retention Area 360 ha) | 76 | 856 | 933 | 5,307 | 4,028 | 28 | 2,897 | 1.93 | 17.5% |
| G21 | G7+G9+G11(Retention Area 320 ha) | 88 | 1,026 | 1,114 | 5,940 | 4,510 | 32 | 3,675 | 2.06 | 18.4% |
| G22 | G7+G10+G11(Retention Area 290 ha) | 97 | 1,153 | 1,251 | 6,009 | 4,563 | 32 | 4,507 | 2.28 | 20.0% |
| G23 | G7+G8+G10+G11 (Retention Area 280 ha) | 102 | 1,202 | 1,303 | 6,133 | 4,656 | 33 | 4,774 | 2.33 | 20.3% |
| G24 | G4+G7+G8+G10+G11 (Retention Area 170 ha) | 151 | 1,699 | 1,850 | 8,804 | 6,625 | 49 | 6,776 | 2.32 | 20.3% |

Table 8.3 Estimation of Economic Benefit and Evaluation: 50-year Return Period (4/4)

Bolgoda Basin (Weras Ganga Basin)

| | Scheme | Flood Damage Reduction Benefit (million Rs.) | Land Enhancement Benefit (million Rs.) | Total Flood Control Benefit (million Rs.) | Project Cost (million Rs.) | Economic Cost (Construction) (million Rs.) | O&M Cost (million Rs.) | B-C (million Rs.) | B/C | EIRR |
|----|--|--|--|---|----------------------------|--|------------------------|-------------------|------|-------|
| B1 | Dredging of Weras Ganga (B = 20 m), Channel Improvement of tributaries and Urban Drainage, Retention Area (372 ha) | 146 | 477 | 624 | 5,128 | 3,880 | 23 | 1,468 | 1.50 | 13.9% |
| B2 | Dredging of Weras Ganga (B = 40 m), Channel Improvement of tributaries and Urban Drainage, Retention Area (372 ha) | 147 | 560 | 706 | 5,317 | 4,026 | 25 | 1,853 | 1.60 | 14.7% |
| B3 | Dredging of Weras Ganga (B = 60 m), Channel Improvement of tributaries and Urban Drainage, Retention Area (372 ha) | 147 | 568 | 715 | 5,657 | 4,285 | 27 | 1,707 | 1.52 | 14.1% |
| B1 | Dredging of Weras Ganga (B = 20 m), Channel Improvement of tributaries and Urban Drainage, Retention Area (295 ha) | 146 | 793 | 939 | 4,912 | 3,880 | 23 | 3,382 | 2.14 | 18.6% |
| B2 | Dredging of Weras Ganga (B = 40 m), Channel Improvement of tributaries and Urban Drainage, Retention Area (295 ha) | 147 | 875 | 1022 | 5,102 | 4,026 | 25 | 3,768 | 2.22 | 19.2% |
| B3 | Dredging of Weras Ganga (B = 60 m), Channel Improvement of tributaries and Urban Drainage, Retention Area (295 ha) | 147 | 883 | 1030 | 5,442 | 4,285 | 27 | 3,622 | 2.10 | 18.4% |

Table 9.1 Disbursement Schedule

(Unit: million Rs.)

| Item | Project Cost | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--|---------------|------------|------------|--------------|--------------|--------------|------------|--------------|--------------|--------------|--------------|------------|
| 1. Ja Ela Basin Stormwater Drainage Plan | | | | | | | | | | | | |
| 1) Ja Ela Channel Improvement (B = 60 m, L = 7 km) | 1,102 | 110 | 110 | 331 | 331 | 220 | | | | | | |
| 2) Dandungam Oya Channel Improvement (B = 80 m, L = 9.9 km) | 2,342 | | | | | 234 | 234 | 468 | 468 | 468 | 468 | |
| 3) Storm Water Retention Area (Lower Area = 500 ha, Upper Area = 376 ha) | 235 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | |
| Total | 3,679 | 134 | 134 | 354 | 354 | 478 | 258 | 492 | 492 | 492 | 492 | |
| 2. Kalu Oya Basin Stormwater Drainage Plan | | | | | | | | | | | | |
| 1) Old Negombo Canal Improvement (B = 40 m, L = 4.2 km) | 648 | 65 | 65 | 194 | 194 | 130 | | | | | | |
| 2) Kalu Oya Channel Improvement (B = 50 m, L = 5 km) | 1,515 | | | | | 152 | 152 | 455 | 455 | 303 | | |
| 3) Storm Water Retention Area (Lower Area = 360 ha, Upper Area = 89 ha) | 300 | 36 | 36 | 36 | 36 | 36 | 30 | 30 | 30 | 30 | | |
| Total | 2,463 | 101 | 101 | 230 | 230 | 317 | 182 | 485 | 485 | 333 | | |
| 3. Greater Colombo Basin Stormwater Drainage Plan | | | | | | | | | | | | |
| 1) Restoration of the Existing Mutwal Tunnel (D = 1.8 m, L = 554 m) | 86 | 9 | 9 | 26 | 26 | 17 | | | | | | |
| 2) Construction of Madiwela South Diversion Canal (B = 40 m, L = 8.8 km) | 3,361 | | | | | 336 | 336 | 672 | 672 | 672 | 672 | |
| 3) New Mutwal Tunnel Construction (D = 4 m, L = 740 m) | 861 | | | | | | | 86 | 86 | 258 | 258 | 172 |
| 4) Storm Water Retention Area (Kolonnawa, Kotte and Heen Marshes and Parliament Lake Area = 380 ha in total) | 81 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | |
| Total | 4,389 | 17 | 17 | 34 | 34 | 361 | 344 | 766 | 766 | 939 | 939 | 172 |
| 4. Bolgoda Basin Storm Water Drainage Plan | | | | | | | | | | | | |
| 1) Dredging of Weras Ganga (B = 40 m, L = 5.5 km) Improvement of Bolgoda Canal, Nugegoda- Rattanapitiya, and Urban Drainage | 3,274 | 327 | 327 | 982 | 982 | 655 | | | | | | |
| 2) Improvement of Boralessgamuwa North and South and Maha Ela | 1,035 | | | | | 104 | 104 | 311 | 311 | 207 | | |
| 3) Storm Water Retention Area in Weras Ganga Basin (97 ha) | 793 | 159 | 159 | 159 | 159 | 159 | | | | | | |
| Total | 5,102 | 486 | 486 | 1,141 | 1,141 | 917 | 104 | 311 | 311 | 207 | | |
| Grand Total | 15,633 | 737 | 737 | 1,759 | 1,759 | 2,074 | 887 | 2,053 | 2,053 | 1,971 | 1,431 | 172 |

Table 10.1 Overall Evaluation for Selection of Priority Project

| Component Project | Economic Viability | | Project Cost | Technical Viability | Land Acquisition | Resettlement (household) | Poor Household Rate | Environmental Impact | Future Land Use of Area | Overall Evaluation | |
|--|--------------------|--------------|--------------|---------------------|----------------------------|--------------------------|---------------------|----------------------|--|--------------------|--|
| | B/C | EIRR | | | | | | | | | |
| 1. Ja Ela Basin Storm Water Drainage Plan | | | | | | | | | | | |
| 1) Ja Ela Channel Improvement | B (1.34) | B (12.9%) | B (3,679) | A | C+C (50 ha+ 876 ha*) | C (570**) | A (37%) | B | B (Semi Urban) | C | |
| 2) Dandugam Oya Channel Improvement | | | | | | | | | | | |
| 3) Storm Water Retention Areas | | | | | | | | | | | |
| 2. Kalu Oya Basin Storm Water Drainage Plan | | | | | | | | | | | |
| 1) Kalu Oya Channel Improvement | A (1.94) | A (17.4%) | A (2,463) | A | C+B (30 ha+ 489 ha*) | C (730**) | A (37%) | B | A (Urban) | B | |
| 2) Old Negombo Canal Improvement | | | | | | | | | | | |
| 3) Storm Water Retention Areas | | | | | | | | | | | |
| 3. Greater Colombo Basin Storm Water Drainage Plan | | | | | | | | | | | |
| 1) Madiwela South Diversion Canal | A (2.23) | A (19.5%) | B (4,389) | A, B | C+B (25 ha+ 380 ha*) | C (1,050**) | B (24%) | B | A (Urban) | B | |
| 2) Restoration of Existing Mutwal Tunnel | | | | | | | | | | | |
| 3) New Mutwal Tunnel | | | | | | | | | | | |
| 4) Storm Water Retention Areas | | | | | | | | | | | |
| 4. Bolgoda Basin Storm Water Drainage Plan (Weras Ganga Basin) | | | | | | | | | | | |
| 1) Weras Ganga Scheme | A (2.22) | A (19.2%) | C (5,102) | A | A+A (31 ha+ 295 ha*) | A (158) | A (35%) | A | A (Urban- Weras Ganga Basin) | A | |
| 2) Nugegoda-Rattanapitiya Scheme | | | | | | | | | | | |
| 3) Bolgoda Canal Scheme | | | | | | | | | | | |
| 4) Boralessgamuwa North Scheme | | | | | | | | | | | |
| 5) Boralessgamuwa South Scheme | | | | | | | | | | | |
| 6) Maha Ela Scheme | | | | | | | | | | | |
| 7) Ratmalana-Moratuwa Scheme | | | | | | | | | | | |

Note: * area for storm water retention area, ** number of households living in riparian area

Table 13.1 Population of Weras Ganga Basin by GN Divisions in 2001 (1/4)

| No. | DS Name | GN Name | MC/UC/PS | Population (2001) | Male | Female | GN Number |
|-----|----------------------|----------------------|----------------|-------------------|-------|--------|-----------|
| 1 | Dehiwala-M. L. | Sri Saranankara | Dehiwala-M. L. | 7,009 | 3,371 | 3,638 | 538C |
| 2 | Dehiwala-M. L. | Vilawala | Dehiwala-M. L. | 8,236 | 4,008 | 4,228 | 537 |
| 3 | Dehiwala-M. L. | Dutugemunu | Dehiwala-M. L. | 5,893 | 3,150 | 2,743 | 537A |
| 4 | Dehiwala-M. L. | Kohuwala | Dehiwala-M. L. | 7,288 | 3,606 | 3,682 | 537B |
| 5 | Dehiwala-M. L. | Kalubovila | Dehiwala-M. L. | 5,720 | 2,771 | 2,949 | 538 |
| 6 | Dehiwala-M. L. | Hathbodhiya | Dehiwala-M. L. | 6,779 | 3,475 | 3,304 | 538B |
| 7 | Dehiwala-M. L. | Galwala | Dehiwala-M. L. | 6,275 | 3,195 | 3,080 | 538A |
| 8 | Dehiwala-M. L. | Dehiwala West | Dehiwala-M. L. | 6,242 | 3,337 | 2,905 | 540A |
| 9 | Dehiwala-M. L. | Dehiwala East | Dehiwala-M. L. | 6,998 | 3,463 | 3,535 | 540 |
| 10 | Dehiwala-M. L. | Udyanaya | Dehiwala-M. L. | 6,228 | 3,011 | 3,217 | 536A |
| 11 | Dehiwala-M. L. | Nedimala | Dehiwala-M. L. | 9,387 | 4,559 | 4,828 | 536 |
| 12 | Dehiwala-M. L. | Malwatta | Dehiwala-M. L. | 4,607 | 2,302 | 2,305 | 539/4 |
| 13 | Dehiwala-M. L. | Jayathilaka | Dehiwala-M. L. | 6,433 | 3,480 | 2,953 | 540B |
| 14 | Dehiwala-M. L. | Kawdana East | Dehiwala-M. L. | 14,491 | 7,106 | 7,385 | 539/4 |
| | Dehiwala-M. L. Total | | | 101,586 | | | |
| 1 | Rathmalana | Mount Lavinia | Dehiwala-M. L. | 11,188 | 5,821 | 5,367 | 541 |
| 2 | Rathmalana | Kawdana West | Dehiwala-M. L. | 7,024 | 3,481 | 3,543 | 539/42C |
| 3 | Rathmalana | Watarappala | Dehiwala-M. L. | 7,002 | 3,498 | 3,504 | 544 |
| 4 | Rathmalana | Wathumulla | Dehiwala-M. L. | 6,130 | 3,073 | 3,057 | 544A |
| 5 | Rathmalana | Katukurunduwatta | Dehiwala-M. L. | 11,756 | 5,590 | 6,166 | 545A |
| 6 | Rathmalana | Attidiya North | Dehiwala-M. L. | 8,625 | 4,140 | 4,485 | 543 |
| 7 | Rathmalana | Attidiya South | Dehiwala-M. L. | 10,440 | 4,873 | 5,567 | 543B |
| 8 | Rathmalana | Piriwena | Dehiwala-M. L. | 6,312 | 3,133 | 3,179 | 545 |
| 9 | Rathmalana | Wedikanda | Dehiwala-M. L. | 8,733 | 4,227 | 4,506 | 546A |
| 10 | Rathmalana | Vihara | Dehiwala-M. L. | 7,965 | 3,871 | 4,094 | 546B |
| 11 | Rathmalana | Rathmalana West | Dehiwala-M. L. | 5,660 | 2,694 | 2,966 | 546 |
| 12 | Rathmalana | Rathmalana East | Dehiwala-M. L. | 6,109 | 3,095 | 3,014 | 546C |
| 13 | Rathmalana | Kandawala | Dehiwala-M. L. | 11,257 | 5,977 | 5,280 | 543A |
| | Rathmalana Total | | | 108,201 | | | |
| 1 | Moratuwa | Angulana North | Moratuwa MC | 3,613 | 1,765 | 1,848 | 547 |
| 2 | Moratuwa | Kaldemulla | Moratuwa MC | 4,946 | 2,330 | 2,616 | 548 |
| 3 | Moratuwa | Soysapura North | Moratuwa MC | 4,451 | 2,043 | 2,408 | 548A |
| 4 | Moratuwa | Soysapura South | Moratuwa MC | 3,274 | 1,548 | 1,726 | 548B |
| 5 | Moratuwa | Dahampura | Moratuwa MC | 3,285 | 1,411 | 1,874 | 548C |
| 6 | Moratuwa | Telawala North | Moratuwa MC | 5,627 | 2,674 | 2,953 | 549B |
| 7 | Moratuwa | Borupana | Moratuwa MC | 6,879 | 3,339 | 3,540 | 549A |
| 8 | Moratuwa | Telawala South | Moratuwa MC | 3,571 | 1,771 | 1,800 | 549 |
| 9 | Moratuwa | Lakshapathiya North | Moratuwa MC | 5,453 | 2,421 | 3,032 | 550A |
| 10 | Moratuwa | Lakshapathiya Centre | Moratuwa MC | 2,947 | 1,443 | 1,504 | 550B |
| 11 | Moratuwa | Angulana South | Moratuwa MC | 3,459 | 1,710 | 1,749 | 547A |
| 12 | Moratuwa | Uyana South | Moratuwa MC | 4,313 | 2,125 | 2,188 | 552A |
| 13 | Moratuwa | Uyana North | Moratuwa MC | 3,822 | 1,893 | 1,929 | 552B |
| 14 | Moratuwa | Rawathawatta South | Moratuwa MC | 2,255 | 1,051 | 1,204 | 557B |
| 15 | Moratuwa | Rawathawatta East | Moratuwa MC | 4,460 | 2,085 | 2,375 | 557 |
| 16 | Moratuwa | Lakshapathiya South | Moratuwa MC | 5,687 | 2,652 | 3,035 | 550 |
| 17 | Moratuwa | Kuduwamulla | Moratuwa MC | 3,067 | 1,517 | 1,550 | 551B |
| 18 | Moratuwa | Katubedda | Moratuwa MC | 10,257 | 5,359 | 4,898 | 551 |
| 19 | Moratuwa | Molpe | Moratuwa MC | 6,237 | 3,113 | 3,124 | 551A |
| 20 | Moratuwa | Moratummulla North | Moratuwa MC | 3,372 | 1,707 | 1,665 | 551C |
| 21 | Moratuwa | Kadalana | Moratuwa MC | 3,622 | 1,766 | 1,856 | 558A |
| 22 | Moratuwa | Rawathawatta West | Moratuwa MC | 3,759 | 1,813 | 1,946 | 557A |
| 23 | Moratuwa | Idama | Moratuwa MC | 3,282 | 1,593 | 1,689 | 552 |
| 24 | Moratuwa | Uswatta | Moratuwa MC | 2,584 | 1,186 | 1,398 | 553C |
| 25 | Moratuwa | Moratuwella South | Moratuwa MC | 4,757 | 2,311 | 2,446 | 553 |
| 26 | Moratuwa | Indibedda West | Moratuwa MC | 4,080 | 2,041 | 2,039 | 559 |
| 27 | Moratuwa | Moratummulla East | Moratuwa MC | 4,139 | 2,085 | 2,054 | 558 |
| 28 | Moratuwa | Moratummulla West | Moratuwa MC | 3,504 | 1,758 | 1,746 | 558B |
| 29 | Moratuwa | Villorawatta East | Moratuwa MC | 3,629 | 1,857 | 1,772 | 560/6 |
| 30 | Moratuwa | Villorawatta West | Moratuwa MC | 4,290 | 2,168 | 2,122 | 560/6 |
| 31 | Moratuwa | Indibedda East | Moratuwa MC | 3,560 | 1,775 | 1,785 | 559A |

