

## CHAPTER 8 ECONOMIC AND FINANCIAL ANALYSIS

### 8.1 Methodological Background

The purpose of economic analysis of projects is to examine and compare various investment options and make investment decision from the viewpoint of economic returns from the projects. It helps to conduct better allocation of resources so that the investment contributes not only to the local or regional economy but also to the national economy in general. The basic identification, such as 1) an appropriate discount rate, 2) comparison of “With” case and “Without” case and 3) conversion to economic cost from market price is needed to perform the economic analysis. And in order to evaluate the projects (economically) based on quantified costs and benefits, the following indicators were analyzed in this study.

- Net Present Value (NPV)
- Benefit Cost Ratio (B/C Ratio)
- Economic Internal Rate of Return (EIRR)

Financial analysis of projects is similar to the economic analysis. Financial analysis of project estimates the profit accruing to the project operating entity or public sector. In order to evaluate the project (financially) based on the expenditures and revenues, the following indicators were computed in this study.

- Net Present Value (NPV)
- Benefit Cost Ratio (B/C Ratio)
- Financial Internal Rate of Return (FIRR)

Both types of analysis are conducted in monetary terms, but how to conduct the cost calculation and benefit concerns are different between financial and economic analysis. Differences between economic and financial evaluation is shown in Table 8.1-1.

**Table 8.1-1 Differences between Economic and Financial Evaluation**

| Content                  | Economic Evaluation  | Financial Evaluation          |
|--------------------------|--|-------------------------------|
| Effectiveness of Targets | Economically viable  | Financially sustainable       |
| Cost Measurement         | Economic cost  | Financial cost (Market price) |
| Benefits                 | Reduction of cost, saving time and increment of productivity | Increment of revenue income   |
| Discount Rate            | Opportunity cost of capital                                  | Long term prime rate          |
| Evaluation Indicator     | NPV, B/C, EIRR   | NPV, B/C, FIRR                |

However, the main objective of this Master Plan is to prepare a plan for the restoration and improvement of urban facilities in Monrovia. There are several sectors such as road and transportation, water supply, sanitation and storm water drainage facilities to be included in the plan for short and medium term programs. Therefore, the comprehensive economic evaluation is essential for all of these sectors. Nevertheless, it is difficult to quantify the same level of benefits in all sectors during the Master Plan

preparation itself.

Based on the understanding mentioned above, economic analysis has been implemented to assess the economic indicators of each sector project in the short- and medium-term programs. Similarly, financial analysis has been implemented to estimate the financial indicator of only one water supply project as “requested project” in this Master Plan.

## **8.2 Economic Evaluation**

### **8.2.1 Road Sector**

There are nine (9) projects to be evaluated for economic analysis in this study. Benefits were derived from the basic traffic data in this sector. A flowchart of economic evaluation procedure for the road sector is presented in Figure 8.2-1.

In order to achieve the objectives of the Study, the following steps have been carried out:

- Step 1: Traffic demand forecast for “With” and “Without” Project case
- Step 2: Estimation of economic benefits based on the traffic demand on the Project Road and unit vehicle operating cost
- Step 3: Estimation of economic costs based on the estimated financial cost as mentioned in the previous section.
- Step 4: Economic evaluation using economic benefits and economic costs
- Step 5: Sensitivity analysis considering various factors that influence the economic indicator of the project, with varying range of input data

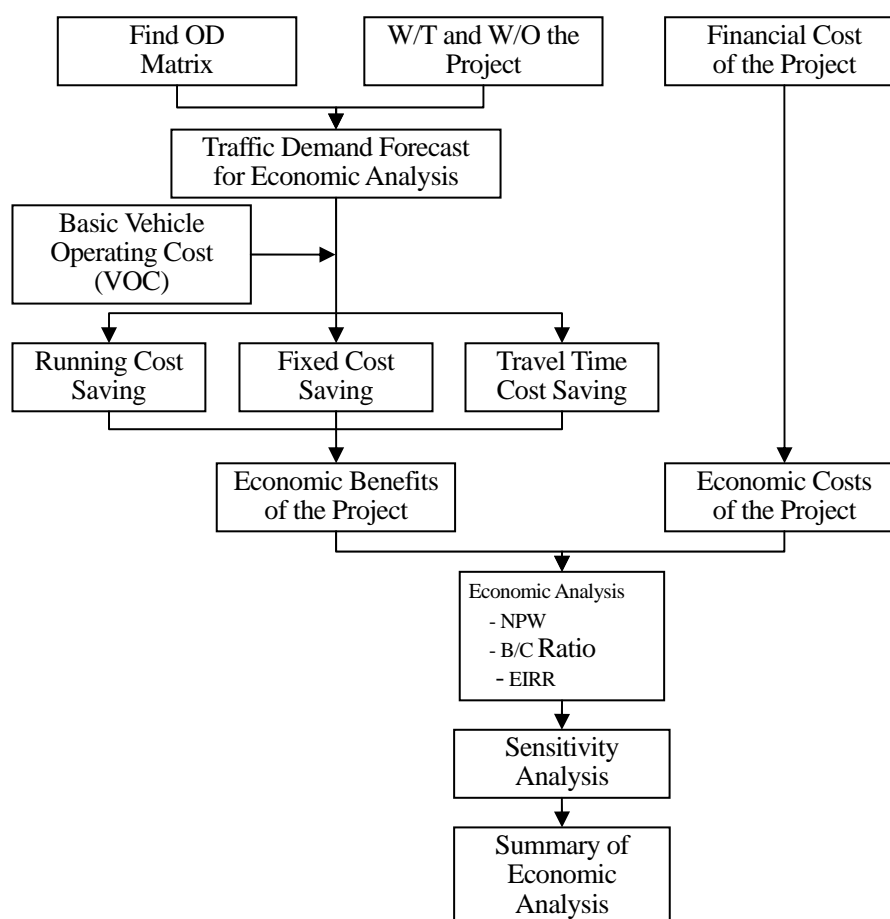


Figure 8.2-1 Flowchart of Procedure for Project Evaluation

### 8.2.1.1 Traffic Demand Forecast for Economic Evaluation

Future traffic demand forecasted in the form of OD matrix (years 2008, 2014 and 2019) was assigned on the road network to estimate traffic volume for all selected projects which are described in Chapter 9.3. The estimated traffic volume, vehicle-kilometers and vehicle-hours, on the roads for the case of “With” the project are shown, respectively.

### 8.2.1.2 Vehicle Operating Cost (VOC)

Unit vehicle operating cost as a function of road roughness and travel time cost for six (6) vehicle types were calculated. Assigned vehicle types, vehicle operating cost and travel time cost are shown in Table 8.2-1. The benefits can be estimated as differences of these VOC’s “With” and “Without” project.

Table 8.2-1 Vehicle Operating Cost (VOC)

| Vehicle Type  | Running(USD/1,000km) | Fixed(USD/hr) | Time(USD/hr) |
|---------------|----------------------|---------------|--------------|
| Passenger Car | 108                  | 0.32          | 1.58         |
| Taxi          | 130                  | 0.84          | 0.31         |
| Mini Bus      | 291                  | 0.96          | 0.81         |
| Large Bus     | 527                  | 1.19          | 2.16         |
| Light Truck   | 376                  | 1.52          | 0.00         |
| Motorcycle    | 29                   | 0.04          | 0.26         |

### **8.2.1.3 Economic Cost**

Each project cost is expressed as the financial cost. It is therefore necessary to convert from financial cost to economic cost. In this study the economic cost was estimated by deducting government taxes and import duty taxes from the financial cost.

### **8.2.1.4 Benefit Cost Analysis**

#### **(1) Evaluation Period**

The evaluation period of each project is assumed to be 25 years taking into account the service life of the road sector project.

#### **(2) “With” and “Without” the Project**

Economic benefits are calculated as the difference between “With the Project” and “Without the Project” cases. For the calculation of economic benefits, “Without the Project” case is defined as “Do Nothing”, while “With the Project” case is defined as Project Alternatives when the proposed projects are assumed to be implemented.

#### **(3) Economic Indicators**

There are various methods in practice for economic evaluation of project. However, all methods principally employ benefits and costs for computing various economic indicators. The economic indicators used in this Study are as follows:

- Net Present Value (NPV)
- Benefit Cost Ratio, (BCR), and
- Economic Internal Rate of Return (EIRR)

#### **(4) Benefit Cost Analysis**

Based on the above mentioned benefits and cost estimates, the economic analysis of the each project was performed. The project life period of 25 years were assumed for the benefit and cost analysis of each project. Annual benefit-cost flow was drawn and economic indicators were computed accordingly.

#### **(5) Sensitivity Analysis**

The sensitivity analysis was conducted under a case scenario incorporating increase and/or decrease of the estimation of costs and benefits. The following three (3) variables are considered as influencing factors for the economic performances.

Combinations of changes in values can be assumed as the following variable items;-

- Increment the investment cost
- Increment the maintenance cost
- Decrease the traffic demand

## **8.2.2 Water Supply Sector**

There are five (5) projects to be evaluated in this study. The steps for the assessment of economic viability of each project are identification, quantification and valuation of the economic costs and benefits of the respective project. Two important principles to be followed are:-

- Comparison between With and Without the project cases and
- Distinction between the current clean water supply and future water capacities costs and benefits.

### **8.2.2.1 With and Without Project Cases**

The project inputs and outputs should be identified, quantified and valued by comparing Without the project case with that of With the project to cover the project costs and benefits.

#### **(1) Without Case**

The Without the project case is the case that the current water service coverage ratio, such as ratio of house connection or kiosk will continue in future too. The case has also assumed that people and kiosk who are not enjoying water services and purchasing water for the daily purpose will purchase water in future too. In short, the current situation will be continued at least within the project life period, i.e. 25 years.

#### **(2) With Case**

Satellite water system or water supply facilities will be constructed, and the project cost will be considered as the project investments. The identification and quantification of the relevant costs and benefits will be estimated in this study.

The evaluation period of each project is assumed to be 25 years taking into account the service life of the water supply sector project.

### **8.2.2.2 Economic Costs and Benefits**

#### **(1) Cost Estimation**

Project construction cost and Operation and Maintenance (O&M) cost require for executing water supply facilities were considered as costs of the project. The economic costs to be converted from financial cost consist of engineering, construction, installation of facilities and operation & maintenance costs.

In the calculation of the operation and maintenance cost, the details were divided into the following sub-cost items:-

- Personnel expenses : for tariff collection, management of account book, operation and pouring of fuel
- Maintenance expenses : repairing of submersible pump, generator, pipe lines and procurement of fuel

#### **(2) Benefits**

With the implementation of the project, significant benefits, both direct and indirect, could be attained. Direct benefits were calculated based on the following two considerations in this study.

- Resource cost savings from the existing volume of water supply replaced by pipe water from the selected project. Measuring shall be in terms of the difference in price between the existing unit cost and new water rate, “willingness to pay”, based on public awareness survey.
- Time cost saving on water collection. This is assumed at 30 minutes per day per household based on public awareness survey. This comes to count the average of 51.5% which extracted from World Bank study for the economic activities.

Indirect benefits are increased productivity of the residents in service area and residents obtaining stable, safe and sufficient supplies with ease, and accordingly the improvement of living environment and sanitation.

### **8.2.3 Sanitation Sector**

The benefits from the improved sewerage system were estimated by assuming four types of benefits as mentioned below;

- 1) Cost savings
- 2) Reduction of damage
- 3) Induced development benefits
- 4) Social benefit

Obtaining/deriving reliable quantitative data of the benefits is difficult in this sector. Therefore, the study team assumed the part of social benefits as the benefits of the project in this study for the economic evaluation of the project.