Table 13.1 Population of Weras Ganga Basin by GN Divisions in 2001 (2/4)

| No. | DS Name | GN Name | MC/UC/PS | Population (2001) | Male | Female | GN Number |
|-----|----------------------------------|---------------------|-----------------|-------------------|-------|--------|-----------|
| 32 | Moratuwa | Moratuwella North | Moratuwa MC | 2,940 | 1,563 | 1,377 | 553A |
| 33 | Moratuwa | Moratuwella West | Moratuwa MC | 2,693 | 1,343 | 1,350 | 553B |
| 34 | Moratuwa | Koralawella North | Moratuwa MC | 5,837 | 2,821 | 3,016 | 554 |
| 35 | Moratuwa | Koralawella East | Moratuwa MC | 2,200 | 1,076 | 1,124 | 554B |
| 36 | Moratuwa | Koralawella West | Moratuwa MC | 3,913 | 1,943 | 1,970 | 554C |
| 37 | Moratuwa | Koralawella South | Moratuwa MC | 4,059 | 2,010 | 2,049 | 554A |
| 38 | Moratuwa | Katukurunda North | Moratuwa MC | 4,033 | 1,960 | 2,073 | 555 |
| 39 | Moratuwa | Katukurunda South | Moratuwa MC | 4,893 | 2,400 | 2,493 | 555A |
| 40 | Moratuwa | Egoda Uyana North | Moratuwa MC | 5,118 | 2,521 | 2,597 | 556 |
| 41 | Moratuwa | Egoda Uyana Central | Moratuwa MC | 3,228 | 1,648 | 1,580 | 556A |
| 42 | Moratuwa | Egoda Uyana South | Moratuwa MC | 6,095 | 2,988 | 3,107 | 556B |
| | Moratuwa Total | | | 45,009 | | | |
| 1 | Sri Jayawardenapura | Obsekarapura | Sri Jayawar. Ko | 11,629 | 5,824 | 5,805 | 514C |
| 2 | Sri Jayawardenapura | Welikada West | Sri Jayawar. Ko | 7,002 | 3,332 | 3,670 | 514A |
| 3 | Sri Jayawardenapura | Welikada East | Sri Jayawar. Ko | 5,752 | 2,738 | 3,014 | 514 |
| 4 | Sri Jayawardenapura | Rajagiriya | Sri Jayawar. Ko | 4,194 | 2,322 | 1,872 | 514B |
| 5 | Sri Jayawardenapura | Welikada North | Sri Jayawar. Ko | 5,116 | 2,937 | 2,179 | 514D |
| 6 | Sri Jayawardenapura | Nawala West | Sri Jayawar. Ko | 4,483 | 2,230 | 2,253 | 520 |
| 7 | Sri Jayawardenapura | Koswatta | Sri Jayawar. Ko | 6,220 | 3,119 | 3,101 | 520A |
| 8 | Sri Jayawardenapura | Ethulkotte West | Sri Jayawar. Ko | 3,515 | 1,754 | 1,761 | 521A |
| 9 | Sri Jayawardenapura | Ethulkotte | Sri Jayawar. Ko | 6,392 | 3,316 | 3,076 | 521 |
| 10 | Sri Jayawardenapura | Pitakotte East | Sri Jayawar. Ko | 4,127 | 2,056 | 2,071 | 522A |
| 11 | Sri Jayawardenapura | Pitakotte | Sri Jayawar. Ko | 3,768 | 1,949 | 1,819 | 522B |
| 12 | Sri Jayawardenapura | Pitakotte West | Sri Jayawar. Ko | 5,343 | 2,550 | 2,793 | 522 |
| 13 | Sri Jayawardenapura | Nawala East | Sri Jayawar. Ko | 5,821 | 3,000 | 2,821 | 520B |
| 14 | Sri Jayawardenapura | Nugegoda West | Sri Jayawar. Ko | 6,163 | 3,113 | 3,050 | 519B |
| 15 | Sri Jayawardenapura | Pagoda | Sri Jayawar. Ko | 6,455 | 3,337 | 3,118 | 519A |
| 16 | Sri Jayawardenapura | Nugegoda | Sri Jayawar. Ko | 5,511 | 3,267 | 2,244 | 519 |
| 17 | Sri Jayawardenapura | Pagoda East | Sri Jayawar. Ko | 5,879 | 2,756 | 3,123 | 519C |
| 18 | Sri Jayawardenapura | Gangodavila North | Sri Jayawar. Ko | 6,227 | 3,112 | 3,115 | 526 |
| 19 | Sri Jayawardenapura | Gangodavila South | Sri Jayawar. Ko | 8,276 | 4,270 | 4,006 | 526A |
| 20 | Sri Jayawardenapura | Gangodavila East | Sri Jayawar. Ko | 3,953 | 2,102 | 1,851 | 526C |
| | Sri Jayawardenapura Total | | | 115,826 | | | |
| 1 | Maharagama | Mirihana South | Maharagama PS | 5,578 | 2,689 | 2,889 | 523A |
| 2 | Maharagama | Mirihana North | Maharagama PS | 6,256 | 2,970 | 3,286 | 523 |
| 3 | Maharagama | Madiwela | Maharagama PS | 6,296 | 3,201 | 3,095 | 524 |
| 4 | Maharagama | Thalawathugoda West | Homagama PS | 5,381 | 2,679 | 2,702 | 493A |
| 5 | Maharagama | Thalawathugoda East | Homagama PS | 4,830 | 2,394 | 2,436 | 493B |
| 6 | Maharagama | Kalgoda | Homagama PS | 3,685 | 1,862 | 1,823 | 493 |
| 7 | Maharagama | Kottawa East | Homagama PS | 3,888 | 1,872 | 2,016 | 496A |
| 8 | Maharagama | Rukmale West | Homagama PS | 3,510 | 1,745 | 1,765 | 497 |
| 9 | Maharagama | Rukmale East A | Homagama PS | 1,051 | 512 | 539 | 497A |
| 10 | Maharagama | Rukmale East B | Homagama PS | 2,578 | 1,159 | 1,419 | 497B |
| 11 | Maharagama | Liyanagoda | Homagama PS | 3,502 | 1,676 | 1,826 | 496E |
| 12 | Maharagama | Kottawa North | Homagama PS | 2,189 | 1,086 | 1,103 | 496C |
| 13 | Maharagama | Depanama | Maharagama UC | 6,610 | 3,277 | 3,333 | 529A |
| 14 | Maharagama | Polwatta | Maharagama UC | 2,443 | 1,196 | 1,247 | 529 |
| 15 | Maharagama | Pamunuwa | Maharagama UC | 4,107 | 1,987 | 2,120 | 528 |
| 16 | Maharagama | Thalapathpitiya | Maharagama UC | 5,505 | 2,740 | 2,765 | 525 |
| 17 | Maharagama | Pragathipura | Maharagama UC | 5,228 | 2,576 | 2,652 | 524A |
| 18 | Maharagama | Udahamulla East | Maharagama UC | 6,010 | 3,020 | 2,990 | 525A |
| 19 | Maharagama | Udahamulla West | Maharagama UC | 4,202 | 2,062 | 2,140 | 525B |
| 20 | Maharagama | Pathiragoda | Maharagama UC | 6,216 | 3,017 | 3,199 | 527A |
| 21 | Maharagama | Maharagama East | Maharagama UC | 3,567 | 1,795 | 1,772 | 527B |
| 22 | Maharagama | Maharagama West | Maharagama UC | 2,419 | 1,228 | 1,191 | 527C |
| 23 | Maharagama | Dambahena | Maharagama UC | 5,049 | 2,425 | 2,624 | 528A |
| 24 | Maharagama | Pannipitiya North | Maharagama UC | 3,741 | 1,854 | 1,887 | 531 |
| 25 | Maharagama | Kottawa West | Homagama PS | 2,410 | 1,195 | 1,215 | 496D |
| 26 | Maharagama | Kottawa South | Homagama PS | 6,170 | 2,993 | 3,177 | 496 |
| 27 | Maharagama | Malapalla West | Homagama PS | 2,464 | 1,196 | 1,268 | 498B |

Table 13.1 Population of Weras Ganga Basin by GN Divisions in 2001 (3/4)

| No. | DS Name | GN Name | MC/UC/PS | Population (2001) | Male | Female | GN Number |
|-----|------------------|---------------------|---------------|----------------------|-------|--------|-----------|
| 28 | Maharagama | Malapalla East | Homagama PS | 2,669 | 1,273 | 1,396 | 498 |
| 29 | Maharagama | Makumbura North | Homagama PS | 3,006 | 1,457 | 1,549 | 498A |
| 30 | Maharagama | Makumbura South | Homagama PS | 1,703 | 897 | 806 | 498C |
| 31 | Maharagama | Kottawa Town | Homagama PS | 5,616 | 2,920 | 2,696 | 496B |
| 32 | Maharagama | Pannipitiya South | Maharagama UC | 2,107 | 1,036 | 1,071 | 531A |
| 33 | Maharagama | Maharagama Town | Maharagama UC | 6,024 | 3,294 | 2,730 | 530 |
| 34 | Maharagama | Godigamuwa South | Maharagama UC | 5,302 | 2,583 | 2,719 | 532A |
| 35 | Maharagama | Godigamuwa South B | Maharagama UC | 6,063 | 2,699 | 3,364 | 532B |
| 36 | Maharagama | Godigamuwa North | Maharagama UC | 4,703 | 2,200 | 2,503 | 532 |
| 37 | Maharagama | Wattegedara | Maharagama UC | 7,804 | 3,920 | 3,884 | 532C |
| 38 | Maharagama | Navinna | Maharagama UC | 5,161 | 2,514 | 2,647 | 527 |
| 39 | Maharagama | Wijerama | Maharagama UC | 3,569 | 2,099 | 1,470 | 526C |
| 40 | Maharagama | Gangodavila South B | Maharagama UC | 6,730 | 2,814 | 3,916 | 526B |
| 41 | Maharagama | Jambugasmulla | Maharagama UC | 4,770 | 2,246 | 2,524 | 526D |
| | Maharagama Total | | | 65,227 | | | |
| 1 | Kesbewa | Bellavila | Kesbewa PS | 3,498 | 1,734 | 1,764 | 535A |
| 2 | Kesbewa | Boralesgamuwa West | Kesbewa PS | 4,198 | 2,007 | 2,191 | 533B |
| 3 | Kesbewa | Boralesgamuwa West | Kesbewa PS | 1,648 | 740 | 908 | 533F |
| 4 | Kesbewa | Rattanaipitiya | Kesbewa PS | 4,024 | 1,899 | 2,125 | 533A |
| 5 | Kesbewa | Egodawatta | Kesbewa PS | 2,606 | 1,206 | 1,400 | 533C |
| 6 | Kesbewa | Boralesgamuwa East | Kesbewa PS | 5,028 | 2,617 | 2,411 | 533 |
| 7 | Kesbewa | Boralesgamuwa West | Kesbewa PS | 2,374 | 1,135 | 1,239 | 533E |
| 8 | Kesbewa | Werahera North | Kesbewa PS | 2,017 | 1,079 | 938 | 577 |
| 9 | Kesbewa | Boralesgamuwa East | Kesbewa PS | 4,669 | 2,000 | 2,669 | 533D |
| 10 | Kesbewa | Neelammahara | Kesbewa PS | 2,854 | 1,356 | 1,498 | 579 |
| 11 | Kesbewa | Katuwawala North | Kesbewa PS | 3,001 | 1,480 | 1,521 | 578 |
| 12 | Kesbewa | Vishwakalawa | Kesbewa PS | 1,870 | 899 | 971 | 574B |
| 13 | Kesbewa | Werahera South | Kesbewa PS | 4,191 | 2,139 | 2,052 | 577A |
| 14 | Kesbewa | Katuwawala South | Kesbewa PS | 1,401 | 695 | 706 | 578A |
| 15 | Kesbewa | Niwanthidiya | Kesbewa PS | 2,350 | 1,159 | 1,191 | 580A |
| 16 | Kesbewa | Erewwala West | Kesbewa PS | 5,274 | 2,525 | 2,749 | 581A |
| 17 | Kesbewa | Erewwala North | Kesbewa PS | 3,266 | 1,635 | 1,631 | 581D |
| 18 | Kesbewa | Erewwala East | Kesbewa PS | 1,919 | 963 | 956 | 581 |
| 19 | Kesbewa | Rathmaladeniya | Kesbewa PS | 4,425 | 2,022 | 2,403 | 581C |
| 20 | Kesbewa | Mahalwarawa | Kesbewa PS | 2,586 | 1,280 | 1,306 | 581E |
| 21 | Kesbewa | Bangalawatta | Kesbewa PS | 2,279 | 1,070 | 1,209 | 581B |
| 22 | Kesbewa | Pelenwatta East | Kesbewa PS | 3,413 | 1,633 | 1,780 | 582B |
| 23 | Kesbewa | Pelenwatta North | Kesbewa PS | 3,473 | 1,687 | 1,786 | 582 |
| 24 | Kesbewa | Pelenwatta West | Kesbewa PS | 4,316 | 2,096 | 2,220 | 582A |
| 25 | Kesbewa | Paligedara | Kesbewa PS | 2,666 | 1,292 | 1,374 | 583A |
| 26 | Kesbewa | Kaliyammahara | Kesbewa PS | 2,142 | 1,049 | 1,093 | 580 |
| 27 | Kesbewa | Bokundara | Kesbewa PS | 3,504 | 1,766 | 1,738 | 575 |
| 28 | Kesbewa | Thumbovila South | Kesbewa PS | 2,890 | 1,370 | 1,520 | 576B |
| 29 | Kesbewa | Thumbovila North | Kesbewa PS | 2,565 | 1,241 | 1,324 | 576A |
| 30 | Kesbewa | Wewala West | Kesbewa PS | 4,198 | 2,073 | 2,125 | 562B |
| 31 | Kesbewa | Wewala East | Kesbewa PS | 1,956 | 898 | 1,058 | 562 |
| 32 | Kesbewa | Thumbovila West | Kesbewa PS | 2,546 | 1,301 | 1,245 | 576 |
| 33 | Kesbewa | Mampe North | Kesbewa PS | 3,168 | 1,633 | 1,535 | 574A |
| 34 | Kesbewa | Makuludoowa | Kesbewa PS | 2,769 | 1,347 | 1,422 | 583 |
| 35 | Kesbewa | Gorakapitiya | Kesbewa PS | 1,322 | 604 | 718 | 584 |
| 36 | Kesbewa | Nampamunuwa | Kesbewa PS | 2,751 | 1,359 | 1,392 | 584A |
| 37 | Kesbewa | Mavittara North | Kesbewa PS | 2,038 | 981 | 1,057 | 586A |
| 38 | Kesbewa | Mampe East | Kesbewa PS | 1,786 | 907 | 879 | 574D |
| 39 | Kesbewa | Bodhirajapura | Kesbewa PS | 2,042 | 1,002 | 1,040 | 577B |
| 40 | Kesbewa | Mampe West | Kesbewa PS | 4,563 | 2,240 | 2,323 | 574 |
| 41 | Kesbewa | Mampe South | Kesbewa PS | 1,765 | 818 | 947 | 574C |
| 42 | Kesbewa | Kolamunna | Kesbewa PS | 3,386 | 1,700 | 1,686 | 563/7 |
| 43 | Kesbewa | Suwarapola East | Kesbewa PS | 2,537 | 1,223 | 1,314 | 562A |
| 44 | Kesbewa | Suwarapola West | Kesbewa PS | 1,373 | 697 | 676 | 562C |
| 45 | Kesbewa | Hedigama | Kesbewa PS | 3,404 | 1,680 | 1,724 | 563/7 |

Table 13.1 Population of Weras Ganga Basin by GN Divisions in 2001 (4/4)

| No. | DS Name | GN Name | MC/UC/PS | Population (2001) | Male | Female | GN Number |
|-----|----------------------|-------------------|------------|----------------------|-------|--------|-----------|
| 46 | Kesbewa | Batakettara North | Kesbewa PS | 4,456 | 2,289 | 2,167 | 565 |
| 47 | Kesbewa | Kesbewa North | Kesbewa PS | 3,915 | 1,886 | 2,029 | 572 |
| 48 | Kesbewa | Kesbewa East | Kesbewa PS | 1,824 | 932 | 892 | 572B |
| 49 | Kesbewa | Mavittara South | Kesbewa PS | 1,533 | 736 | 797 | 586 |
| 50 | Kesbewa | Honnanthara North | Kesbewa PS | 2,870 | 1,389 | 1,481 | 585 |
| 51 | Kesbewa | Honnanthara South | Kesbewa PS | 3,680 | 1,756 | 1,924 | 585A |
| 52 | Kesbewa | Makandana East | Kesbewa PS | 3,796 | 1,881 | 1,915 | 569 |
| 53 | Kesbewa | Kesbewa South | Kesbewa PS | 5,353 | 2,666 | 2,687 | 572A |
| 54 | Kesbewa | Batakettara South | Kesbewa PS | 5,293 | 2,573 | 2,720 | 565A |
| 55 | Kesbewa | Madapatha | Kesbewa PS | 2,924 | 1,452 | 1,472 | 567 |
| 56 | Kesbewa | Delthara West | Kesbewa PS | 1,866 | 960 | 906 | 564 |
| 57 | Kesbewa | Delthara East | Kesbewa PS | 1,347 | 670 | 677 | 564A |
| 58 | Kesbewa | Dampe | Kesbewa PS | 3,098 | 1,533 | 1,565 | 566 |
| 59 | Kesbewa | Makandana West | Kesbewa PS | 2,753 | 1,371 | 1,382 | 569A |
| 60 | Kesbewa | Nivungama | Kesbewa PS | 1,812 | 864 | 948 | 568A |
| 61 | Kesbewa | Halpita | Kesbewa PS | 3,973 | 1,923 | 2,050 | 570/5 |
| 62 | Kesbewa | Horathuduwa | Kesbewa PS | 1,391 | 714 | 677 | 570/7 |
| 63 | Kesbewa | Morenda | Kesbewa PS | 1,137 | 586 | 551 | 568 |
| 64 | Kesbewa | Batuwandara North | Kesbewa PS | 1,239 | 601 | 638 | 596 |
| 65 | Kesbewa | Batuwandara South | Kesbewa PS | 1,168 | 557 | 611 | 596A |
| 66 | Kesbewa | Jamburaliya | Kesbewa PS | 2,431 | 1,182 | 1,249 | 597 |
| 67 | Kesbewa | Polhena | Kesbewa PS | 1,555 | 740 | 815 | 598B |
| 68 | Kesbewa | Regidel Watta | Kesbewa PS | 1,132 | 564 | 568 | 598A |
| 69 | Kesbewa | Kahapola | Kesbewa PS | 2,647 | 1,307 | 1,340 | 598 |
| | Kesbewa Total | | | 63,193 | | | |
| | Grand Total | | | 63,193 | | | |

Source: Census 2001 Department of Census and Statistics

Note: GN Division in bold is within Weras Ganga Basin.

Table 13.2 Property-related Characteristics of Households Surveyed (1/2)

Duration of Dwelling in Present Location

(Unit: nos.)

| Scheme | Duration of Dwelling | | | | | | Total | Average year |
|---|----------------------|-------------|--------------|---------------|---------------|----------------|----------------|--------------|
| | Less 1 year | 1 - 5 years | 6 - 10 years | 11 - 20 years | Over 20 years | | | |
| 1. Weras Ganga | | | | | | | | |
| - Dredging and flood protection wall const. | 1 (0) | 196 (16) | 160 (7) | 192 (5) | 44 (0) | 593 (28) | 10.7 (6.6) | |
| - Weras Ganga Swamp Retention Area | 0 (-) | 29 (-) | 14 (-) | 5 (-) | 3 (-) | 51 (-) | 7.8 (-) | |
| - Maha Ela Retention Area | 0 (-) | 28 (-) | 18 (-) | 24 (-) | 19 (-) | 89 (-) | 14.8 (-) | |
| 2. Bolgoda Canal | | | | | | | | |
| - Dredging and channel improvement | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 3 (3) | 3 (3) | 33.3 (33.3) | |
| - Bellanwila-Attidiya Retention Area | 2 (-) | 74 (-) | 58 (-) | 74 (-) | 72 (-) | 280 (-) | 16.2 (-) | |
| 3. Nugegoda-Rattanaipitiya | 2 (1) | 85 (16) | 51 (13) | 106 (20) | 135 (32) | 379 (82) | 21.6 (24.7) | |
| 4. Ratmalana-Moratuwa | 0 (0) | 13 (4) | 23 (5) | 12 (3) | 5 (2) | 53 (14) | 11.0 (12.0) | |
| Total | 5 (1) | 425 (36) | 324 (25) | 413 (28) | 281 (37) | 1,448 (127) | 14.8 (19.5) | |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

Average Land Area Occupied by Surveyed Households

(Unit: number of households)

| Scheme | Average Land Area (m ²) | | | | | |
|---|-------------------------------------|-------------|-------------|-------------|----------------|------------------|
| | Less 50 | 51 - 100 | 101 - 200 | Over 200 | Total | Average Area |
| 1. Weras Ganga | | | | | | |
| - Dredging and flood protection wall const. | 44 (3) | 154 (9) | 251 (12) | 162 (5) | 611 (29) | 171.9 (132.8) |
| - Weras Ganga Swamp Retention Area | 1 (-) | 2 (-) | 24 (-) | 28 (-) | 55 (-) | 220.4 (-) |
| - Maha Ela Retention Area | 0 (-) | 11 (-) | 31 (-) | 55 (-) | 97 (-) | 351.0 (-) |
| 2. Bolgoda Canal | | | | | | |
| - Dredging and channel improvement | 1 (1) | 0 (0) | 2 (2) | 0 (0) | 3 (3) | 112.9 (112.9) |
| - Bellanwila-Attidiya Retention Area | 17 (-) | 14 (-) | 70 (-) | 179 (-) | 280 (-) | 367.0 (-) |
| 3. Nugegoda-Rattanaipitiya | 32 (11) | 49 (16) | 95 (23) | 200 (32) | 376 (82) | 317.4 (242.5) |
| 4. Ratmalana-Moratuwa | 3 (2) | 21 (2) | 28 (5) | 4 (3) | 56 (12) | 128.7 (140.3) |
| Total | 98 (17) | 251 (27) | 501 (42) | 628 (40) | 1,478 (126) | 258.5 (204.7) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

Table 13.2 Property-related Characteristics of Households Surveyed (2/2)