Reduction of water-borne disease, a part of social impact, is applied to quantify the benefits. Based on public awareness survey, people of the study area are suffered/afflicted with waterborne disease at the rate of 46% of household annually, spending a significant part of their incomes as the medical expenses. Because of the waterborne diseases in the community, it causes two kinds of economic costs; (i) medical cost, and (ii) opportunity cost: cost of time spent by a hospitalized patient. It is difficult to estimate the cost of time spent by patient so that the study team considered only the medical cost saving due to the improved health condition in the household.

### **8.3 Financial Evaluation**

The financial benefit-cost analysis is to assess the financial viability of the requested project, the “Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia” in this study.

The project capital shall be funded by grant aid scheme so it do not occur the financial interest to be considered.

The financial benefit-cost analysis includes the following steps;-

- Step 1: Determine annual project revenues
- Step 2: Determine project cost (using market price)
- Step 3: Calculate annual project net financial benefits

Step 4: Calculate the financial net present value (NPV) and the financial internal rate of return (FIRR)

Step 5: Sensitivity analysis

### **8.3.1 Assumptions of Revenue and Cost**

#### **8.3.1.1 Revenue**

The project revenues are usually determined for different groups of users, such as households, government intuitions and private commercial/industrial institutions. The proposed project will supply water to the residential area in particular so that the Study team has assumed the following items for the financial projections, to be used for the financial evaluation of the projects;-

- 1) The volume of water produced and sold through service connection is based on the water demand analysis.
- 2) Average water charges for service households derived based on the public awareness survey.
- 3) Service households shall not be increased during project evaluation period.

#### **8.3.1.2 Financial Cost**

The requested project cost estimates are typically categorized into the following items;-

- 1) Investment cost; engineering, construction, facilities and equipments.
- 2) Operation and maintenance cost is based on the actual cost of the pilot project in this master plan study.
- 3) Annual repair cost is assumed the designed wastage rate of facilities or equipments.
- 4) Depreciation is calculated using the designed life of facilities or equipments.
- 5) Replacement cost; equipments shall be replaced the new purchase after completion of individual service life.
- 6) Land cost and land acquisition cost are not assumed.

### **8.3.2 Net Financial Benefits**

The project net benefit is the difference between the project revenues and project costs. The net benefit stream during the lifetime of the project, 25 years, shows the project value.

The profitability of the selected project to the entity is indicated by the project FIRR. The NPV was calculated using a discount rate of 12% in financial analysis.

The project revenues, project costs and project net benefits have been presented for the full period as shown in Table 8.3-1.

**Table 8.3-1 Estimation of FIRR**

| B/C  | FIRR (%) | NPV (1,000 USD) |
|------|----------|-----------------|
| 1.21 | 56.57    | 1,421           |

The water revenues cover the O & M expenses and the replacement of equipments cost according to the financial results so that they are considered to be financially viable.

However, in case of the shortage of water revenues, an Operation and Maintenance Trust Fund is proposed for operation and maintenance (O&M) of water supply project in the Greater Monrovia. An autonomous body will be registered in Monrovia Municipality. This O&M trust fund will be administered and managed by the autonomous body which comprises representatives from local communities. Revenue collected from water tariff from each household will be collected and deposited in O&M trust fund. Certain amount of annual O&M budget will be allocated by the local government (Monrovia Municipality) for the water supply project. If the annual income of O&M trust fund will be insufficient for operation and maintenance, the required (and insufficient) amount will be collected from households (water supply users) by taking consent from all water users. The provision of collecting certain amount of money for maintenance program from water users will not only collect insufficient amount but also enhance the sustainability of the system because it makes the water users feeling of ownership of the project rather than the state owned system. This approach has already been adopting in many developing countries, and proved to be very successful and sustainable. Some of those successful and sustainable systems are community forestry farmers-managed irrigation system and community water supply system.



## CHAPTER 9 COMPREHENSIVE MASTER PLAN ON URBAN FACILITIES RESTORATION AND IMPROVEMENT

### 9.1 Strategy of Comprehensive Master Plan

#### 9.1.1 Principles for Master Plan Formulation

As stated in Chapter 3, the issues in the four sectors covered by this Study (that is, road and transportation, water supply, sanitation and storm water drainage) differ in the degrees of seriousness, necessity and urgency. Therefore, this Study formulated a comprehensive urban facilities restoration and improvement master plan with different emphasis on each sector in accordance with the characteristics and condition of each sector.

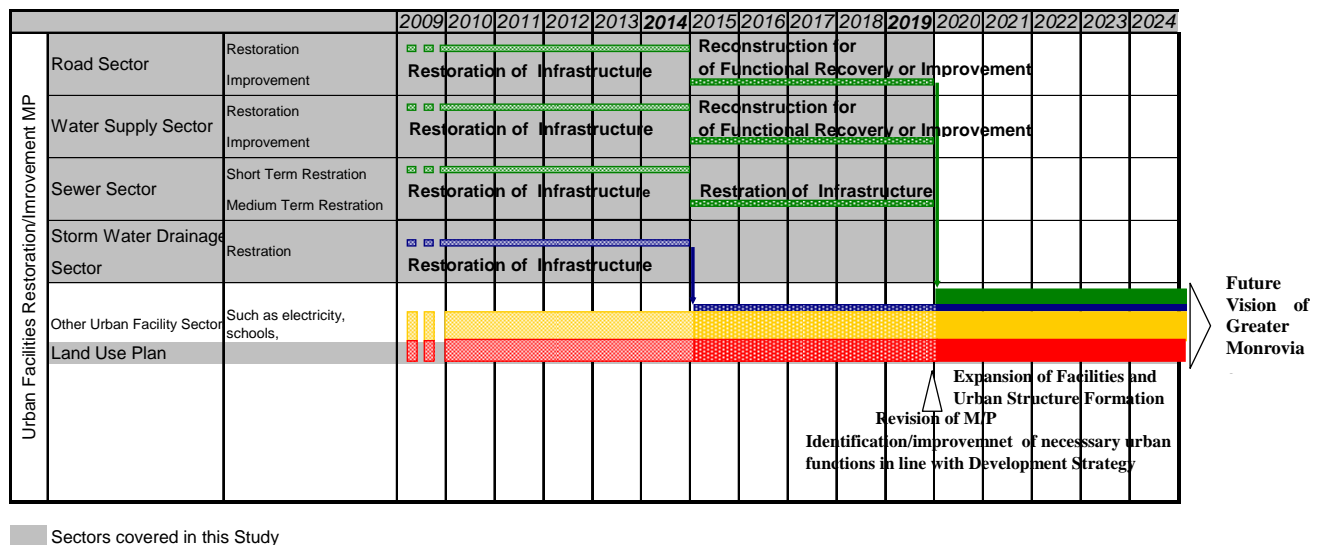


Figure 9.1-1 Sectoral Restoration/Improvement Plan in Time Schedule

In formulating a master plan, it is more meaningful to comprehensively accommodate cross-cutting urban facility restoration/improvement issues in a common socio-economic framework than to individually and separately accommodate sectoral issues. In this context, issues are studied comprehensively and are mutually adjusted from the viewpoints of required space, schedule, resource and techniques for smooth project implementation and synergy effect to formulate a master plan.

Followings are the major points to which attention was paid in the formulation of this Master Plan.

#### 1) Restoration/Improvement Plan based on the Required Needs

The sectoral goals of restoration/improvement plan in each sector were set through discussions with counterpart agencies based on the MDGs numerical goals. Although considering the budgetary restraints of Liberian Governmental expenditure, the required level of infrastructure and its service level are determined based on the assessed needs required in the formulation of the master plan. In case where the numerical goal is not met until the targeted year, projects would be left to implement in the following planning period. However, in this Study, the Master Plan challenged to include all projects based on the assessed needs required.

#### 2) Packaged Project Formulation Based on the Restoration/Improvement Needs

Although the difference between the level of present conditions and targeted level in the future can be regarded as the required amount of restoration and improvement, such required amount shall not be regarded as a project in itself. In this Study, required amount of restoration and improvement are decomposed and integrated into packaged projects after studying the required fund, implementation schedule, and project scheme so as to comply with the schemes of various donor agencies.

#### 3) Project Formation at Community Level

In this Study, formulation of an integrated project to improve living standards of communities is proposed apart from the sectoral projects. That is, sectoral projects as community road restoration and improvement, water supply development by deep well, collective sewer system and drainage are combined together and integrated into a community infrastructure improvement project for the effective use of fund to apply to community needs. Not only governments but also communities, and NGOs are expected to be the implementing body of the project.

#### 4) Project Formation for Residents within UCA

In this Study, Urbanization Control Area (UCA) is proposed after analyzing the urban structure as a base for infrastructure restoration and improvement not only for effective use of governmental funds on infrastructure but also for environmental conservation. However, this does not imply that residents living within UCA shall be discarded. In this Study, infrastructure restoration and improvement are also considered in connection with the above project formulation for residents at small settlements within UCA.

#### 5) Adjustment of Implementation among Relevant Projects

The schedules of projects related to each other are mutually adjusted in the formulation of the Master Plan. Since the urban area of Greater Monrovia is spread over on the low land including swampy areas, road conditions are much influenced by the rainfall. Drainage restoration and improvement shall be implemented together with road projects. The old district areas in Monrovia are densely urbanized and very hard to spare the land for collective sewer system, therefore central sewer system is preferable and shall be implemented with the Expansion Project of White Plains Water Supply Project. In this Study project implementation timing was mutually adjusted as such.

### **9.1.2 Relationship between Master Plan and PRS**

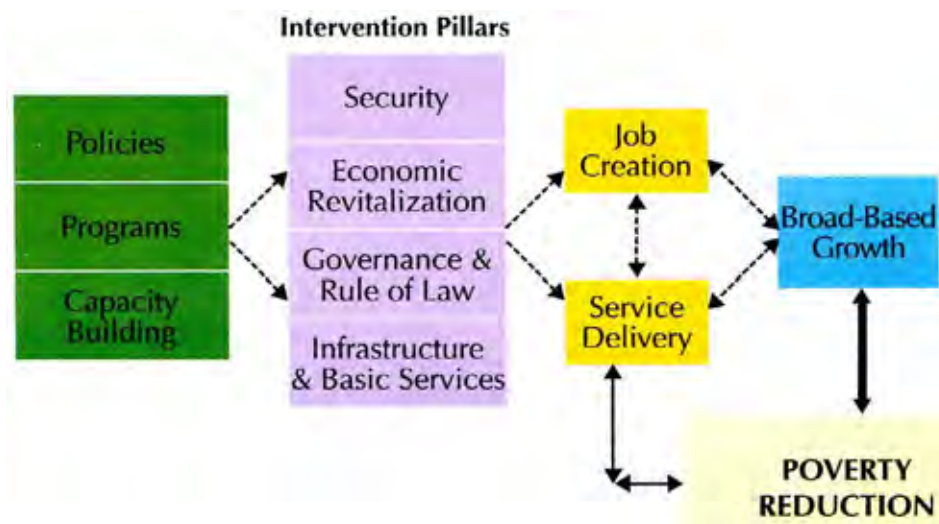
The planning period of PRS is from 2008 to 2011, showing vision and strategy toward poverty reduction and sustainable development, and MDGs are shown as an indicator of achievement progress. On the other hand, the planning period of the Master Plan in this Study is far beyond that of PRS.

The Master Plan in this Study shows the future vision corresponding to 3 pillars out of the 4 pillars shown in the PRS, excluding Security. In the economic analysis of the projects in this Study, both positive and negative externalities were examined from environmental-social aspects with more positive consideration of environmental-social sector project. This is because the Master Plan is required to be formulated with a view to not only restoration/improvement but also improvement of longer planning period of this Study. Therefore, project for economic externality is regarded indispensable in the formulation of the Master Plan either whether it is included or not included. (For instance the seashore protection project or swampy are protection are examples of such projects though those are out of scope of work of this Study.)

MDGs are adopted in the Master Plan with minor modification because of the difference of time horizons and areas of this Study.

#### <Reference>

In the "Poverty Reduction Strategy" 2008, four (4) strategic pillars are shown for the reduction of poverty and sustainable development and those strategic pillars are mutually reinforced. "Infrastructure and Basic Services" is one of four strategic pillars and restoration and improvement of basic infrastructure is pointed out to be necessary for the broad economic growth, provision of basic services nationwide and decentralization.



Source: Poverty Reduction Strategy, 2008

**Figure 9.1-2 Strategic Framework of PRS**

#### <Millennium Development Goals (MDGs)>

- Goal 1: halve the rates for \$1 a day poverty and malnutrition
- Goal 2: ensure that children are able to complete primary schooling
- Goal 3: eliminate gender disparity in education and empower woman
- Goal 4: reduce under-5 mortality by two-thirds
- Goal 5: reduce maternal mortality by three-fourths
- Goal 6: halt and begin to reverse the spread of HIV/AIDs and other Major diseases
- Goal 7: halve the proportion of people without sustainable access to basic needs
- Goal 8: develop a global partnership for development

### 9.1.3 Detailed Future Visions and Goals

Detailed visions and goals are studied and shown below. These are corresponding to the three pillars excluding Security in PRS and environmental and social aspects are added. Goals are set from the restoration and improvement aspects of living standard and economy for both old districts and urbanizing districts.

In the residential areas future vision to be pursued is restoration of living standards to achieve basic human needs. Different detailed goals are set for old districts where mostly restoration of old infrastructure and for urbanizing districts where new infrastructure provision is required to accommodate the influx of population.

From the viewpoint of economic recovery, future vision to be pursued in the old districts is restoration and improvement of existing urban functions and industrial functions; to be more precise, emphases were put on restoration and improvement of access to Freeport and CBD and road network within old districts. Goal to improve access to Freeport and CBD is set from the aspects to improve not only domestic accessibility within Greater Monrovia Area but also to improve international accessibility.

In the urbanizing districts, future vision to be pursued is coordinated restoration and improvement of industrial functions (regeneration of old industrial area and rearrangement of commercial functions). In detail, emphasis is put on restoration and improvement of economic infrastructure to promote location of industrial functions at dilapidated industrial zone. In the urbanizing districts, partial malfunction of traffic fluidity is already occurring due to the rapid expansion of market areas from rapid population inflow. Therefore, intention to improve traffic fluidity is considered in the future vision.

In the water supply sector the Master Plan in this Study succeeds to numerical goals of LWSC. According to the goals of LWSC, the population coverage ratio of water supply is set at 70% for 2014 regardless of public kiosk or individual tap and at 100% for 2019. These goals are broken down for districts in this Study.

In the sanitation sector the Master Plan in this Study also succeeds to numerical goals of LWSC. According to the goals of LWSC, the population coverage ratio of sanitation system is set at 50% for 2014 and at 80% for 2019. These goals are broken down for districts.

In the storm water drainage sector, restoration plan including under ground pipes and cleaning of open channels are formulated for 2014. The flood control measures are to be implemented in the road network rehabilitation project.

**Table 9.1-1 Future Vision and Goals by Area from Infrastructure Restoration and Improvement Aspect (2014)**

|                          |                                    | Future Vision by area from infrastructure restoration and improvement (2014)  |  |
|--------------------------|------------------------------------|---|--|
|                          |                                    | Old Districts*  | Urbanizing Districts   |
| Poverty Reduction Issues | Basic living condition improvement | <p>○ <b>Improvement of living conditions in old districts (including built-up informal settlement)</b></p> <ul style="list-style-type: none"> <li>• Restoration/improvement of infrastructure to accommodate population density increase</li> <li>• Establishment of operation and maintenance system of road</li> <li>• Safe water supply and establishment of operation and maintenance system</li> <li>• Expansion of sanitation system coverage area by restoration/improvement of existing sanitation system and establishment of operation and maintenance system</li> <li>• Restoration and improvement of storm water drainage<br/>( • Power supply)</li> </ul> | <p>○ <b>Improvement of living conditions of existing communities</b></p> <ul style="list-style-type: none"> <li>• Restoration/improvement of infrastructure to accommodate population density increase</li> <li>• Community road restoration/improvement as all tear round road (improvement of access to schools, hospitals etc.)</li> <li>• Public transport service supply at low price</li> <li>• Safe water supply and establishment of operation and maintenance system</li> <li>• Expansion of sanitation system coverage area by on-site sanitation<br/>( • Construction of schools and educational facilities)<br/>( • Power supply)</li> </ul> |
|                          |                                    | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• Pop density (211/ha)</li> <li>• To raise restored road pavement rate of secondary roads to 72%</li> <li>• To raise restored road pavement rate of tertiary roads to 36%</li> <li>• To raise water service coverage ratio to 77%</li> <li>• Approx. 38% of population with sanitation</li> <li>• Restoration and establishment of operation and maintenance system of 27km underground drainage pipes</li> <li>• Improvement and establishment of 17.5km open drainage channels</li> </ul>  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• Pop density (65/ha) for Urbanization Promotion Areas</li> <li>• To raise restored road pavement rate of secondary road to 58%</li> <li>• To raise restored road pavement rate of tertiary roads to 48%</li> <li>• To raise water service coverage ratio to 67%</li> <li>• Approx. 22% of population with sanitation</li> </ul>  |
| Economic Recovery        | Economic Recovery                  | <p>○ <b>Restoration and improvement of existing urban functions and industrial functions</b></p> <ul style="list-style-type: none"> <li>• Restoration/improvement of trunk road network and IT infrastructure (Restoration improvement of access to Freeport, RIA and CBD, and street within old districts)</li> <li>• Enhancement of traffic fluidity<br/>( • Restoration and improvement of Freeport and RIA)<br/>( • Elimination of Illegal occupants at industrial sites<br/>( • Power supply)</li> </ul>   | <p>○ <b>Coordinated restoration and improvement of industrial functions (regeneration of old industrial area and rearrangement of commercial functions)</b></p> <ul style="list-style-type: none"> <li>• Restoration/improvement of trunk road network and IT infrastructure (Restoration improvement of access to Freeport CBD)</li> <li>• Enhancement of traffic fluidity near large market<br/>( • Power supply)</li> </ul>   |
|                          |                                    | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• To raise restored road pavement rate of primary roads to 100%</li> <li>• Reconstruction/improvement of Vai Town, Caldwell, and Johnson St. Bridges</li> </ul>  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• To solve traffic congestion at intersection near large market</li> </ul>  |

|                        |                                    | Future Vision by area from infrastructure restoration and improvement (2014)   |   |
|------------------------|------------------------------------|--|---|
|                        |                                    | Old Districts*   | Urbanizing Districts  |
|                        | Governance enhancement             | Recovery of governmental functions   | Self-supportive community empowerment   |
|                        | Environmental-Social consideration | ○Restoration of swampy area (restoration of urbanizing swampy area to original swampy area)<br>• Preparation of alternative land for relocation of illegal residents)<br>(○Shore protection) | ○Restoration of swampy area (restoration of urbanizing swampy area to original swampy area)<br>• Preparation of alternative land for relocation of illegal residents) |
|                        |                                    | <b>Goals</b><br>• To restrict population increase in informal settlement   | <b>Goals</b><br>• To restrict population increase in informal settlement  |
| Project Implementation |                                    | Attention to job creation  |   |

\* Old districts : New Kru Town, Logan Town, Clara Town, West Point, Central Monrovia A, Central Monrovia B, Sinkor, Lakpazee, Old Road, and Congo Town

**Table 9.1-2 Future Vision and Goals by Area from Infrastructure Restoration and Improvement Aspect (2019)**

|                          |                                    | Future Vision by area from infrastructure restoration and improvement (2019)   |  |
|--------------------------|------------------------------------|--|--|
|                          |                                    | Old Districts*   | Urbanizing Districts   |
| Poverty Reduction Issues | Basic living condition improvement | ○ <b>Improvement of living conditions in old districts (including built-up informal settlement)</b><br>• Restoration/improvement of infrastructure to accommodate population density increase<br>• Establishment of operation and maintenance system of road<br>• Safe water supply and establishment of operation and maintenance system<br>• Expansion of sanitation system coverage area by restoration/improvement of existing sanitation system and establishment of operation and maintenance system<br>• Restoration and improvement of storm water drainage<br>( • Power supply) | ○ <b>Improvement of living conditions of existing communities</b><br>• Restoration/improvement of infrastructure to accommodate population density increase<br>• Community road restoration/improvement as all tear round road (improvement of access to schools, hospitals etc.)<br>• Public transport service supply at low price<br>• Safe water supply and establishment of operation and maintenance system<br>• Expansion of sanitation system coverage area by on-site sanitation<br>( • Construction of schools and educational facilities)<br>( • Power supply) |
|                          |                                    | <b>Goals</b><br>• Pop density (227/ha)<br>• To raise restored road pavement rate of secondary roads to 100%<br>• To raise restored road pavement rate of tertiary roads to 100%<br>• To raise water service coverage ratio to 100%<br>• Approx. 64% of population with sanitation  | <b>Goals</b><br>• Pop density (84/ha) for Urbanization Promotion Areas<br>• To raise restored road pavement rate of secondary roads to 100%<br>• To raise restored road pavement rate of tertiary roads to 100%<br>• To raise water service coverage ratio to 100%<br>• Approx. 70% of population with sanitation  |

|                                    |  | Future Vision by area from infrastructure restoration and improvement (2019)  |   |
|------------------------------------|--|---|---|
|                                    |  | Old Districts*  | Urbanizing Districts  |
| Economic Recovery                  |  | <p>○ <b>Restoration and improvement of existing urban functions and industrial functions</b></p> <ul style="list-style-type: none"> <li>• Restoration/improvement of trunk road network and IT infrastructure (Restoration improvement of access to Freeport and CBD, and street within old districts)</li> <li>• Enhancement of traffic fluidity ( <ul style="list-style-type: none"> <li>• Elimination of Illegal occupants at industrial sites</li> <li>• Power supply)</li> </ul> </li> </ul> | <p>○ <b>Coordinated restoration and improvement of industrial functions (regeneration of old industrial area and rearrangement of commercial functions)</b></p> <ul style="list-style-type: none"> <li>• Restoration/improvement of trunk road network and IT infrastructure (Restoration improvement of access to Freeport CBD)</li> <li>• Enhancement of traffic fluidity near large market ( <ul style="list-style-type: none"> <li>• Regeneration of old industrial area)</li> <li>• Power supply)</li> </ul> </li> </ul> |
|                                    |  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• To raise restored road pavement rate of primary roads to 100%</li> </ul>   | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• To restrict population increase in informal settlement</li> </ul>  |
| Governance enhancement             |  | Recovery of governmental functions  | Self-supportive community empowerment   |
| Environmental-Social consideration |  | <p>○ Restoration of swampy area (restoration of urbanizing swampy area to original swampy area)</p> <ul style="list-style-type: none"> <li>• Preparation of alternative land for relocation of illegal residents) (○Shore protection)</li> </ul>  | <p>○ Restoration of swampy area (restoration of urbanizing swampy area to original swampy area)</p> <ul style="list-style-type: none"> <li>• Preparation of alternative land for relocation of illegal residents)</li> </ul>  |
|                                    |  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• To restrict population increase in informal settlement</li> </ul>  |   |
| Project Implementation             |  | Attention to job creation   |   |

\* Old districts : New Kru Town, Logan Town, Clara Town, West Point, Central Monrovia A, Central Monrovia B, Sinkor, Lakpazee, Old Road, and Congo Town

## 9.2 Formulation of Master Plan (Short and Medium Term)

### 9.2.1 Cost and Available Fund

#### 9.2.1.1 Aggregate Costs

Required costs for the proposed projects for the sectors considered in this Study are shown below. The yearly required costs are estimated by apportioning the project cost to each year in the project period.