Tenure Status of Land and House

(Unit: number of households)

| Scheme | Tenure Status | | | | | |
|---|---------------|--------|----------|----------|--------|-------------|
| | (a) | (b) | (c) | (d) | (e) | Total |
| 1. Weras Ganga | | | | | | |
| - Dredging and flood protection wall const. | 311 (6) | 1 (0) | 14 (1) | 253 (16) | 32 (5) | 611 (28) |
| - Weras Ganga Swamp Retention Area | 50 (-) | 1 (-) | 5 (-) | 0 (-) | 1 (-) | 57 (-) |
| - Maha Ela Retention Area | 75 (-) | 1 (-) | 13 (-) | 4 (-) | 5 (-) | 98 (-) |
| 2. Bolgoda Canal | | | | | | |
| - Dredging and channel improvement | 3 (3) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 3 (3) |
| - Bellanwila-Attidiya Retention Area | 237 (-) | 8 (-) | 30 (-) | 8 (-) | 4 (-) | 287 (-) |
| 3. Nugegoda-Rattanaipitiya | 289 (53) | 7 (3) | 46 (12) | 50 (18) | 6 (1) | 398 (87) |
| 4. Ratmalana-Moratuwa | 27 (14) | 0 (0) | 0 (0) | 22 (1) | 6 (0) | 55 (15) |
| Total | 992 (76) | 18 (3) | 108 (13) | 337 (35) | 54 (6) | 1,509 (133) |

Note: (a): Own land and house, (b): Rent land and own house, (c): Rent land and house, (d): Illegal occupancy of land & own house, (e): Others (mostly land permit in public land)

The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

Ownership Status of Land

(Unit: number of households)

| Scheme | Owner Status of Land | | | | |
|---|----------------------|---------|--------|----------|-------------|
| | (a) | (b) | (c) | (d) | Total |
| 1. Weras Ganga | | | | | |
| - Dredging and flood protection wall const. | 203 (1) | 52 (7) | 74 (2) | 287 (17) | 617 (27) |
| - Weras Ganga Swamp Retention Area | 56 (-) | 0 (-) | 0 (-) | 0 (-) | 56 (-) |
| - Maha Ela Retention Area | 94 (-) | 0 (-) | 0 (-) | 0 (-) | 94 (-) |
| 2. Bolgoda Canal | | | | | |
| - Dredging and channel improvement | 3 (3) | 0 (0) | 0 (0) | 0 (0) | 3 (3) |
| - Bellanwila-Attidiya Retention Area | 262 (-) | 4 (-) | 5 (-) | 8 (-) | 279 (-) |
| 3. Nugegoda-Rattanaipitiya | 323 (64) | 24 (7) | 11 (7) | 21 (9) | 379 (87) |
| 4. Ratmalana-Moratuwa | 23 (15) | 5 (0) | 3 (0) | 24 (0) | 55 (15) |
| Total | 964 (83) | 85 (14) | 93 (9) | 340 (26) | 1,483 (132) |

Note: (a): Privately owned land, (b): State land owned by UDA or SLLRDC, (c): Local authority's land, (d): Permitted land owned by UDA/MC/SLLRDC
The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

Table 13.3 Socio-economic Characteristics of Households Surveyed (1/2)

Average Number of Household Member

(Unit: number of households)

| Scheme | Average Number of Household Member (person) | | | | |
|---|---|------------|----------|-------------|----------------|
| | Less 3 | 3 – 5 | Over 5 | Total | Average Number |
| 1. Weras Ganga | | | | | |
| - Dredging and flood protection wall const. | 44 (4) | 493 (20) | 89 (5) | 626 (29) | 4.2 (4.0) |
| - Weras Ganga Swamp Retention Area | 7 (-) | 43 (-) | 7 (-) | 57 (-) | 4.0 (-) |
| - Maha Ela Retention Area | 10 (-) | 75 (-) | 13 (-) | 98 (-) | 4.0 (-) |
| 2. Bolgoda Canal | | | | | |
| - Dredging and channel improvement | 1 (1) | 2 (2) | 0 (0) | 3 (0) | 4.0 (4.0) |
| - Bellanwila-Attidiya Retention Area | 42 (-) | 189 (-) | 56 (-) | 287 (-) | 4.2 (-) |
| 3. Nugegoda-Rattanaipitiya | 55 (9) | 258 (58) | 61 (14) | 374 (81) | 4.1 (4.4) |
| 4. Ratmalana-Moratuwa | 0 (0) | 46 (11) | 10 (4) | 56 (15) | 4.7 (5.0) |
| Total | 159 (14) | 1,106 (91) | 236 (23) | 1,501 (125) | 4.2 (4.4) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

Main Occupation of Household Heads

| Scheme | Ranking of Main Occupation (Top 5) | | | | |
|---|------------------------------------|-----------|--------|-----------|------------|
| | 1 | 2 | 3 | 4 | 5 |
| 1. Weras Ganga | | | | | |
| - Dredging and flood protection wall const. | N1 (N1,N2,C) | N2(E,H,J) | E (M) | H (-) | C (-) |
| - Weras Ganga Swamp Retention Area | N1 (-) | M (-) | C (-) | H, N2 (-) | B, D (-) |
| - Maha Ela Retention Area | M (-) | N1 (-) | N2 (-) | B, E (-) | A,D,H,J(-) |
| 2. Bolgoda Canal | | | | | |
| - Dredging and channel improvement | N1,N,E (N1,N,E) | - (-) | - (-) | - (-) | - (-) |
| - Bellanwila-Attidiya Retention Area | N1 (-) | N2 (-) | M (-) | E (-) | A (-) |
| 3. Nugegoda-Rattanaipitiya | N1 (N1) | M (M,N2) | E (B) | B (C,E) | N2 (D,H) |
| 4. Ratmalana-Moratuwa | N1 (N1) | H (C) | C (E) | E (-) | F, J (-) |

Note: A: Senior official or manager, B: Professional, C: Technicians or associate professional, D: Clerk, E: Sales or service worker, H: Craft or related worker, J: Elementary occupation, M: Unemployed, N1:labour, N2:driver

The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Source: EIA Study on Weras Ganga Sub-basin Storm Water Drainage Plan, JICA Study Team, 2002

Table 13.3 Socio-economic Characteristics of Households Surveyed (2/2)

Religious Characteristics of Surveyed Households

(Unit: number of households)

| Scheme | Religions | | | | | |
|---|--------------------|---------------|---------------|---------------|--------------|--------------------|
| | Buddhist | Hindu | Christians | Muslims | Others | Total |
| 1. Weras Ganga | | | | | | |
| - Dredging and flood protection wall const. | 557 (22) | 9 (1) | 50 (5) | 5 (1) | 0 (0) | 621 (29) |
| - Weras Ganga Swamp Retention Area | 56 (-) | 0 (-) | 0 (-) | 1 (-) | 0 (-) | 57 (-) |
| - Maha Ela Retention Area | 97 (-) | 0 (-) | 2 (-) | 0 (-) | 0 (-) | 99 (-) |
| 2. Bolgoda Canal | | | | | | |
| - Dredging and channel improvement | 3 (3) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 3 (3) |
| - Bellanwila-Attidiya Retention Area | 273 (-) | 1 (-) | 9 (-) | 2 (-) | 0 (-) | 285 (-) |
| 3. Nugegoda-Rattanaipitiya | 317 (62) | 11 (5) | 25 (2) | 3 (2) | 0 (0) | 356 (71) |
| 4. Ratmalana-Moratuwa | 50 (15) | 0 (0) | 6 (0) | 0 (0) | 0 (0) | 56 (15) |
| Total | 1,353 (102) | 21 (6) | 92 (7) | 11 (3) | 0 (0) | 1,477 (118) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Income Level Characteristics of Surveyed Households

(Unit: number of households)

| Scheme | Income (Rs./month) | | | | | | Total |
|--|--------------------|------------------|------------------|------------------|-------------------|----------------|----------------|
| | Less 3,000 | 3,000 - 5,000 | 5,000 - 7,000 | 7,000 - 9,000 | 9,000 - 10,000 | Over 10,000 | |
| 1. Weras Ganga | | | | | | | |
| - Dredging and flood protection wall const. | 160 (12) | 237 (9) | 104 (4) | 54 (2) | 28 (1) | 40 (1) | 623 (29) |
| - Weras Ganga Swamp Retention Area | 7 (-) | 12 (-) | 12 (-) | 2 (-) | 4 (-) | 20 (-) | 57 (-) |
| - Maha Ela Retention Area | 24 (-) | 21 (-) | 17 (-) | 10 (-) | 3 (-) | 22 (-) | 97 (-) |
| 2. Bolgoda Canal | | | | | | | |
| - Dredging and channel improvement | 2 (2) | 1 (1) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 3 (3) |
| - Bellanwila-Attidiya Retention Area | 41 (-) | 70 (-) | 45 (-) | 22 (-) | 24 (-) | 82 (-) | 284 (-) |
| 3. Nugegoda-Rattanapitiya | 52 (16) | 61 (15) | 70 (22) | 36 (5) | 26 (3) | 113 (11) | 358 (72) |
| 4. Ratmalana-Moratuwa | 17 (7) | 17 (3) | 5 (1) | 5 (2) | 3 (0) | 9 (2) | 56 (15) |
| Total | 303 (37) | 419 (28) | 253 (27) | 129 (9) | 88 (4) | 286 (14) | 1,478 (119) |

Note: The numbers in parentheses indicate the numbers of households to be relocated out of total number of the households surveyed.

Table 14.1 Calculated Maximum Flood Water Level and Runoff at Selected Points

(1) Maximum Water Level of Each Return Period

(Unit : meter above MSL)

| Point | Land Use | Return Period | | | | |
|--|----------|---------------|------|-------|-------|-------|
| | | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr |
| (a) Bolgoda Canal at Attidiya Rd. | Present | 1.05 | 1.21 | 1.30 | 1.40 | 1.47 |
| | Future | 1.05 | 1.20 | 1.28 | 1.39 | 1.46 |
| (b) Rattapitiya Ela at Colombo-Piliyandala Rd. | Present | 1.48 | 1.60 | 1.67 | 1.74 | 1.78 |
| | Future | 1.57 | 1.69 | 1.75 | 1.81 | 1.87 |
| (c) Bolgoda Canal at Elewalla Rd. | Present | 1.01 | 1.17 | 1.26 | 1.36 | 1.43 |
| | Future | 0.96 | 1.11 | 1.20 | 1.30 | 1.37 |
| (d) Weras Ganga at Ratmalana-Orupana Rd. | Present | 0.61 | 0.67 | 0.73 | 0.81 | 0.88 |
| | Future | 0.65 | 0.75 | 0.83 | 0.93 | 1.01 |
| (e) Maha Ela Outfall | Present | 0.83 | 0.93 | 1.00 | 1.08 | 1.12 |
| | Future | 0.94 | 1.06 | 1.12 | 1.17 | 1.21 |
| (f) Weras Ganga Outfall | Present | 0.53 | 0.54 | 0.55 | 0.58 | 0.60 |
| | Future | 0.53 | 0.55 | 0.57 | 0.61 | 0.63 |

(2) Maximum Flood Runoff of Each Return Period

(Unit : m³/sec)

| Point | Land Use | Return Period | | | | |
|--|----------|---------------|------|-------|-------|-------|
| | | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr |
| (a) Bolgoda Canal at Attidiya Rd. (7.0 km ²) | Present | 18.5 | 25.3 | 29.8 | 35.9 | 40.8 |
| | Future | 20.2 | 27.7 | 32.5 | 39.1 | 44.3 |
| (b) Rattapitiya Ela at Colombo-Piliyandala Rd. (6.7 km ²) | Present | 20.2 | 27.2 | 32.8 | 39.5 | 45.3 |
| | Future | 25.5 | 34.7 | 40.6 | 50.6 | 58.9 |
| (c) Bolgoda Canal at Elewalla Rd. (20.8 km ²) | Present | 19.5 | 26.9 | 33.0 | 40.4 | 46.0 |
| | Future | 25.5 | 35.2 | 42.7 | 53.8 | 62.7 |
| (d) Weras Ganga at Ratmalana-Orupana Rd. (27.6 km ²) | Present | 25.2 | 33.7 | 40.9 | 50.3 | 57.5 |
| | Future | 32.7 | 43.9 | 52.7 | 63.7 | 72.6 |
| (e) Maha Ela Outfall (20.4 km ²) | Present | 7.9 | 10.6 | 12.6 | 15.3 | 17.3 |
| | Future | 11.0 | 14.7 | 17.2 | 20.3 | 22.4 |
| (f) Weras Ganga Outfall (55.5 km ²) | Present | 48.3 | 60.6 | 69.8 | 83.6 | 94.0 |
| | Future | 52.0 | 69.9 | 82.4 | 99.0 | 112.9 |

Note : Locations of above points are shown in Figure 14.5.