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Table 9.2-1 Required Costs for the Proposed Projects

(Unit: mln USD)

| Sector/Projects   | Total Cost    | Year         |               |               |              |              |              |              |              |              |              |              |
|---|---------------|--------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|   |               | 2009         | 2010          | 2011          | 2012         | 2013         | 2014         | 2015         | 2016         | 2017         | 2018         | 2019         |
| <b>Estimated Cost for Road and Transport</b>  |               |              |               |               |              |              |              |              |              |              |              |              |
| TR-0 Emergency Infrastructure Project (MPW, LRTF, on-going)   | 18.60         | 6.20         | 6.20          | 6.20          |              |              |              |              |              |              |              |              |
| TR-1 Johnson Street Bridge Improvement Project (Undecided)  | 24.00         |              | 3.60          | 3.60          | 8.40         |              |              |              |              |              |              |              |
| TR-2 Somalia Drive Reconstruction Project (Undecided)   | 21.10         |              | 5.28          | 5.28          | 10.55        |              |              |              |              |              |              |              |
| TR-3 Reconstruction of Bridges on Missing Link (Undecided)  | 10.64         |              | 2.66          | 2.66          | 5.32         |              |              |              |              |              |              |              |
| TR-4 Road Rehabilitation Project (Undecided)  | 48.28         |              |               |               | 4.83         | 4.83         | 4.83         | 6.76         | 6.76         | 6.76         | 6.76         | 6.76         |
| TR-5 Intersection Improvement Project (Undecided)   | 5.30          |              |               |               | 0.44         | 0.44         | 0.44         | 0.80         | 0.80         | 0.80         | 0.80         | 0.80         |
| TR-6 Bus Terminal & Bus Stop Facilities Construction Project (Undecided)  | 6.80          |              | 0.34          | 0.34          | 0.34         | 0.34         | 1.02         | 1.02         | 1.02         | 1.02         | 1.02         | 1.02         |
| TR-7 Traffic Safe Management Project (Undecided)  | 2.00          |              |               |               |              |              | 0.20         | 0.60         | 0.60         | 0.60         |              |              |
| TR-8 Vai Town Bridge Reconstruction (WB, Grant, on-going)   | 15.00         | 5.00         | 5.00          | 5.00          |              |              |              |              |              |              |              |              |
| TR-9 Rehabilitation of Monrovia City Streets Project (WB, Grant, on-going)  | 17.60         | 5.87         | 5.87          | 5.87          |              |              |              |              |              |              |              |              |
| TR-10 Caldwell Bridge Construction Project (WB, Grant, on-going)  | 7.00          |              | 3.15          | 3.15          | 0.70         |              |              |              |              |              |              |              |
| Cotton Tree - Buchanan Corridor Project (WB)  | 45.00         |              | 9.00          | 9.00          | 9.00         | 9.00         | 9.00         |              |              |              |              |              |
| Monrovia - Ganta/Guinea Border Corridor Project (WB)  | 100.00        |              | 20.00         | 20.00         | 20.00        | 20.00        | 20.00        |              |              |              |              |              |
| Performance-based Road Contract for Rehabilitation of specified Monrovia City Streets (WB)                            | 17.00         | 7.08         | 8.50          | 1.42          |              |              |              |              |              |              |              |              |
| Rehabilitation and Maintenance of the Monrovia-Ganta and Airport-Buchanan road (WB)                                   | 60.00         |              | 12.00         | 12.00         | 12.00        | 12.00        | 12.00        |              |              |              |              |              |
| Feeder Road in Bong, Lofa and Nimba Counties (WB)   | 6.27          | 0.63         | 1.25          | 1.25          | 1.25         | 1.25         | 0.63         |              |              |              |              |              |
| Rehabilitation of the Suakoko-Kaflee-Yaendendewoun Road (Ongoing)   | 0.11          | 0.05         | 0.05          |               |              |              |              |              |              |              |              |              |
| Rehabilitation of the Saniquellie-Ganta Road (Ongoing)  | 0.04          | 0.02         | 0.02          |               |              |              |              |              |              |              |              |              |
| <b>Estimated Cost for Projects Proposed in this M/P</b>   | <b>118.12</b> | <b>0.00</b>  | <b>11.88</b>  | <b>11.88</b>  | <b>29.88</b> | <b>14.01</b> | <b>5.81</b>  | <b>9.17</b>  | <b>9.17</b>  | <b>9.17</b>  | <b>9.17</b>  | <b>8.57</b>  |
| <b>Total Estimated Cost for Road and Transport</b>  | <b>404.73</b> | <b>24.85</b> | <b>82.92</b>  | <b>75.76</b>  | <b>72.83</b> | <b>56.26</b> | <b>47.44</b> | <b>9.17</b>  | <b>9.17</b>  | <b>9.17</b>  | <b>9.17</b>  | <b>8.57</b>  |
| <b>Estimated Cost for Water Supply</b>  |               |              |               |               |              |              |              |              |              |              |              |              |
| WS-1 Monrovia Water and Sanitation Rehabilitation Program (Ongoing)   | 38.50         | 4.75         | 9.75          | 24.00         |              |              |              |              |              |              |              |              |
| WS-2 Monrovia Expansion and Rehabilitation of Three County Capitals   | 19.24         | 3.00         | 8.12          | 8.12          |              |              |              |              |              |              |              |              |
| WS-3 Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (PEDW)               | 16.60         |              | 2.50          | 7.10          | 7.00         |              |              |              |              |              |              |              |
| WS-4 Expansion Project of White Plains Water Supply System (EPWS)   | 128.63        |              |               |               |              | 17.09        | 17.09        | 25.17        | 22.66        | 22.67        | 15.87        | 8.08         |
| Expansion of Treatment Plant Phase I  | 15.93         |              |               |               |              | 5.30         | 5.30         | 5.33         |              |              |              |              |
| Expansion of Treatment Plant Phase II   | 23.34         |              |               |               |              |              |              |              | 7.78         | 7.78         | 7.78         |              |
| Expansion of Rising Main Line   | 33.96         |              |               |               |              | 6.79         | 6.79         | 6.79         | 6.79         | 6.80         |              |              |
| Expansion of Distribution Main Line   | 40.44         |              |               |               |              |              |              | 8.09         | 8.09         | 8.09         | 8.09         | 8.08         |
| Service Reservoir Installation  | 14.96         |              |               |               |              | 5.00         | 5.00         | 4.96         |              |              |              |              |
| WS-5 Project for Expansion of Water Supply System at Paynesville in Greater Monrovia (PEWS) Phase II (Undecided)      | 22.87         |              |               |               | 2.07         | 6.76         | 4.68         | 4.68         | 4.68         |              |              |              |
| WS-6 Technical Cooperation Project of Groundwater Management (Undecided)  | 0.32          |              |               |               | 0.10         | 0.11         | 0.11         |              |              |              |              |              |
| WS-7 Technical Cooperation Project of Non-Renewable Water (Undecided)   | 1.50          |              |               |               | 0.50         | 0.50         | 0.50         |              |              |              |              |              |
| Capacity Building for LWSC (Ongoing)  | 5.00          | 1.67         | 1.67          | 1.67          |              |              |              |              |              |              |              |              |
| Assistance on Program Management (Ongoing)  | 7.00          | 2.33         | 2.33          | 2.33          |              |              |              |              |              |              |              |              |
| Assistance on Sector Reform (Ongoing)   | 2.00          | 0.67         | 0.67          | 0.67          |              |              |              |              |              |              |              |              |
| <b>Estimated Cost for Projects Proposed in this M/P</b>   | <b>169.92</b> | <b>0.00</b>  | <b>2.50</b>   | <b>7.10</b>   | <b>9.67</b>  | <b>24.46</b> | <b>22.38</b> | <b>29.85</b> | <b>27.34</b> | <b>22.67</b> | <b>15.87</b> | <b>8.08</b>  |
| <b>Total Estimated Cost for Water Supply</b>  | <b>241.66</b> | <b>12.42</b> | <b>25.04</b>  | <b>43.89</b>  | <b>9.67</b>  | <b>24.46</b> | <b>22.38</b> | <b>29.85</b> | <b>27.34</b> | <b>22.67</b> | <b>15.87</b> | <b>8.08</b>  |
| <b>Estimated Cost for Sewer</b>   |               |              |               |               |              |              |              |              |              |              |              |              |
| SN-1 Monrovia Water and Sanitation Rehabilitation Program   | 15.00         | 5.00         | 5.00          | 5.00          |              |              |              |              |              |              |              |              |
| SN-2 Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations (WB, ongoing) | 4.80          | 0.80         | 2.00          | 2.00          |              |              |              |              |              |              |              |              |
| SN-3 Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan for 2014 (Undecided)    | 18.11         |              |               | 4.53          | 4.53         | 4.53         | 4.53         |              |              |              |              |              |
| SN-4 Project for Reconstruction of Sewerage Treatment & Sludge Treatment Plant (Undecided)                            | 74.20         |              |               |               |              |              |              | 14.84        | 14.84        | 14.84        | 14.84        | 14.84        |
| SN-5 Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan for 2019 (Undecided)    | 23.38         |              |               |               |              |              |              | 4.68         | 4.68         | 4.68         | 4.68         | 4.68         |
| <b>Estimated Cost for Projects Proposed in this M/P</b>   | <b>115.69</b> | <b>0.00</b>  | <b>0.00</b>   | <b>4.53</b>   | <b>4.53</b>  | <b>4.53</b>  | <b>4.53</b>  | <b>19.52</b> | <b>19.52</b> | <b>19.52</b> | <b>19.52</b> | <b>19.52</b> |
| <b>Total Estimated Cost for Sewer</b>   | <b>135.49</b> | <b>5.80</b>  | <b>7.00</b>   | <b>11.53</b>  | <b>4.53</b>  | <b>4.53</b>  | <b>4.53</b>  | <b>19.52</b> | <b>19.52</b> | <b>19.52</b> | <b>19.52</b> | <b>19.52</b> |
| <b>Estimated Cost for Storm Water Drainage</b>  |               |              |               |               |              |              |              |              |              |              |              |              |
| Special Project Monrovia (Ongoing)  | 0.20          | 0.20         |               |               |              |              |              |              |              |              |              |              |
| SW-1 Improvement of Drainage System in Monrovia Core Area (Undecided)   | 12.26         |              |               | 1.14          | 4.26         | 4.72         | 2.13         |              |              |              |              |              |
| Drainage System Improvement (Central Monrovia)  | 1.62          |              |               | 0.54          | 1.08         |              |              |              |              |              |              |              |
| Drainage System Improvement (Sinkor)  | 3.97          |              |               |               | 1.98         | 1.98         |              |              |              |              |              |              |
| Drainage System Improvement (Bushrod Island)  | 3.07          |              |               |               |              | 1.53         | 1.53         |              |              |              |              |              |
| (Admin, ES, Contingency, etc.)  | 3.60          |              |               | 0.60          | 1.20         | 1.20         | 0.60         |              |              |              |              |              |
| SW-2 Equipment Supply for Drainage Pipes Cleaning (Undecided)   | 1.33          |              |               | 0.67          | 0.67         |              |              |              |              |              |              |              |
| Procurement of Equipment  | 0.93          |              |               | 0.47          | 0.47         |              |              |              |              |              |              |              |
| (Admin, ES, Contingency, etc.)  | 0.40          |              |               | 0.20          | 0.20         |              |              |              |              |              |              |              |
| SW-3 Technical Cooperation Programme (Undecided)  | 0.28          |              |               | 0.14          | 0.14         |              |              |              |              |              |              |              |
| <b>Estimated Cost for Projects Proposed in this M/P</b>   | <b>13.86</b>  | <b>0.00</b>  | <b>0.00</b>   | <b>1.94</b>   | <b>5.07</b>  | <b>4.72</b>  | <b>2.13</b>  | <b>0.00</b>  | <b>0.00</b>  | <b>0.00</b>  | <b>0.00</b>  | <b>0.00</b>  |
| <b>Total Estimated Cost for Storm Water Drainage</b>  | <b>14.07</b>  | <b>0.20</b>  | <b>0.00</b>   | <b>1.94</b>   | <b>5.07</b>  | <b>4.72</b>  | <b>2.13</b>  | <b>0.00</b>  | <b>0.00</b>  | <b>0.00</b>  | <b>0.00</b>  | <b>0.00</b>  |
| <b>Estimated Cost for Community Infrastructure Improvement</b>  |               |              |               |               |              |              |              |              |              |              |              |              |
| CM-1 Community Infrastructure Improvement Project (Undecided)   | 27.79         |              |               | 3.20          | 4.16         | 3.73         | 3.92         | 3.92         | 2.96         | 2.96         | 2.96         | 2.96         |
| Road Rehabilitation   | 16.09         |              |               | 1.61          | 1.61         | 1.61         | 2.25         | 2.25         | 2.25         | 2.25         | 2.25         | 2.25         |
| Water Supply  | 4.69          |              |               | 0.43          | 1.38         | 0.96         | 0.96         | 0.96         |              |              |              |              |
| Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement                                   | 7.01          |              |               | 1.16          | 1.16         | 1.16         | 0.70         | 0.70         | 0.70         | 0.70         | 0.70         | 0.70         |
| <b>Estimated Cost for All Projects Proposed in this M/P</b>   | <b>445.38</b> | <b>0.00</b>  | <b>14.38</b>  | <b>25.45</b>  | <b>52.35</b> | <b>51.87</b> | <b>38.58</b> | <b>62.46</b> | <b>59.95</b> | <b>54.32</b> | <b>46.92</b> | <b>39.13</b> |
| <b>Total Estimated Cost for All Sectors</b>   | <b>823.74</b> | <b>43.27</b> | <b>114.96</b> | <b>133.12</b> | <b>95.30</b> | <b>94.12</b> | <b>80.21</b> | <b>62.46</b> | <b>59.95</b> | <b>54.32</b> | <b>46.92</b> | <b>39.13</b> |