Table 14.2 Estimated Flood Inundation Area for Each Return Period under Present Land Use Condition

(Unit : ha)

| Return Period (Years) | Maximum Inundation Depth | Total | Land Use Category | | | | | | | | | | | | | | Net Inundation Area* |
|-----------------------|--------------------------|---------|-------------------|---------|--------------|---------|-----------|--------|--------------|-------|--------|--------|-----------|-------|------------|--------|----------------------|
| | | | Water | Airport | Dumping Site | Factory | Grassland | Garden | High Density | Paddy | Shanty | Vacant | Homestead | Marsh | Vegetation | Others | |
| 2 | Below 20 cm | 305.8 | 0.0 | 0.9 | 0.3 | 0.3 | 32.6 | 35.5 | 20.3 | 80.9 | 2.2 | 4.6 | 31.1 | 57.8 | 16.7 | 39.4 | 305.8 |
| | 20 ~ 50 cm | 270.9 | 0.0 | 0.0 | 0.0 | 1.0 | 23.8 | 22.6 | 10.5 | 58.7 | 3.1 | 3.5 | 14.7 | 105.0 | 13.4 | 27.9 | 270.9 |
| | 50 ~ 100 cm | 134.4 | 0.0 | 0.0 | 0.0 | 2.0 | 18.8 | 7.3 | 2.0 | 14.1 | 0.0 | 0.3 | 3.7 | 78.2 | 2.3 | 8.0 | 134.4 |
| | 100 ~ 200 cm | 9.7 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 1.3 | 0.4 | 2.0 | 0.0 | 0.0 | 0.3 | 0.5 | 0.7 | 0.9 | 9.7 |
| | Over 200 cm | 120.3 | 120.3 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| | Total | 841.1 | 120.3 | 0.9 | 0.3 | 3.4 | 79.6 | 66.7 | 33.2 | 155.7 | 5.3 | 8.5 | 49.9 | 241.5 | 33.1 | 76.3 | 720.8 |
| 5 | Below 20 cm | 326.3 | 0.0 | 1.1 | 0.7 | 0.6 | 34.3 | 38.7 | 25.3 | 88.7 | 2.5 | 6.2 | 35.6 | 37.1 | 31.9 | 55.4 | 326.3 |
| | 20 ~ 50 cm | 323.4 | 0.0 | 0.1 | 0.1 | 0.1 | 32.5 | 32.1 | 13.2 | 77.7 | 3.7 | 4.4 | 24.5 | 99.1 | 16.9 | 36.0 | 323.4 |
| | 50 ~ 100 cm | 192.1 | 0.0 | 0.0 | 0.0 | 2.1 | 20.3 | 12.8 | 4.4 | 18.3 | 0.0 | 1.4 | 5.9 | 113.6 | 4.5 | 13.3 | 192.1 |
| | 100 ~ 200 cm | 30.9 | 0.0 | 0.0 | 0.0 | 0.9 | 10.6 | 2.5 | 0.9 | 7.3 | 0.0 | 0.0 | 1.2 | 4.9 | 0.9 | 2.7 | 30.9 |
| | Over 200 cm | 120.8 | 120.6 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.2 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.2 |
| | Total | 993.4 | 120.6 | 1.3 | 0.8 | 3.7 | 97.7 | 86.1 | 43.9 | 192.1 | 6.2 | 12.2 | 67.1 | 254.8 | 54.1 | 107.4 | 872.8 |
| 10 | Below 20 cm | 313.8 | 0.0 | 2.6 | 0.8 | 0.9 | 35.7 | 41.1 | 25.1 | 90.6 | 3.9 | 7.2 | 38.4 | 28.1 | 17.9 | 39.5 | 313.8 |
| | 20 ~ 50 cm | 367.3 | 0.0 | 0.3 | 0.6 | 0.1 | 37.2 | 37.2 | 15.0 | 92.5 | 4.1 | 5.9 | 28.9 | 89.8 | 32.3 | 55.7 | 367.3 |
| | 50 ~ 100 cm | 209.3 | 0.0 | 0.0 | 0.0 | 0.7 | 16.6 | 15.1 | 5.6 | 18.7 | 0.0 | 1.9 | 7.4 | 124.1 | 7.4 | 19.2 | 209.3 |
| | 100 ~ 200 cm | 61.8 | 0.0 | 0.0 | 0.0 | 2.3 | 18.2 | 5.6 | 0.9 | 11.2 | 0.0 | 0.2 | 2.0 | 17.6 | 1.0 | 3.8 | 61.8 |
| | Over 200 cm | 121.0 | 120.7 | 0.0 | 0.0 | 0.0 | 0.3 | 0.1 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.3 |
| | Total | 1,073.1 | 120.7 | 2.9 | 1.4 | 4.0 | 108.0 | 99.1 | 46.6 | 213.0 | 8.0 | 15.3 | 76.6 | 259.6 | 58.7 | 118.2 | 952.4 |
| 25 | Below 20 cm | 306.0 | 0.0 | 3.6 | 0.2 | 1.0 | 34.3 | 42.2 | 27.8 | 89.8 | 3.1 | 6.6 | 41.3 | 23.0 | 11.4 | 33.1 | 306.0 |
| | 20 ~ 50 cm | 391.1 | 0.0 | 1.7 | 0.7 | 0.3 | 42.6 | 40.9 | 18.0 | 103.4 | 3.6 | 7.4 | 34.9 | 72.9 | 38.0 | 64.8 | 391.1 |
| | 50 ~ 100 cm | 248.9 | 0.0 | 0.0 | 0.0 | 0.1 | 17.6 | 22.0 | 7.1 | 31.9 | 1.3 | 3.3 | 10.5 | 130.2 | 11.4 | 24.8 | 248.9 |
| | 100 ~ 200 cm | 92.7 | 0.0 | 0.0 | 0.0 | 2.9 | 20.8 | 7.6 | 0.8 | 12.3 | 0.0 | 0.5 | 2.8 | 40.5 | 0.8 | 4.4 | 92.7 |
| | Over 200 cm | 124.2 | 120.7 | 0.0 | 0.0 | 0.0 | 2.5 | 0.2 | 0.0 | 0.3 | 0.0 | 0.1 | 0.0 | 0.1 | 0.6 | 0.2 | 3.5 |
| | Total | 1,162.8 | 120.7 | 5.3 | 1.0 | 4.3 | 117.8 | 113.0 | 53.7 | 237.6 | 8.0 | 17.8 | 89.6 | 266.7 | 62.2 | 127.3 | 1,042.2 |
| 50 | Below 20 cm | 298.0 | 0.0 | 3.3 | 0.4 | 1.2 | 33.0 | 44.1 | 28.6 | 85.9 | 3.3 | 5.7 | 42.1 | 20.8 | 7.6 | 29.5 | 298.0 |
| | 20 ~ 50 cm | 397.2 | 0.0 | 1.9 | 0.8 | 0.3 | 44.2 | 40.3 | 20.5 | 112.1 | 3.4 | 8.3 | 37.8 | 60.1 | 39.1 | 67.5 | 397.2 |
| | 50 ~ 100 cm | 282.3 | 0.0 | 0.0 | 0.0 | 0.0 | 20.6 | 28.4 | 8.2 | 42.1 | 2.1 | 4.4 | 15.0 | 130.4 | 15.6 | 30.9 | 282.3 |
| | 100 ~ 200 cm | 115.8 | 0.0 | 0.0 | 0.0 | 3.0 | 21.4 | 9.2 | 0.8 | 11.9 | 0.0 | 0.8 | 3.6 | 59.2 | 1.2 | 6.0 | 115.8 |
| | Over 200 cm | 128.4 | 120.7 | 0.0 | 0.0 | 0.0 | 4.9 | 0.8 | 0.0 | 1.2 | 0.0 | 0.1 | 0.2 | 0.1 | 0.7 | 0.5 | 7.8 |
| | Total | 1,221.6 | 120.7 | 5.2 | 1.2 | 4.5 | 124.1 | 122.8 | 58.1 | 253.3 | 8.9 | 19.3 | 98.6 | 270.6 | 64.2 | 134.3 | 1,100.9 |

Note : *Net inundation area is total inundation area except for water body.

Table 14.3 Estimated Flood Inundation Area for Each Return Period under Future Land Use Condition

(Unit : ha)

| Return Period (Years) | Maximum Inundation Depth | Total | Land Use Category | | | | | | | | | | | | | | Net Inundation Area* |
|-----------------------|--------------------------|---------|-------------------|---------|--------------|---------|-----------|--------|--------------|-------|--------|--------|-----------|-------|------------|--------|----------------------|
| | | | Water | Airport | Dumping Site | Factory | Grassland | Garden | High Density | Paddy | Shanty | Vacant | Homestead | Marsh | Vegetation | Others | |
| 2 | Below 20 cm | 277.2 | 0.0 | 0.0 | 0.1 | 0.2 | 0.0 | 25.8 | 13.6 | 90.1 | 2.1 | 3.7 | 73.1 | 40.9 | 8.4 | 27.7 | 277.2 |
| | 20 ~ 50 cm | 318.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 21.4 | 8.2 | 99.4 | 3.3 | 3.5 | 57.2 | 100.3 | 11.2 | 25.5 | 318.8 |
| | 50 ~ 100 cm | 149.4 | 0.0 | 0.0 | 0.0 | 1.8 | 0.0 | 8.7 | 2.5 | 24.2 | 0.0 | 1.1 | 26.6 | 75.7 | 2.5 | 8.8 | 149.4 |
| | 100 ~ 200 cm | 32.8 | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 2.9 | 1.1 | 8.9 | 0.0 | 0.0 | 13.7 | 3.5 | 0.1 | 1.6 | 32.8 |
| | Over 200 cm | 117.2 | 117.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.2 | 0.1 | 0.0 | 0.0 | 0.1 |
| | Total | 895.2 | 117.1 | 0.0 | 0.1 | 3.2 | 0.0 | 58.8 | 25.3 | 222.6 | 5.4 | 8.3 | 170.8 | 220.5 | 22.1 | 63.5 | 778.1 |
| 5 | Below 20 cm | 305.9 | 0.0 | 0.0 | 0.7 | 0.5 | 0.0 | 28.1 | 32.8 | 83.1 | 2.2 | 6.3 | 83.6 | 32.0 | 13.2 | 36.7 | 305.9 |
| | 20 ~ 50 cm | 373.2 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 26.9 | 18.6 | 113.8 | 4.2 | 5.3 | 82.9 | 86.0 | 13.3 | 35.2 | 373.2 |
| | 50 ~ 100 cm | 224.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 12.5 | 6.9 | 43.0 | 0.0 | 2.3 | 35.1 | 108.4 | 4.7 | 15.7 | 224.0 |
| | 100 ~ 200 cm | 64.3 | 0.0 | 0.0 | 0.0 | 2.9 | 0.0 | 7.1 | 1.6 | 12.4 | 0.0 | 0.4 | 23.2 | 13.1 | 0.3 | 3.6 | 64.3 |
| | Over 200 cm | 123.2 | 119.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.3 | 0.0 | 0.1 | 3.0 | 0.1 | 0.0 | 0.0 | 3.3 |
| | Total | 1,090.5 | 119.9 | 0.0 | 0.8 | 3.6 | 0.0 | 74.8 | 60.0 | 252.5 | 6.5 | 14.4 | 227.7 | 239.5 | 31.5 | 91.2 | 970.7 |
| 10 | Below 20 cm | 284.1 | 0.0 | 0.2 | 0.4 | 0.9 | 0.0 | 28.0 | 33.0 | 74.3 | 2.6 | 6.8 | 83.4 | 23.4 | 10.4 | 31.1 | 284.1 |
| | 20 ~ 50 cm | 387.5 | 0.0 | 0.0 | 0.4 | 0.1 | 0.0 | 27.4 | 20.4 | 122.5 | 3.7 | 5.5 | 89.4 | 76.2 | 15.8 | 41.9 | 387.5 |
| | 50 ~ 100 cm | 271.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.5 | 8.3 | 59.3 | 1.3 | 3.7 | 43.5 | 117.0 | 8.0 | 20.8 | 271.4 |
| | 100 ~ 200 cm | 81.7 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 8.3 | 1.5 | 12.2 | 0.0 | 0.8 | 24.4 | 27.6 | 0.5 | 4.0 | 81.7 |
| | Over 200 cm | 128.2 | 119.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 1.4 | 0.0 | 0.1 | 6.1 | 0.1 | 0.0 | 0.0 | 8.3 |
| | Total | 1,152.8 | 119.9 | 0.2 | 0.7 | 4.1 | 0.0 | 82.1 | 63.3 | 269.7 | 7.6 | 16.9 | 246.7 | 244.3 | 34.7 | 97.7 | 1,032.9 |
| 25 | Below 20 cm | 273.4 | 0.0 | 0.7 | 0.3 | 1.0 | 0.0 | 28.8 | 37.1 | 58.3 | 3.1 | 6.5 | 83.4 | 24.0 | 8.3 | 30.2 | 273.4 |
| | 20 ~ 50 cm | 386.3 | 0.0 | 0.0 | 0.7 | 0.2 | 0.0 | 28.7 | 23.9 | 122.3 | 3.3 | 6.9 | 95.8 | 58.1 | 17.6 | 46.4 | 386.3 |
| | 50 ~ 100 cm | 342.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 22.4 | 10.4 | 86.0 | 3.1 | 4.6 | 63.4 | 123.4 | 13.0 | 29.2 | 342.4 |
| | 100 ~ 200 cm | 109.1 | 0.0 | 0.0 | 0.0 | 2.1 | 0.0 | 11.1 | 1.6 | 10.2 | 0.0 | 1.4 | 28.0 | 49.7 | 0.7 | 5.2 | 109.1 |
| | Over 200 cm | 140.0 | 120.1 | 0.0 | 0.0 | 0.9 | 0.0 | 2.1 | 0.0 | 6.0 | 0.0 | 0.1 | 10.1 | 0.1 | 0.0 | 0.7 | 20.0 |
| | Total | 1,251.1 | 120.1 | 0.7 | 1.0 | 4.3 | 0.0 | 93.0 | 73.0 | 282.7 | 9.5 | 19.4 | 280.7 | 255.2 | 39.6 | 111.6 | 1,131.1 |
| 50 | Below 20 cm | 271.9 | 0.0 | 1.2 | 0.4 | 1.2 | 0.0 | 30.6 | 38.6 | 52.0 | 3.7 | 5.5 | 86.2 | 23.1 | 7.4 | 29.4 | 271.9 |
| | 20 ~ 50 cm | 377.1 | 0.0 | 0.0 | 0.8 | 0.3 | 0.0 | 29.5 | 27.2 | 114.5 | 3.2 | 8.2 | 98.2 | 49.2 | 17.7 | 46.2 | 377.1 |
| | 50 ~ 100 cm | 368.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 24.7 | 11.5 | 100.9 | 3.7 | 4.6 | 67.4 | 122.2 | 15.1 | 33.2 | 368.2 |
| | 100 ~ 200 cm | 129.8 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 11.2 | 1.8 | 13.1 | 0.0 | 2.0 | 29.5 | 65.2 | 0.9 | 6.1 | 129.8 |
| | Over 200 cm | 152.9 | 120.1 | 0.0 | 0.0 | 2.1 | 0.0 | 4.8 | 0.0 | 8.9 | 0.0 | 0.2 | 15.7 | 0.1 | 0.0 | 1.0 | 32.8 |
| | Total | 1,299.9 | 120.1 | 1.2 | 1.2 | 4.5 | 0.0 | 100.7 | 79.1 | 289.3 | 10.5 | 20.5 | 297.1 | 259.9 | 41.1 | 115.9 | 1,179.8 |

Note : *Net inundation area is total inundation area except for water body.