Note: M/P - Master Plan, ES - Engineering Service

### 9.2.1.2 Government Financing

Actual budget in the past for the sectors covered in this Study is shown below.

**Table 9.2-2 Actual Budget in Urban Facility Sectors**

|   | 2000 | 2001      | 2002      | 2003      | 2004      | 2005      | 2006      | 2007      | 2008      |
|---|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Liberia Population  |      | 2,600,000 | 2,700,000 | 2,800,000 | 2,900,000 | 3,000,000 | 3,100,000 | 3,200,000 | 3,300,000 |
| GDP at Current Prices (mil.USD)                                     | a    | 521.9     | 560.7     | 432.6     | 526.6     | 577.6     | 642.5     | 696.5     | 754.5     |
| (Growth rate p.a.)  | b    | -         | -         | -         | -         | -         | -         | -         | -         |
| Total GoL Domestic Revenue (mil.USD)                                | c    |           |           |           |           |           | 117.0     | 166.3     | 212.9     |
| (% of GDP)  | c/a  |           |           |           |           |           |           | 23.9%     | 28.2%     |
| Total Grants (mil.USD)  | d    | -         | -         | -         | -         | -         | -         | 1.5       | 0.0       |
| MPW Budget (1,000USD)   | e    |           |           |           |           |           |           |           | 16,022    |
| (% of GoL Revenue)  | e/c  |           |           |           |           |           |           |           | 7.5%      |
| Capital Investment (1,000USD)                                       | f    |           |           |           |           |           |           |           | 12,107    |
| Grant to MPW for Capital Investment (mil.USD)                       | g    |           |           |           |           |           |           |           | 0         |
| LWSC Revenue (1,000USD)   | h    |           |           |           | 580       | 520       | 872       | 1,532     | 2,210     |
| Subsidy and Grant to LWSC (1,000USD)                                | i    |           |           |           | 0         | 0         | 187       | 293       | 1,048     |
| LWSC Capital Investment (1,000USD)                                  | j    |           |           |           | 100       | 200       | 117       | 127       | 326       |
| Total Expenditure for Urban Facilities (est.)<br>(f+g+i) (1,000USD) | k    |           |           |           |           |           |           |           | 12,433    |

Source: JICA Study Team based on the data in Poverty Reduction Strategy, MPW, and LWSC

Budgetary frame in the urban facility sectors are estimated applying parameters to forecast GDP and other indicators based on the past trend in the actual budget. The budget frame from international organizations which is not committed as yet is estimated in expectation of continuous international assistance until the PRS period as the amount is likely to decrease after the termination of the PRS period.

**Table 9.2-3 Budgetary Frame in Urban Facility Sectors**

|  | 2009      | 2010      | 2011      | 2012      | 2013      | 2014      | 2015      | 2016      | 2017      | 2018      | 2019      |         |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|
| Liberia Population   | 3,577,000 | 3,666,000 | 3,758,000 | 3,850,000 | 3,943,000 | 4,035,000 | 4,127,000 | 4,227,000 | 4,326,000 | 4,425,000 | 4,525,000 |         |
| GDP (at 2009 constnt prices)                                 | a         | 935.6     | 1,029.2   | 1,132.1   | 1,245.3   | 1,369.8   | 1,534.2   | 1,718.3   | 1,924.5   | 2,155.4   | 2,414.1   | 2,703.8 |
| (Growth rate p.a.)   | b         | 10.7%     | 10.0%     | 10.0%     | 10.0%     | 10.0%     | 12.0%     | 12.0%     | 12.0%     | 12.0%     | 12.0%     | 12.0%   |
| Total GoL Domestic Revenue (mil.USD)                         | c         | 250.6     | 289       | 317       | 349       | 384       | 430       | 481       | 539       | 604       | 676       | 757     |
| (% of GDP)   | c/a       | 26.8%     | 28%       | 28%       | 28%       | 28%       | 28%       | 28%       | 28%       | 28%       | 28%       | 28%     |
| Total Grants (mil.USD)                                       | d         | 5.9       | -         | -         | -         | -         | -         | -         | -         | -         | -         | -       |
| MPW Budget (1,000USD)  | e         | 18,795    | 21,638    | 23,775    | 26,175    | 28,800    | 32,250    | 36,075    | 40,425    | 45,300    | 50,700    | 56,775  |
| (% of GoL Revenue)   | e/c       | 7.5%      | 7.5%      | 7.5%      | 7.5%      | 7.5%      | 7.5%      | 7.5%      | 7.5%      | 7.5%      | 7.5%      | 7.5%    |
| Capital Investment (1,000USD)                                | f         | 14,202    |           |           |           |           |           |           |           |           |           |         |
| Grant to MPW for Capital Investment (mil.USD)                | g         | 18.15     | -         | -         | -         | -         | -         | -         | -         | -         | -         | -       |
| LWSC Revenue (1,000USD)                                      | h         | 3,182     |           |           |           |           |           |           |           |           |           |         |
| Subsidy and Grant to LWSC (1,000USD)                         | i         | 16,443    |           |           |           |           |           |           |           |           |           |         |
| LWSC Capital Investment (1,000USD)                           | j         | 14,272    |           |           |           |           |           |           |           |           |           |         |
| Total Expenditure for Urban Facilities<br>(f+g+i) (1,000USD) | k         | 46,624    |           |           |           |           |           |           |           |           |           |         |

Source: JICA Study Team

### 9.2.1.3 Financing Gap

Yearly budget of MPW was actually USD 16-20 mln.. Out of this MPW budget, capital investment was around USD 12 mln. level. On the contrary, total amount of grants from international grant aid project in 2008 for the four infrastructure sectors covered in this Study, when international donor assistance became active, was almost the same as the total MPW budget. It should be noted that the figure of capital investment by MPW includes those outside of Greater Monrovia area.

Although the maximum fund required per year reached USD 60mln. in this Master Plan, it becomes USD 30mln. if the amount of projects to generate revenue in water supply and sanitation sector is deducted from maximum fund required and on the average it becomes some USD 10mln.. As stated in section 9.1, despite some discrepancy between fund requirement to implement this Master Plan and the affordable budget of MPW, the projects proposed in each sector are included and integrated in the Master Plan.

Meanwhile, conditions to receive bilateral projects and loan projects shall be prepared, as loan projects start to substitute grant aid projects and bilateral projects will gradually become important when the amount of grants from international donor organizations will fall after the initial stage of international cooperation.



### 9.2.2 Adjustment of Project Implementation

Bus bay construction comprising a part of Bus Stop and Terminal Improvement Project is very effective to solve traffic congestion near Redlight junction and UN Drive-Somalia Drive junction, as the main reason of congestion is public transport vehicles on the carriageway. Therefore, the implementation of some bus bay construction works shall be moved forward on the premise of the future road widening.

Components of Community Infrastructure Development Project are conducted at the same project area. Therefore, minor adjustment was made in formulating project program.

### 9.2.3 Formulation of Master Plan (Short and Medium Term)

Program of Master Plan (Short and medium Term) is presented below.

In the program formulation, following evaluation criteria were applied to comprehensively adjust implementation schedule of each projects.

**Table 9.2-4 Evaluation Item and Criteria for Program Formulation**

| Evaluation Item                                   | Criteria  |
|---|---|
| 1. Urgency  | Urgency from the seriousness of problem, or humanitarian aid aspect   |
| 2. EIRR   | Feasibility of the project from the national economy aspect<br>A: 20% or more B: 5-20% C: less than 5%  |
| 3. Beneficial population                          | The size of beneficial population<br>A: (almost) all population of Greater Monrovia Area B: 100,000-900,000<br>C: less than 100,000   |
| 4. Maturity                                       | Possibility of early implementation because of the project maturity<br>(The willingness of the residents is for the Project and community organization is ready for the Project, implementing body and organization of the Project is sufficiently formulated.) |
| 5. Necessity of socio-environmental consideration | Easiness of project implementation because of necessity of socio-environmental consideration<br>A: Category C B: Category B C: Category A   |
| 6. Relevance with other project                   | Necessity to adjust implementation schedule in consideration of other relevant project<br>(The Project can be independently implemented, or can be implemented on condition of the completion other project.)   |
| Other important matters                           | Description of important remarks in consideration of priority and schedule of the Project   |
| Overall evaluation                                | Overall evaluation of the Project by totaling the evaluation scores by evaluation item  |

Evaluation rank A: Excellent B: Ordinal C: Inferior

Table 9.2-5 Priority Evaluation—Road Sector

| Proj. No. | Proj. name  | Proj. type                     | 1. Urgency               | 2. EIRR         | 3. Beneficial population | 4. Maturity     | 5. Necessity of socio-environmental consideration | 6. Relevance with other project | Remarks  | Overall evaluation |
|-----------|---|--------------------------------|--------------------------|-----------------|--------------------------|-----------------|---|---------------------------------|--|--------------------|
| TR-0      | Emergency Infrastructure Project (MPW, LRTE, on-going)                | Infra restoration/ improvement | On-going by donor agency |                 |                          |                 |   |                                 |  |                    |
| TR-1      | Johnson Street Bridge Improvement Project (Undecided)                 | Infra restoration/ improvement | <b>A</b><br>(3)          | <b>A</b><br>(3) | <b>A</b><br>(3)          | <b>C</b><br>(1) | <b>C</b><br>(1)                                   | <b>A</b><br>(3)                 | Adjustment with utilization of historical asset (The Providence Island)                                | <b>A</b><br>(14)   |
| TR-2      | Somalia Drive Reconstruction Project (Undecided)                      | Infra restoration/ improvement | <b>A</b><br>(3)          | <b>A</b><br>(3) | <b>A</b><br>(3)          | <b>A</b><br>(3) | <b>C</b><br>(1)                                   | <b>A</b><br>(3)                 | Strong interrelation with regional artery and major component of urban structure                       | <b>A</b><br>(16)   |
| TR-3      | Reconstruction of Bridges on Missing Link (Undecided)                 | Infra restoration/ improvement | <b>A</b><br>(3)          | <b>A</b><br>(3) | <b>B</b><br>(2)          | <b>B</b><br>(2) | <b>B</b><br>(2)                                   | <b>A</b><br>(3)                 | No remarks to refer  | <b>A</b><br>(15)   |
| TR-4      | Road Rehabilitation Project (Undecided)                               | Infra restoration/ improvement | <b>B</b><br>(2)          | <b>A</b><br>(3) | <b>B</b><br>(2)          | <b>B</b><br>(2) | <b>B</b><br>(2)                                   | <b>B</b><br>(2)                 | Strong relevance with other Project schedule   | <b>B</b><br>(13)   |
| TR-5      | Intersection Improvement Project (Undecided)                          | Infra restoration/ improvement | <b>A</b><br>(3)          | <b>A</b><br>(3) | <b>B</b><br>(2)          | <b>C</b><br>(1) | <b>B</b><br>(2)                                   | <b>B</b><br>(2)                 | Implementation of the Project expected on condition of road restoration/improvement project completion | <b>B</b><br>(13)   |
| TR-6      | Bus Terminal & Bus Stop Facilities Construction Project (Undecided)   | Infra restoration/ improvement | <b>B</b><br>(2)          | <b>A</b><br>(3) | <b>A</b><br>(3)          | <b>B</b><br>(2) | <b>B</b><br>(2)                                   | <b>B</b><br>(2)                 | Bus bay construction needed urgently to alleviate present traffic congestion                           | <b>A</b><br>(14)   |
| TR-7      | Traffic Safe Management Project (Undecided)                           | Technical enhancement          |                          |                 |                          |                 |   |                                 | Adjustment with Capacity Development Project by GTZ  |                    |
| TR-8      | Vai Town Bridge Reconstruction (WB, Grant, on-going)                  | Infra restoration/ improvement | On-going by donor agency |                 |                          |                 |   |                                 |  |                    |
| TR-9      | Rehabilitation of Monrovia City Streets Project (WB, Grant, on-going) | Infra restoration/ improvement | On-going by donor agency |                 |                          |                 |   |                                 |  |                    |
| TR-10     | Caldwell Bridge Construction Project (WB, Grant, on-going)            | Infra restoration/ improvement | On-going by donor agency |                 |                          |                 |   |                                 |  |                    |

Evaluation rank A: Excellent (3) B: Ordinal (2) C: Inferior (1)

Note: As for TR-4 and TR-5, the beneficiaries are rather confined due to the affected area of the individual component of the Project, therefore the JICA Study Team ranked B for those Projects.

- TR-0, TR-8, TR-9 and TR-10 are currently on-going by donor agencies.
- TR-2 is a Project aspired by the Liberian Government for immediate implementation.
- Implementation of TR-5 after road restoration/improvement is reasonable in view of project detailed designing. The Project is proposed on condition of power supply for installation of traffic signals, however power is not sufficiently supplied.
- Bus bay construction, components of TR-6 is urgently needed to alleviate traffic congestion, however adjustment with road restoration and improvement Project is necessary.

Based on the above evaluation and consideration, TR-2 (commencement in 2010) was prioritized and TR-3 followed. Regarding TR-1, deliberate adjustment is required for the utilization of historical island (The Providence Island), although the Project is urgently needed from the viewpoint of traffic engineering aspect.

**Table 9.2-6 Priority Evaluation - Water Supply Sector**

| Proj. No.   | Proj. name  | Proj. type                    | 1. Urgency               | 2. EIRR         | 3. Beneficial population | 4. Maturity     | 5. Necessity of socio-environmental consideration | 6. Relevance with other project | Remarks   | Overall evaluation |
|-------------|---|-------------------------------|--------------------------|-----------------|--------------------------|-----------------|---|---------------------------------|---|--------------------|
| WS-1        | Monrovia Water and Sanitation Rehabilitation Program (Ongoing)  | Infra restoration/improvement | On-going by donor agency |                 |                          |                 |   |                                 |   |                    |
| WS-2        | Monrovia Expansion and Rehabilitation of Three County Capitals (Ongoing)                                    | Infra restoration/improvement | On-going by donor agency |                 |                          |                 |   |                                 |   |                    |
| WS-3 (2014) | Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (PEDW)          | Infra restoration/improvement | <b>A</b><br>(3)          | <b>B</b><br>(2) | <b>C</b><br>(1)          | <b>A</b><br>(3) | <b>B</b><br>(2)                                   | <b>A</b><br>(3)                 | No remarks to refer   | <b>A</b><br>(14)   |
| WS-4 (2019) | Expansion Project of White Plains Water Supply System (EPWS) (Undecided)                                    | Infra restoration/improvement | <b>B</b><br>(2)          | <b>A</b><br>(3) | <b>A</b><br>(3)          | <b>B</b><br>(2) | <b>A</b><br>(3)                                   | <b>B</b><br>(2)                 | Relevance with other Project schedule                         | <b>A</b><br>(15)   |
| WS-5 (2019) | Project for Expansion of Water Supply System at Paynesville in Greater Monrovia (PEWS) Phase II (Undecided) | Infra restoration/improvement | <b>A</b><br>(3)          | <b>B</b><br>(2) | <b>C</b><br>(1)          | <b>A</b><br>(3) | <b>B</b><br>(2)                                   | <b>B</b><br>(2)                 | Relevance with other Project schedule                         | <b>B</b><br>(13)   |
| WS-6        | Technical Cooperation Project of Groundwater Management (Undecided)   | Technical enhancement         |                          |                 |                          |                 |   |                                 | Implementation expected after the completion of WS-1 and WS-2 |                    |
| WS-7        | Technical Cooperation Pproject of Non-Revenue Water (Undecided)   | Technical enhancement         |                          |                 |                          |                 |   |                                 | Implementation expected after the completion of WS-1 and WS-2 |                    |

Evaluation rank A: Excellent (3) B: Ordinal (2) C: Inferior (1)

- WS-1 and WS-2 are currently on-going by donor agencies.
- WS-3 is the independent Project newly proposed in JICA M/P study.
- WS-4 is the Project for which completion of WS-1 is prerequisite.
- WS-5 is the Project to cover the areas where water is not supplied by WS-3.

Though WS-4 was given high priority, implementation of WS-4 is subject to WS-1.

Based on the above evaluation and consideration, WS-3 (commencement in 2010) was prioritized and WS-5 (commencement in 2012) and WS-4 (commencement in 2013) followed. WS-6 and WS-7 shall be commenced from 2012 as a technical project to improve operation and management of water supply system after the completion of WS-1 and WS-2 in 2011.

Table 9.2-7 Priority Evaluation - Sanitation Sector

| Proj. No. | Proj. name   | Proj. type   | 1. Urgency               | 2. EIRR         | 3. Beneficial population | 4. Maturity     | 5. Necessity of socio-environmental consideration | 6. Relevance with other project | Remarks  | Overall evaluation |
|-----------|--|--|--------------------------|-----------------|--------------------------|-----------------|---|---------------------------------|--|--------------------|
| SN-1      | Monrovia Water and Sanitation Rehabilitation Program (WSRP)(Ongoing)   | Infra restoration/ improvement                                 | On-going by donor agency |                 |                          |                 |   |                                 |  |                    |
| SN-2      | Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations (WB, ongoing) | Infra restoration/ improvement                                 | On-going by donor agency |                 |                          |                 |   |                                 |  |                    |
| SN-3      | Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan for 2014 (Undecided)    | Infra restoration/ improvement                                 | <b>A</b><br>(3)          | <b>B</b><br>(2) | <b>B</b><br>(2)          | <b>A</b><br>(3) | <b>A</b><br>(3)                                   | <b>B</b><br>(2)                 | Strong relevance with other Project schedule   | <b>A</b><br>(15)   |
| SN-4      | Project for Reconstruction of Sewerage Treatment & Sludge Treatment Plant (Undecided)                            | Infra restoration/ improvement                                 | <b>A</b><br>(3)          | <b>B</b><br>(2) | <b>A</b><br>(3)          | <b>C</b><br>(1) | <b>C</b><br>(1)                                   | <b>B</b><br>(2)                 | <ul style="list-style-type: none"> <li>➤ Strong relevance with other Project schedule</li> <li>➤ IEE result is Category-A</li> <li>➤ Establishment of organization for O&amp;M is prerequisite.</li> </ul> | <b>B</b><br>(12)   |
| SN-5      | Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan for 2019 (Undecided)    | Infra restoration/improvement / Equipment/material procurement | <b>A</b><br>(3)          | <b>B</b><br>(2) | <b>B</b><br>(2)          | <b>C</b><br>(1) | <b>A</b><br>(3)                                   | <b>C</b><br>(1)                 | <ul style="list-style-type: none"> <li>➤ Strong relevance with other Project schedule</li> <li>➤ Establishment of organization for O&amp;M is prerequisite.</li> </ul>                                     | <b>B</b><br>(12)   |

Evaluation rank A: Excellent (3) B: Ordinal (2) C: Inferior (1)

Note: EIRR for SN-3 and SN-5 were not calculated. JICA Study Team assumed rank B for those Projects.

- SN-1 and SN-2 are currently under implementation by donor agencies.
- SN-3 is the Project for which completion of SN-1 is prerequisite.
- SN-4 is the Project for which completion of SN-2 is prerequisite.
- SN-5 is the Project for which completion of SN-2, SN-3 and SN-4 is prerequisite.
- SN-4 and SN-5 are the Projects for which establishment of O&M organization for sanitation systems in LWSC is prerequisite.

Based on the above evaluation and consideration, SN-3 (commencement in 2012) was prioritized. SN-4 shall be implemented after approval of EIA.