Table 15.1 Transition Matrix between Present Land Use and Future Land Use

(Unit : ha)

| Present Land Use | Future Land Use | | | | | | | | | | |
|----------------------------|-----------------|-----|-------|-----|-----|-----|-----|-----|-----|-----|-------|
| | (a) | (b) | (c) | (d) | (e) | (h) | (I) | (k) | (l) | (m) | Total |
| (a) Very High Density Area | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| (b) High Density Area | 0 | 819 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 819 |
| (c) Homestead | 0 | 55 | 1,392 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,447 |
| (d) Garden | 0 | 0 | 851 | 458 | 0 | 0 | 0 | 0 | 0 | 0 | 1,310 |
| (e) Paddy | 0 | 0 | 0 | 0 | 359 | 0 | 0 | 0 | 0 | 0 | 359 |
| (f) Grassland | 0 | 0 | 229 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 229 |
| (g) Vacant | 0 | 0 | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 75 |
| (h) Airport | 0 | 0 | 0 | 0 | 0 | 139 | 0 | 0 | 0 | 0 | 139 |
| (I) Factory | 0 | 0 | 0 | 0 | 0 | 0 | 136 | 0 | 0 | 0 | 136 |
| (j) Dumping Site | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| (k) Vegetation | 0 | 0 | 65 | 0 | 0 | 28 | 0 | 126 | 0 | 0 | 219 |
| (l) Marsh | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 292 | 0 | 302 |
| (m) Water | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 121 | 121 |
| Total | 30 | 883 | 2,612 | 458 | 359 | 166 | 136 | 126 | 292 | 121 | 5,185 |

Table 17.1 Ministries and Agencies Relevant to the Project

| | |
|----|---|
| 1 | Ministry of Housing and Plantation Infrastructure (MHPI) (1) Sri Lanka Land Reclamation and Development Corporation (SLLRDC) (2) National Housing Development Authority (NHDA) (3) National Water Supply and Drainage Board (NWSDB) |
| 2 | Ministry of Home Affairs, Provincial Councils and Local Government (MHAPCLG) (1) Western Provincial Council (WPC) (2) Dehiwara-Mt. Lavinia Municipal Council (DMMC) (3) Moratuwa Municipal Council (MMC) (4) Maharagama Urban Council (MUC) (5) Kesbewa Pradeshiya Sabha (KPS) |
| 3 | Ministry of Western Regional Development (1) Urban Development Authority (UDA) |
| 4 | Ministry of Environment and Natural Resources (1) Central Environmental Agency (CEA) |
| 5 | Ministry of Fisheries and Ocean Resources (1) Coastal Conservation Department (CCD) |
| 6 | Ministry of Irrigation and Water Management (1) Irrigation Department (IRD) |
| 7 | Ministry of Land (1) Survey Department |
| 8 | Ministry of Agriculture and Livestock (1) Agrarian Development Department |
| 9 | Ministry of Highways (1) Road Development Authority (RDA) |
| 10 | Ministry of Power and Energy (1) Ceylon Electricity Board (CEB) |
| 11 | Ministry of Posts and Energy (1) Sri Lanka Telecom (SLTL) |
| 12 | Ministry of Finance and Planning (MFP) (1) External Resources Department (2) National Planning Department |

Table 17.2 Proposed Members of Inter-Agency Steering Committee

| |
|--|
| Chairman |
| Secretary of MHPI |
| Members |
| 1 Secretary of MHAPCLG |
| 2 Chief Secretary of Western Provincial Council |
| 3 Director of UDA |
| 4 Director of NHDA |
| 5 Director of CEA |
| 6 Director of NWSDB |
| 7 Director of IRD |
| 8 Director of DWLC |
| 9 Director of External Resources Department, MFP |
| 10 Director of National Planning Department, MFP |
| 11 Municipal Commissioner of DMMC |
| 12 Municipal Commissioner of MMC |
| 13 Municipal Commissioner of Kotte MC |
| 14 Secretary of MUC |
| 15 Secretary of KPS |
| 16 General Manager of SLLRDC |
| 17 Deputy General Manager of CDM, SLLRDC |
| Ad hoc Members |
| 1 Representative of CCD |
| 2 Representative of IRD |
| 3 Representative of Ministry of Land |
| 4 Representative of ADD |
| 5 Representative of RDA |
| 6 Representative of CEB |
| 7 Representative of SLTL |

Table 17.3 Current Staff Allocation in Local Authorities Relevant to the Project

| Local Authority | Chief Engineer | Engineer | Technical Officer | Road Laborer | Health Laborer | Others | Total |
|--|----------------|----------|-------------------|--------------|----------------|--------|-------------|
| 1 Dehiwala-Mt. Lavinia Municipal Council | 1 | 6 | 42 | 551 | 825 | 792 | 2217 |
| 2 Moratuwa Municipal Council | 0 | 1 | 13 | 98 | 224 | 408 | 744 |
| 3 Kotte Municipal Council | 0 | 0 | 3 | 53 | | - | - |
| 4 Maharagama Urban Council | 0 | 0 | 5 | 105 | | 127 | 237 |
| 5 Kesbewa Pradeshiya Sabha | 0 | 0 | 4 | 28 | 35 | 101 | 168 |

Note: The total number of road and health laborer in Maharagama Urban Council is 105. (No statistics of each post is available.)

Some of health laborers are assigned for O&M activities of drainage.

Source: Staff Allocation of Local Authorities in 2002, Western Provincial Council

Table 17.4 Annual Financial Statement of SLLRDC(Unit : x 10³ Rs.)

| Item | 1996 | 1997 | 1998 | 1999 | 2000 | Share* |
|--|----------------|----------------|----------------|------------------|----------------|---------------|
| Turnover | 211,491 | 307,827 | 307,194 | 1,214,292 | 275,862 | 100.0% |
| Land sales | 62,026 | 138,369 | 116,158 | 574,242 | 49,178 | 33.2% |
| Reclamation | 13,438 | 20,069 | 28,931 | 69,874 | 139,962 | 18.4% |
| Miscellaneous projects | 48,140 | 61,491 | 78,702 | 4,724 | 6,666 | 17.7% |
| Dredging | 16,172 | 11,378 | 19,200 | 26,737 | 42,810 | 8.1% |
| Construction | 71,715 | 76,520 | 64,203 | 32,668 | 28,750 | 21.9% |
| Work done for GCF&EIP (Greater Colombo Flood Control) | | | | 506,047 | | 0.0% |
| Sales of houses | | | | | 8,496 | 0.8% |
| Turnover Tax | | 22,620 | 14,460 | 22,713 | | 3.4% |
| Net Turnover | 211,491 | 285,207 | 292,734 | 1,191,579 | 275,862 | 96.6% |
| Cost of Sales | 170,059 | 221,056 | 171,639 | 974,636 | 196,846 | 68.9% |
| Cost of land sold | 23,457 | 79,911 | 31,205 | 482,254 | 29,651 | 14.9% |
| Cost of reclamation | 9,757 | 10,009 | 24,648 | 61,949 | 99,748 | 13.1% |
| Cost of miscellaneous projects | 43,385 | 51,216 | 48,292 | 3,419 | 5,978 | 13.5% |
| Cost of dredging | 14,813 | 3,447 | 16,602 | 14,826 | 26,979 | 5.6% |
| Cost of construction | 78,647 | 76,473 | 50,892 | 31,112 | 26,994 | 21.1% |
| Work done for GCF&EIP (Greater Colombo Flood Control) | | | | 381,076 | | 0.0% |
| Sales of houses | | | | | 7,496 | 0.7% |
| Gross Profit | 41,432 | 64,151 | 121,095 | 216,943 | 79,016 | 27.7% |
| | | | | | | |
| Operating Expenses | 69,685 | 82,634 | 105,422 | 149,989 | 186,342 | 40.3% |
| Director's fees | 45 | 43 | 32 | 27 | 30 | 0.0% |
| Depreciation | 5,816 | 5,729 | 5,607 | 5,924 | 6,027 | 2.1% |
| Audit fees | 66 | 73 | 80 | 69 | 69 | 0.0% |
| Interest | 2,484 | 1,016 | 486 | 428 | 1,639 | 0.5% |
| Other expenses (including staff salary) | 61,274 | 75,773 | 99,217 | 143,541 | 178,577 | 37.6% |
| Other Income | 72,070 | 147,659 | 168,013 | 202,307 | 214,790 | 54.7% |
| Registration of supplies | 70 | 129 | 245 | 231 | 311 | 0.1% |
| Fines and Surcharges | 77 | 142 | 70 | 66 | 110 | 0.0% |
| Interest from fixed deposits | 56,927 | 125,667 | 150,264 | 180,072 | 186,847 | 47.1% |
| Miscellaneous Income | 14,982 | 19,898 | 17,410 | 21,837 | 27,510 | 7.2% |
| Profit on sale of fixed assets and unserviceable items | 14 | 1,823 | 24 | 101 | 12 | 0.2% |
| Net Profit before tax | 43,817 | 129,176 | 183,686 | 269,261 | 107,464 | 42.1% |
| | | | | | | |
| Tax | 26,940 | 71,000 | 70,800 | 109,000 | 35,281 | 18.5% |
| Provision for income tax | 21,330 | 51,000 | 32,800 | 55,000 | 32,169 | 12.5% |
| Deferred tax | | | | | 15,711 | 1.4% |
| Provision for deemed dividend tax | 5,610 | 20,000 | 38,000 | 54,000 | 18,823 | 7.5% |
| Net Profit after tax | 16,877 | 58,176 | 112,886 | 160,261 | 72,183 | 23.6% |

Note: Share* is an average of Year 1996, 1997, 1998 and 2000,
since figures in 1999 is exceptional by the Greater Colombo Food Control Project)
Source: Annual Report of SLLRDC

Table 19.1 Potential Environmental Impacts by Project Components of the Proposed Schemes

| Potential Environmental Impacts | Resettlement by land acquisition | Relocation of public facilities | Temporary traffic disturbance during construction | Breeding places for mosquitoes | Flora & fauna in the protected area | Emission gas and dust during construction | Noise and vibration during construction | Offensive odor by disposal of dredged material |
|---|----------------------------------|---------------------------------|---|--------------------------------|-------------------------------------|---|---|--|
| Project Components | | | | | | | | |
| 1. Weras Ganga Scheme | | | | | | | | |
| (1)Dredging of Weras Ganga riverbed - Widening and deepening of the existing earth canal - Replacement of the Borupana bridge | - | - | X | - | X | X | X | X |
| (2)Construction of flood protection wall with flap gate | XX | X | X | - | - | X | X | - |
| (3)Conservation of retention areas(Weras Ganga swamp and Maha Ela retention areas) - Construction of peripheral channel and path way | - | - | - | X | X | X | X | - |
| 2. Bolgoda Canal Scheme | | | | | | | | |
| (1) Dredging and channel improvement of Bolgoda Canal - Widening and deepening of the existing earth canal - Embankment and construction of O&M road - Replacement of bridge | XX | - | X | - | X | X | X | X |
| (2)Conservation of a retention area (Bellanwila-Attidiya retention area) - Construction of peripheral channel and path way | - | - | - | X | X | X | X | - |
| 3. Nugegoda-Rattanaipitiya Scheme | | | | | | | | |
| (1)Channel improvement of Rattanaipitiya Ela, Delkanta Ela and Nugegoda Ela - Widening and deepening of the existing canal - Bank protection of the existing earth canal with gabion - Construction of concrete open channel - Embankment and construction of O&M road - Replacement of bridge and cross culvert | XX | X | X | - | - | X | X | X |
| (2) Conservation of three retention areas - Construction of peripheral channel and path way | - | - | - | X | X | X | X | - |
| 4. Ratmalana-Moratuwa Scheme | | | | | | | | |
| (1)Improvement of urban drainage system in Ratmalana-Moratuwa area - Widening and deepening of the existing canal - Bank protection of the existing earth canal with gabion - Construction of concrete open channel and concrete flume with cover slab - Construction of underground pipes and culverts | - | - | X | - | - | X | X | X |
| (2) Construction of retention ponds(Kandawala pond and Telewala pond) | XX | - | - | X | - | X | X | - |

Note: XX: Potential negative impact with significance, X: Potential negative impact in some extent, -: no impact

Table 21.1 Breakdown of Construction Cost(Unit: x 10³ Rs.)

| Item | Construction Cost |
|--|-------------------|
| 1. Weras Ganga Scheme | |
| Dredging of Weras Ganga (WG1) | 122,338 |
| Dredging of Weras Ganga (WG2) | 119,844 |
| Flood Protection Wall | 31,768 |
| Kandawala Gate1 | 4,599 |
| Telawala Gate1 | 5,076 |
| Telawala Gate2 | 2,376 |
| Weras Ganga Swamp Retention Area (Periphery Canal) | 8,976 |
| Maha Ela Retention Area (Periphery Canal) | 12,240 |
| Total | 307,217 |
| 2. Nugegoda-Rattanaipitiya Scheme | |
| 2.1 Rattanaipitiya Ela | |
| River Improvement | 190,290 |
| Inspection Road | 16,030 |
| Bridge RE1 | 26,968 |
| Bridge RE2 | 47,144 |
| Bridge RE3 | 11,022 |
| Bridge RE4 | 13,410 |
| Bridge RE5 | 13,410 |
| Total of 2.1 | 318,274 |
| 2.2 Delkanda | |
| River Improvement | 112,649 |
| Inspection Road | 6,860 |
| Bridge D1 | 15,171 |
| Bridge D2 | 10,153 |
| Bridge D3 | 6,190 |
| Bridge D4 | 33,577 |
| Bridge D5 | 11,808 |
| Bridge D6 | 8,615 |
| Culvert D7 | 3,531 |
| Total of 2.2 | 208,553 |
| 2.3 Nugegoda Ela | |
| River Improvement | 99,987 |
| Inspection Road | 11,456 |
| Bridge NE1 | 12,826 |
| Bridge NE2 | 3,940 |
| Bridge NE3 | 9,530 |
| Nugegoda Ela Retention Area | 10,608 |
| Total of 2.3 | 148,348 |
| Total | 675,176 |
| 3. Bolgoda Canal Scheme | |
| River Improvement | 60,623 |
| Inspection Road | 17,868 |
| Bridge BC1 | 25,764 |
| Bellanwila-Attidiya Marsh Retention Area | 8,976 |
| Total | 113,231 |
| 4. Ratmalana Moratuwa Scheme | |
| Concrete Flume with Cover Slab | 491,778 |
| Masonry Channel | 82,902 |
| Earth Open Channel with Gabion | 48,661 |
| Earth Open Channel | 15,262 |
| Total | 638,604 |
| Total of Direct Construction Cost | 1,734,228 |

Table 21.2 Total Project Cost(Unit: x 10³ Rs.)

| Cost Item | FC | LC | Total |
|--|-----------|-----------|-----------|
| 1. Construction Cost | 1,372,300 | 535,351 | 1,907,651 |
| Preparatory Works | 124,755 | 48,668 | 173,423 |
| Construction Cost | 1,247,545 | 486,683 | 1,734,228 |
| 2. Land Acquisition & Compensation Cost | 0 | 840,535 | 840,535 |
| Land Acquisition | 0 | 658,255 | 658,255 |
| Compensation | 0 | 182,280 | 182,280 |
| 3. Cost for Procurement of O/M Equipment | 108,223 | 4,501 | 112,724 |
| 4. Engineering Service | 267,071 | 114,459 | 381,530 |
| 5. Administration Cost | 0 | 62,594 | 62,594 |
| (1+2+3+4+5) | 1,747,594 | 1,557,440 | 3,305,034 |
| 6. Price Escalation | 20,971 | 66,970 | 87,941 |
| 7. Physical Contingency | 155,995 | 146,666 | 302,661 |
| 8. Tax | 0 | 693,691 | 693,691 |
| Project Cost | 1,924,560 | 2,464,767 | 4,389,327 |

Table 22.1 Probable Flood Damage in Weras Ganga Basin

(Unit: Rs.)

| Basin | Return Period | General Assets | | | | | | Total of Direct Damage | Disturbance to Business Activities | Damage to Infrastructure | Total of Probable Damage |
|----------------------------------|---------------|----------------|-------------|-------------------|-------------------|------------|-----------|------------------------|------------------------------------|--------------------------|--------------------------|
| | | High Density | Homestead | Garden/ Grassland | Very High Density | Factory | Paddy | | | | |
| Weras Ganga Basin | 2 | 25,909,033 | 123,907,474 | 26,562,314 | 2,373,492 | 18,971,128 | 3,122,956 | 200,846,397 | 11,863,406 | 55,362,564 | 268,072,367 |
| | 5 | 60,289,737 | 179,192,923 | 36,880,976 | 2,936,643 | 19,334,007 | 3,662,474 | 302,296,760 | 17,918,057 | 83,617,600 | 403,832,417 |
| | 10 | 65,108,600 | 199,030,547 | 42,246,591 | 3,888,541 | 19,298,975 | 3,993,856 | 333,567,109 | 19,774,395 | 92,280,511 | 445,622,014 |
| | 25 | 76,197,762 | 244,240,786 | 51,750,292 | 5,483,725 | 19,903,773 | 3,773,075 | 401,349,413 | 23,854,580 | 111,321,374 | 536,525,368 |
| | 50 | 84,102,032 | 261,584,399 | 57,155,098 | 6,110,686 | 20,379,869 | 4,585,898 | 433,917,982 | 25,759,925 | 120,212,983 | 579,890,890 |
| Nugegoda-Rattanapitiya Sub-basin | 2 | 8,366,070 | 15,828,272 | 11,102,751 | 0 | 0 | 17,685 | 35,314,778 | 2,117,826 | 9,883,186 | 47,315,790 |
| | 5 | 11,939,068 | 21,422,716 | 14,898,874 | 0 | 0 | 19,616 | 48,280,273 | 2,895,639 | 13,512,984 | 64,688,897 |
| | 10 | 13,077,101 | 24,819,051 | 16,726,272 | 0 | 0 | 18,981 | 54,641,404 | 3,277,345 | 15,294,279 | 73,213,028 |
| | 25 | 15,156,691 | 29,799,504 | 20,220,623 | 0 | 0 | 19,823 | 65,196,642 | 3,910,609 | 18,249,509 | 87,356,760 |
| | 50 | 17,502,919 | 33,040,216 | 22,107,242 | 0 | 0 | 19,555 | 72,669,932 | 4,359,023 | 20,342,106 | 97,371,060 |
| Boralesgamuwa North Sub-basin | 2 | 2,339,783 | 8,535,848 | 1,969,999 | 0 | 0 | 254,484 | 13,100,114 | 770,738 | 3,596,776 | 17,467,628 |
| | 5 | 3,285,201 | 11,312,172 | 2,443,103 | 0 | 0 | 309,361 | 17,349,837 | 1,022,429 | 4,771,333 | 23,143,599 |
| | 10 | 3,376,380 | 12,595,457 | 2,908,813 | 0 | 0 | 337,368 | 19,218,018 | 1,132,839 | 5,286,582 | 25,637,439 |
| | 25 | 3,910,316 | 15,469,688 | 3,326,001 | 0 | 0 | 371,624 | 23,077,630 | 1,362,360 | 6,357,682 | 30,797,672 |
| | 50 | 3,943,183 | 16,852,758 | 3,617,682 | 0 | 0 | 383,794 | 24,797,417 | 1,464,817 | 6,835,814 | 33,098,049 |
| Boralesgamuwa South Sub-basin | 2 | 1,781,540 | 4,782,940 | 816,820 | 0 | 0 | 92,818 | 7,474,118 | 442,878 | 2,066,764 | 9,983,761 |
| | 5 | 2,275,396 | 5,780,687 | 1,019,944 | 0 | 0 | 98,544 | 9,174,571 | 544,562 | 2,541,287 | 12,260,420 |
| | 10 | 2,657,509 | 6,762,281 | 1,315,846 | 0 | 0 | 103,584 | 10,839,220 | 644,138 | 3,005,978 | 14,489,336 |
| | 25 | 2,177,603 | 9,868,908 | 2,026,791 | 0 | 0 | 108,883 | 14,182,185 | 844,398 | 3,940,525 | 18,967,108 |
| | 50 | 3,294,364 | 9,107,770 | 2,355,796 | 0 | 0 | 110,930 | 14,868,861 | 885,476 | 4,132,221 | 19,886,557 |
| Maha Ela Sub-basin | 2 | 1,879,341 | 42,974,577 | 4,953,393 | 0 | 8,081,715 | 1,728,421 | 59,617,448 | 3,473,342 | 16,208,927 | 79,299,717 |
| | 5 | 2,178,369 | 52,988,075 | 6,568,174 | 0 | 8,081,715 | 1,982,685 | 71,799,019 | 4,188,980 | 19,548,573 | 95,536,572 |
| | 10 | 2,264,561 | 57,499,398 | 7,329,262 | 0 | 7,911,584 | 2,130,920 | 77,135,724 | 4,500,288 | 21,001,345 | 102,637,358 |
| | 25 | 2,353,801 | 64,424,648 | 8,221,534 | 0 | 7,911,584 | 2,061,354 | 84,972,922 | 4,974,694 | 23,215,239 | 113,162,855 |
| | 50 | 2,464,387 | 68,552,344 | 9,241,467 | 0 | 7,911,584 | 2,363,551 | 90,533,333 | 5,290,187 | 24,687,539 | 120,511,059 |
| Tumbowila Sub-basin | 2 | 0 | 4,696,914 | 9,758 | 0 | 0 | 18,592 | 4,725,264 | 282,400 | 1,317,868 | 6,325,533 |
| | 5 | 0 | 8,634,955 | 16,264 | 0 | 0 | 24,578 | 8,675,796 | 519,073 | 2,422,341 | 11,617,211 |
| | 10 | 0 | 9,446,333 | 19,517 | 0 | 0 | 25,938 | 9,491,788 | 567,951 | 2,650,438 | 12,710,177 |
| | 25 | 0 | 16,788,616 | 37,009 | 0 | 0 | 28,465 | 16,854,090 | 1,009,538 | 4,711,175 | 22,574,802 |
| | 50 | 0 | 16,110,362 | 42,026 | 0 | 0 | 28,478 | 16,180,865 | 969,143 | 4,522,669 | 21,672,677 |
| Bolgoda Canal Sub-basin | 2 | 10,390,972 | 13,814,759 | 1,410,278 | 0 | 0 | 0 | 25,616,009 | 1,536,961 | 7,172,482 | 34,325,452 |
| | 5 | 62,447,300 | 47,680,410 | 4,978,669 | 0 | 567,342 | 0 | 115,673,722 | 6,940,423 | 32,388,642 | 155,002,787 |
| | 10 | 66,679,490 | 52,792,188 | 6,031,391 | 0 | 567,342 | 0 | 126,070,412 | 7,564,225 | 35,299,715 | 168,934,352 |
| | 25 | 77,987,791 | 63,842,190 | 7,976,228 | 0 | 1,323,798 | 0 | 151,130,008 | 9,067,800 | 42,316,402 | 202,514,210 |
| | 50 | 85,314,237 | 70,947,918 | 8,672,292 | 0 | 1,512,912 | 0 | 166,447,359 | 9,986,842 | 46,605,261 | 223,039,461 |
| Ratmalana-Moratuwa Sub-basin | 2 | 5,045,040 | 7,544,376 | 3,839,993 | 2,960,793 | 635,221 | 0 | 20,025,423 | 1,201,525 | 5,607,119 | 26,834,067 |
| | 5 | 6,722,672 | 11,724,121 | 5,212,017 | 3,663,291 | 635,221 | 0 | 27,957,322 | 1,677,439 | 7,828,050 | 37,462,811 |
| | 10 | 7,612,928 | 14,342,247 | 6,224,015 | 4,850,728 | 1,151,441 | 0 | 34,181,359 | 2,050,882 | 9,570,780 | 45,803,020 |
| | 25 | 9,932,387 | 18,619,469 | 8,769,818 | 6,840,627 | 1,327,266 | 0 | 45,489,567 | 2,729,374 | 12,737,079 | 60,956,020 |
| | 50 | 11,258,013 | 21,416,823 | 9,634,371 | 7,622,726 | 1,843,485 | 0 | 51,775,418 | 3,106,525 | 14,497,117 | 69,379,059 |