**Table 9.2-8 Priority Evaluation - Storm Water Drainage**

| Proj. No.   | Proj. name   | Proj. type                     | 1. Urgency      | 2. EIRR | 3. Beneficial population | 4. Maturity     | 5. Necessity of socio-environmental consideration | 6. Relevance with other project | Remarks  | Overall evaluation |
|-------------|--|--------------------------------|-----------------|---------|--------------------------|-----------------|---|---------------------------------|--|--------------------|
| SW-1 (2014) | Improvement of Drainage System in Monrovia Core Area (Undecided) | Infra restoration/ improvement | <b>A</b><br>(3) | -       | <b>B</b><br>(2)          | <b>A</b><br>(3) | <b>A</b><br>(3)                                   | <b>B</b><br>(2)                 | No remarks to refer                                    | <b>A</b><br>(13)   |
| SW-2 (2014) | Equipment Supply for Drainage Pipes Cleaning (Undecided)         | Equipment/material procurement | <b>A</b><br>(3) | -       | <b>B</b><br>(2)          | <b>B</b><br>(2) | <b>A</b><br>(3)                                   | <b>B</b><br>(2)                 | Establishment of organization for O&M is prerequisite. | <b>A</b><br>(13)   |
| SW-3 (2014) | Technical Cooperation Programme (Undecided)                      | Technical enhancement          |                 |         |                          |                 |   |                                 | Establishment of organization for O&M is prerequisite. |                    |

Evaluation rank A: Excellent (3) B: Ordinal (2) C: Inferior (1)

Measures for flood control such as culvert construction shall be taken in the road rehabilitation/improvement projects.



Table 9.2-9 Master Plan Program (Short and Medium Term)


| Sector                      | Projects   | Year   |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|-----------------------------|--|--|------|------|------|------|------|-------------|---------------------|------|------|------|---------------------|---------------------|
|                             |  | 2008   | 2009 | 2010 | 2011 | 2012 | 2013 | 2014        | 2015                | 2016 | 2017 | 2018 | 2019                |                     |
| <b>Socio-economic Frame</b> | Population of Greater Monrovia   | 1,010,575  |      |      |      |      |      | 1,250,000   |                     |      |      |      |                     | 1,470,000           |
|                             | GNI per capita (USD) (Liberia)   | 196.5  |      |      |      |      |      | 348.1       |                     |      |      |      |                     | 560.6               |
|                             | Industry of Greater Monrovia (increase of points compared to 2008 figure)                  |  |      |      |      |      |      |             | Pri. 2.00% (-0.93)  |      |      |      |                     | Pri. 1.00% (-1.93)  |
|                             |  |  |      |      |      |      |      |             | Sec. 12.67% (+0.12) |      |      |      |                     | Sec. 12.80% (+0.25) |
|                             |  |  |      |      |      |      |      | Ter. 84.52% |                     |      |      |      | Ter. 86.20% (+1.68) |                     |
|                             | Distribution of Population of Greater Monrovia   |  |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | Population Distribution based on Future Socio-economic Frame                               |  |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | Land Use   |  |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | Land Demand Forecast based on Future Socio-economic Frame and Population Distribution      |  |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | Demand Forecasts for Each Sector based on Population Distribution and Land Demand Forecast |  |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | <b>Transportation/Road</b>   | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>To recover and enhance the economic activity throughout improving the road infrastructure, keeping the stable transport network and reducing traffic congestion, mainly by road and bridge rehabilitation</li> <li>To reduce poverty and raise living standard throughout implementing the fundamental public transportation services and managing traffic control and safety</li> </ul> <p><b>2014 Target</b></p> <ul style="list-style-type: none"> <li>To link an urban road network by paved and categorized road system</li> <li>To reconstruct the missing link and damaged bridge and keep continuous traffic throughout the year</li> <li>To implement the bus stop facilities and enhance scheduled public bus service</li> <li>To intensify the capacity of primary road</li> <li>To install and study traffic control and management system (traffic education, traffic signal)</li> </ul> <p><b>2019 Target</b></p> <ul style="list-style-type: none"> <li>To enhance the function of road network (capacity, surface, linkage)</li> <li>To implement comprehensive public transport system and transit terminal</li> <li>To implement traffic control and management system</li> </ul> |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | <b>Water Supply</b>  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>To raise water service coverage ratio to 50% by 2011 in overall Liberia</li> <li>To raise water service coverage ratio to 100% in Greater Monrovia</li> </ul> <p><b>2014 Target</b></p> <ul style="list-style-type: none"> <li>To raise water service coverage ratio to about 70% in Greater Monrovia</li> </ul> <p><b>2019 Target</b></p> <ul style="list-style-type: none"> <li>To raise water service coverage ratio to about 70% in Greater Monrovia</li> </ul>   |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | <b>Sanitation</b>  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>To raise sanitary service coverage ratio to 40% by 2011 in overall Liberia</li> <li>To raise sanitary service coverage ratio to about 80% in Greater Monrovia</li> </ul> <p><b>2014 Target</b></p> <ul style="list-style-type: none"> <li>Approx. 50% (40% MDGs achievement base) of population with sanitation in Greater Monrovia</li> </ul> <p><b>2019 Target</b></p> <ul style="list-style-type: none"> <li>Approx. 80% (68% MDGs achievement base) of population with sanitation in Greater Monrovia</li> </ul>  |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | <b>Storm Water Drainage</b>  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>To strengthen the capacity of operation and maintenance by supply of cleaning vehicle of underground drainage and preparation of operation and maintenance manual</li> <li>To strengthen the drainage capacity by drainage channel construction</li> </ul> <p><b>2014 Target</b></p> <ul style="list-style-type: none"> <li>Improvement of Drainage System in Monrovia Core Area</li> <li>Central Monrovia</li> <li>Sinkor</li> <li>Bushrod Island</li> </ul> <p><b>2019 Target</b></p> <ul style="list-style-type: none"> <li>Equipment Supply for Drainage Pipes Cleaning</li> <li>Establishment of Operation and Maintenance Management System</li> </ul>  |      |      |      |      |      |             |                     |      |      |      |                     |                     |
|                             | <b>Community Infrastructure Improvement</b>  | <p><b>Goals</b></p> <ul style="list-style-type: none"> <li>To enhance community living standard</li> <li>Community empowerment</li> <li>To create jobs</li> <li>To rehabilitate damaged community roads in Greater Monrovia</li> <li>To secure the access from/to village</li> <li>To secure safe water supply</li> <li>To secure sanitation</li> </ul> <p><b>2014 Target</b></p> <ul style="list-style-type: none"> <li>Community Infrastructure Improvement Project</li> <li>Road Rehabilitation</li> <li>Water Supply</li> <li>Community/Sanitary System and Public Toilet Installation &amp; Vacuum Truck Procurement</li> <li>Technical Cooperation</li> </ul>  |      |      |      |      |      |             |                     |      |      |      |                     |                     |

### **9.3 Profile of Short and Medium Term Projects**

#### **9.3.1 Road and Transportation Sector**

| Sector                  | Project No. | Project Name  |
|-------------------------|-------------|---|
| Road and Transportation | TR-1        | Johnson Street Bridge Improvement Project               |
|                         | TR-2        | Somalia Drive Reconstruction Project                    |
|                         | TR-3        | Reconstruction of Bridges on Missing Link               |
|                         | TR-4        | Road Rehabilitation Project                             |
|                         | TR-5        | Intersection Improvement Project                        |
|                         | TR-6        | Bus Terminal & Bus Stop Facilities Construction Project |
|                         | TR-7        | Traffic Safe Management Project                         |
|                         | TR-8        | Vai Town Bridge Reconstruction Project                  |
|                         | TR-9        | Rehabilitation of Monrovia City Streets Project         |