Table 22.2 Annual Average Flood Damage in Weras Ganga Basin without Project

| Basin | Return Period | Exceedance | Difference of Exceedance | Damage (million Rs.) | | Annual Damage (million Rs.) | |
|--------------------------------|---------------|------------|--------------------------|----------------------|---------|-----------------------------|------------|
| | | | | Amount | Average | Segment | Cumulative |
| Weras Ganga Basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 268 | 134 | 67 | 67 |
| | 5 | 0.20 | 0.30 | 404 | 336 | 101 | 168 |
| | 10 | 0.10 | 0.10 | 446 | 425 | 42 | 210 |
| | 25 | 0.04 | 0.06 | 537 | 491 | 29 | 240 |
| | 50 | 0.02 | 0.02 | 580 | 558 | 11 | 251 |
| Nugegoda-Rattapitiya Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 47 | 24 | 12 | 12 |
| | 5 | 0.20 | 0.30 | 65 | 56 | 17 | 29 |
| | 10 | 0.10 | 0.10 | 73 | 69 | 7 | 36 |
| | 25 | 0.04 | 0.06 | 87 | 80 | 5 | 40 |
| | 50 | 0.02 | 0.02 | 97 | 92 | 2 | 42 |
| Boralesgamuwa North Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 17 | 9 | 4 | 4 |
| | 5 | 0.20 | 0.30 | 23 | 20 | 6 | 10 |
| | 10 | 0.10 | 0.10 | 26 | 24 | 2 | 13 |
| | 25 | 0.04 | 0.06 | 31 | 28 | 2 | 15 |
| | 50 | 0.02 | 0.02 | 33 | 32 | 1 | 15 |
| Boralesgamuwa South Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 10 | 5 | 2 | 2 |
| | 5 | 0.20 | 0.30 | 12 | 11 | 3 | 6 |
| | 10 | 0.10 | 0.10 | 14 | 13 | 1 | 7 |
| | 25 | 0.04 | 0.06 | 19 | 17 | 1 | 8 |
| | 50 | 0.02 | 0.02 | 20 | 19 | 0 | 9 |
| Maha Ela Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 79 | 40 | 20 | 20 |
| | 5 | 0.20 | 0.30 | 96 | 87 | 26 | 46 |
| | 10 | 0.10 | 0.10 | 103 | 99 | 10 | 56 |
| | 25 | 0.04 | 0.06 | 113 | 108 | 6 | 62 |
| | 50 | 0.02 | 0.02 | 121 | 117 | 2 | 65 |
| Tumbowila Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 6 | 3 | 2 | 2 |
| | 5 | 0.20 | 0.30 | 12 | 9 | 3 | 4 |
| | 10 | 0.10 | 0.10 | 13 | 12 | 1 | 5 |
| | 25 | 0.04 | 0.06 | 23 | 18 | 1 | 7 |
| | 50 | 0.02 | 0.02 | 22 | 22 | 0 | 7 |
| Bolgoda Canal Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 34 | 17 | 9 | 9 |
| | 5 | 0.20 | 0.30 | 155 | 95 | 28 | 37 |
| | 10 | 0.10 | 0.10 | 169 | 162 | 16 | 53 |
| | 25 | 0.04 | 0.06 | 203 | 186 | 11 | 64 |
| | 50 | 0.02 | 0.02 | 223 | 213 | 4 | 69 |
| Ratmalana-Moratuwa Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 27 | 13 | 7 | 7 |
| | 5 | 0.20 | 0.30 | 37 | 32 | 10 | 16 |
| | 10 | 0.10 | 0.10 | 46 | 42 | 4 | 21 |
| | 25 | 0.04 | 0.06 | 61 | 53 | 3 | 24 |
| | 50 | 0.02 | 0.02 | 69 | 65 | 1 | 25 |

Table 22.3 Flood Damage Reduction Benefit

| Basin | Return Period | Exceedance | Difference of Exceedance | Damage (million Rs.) | | Annual Damage (million Rs.) | |
|--|---------------|------------|--------------------------|----------------------|---------|-----------------------------|------------|
| | | | | Amount | Average | Segment | Cumulative |
| Weras Ganga Basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 76.12 | 38.06 | 19.03 | 19.03 |
| | 5 | 0.20 | 0.30 | 170.56 | 123.34 | 37.00 | 56.03 |
| | 10 | 0.10 | 0.10 | 174.04 | 172.30 | 17.23 | 73.26 |
| | 25 | 0.04 | 0.06 | 105.65 | 139.85 | 8.39 | 81.65 |
| | 50 | 0.02 | 0.02 | 103.62 | 104.63 | 2.09 | 83.75 |
| Nugegoda-Rattanaipitiya Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 27.33 | 13.67 | 6.83 | 6.83 |
| | 5 | 0.20 | 0.30 | 39.78 | 33.56 | 10.07 | 16.90 |
| | 10 | 0.10 | 0.10 | 44.61 | 42.19 | 4.22 | 21.12 |
| | 25 | 0.04 | 0.06 | 19.50 | 32.05 | 1.92 | 23.04 |
| | 50 | 0.02 | 0.02 | 19.92 | 19.71 | 0.39 | 23.44 |
| Boralesgamuwa North Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 5.22 | 2.61 | 1.30 | 1.30 |
| | 5 | 0.20 | 0.30 | 6.78 | 6.00 | 1.80 | 3.10 |
| | 10 | 0.10 | 0.10 | 8.18 | 7.48 | 0.75 | 3.85 |
| | 25 | 0.04 | 0.06 | 5.57 | 6.88 | 0.41 | 4.27 |
| | 50 | 0.02 | 0.02 | 6.34 | 5.96 | 0.12 | 4.38 |
| Boralesgamuwa South Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 3.08 | 1.54 | 0.77 | 0.77 |
| | 5 | 0.20 | 0.30 | 4.35 | 3.71 | 1.11 | 1.88 |
| | 10 | 0.10 | 0.10 | 5.40 | 4.87 | 0.49 | 2.37 |
| | 25 | 0.04 | 0.06 | 7.29 | 6.35 | 0.38 | 2.75 |
| | 50 | 0.02 | 0.02 | 6.22 | 6.76 | 0.14 | 2.89 |
| Maha Ela Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 9.75 | 4.87 | 2.44 | 2.44 |
| | 5 | 0.20 | 0.30 | 55.21 | 32.48 | 9.74 | 12.18 |
| | 10 | 0.10 | 0.10 | 56.81 | 56.01 | 5.60 | 17.78 |
| | 25 | 0.04 | 0.06 | 23.83 | 40.32 | 2.42 | 20.20 |
| | 50 | 0.02 | 0.02 | 24.03 | 23.93 | 0.48 | 20.68 |
| Tumbowila Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 0.33 | 0.17 | 0.08 | 0.08 |
| | 5 | 0.20 | 0.30 | 3.29 | 1.81 | 0.54 | 0.63 |
| | 10 | 0.10 | 0.10 | 1.57 | 2.43 | 0.24 | 0.87 |
| | 25 | 0.04 | 0.06 | 7.61 | 4.59 | 0.28 | 1.15 |
| | 50 | 0.02 | 0.02 | 4.28 | 5.94 | 0.12 | 1.26 |
| Bolgoda Canal Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 3.29 | 1.64 | 0.82 | 0.82 |
| | 5 | 0.20 | 0.30 | 8.97 | 6.13 | 1.84 | 2.66 |
| | 10 | 0.10 | 0.10 | 0.00 | 4.48 | 0.45 | 3.11 |
| | 25 | 0.04 | 0.06 | 5.38 | 2.69 | 0.16 | 3.27 |
| | 50 | 0.02 | 0.02 | 5.13 | 5.25 | 0.11 | 3.37 |
| Bolgoda Canal Sub-basin (Weras Ganga Scheme & Bolgoda Canal) | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 8.66 | 4.33 | 2.17 | 2.17 |
| | 5 | 0.20 | 0.30 | 34.38 | 21.52 | 6.46 | 8.62 |
| | 10 | 0.10 | 0.10 | 32.38 | 33.38 | 3.34 | 11.96 |
| | 25 | 0.04 | 0.06 | 43.52 | 37.95 | 2.28 | 14.24 |
| | 50 | 0.02 | 0.02 | 47.66 | 45.59 | 0.91 | 15.15 |
| Ratmalana-Moratuwa Sub-basin | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 15.93 | 7.97 | 3.98 | 3.98 |
| | 5 | 0.20 | 0.30 | 10.18 | 13.05 | 3.92 | 7.90 |
| | 10 | 0.10 | 0.10 | 11.95 | 11.06 | 1.11 | 9.01 |
| | 25 | 0.04 | 0.06 | 18.93 | 15.44 | 0.93 | 9.93 |
| | 50 | 0.02 | 0.02 | 22.74 | 20.83 | 0.42 | 10.35 |
| Weras Ganga Scheme Alone | | 1.00 | | | | | |
| | 2 | 0.50 | 0.50 | 15.41 | 7.70 | 3.85 | 3.85 |
| | 5 | 0.20 | 0.30 | 27.34 | 21.37 | 6.41 | 10.26 |
| | 10 | 0.10 | 0.10 | 16.16 | 21.75 | 2.18 | 12.44 |
| | 25 | 0.04 | 0.06 | 48.79 | 32.48 | 1.95 | 14.39 |
| | 50 | 0.02 | 0.02 | 44.59 | 46.69 | 0.93 | 15.32 |

Table 22.4 Cost Benefit Stream of F/S Project

| (Unit: million Rs.) | | | | | | | |
|----------------------|----------|-------|------------|--------|--------|----------|-----------|
| Year | Cost | O&M | Total Cost | Flood | Land | Benefit | B-C |
| 1 | 353.07 | | 353.07 | | | 0.00 | -353.07 |
| 2 | 282.45 | | 282.45 | | | 0.00 | -282.45 |
| 3 | 988.59 | | 988.59 | | | 0.00 | -988.59 |
| 4 | 1,059.20 | | 1,059.20 | | | 0.00 | -1,059.20 |
| | 847.36 | | 847.36 | | | 0.00 | -847.36 |
| 5 | | 40.00 | 40.00 | 115.60 | 760.94 | 876.54 | 836.54 |
| 6 | | 40.00 | 40.00 | 121.38 | 760.94 | 882.32 | 842.32 |
| 7 | | 40.00 | 40.00 | 127.45 | 760.94 | 888.39 | 848.39 |
| 8 | | 40.00 | 40.00 | 133.82 | 760.94 | 894.76 | 854.76 |
| 9 | | 40.00 | 40.00 | 140.51 | 760.94 | 901.45 | 861.45 |
| 10 | | 40.00 | 40.00 | 147.54 | 760.94 | 908.48 | 868.48 |
| 11 | | 40.00 | 40.00 | 154.92 | 760.94 | 915.86 | 875.86 |
| 12 | | 40.00 | 40.00 | 162.66 | 760.94 | 923.60 | 883.60 |
| 13 | | 40.00 | 40.00 | 170.79 | 760.94 | 931.73 | 891.73 |
| 14 | | 40.00 | 40.00 | 179.33 | 760.94 | 940.27 | 900.27 |
| 15 | | 40.00 | 40.00 | 188.30 | 760.94 | 949.24 | 909.24 |
| 16 | | 40.00 | 40.00 | 197.72 | 760.94 | 958.66 | 918.66 |
| 17 | | 40.00 | 40.00 | 207.60 | 760.94 | 968.54 | 928.54 |
| 18 | | 40.00 | 40.00 | 217.98 | 760.94 | 978.92 | 938.92 |
| 19 | | 40.00 | 40.00 | 228.88 | 760.94 | 989.82 | 949.82 |
| 20 | | 40.00 | 40.00 | 240.32 | 760.94 | 1,001.26 | 961.26 |
| 21 | | 40.00 | 40.00 | 252.34 | 760.94 | 1,013.28 | 973.28 |
| 22 | | 40.00 | 40.00 | 264.96 | 760.94 | 1,025.90 | 985.90 |
| 23 | | 40.00 | 40.00 | 278.21 | 760.94 | 1,039.15 | 999.15 |
| 24 | | 40.00 | 40.00 | 292.12 | 760.94 | 1,053.06 | 1,013.06 |
| 25 | | 40.00 | 40.00 | 306.72 | 760.94 | 1,067.66 | 1,027.66 |
| 26 | | 40.00 | 40.00 | 322.06 | 760.94 | 1,083.00 | 1,043.00 |
| 27 | | 40.00 | 40.00 | 338.16 | 760.94 | 1,099.10 | 1,059.10 |
| 28 | | 40.00 | 40.00 | 355.07 | 760.94 | 1,116.01 | 1,076.01 |
| 29 | | 40.00 | 40.00 | 372.82 | 760.94 | 1,133.76 | 1,093.76 |
| 30 | | 40.00 | 40.00 | 391.46 | 760.94 | 1,152.40 | 1,112.40 |
| 31 | | 40.00 | 40.00 | 411.04 | 760.94 | 1,171.98 | 1,131.98 |
| 32 | | 40.00 | 40.00 | 431.59 | 760.94 | 1,192.53 | 1,152.53 |
| 33 | | 40.00 | 40.00 | 453.17 | 760.94 | 1,214.11 | 1,174.11 |
| 34 | | 40.00 | 40.00 | 475.83 | 760.94 | 1,236.77 | 1,196.77 |
| 35 | | 40.00 | 40.00 | 499.62 | 760.94 | 1,260.56 | 1,220.56 |
| 36 | | 40.00 | 40.00 | 524.60 | 760.94 | 1,285.54 | 1,245.54 |
| 37 | | 40.00 | 40.00 | 550.83 | 760.94 | 1,311.77 | 1,271.77 |
| 38 | | 40.00 | 40.00 | 578.37 | 760.94 | 1,339.31 | 1,299.31 |
| 39 | | 40.00 | 40.00 | 607.29 | 760.94 | 1,368.23 | 1,328.23 |
| 40 | | 40.00 | 40.00 | 637.65 | 760.94 | 1,398.59 | 1,358.59 |
| 41 | | 40.00 | 40.00 | 669.53 | 760.94 | 1,430.47 | 1,390.47 |
| 42 | | 40.00 | 40.00 | 703.01 | 760.94 | 1,463.95 | 1,423.95 |
| 43 | | 40.00 | 40.00 | 738.16 | 760.94 | 1,499.10 | 1,459.10 |
| 44 | | 40.00 | 40.00 | 775.07 | 760.94 | 1,536.01 | 1,496.01 |
| Net Present Value | | | 2,789.62 | | | 5,832.71 | |
| EIRR | | | | | | | 18.8% |
| B-C (million Rs.) | | | | | | | 3,043.09 |
| B/C | | | | | | | 2.09 |