## Project Profile

| Project No. and Project Name: TR-1, Johnson Street Bridge Improvement Project  |  |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
|--|--|------|------|------|------|------|------|------|------|------|------|--------------|---|---|--|--|--|--|--|--|--|--|--------|--|---|---|---|---|--|--|--|--|--|---------------|--|--|--|---|---|--|--|--|--|--|--|
| <b>Background of the Project</b><br>The existing bridge is located at the entrance of Central Monrovia where the most developed Central Business District (CBD) is located. The access to CBD is only allowed by UN Drive from northern area and Tubman Boulevard from eastern area. Both approaching roads of the bridge have multi lanes for one direction, but the bridge does not have enough width for multi lane operation, so the carriageway is divided to provide one lane for one direction. This narrowed section is the bottle neck of the traffic. Another bridge, called Vai Town Bridge located on UN Drive, for access to CBD collapsed in 2006. The reconstruction project is scheduled to complete in 2010. Although this new bridge will be provided, the capacity of the two bridges is insufficient according to the traffic forecast. The traffic congestion of the roads on both sides of the bridge will be worse near future. | <b>Effects of the Project</b><br><b>Target Beneficiaries:</b> <ul style="list-style-type: none"> <li>Whole population of Greater Monrovia of about 1 million</li> </ul> <b>Effects:</b> <ul style="list-style-type: none"> <li>Vehicle operation cost savings and travel time reduction</li> <li>Exact operation of public transport</li> <li>Reduction of energy loss and exhaust fume</li> </ul>   |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>To mitigate traffic congestion</li> <li>To provide favorable and acceptable road service at crossroad of Mesurado marshland</li> </ul>   | <b>Evaluation of the Project</b><br><b>Economic Viability:</b> <ul style="list-style-type: none"> <li>Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.</li> <li>NPV : USD 17.6 million</li> <li>B/C : 1.85</li> <li>EIRR: 22.37 %</li> </ul> <b>Financial Soundness:</b> <ul style="list-style-type: none"> <li>Requested Japan’s Grant Aid</li> </ul> <b>Environmental Impact: <b>Category A</b></b> <ul style="list-style-type: none"> <li><b>Positive Impacts</b><br/>Improve travel speed and mitigate CO2 emission gas<br/>Improve accessibility to social/public facilities</li> <li><b>Negative Impacts</b><br/>Involuntary resettlement is required in Via Town<br/>Negative impact against Mesurado wetland</li> </ul> |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>Central Monrovia and Clara Town District in Greater Monrovia</li> </ul>  | <b>External Conditions</b> <ul style="list-style-type: none"> <li>Good peace and order is maintained.</li> <li>Responsible agency for operation and maintenance has sufficient capacity.</li> </ul> <b>Preconditions</b> <ul style="list-style-type: none"> <li>Road right-of way is secured.</li> <li>Market and vendors within the right-of-way are removed.</li> <li>Necessary fund is prepared.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>New Bridge parallel to the existing bridge: 450 m</li> <li>Approach Road: 400 m</li> </ul>  | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>“Vai Town Bridge Reconstruction Project” will provide better access to CBD together with this project.</li> <li>“Rehabilitation of Monrovia City Street Project” will be the precondition of increasing traffic from the bridge.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>Project Implementation : Ministry of Public Works</li> <li>Operation : Ministry of Public Works</li> <li>Maintenance : Ministry of Public Works</li> </ul>  |  |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>Detailed Design &amp; Supervision Cost: USD 2.2 mln.</li> <li>Construction:                             <ul style="list-style-type: none"> <li>Bridge: USD 20.9 mln.</li> <li>Approach Road: USD 0.9 mln.</li> </ul> </li> <li>Total Cost: USD 24.0 mln.</li> </ul>   |  |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| <b>Implementation Schedule</b> <table border="1"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Design &amp; bid</td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bridge</td> <td></td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Approach Road</td> <td></td> <td></td> <td></td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>  |  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Design & bid | █ | █ |  |  |  |  |  |  |  |  | Bridge |  | █ | █ | █ | █ |  |  |  |  |  | Approach Road |  |  |  | █ | █ |  |  |  |  |  |  |
|  | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| Design & bid   | █  | █    |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| Bridge   |  | █    | █    | █    | █    |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |
| Approach Road  |  |      |      | █    | █    |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |        |  |   |   |   |   |  |  |  |  |  |               |  |  |  |   |   |  |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: TR-2 Somalia Drive Reconstruction Project  |   |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
|--|---|------|------|------|------|------|------|------|------|------|------|--------------|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|--|
| <b>Background of the Project</b><br>Somalia Drive is one of the busiest primary roads in Greater Monrovia. This road was rehabilitated by the World Bank grant in 2008. The original road width had 4 lane carriageway, but only 2 lanes were rehabilitated. The road is located to the north of Mesurado marshland. The land use of the roadside is mainly commercial including the Ma-juah market, nearby stalls and some open garages. The vicinity consists of many narrow community alleys which connect directly to Somalia Drive, thereby causing congestion as vehicles from such community alleys try accessing the Somalia Drive.<br>The congestion has caused severe economic losses over time, and is projected to increase by 2014. Therefore, the upgrade of road capacity to secure smooth traffic flow is necessary, as it completes the ring road in Greater Monrovia Area that connects with Tubman Boulevard. | <b>Effects of the Project</b><br>Target Beneficiaries : <ul style="list-style-type: none"> <li>• Whole population of Greater Monrovia of about 1 million</li> </ul> Effects: <ul style="list-style-type: none"> <li>• Vehicle operation cost savings and travel time reduction</li> <li>• Exact operation of public transport</li> <li>• Reduction of energy loss and exhaust fume</li> </ul>   |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>• To mitigate traffic congestion</li> <li>• To provide favorable and acceptable road service at ring road around Mesurado marshland</li> </ul>   | <b>Evaluation of the Project</b><br>Economic Viability <ul style="list-style-type: none"> <li>• Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.<br/>NPV : USD 47.4 mln<br/>B/C : 3.12<br/>EIRR: 20.72 %</li> </ul> Financial Soundness <ul style="list-style-type: none"> <li>• Requested Japan’s Grant Aid</li> </ul> Environmental Impact: <b>Category A</b> <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve travel speed and mitigate CO2 emission gas<br/>Improve accessibility to social/public facilities<br/>Enhance economic activity</li> <li>• Negative Impacts<br/>Involuntary resettlement such as permanent structures, temporary kiosks, vendors located within ROW is required along the Project road</li> </ul> |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>• Clara Town, New Georgia, Gardnersville and Paynesville District in Greater Monrovia</li> </ul>   | <b>External Conditions</b> <ul style="list-style-type: none"> <li>• Good peace and order is maintained.</li> <li>• Responsible agency for operation and maintenance has sufficient capacity.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>• Expanding carriage way to 4 lanes for 13 km stretch</li> <li>• Additional Bridge on Stockton Bridge</li> <li>• Rehabilitation of existing Double Bridge</li> <li>• Improvement of major intersections</li> </ul>  | <b>Preconditions</b> <ul style="list-style-type: none"> <li>• Clear the road reserve and relocate the people making business within Right of Way</li> <li>• Necessary fund is prepared.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>• Project Implementation : Ministry of Public Works</li> <li>• Operation : Ministry of Public Works</li> <li>• Maintenance : Ministry of Public Works</li> </ul>  | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>• “Vai Town Bridge Reconstruction Project” and “Johnson Street Bridge Improvement Project” will mitigate the traffic congestion at Free Port Intersection.</li> <li>• “Road Rehabilitation Project” will create adequate road network and reduce the direct access from small alleys to Somalia Drive.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>• Detailed Design &amp; Supervision Cost: USD 1.91 mln.</li> <li>• Construction:                             <ul style="list-style-type: none"> <li>Earth Work: USD 2.285 mln.</li> <li>Pavement: USD 9.790 mln.</li> <li>Road Facilities: USD 3.515 mln.</li> <li>Bridge: USD 3.600 mln.</li> </ul> </li> <li>• Total Cost: USD 21.10 mln.</li> </ul>  |   |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| <b>Implementation Schedule</b> <table border="1"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Design &amp; bid</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Road</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bridge</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>   |   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Design & bid |  |  |  |  |  |  |  |  |  |  | Road |  |  |  |  |  |  |  |  |  |  | Bridge |  |  |  |  |  |  |  |  |  |  |  |
|  | 2010  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| Design & bid   |   |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| Road   |   |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |
| Bridge   |   |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |      |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: TR-3 Reconstruction of Bridges on Missing Link  |   |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
|---|---|------|------|------|------|------|------|------|------|------|------|------|--------------|---|--|--|--|--|--|--|--|--|--|--------|--|---|--|--|--|--|--|--|--|--|----------|--|--|---|--|--|--|--|--|--|
| <b>Background of the Project</b><br>After civil strife, the primary roads were rehabilitated with the assistance of several donors, and some secondary roads and urban streets rehabilitation works are going to be implemented as well. However recovery and maintenance of feeder roads have not been carried out enough so far. The condition of road is getting worse by heavy rain, and the damaged roads are becoming impassable by vehicle.<br>There are several reasons for this impassability, such as washing away of the road embankment, large gap by deep erosion, inundation on road, muddy surface, no appropriate crossing across the water stream and so on. The damage of the feeder roads that directly support the daily activities of residents makes the movement of the people difficult, as transport service is only available on the main road. The recovery of missing link to/from the communities is an important issue for commuters and neighborhoods. | <b>Effects of the Project</b><br><b>Target Beneficiaries :</b> <ul style="list-style-type: none"> <li>Approximately 550 thousand people living in the northern 5 districts</li> </ul> <b>Effects:</b> <ul style="list-style-type: none"> <li>Utilization of sustainable road service</li> <li>Exchange of social &amp; economic activities between villages</li> <li>Improvement of convenience &amp; time saved for travel</li> <li>Provide opportunities to access market business</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>To secure passable road even during rainy season</li> <li>To secure the daily activities of suburb residents</li> <li>To improve farm to market accessibility</li> </ul>  | <b>Evaluation of the Project</b><br><b>Economic Viability</b> <ul style="list-style-type: none"> <li>Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.</li> <li>NPV : USD 26.4 mln</li> <li>B/C : 3.69</li> <li>EIRR: 32.7 %</li> </ul> <b>Financial Soundness</b> <ul style="list-style-type: none"> <li>Requested Japan’s Grant Aid</li> </ul> <b>Environmental Impact: Category B</b> <ul style="list-style-type: none"> <li><b>Positive Impacts</b> <ul style="list-style-type: none"> <li>Improve the living standard of suburb residents</li> <li>Improve the accessibility to social/public facilities for residents</li> </ul> </li> <li><b>Negative Impacts</b> <ul style="list-style-type: none"> <li>Specific negative impact is not found.</li> </ul> </li> </ul> |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>New Georgia, Gardnersville, Barnersville, Caldwell and Paynesville District in Greater Monrovia</li> </ul>  | <b>External Conditions</b> <ul style="list-style-type: none"> <li>Good peace and order is maintained.</li> <li>Responsible agency for operation and maintenance has sufficient capacity.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>11 bridges on Missing Links</li> <li>Approach road of bridges</li> </ul>   | <b>Preconditions</b> <ul style="list-style-type: none"> <li>Securing the land as Right of Way</li> <li>Rehabilitation of access road to the site</li> <li>Necessary fund is prepared.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>Project Implementation : Ministry of Public Works</li> <li>Operation : Ministry of Public Works</li> <li>Maintenance : Ministry of Public Works</li> </ul>   | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>“Road Rehabilitation Project” will rehabilitate access road to the missing links from/to the main road.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>Detailed Design &amp; Supervision Cost: USD 1.00 mln.</li> <li>Construction:                             <ul style="list-style-type: none"> <li>Bridge: USD 9.15 mln.</li> <li>Approach: USD 0.49 mln.</li> </ul> </li> <li>Total Cost: USD 10.64 mln.</li> </ul>  |   |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| <b>Implementation Schedule</b> <table border="1"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Design &amp; bid</td> <td colspan="2">█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bridge</td> <td></td> <td colspan="2">█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Approach</td> <td></td> <td></td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>   |   |      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Design & bid | █ |  |  |  |  |  |  |  |  |  | Bridge |  | █ |  |  |  |  |  |  |  |  | Approach |  |  | █ |  |  |  |  |  |  |
|   | 2010  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| Design & bid  | █   |      |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| Bridge  |   | █    |      |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |
| Approach  |   |      | █    |      |      |      |      |      |      |      |      |      |              |   |  |  |  |  |  |  |  |  |  |        |  |   |  |  |  |  |  |  |  |  |          |  |  |   |  |  |  |  |  |  |

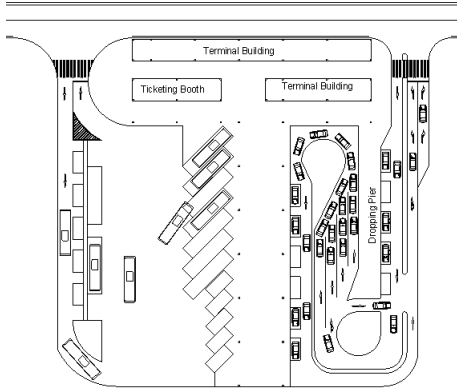
## Project Profile

| <b>Project No. and Project Name: TR-4 Road Rehabilitation Project</b>  |  |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
|--|--|------|------|------|------|------|------|------|------|------|------|-----------|--|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|--|--|
| <b>Background of the Project</b><br>During the civil conflict, the Ministry of Public Works lost their capacity to manage their respective functions. Almost no road maintenance has been carried out from 1986 to 2006. As a result, most roads are in very poor condition and some roads are impassable at present.<br>This project includes not only primary and secondary road but also tertiary roads. The road sections under this project are 182 sections in total and these sections are divided into three (3) package depending on the criteria. Primary and secondary roads are set up in Package 1 due to the importance of the road function with the total network. In addition, missing links of tertiary roads also included in Package 1 because of the urgency to recovery to adequate condition. Total number of Package 1 is 42 sections. Basically, tertiary roads are classified into Package 2 and total number is 108 sections.<br>Package 3 is set up for the necessity of special consideration on the environmental issue. The roads located within the Ramsar site of Mesurado wetlands belong to this package to separate the implementation schedule from roads of normal condition in other areas. Total number is 22 sections | <b>Effects of the Project</b><br>Target Beneficiaries : <ul style="list-style-type: none"> <li>• Whole population of Greater Monrovia of about 1 million</li> </ul> Effects: <ul style="list-style-type: none"> <li>• Vehicle operation cost savings &amp; travel time reduction</li> <li>• Reduction of damages on vehicle</li> <li>• Improvement of accessibility</li> <li>• Increase of maintainable road sections</li> </ul>   |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>• To rehabilitate damaged roads in Greater Monrovia</li> <li>• To improve primary and secondary road network</li> <li>• To promote social and economic activities</li> <li>• To secure access from/to village</li> </ul>   | <b>Evaluation of the Project</b><br>Economic Viability <ul style="list-style-type: none"> <li>• Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.<br/>NPV : USD 307.9 mln<br/>B/C : 4.08<br/>EIRR: 42.4 %</li> </ul> Financial Soundness <ul style="list-style-type: none"> <li>• Necessary budget allocation</li> </ul> Environmental Impact: <b>Category B for Package 1 &amp; 2, Category A for Package 3</b> <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve the living standard of suburb residents<br/>Improvement of accessibility to social/public facilities for residents</li> <li>• Negative Impacts<br/>Negative impact against Mesurado wetland by Package 3<br/>Land acquisition to build new road or widening activity</li> </ul> |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>• Whole area of Greater Monrovia</li> </ul>  | Environmental Impact: <b>Category B for Package 1 &amp; 2, Category A for Package 3</b> <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve the living standard of suburb residents<br/>Improvement of accessibility to social/public facilities for residents</li> <li>• Negative Impacts<br/>Negative impact against Mesurado wetland by Package 3<br/>Land acquisition to build new road or widening activity</li> </ul>  |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>• 182 road sections</li> </ul>  | <b>External Conditions</b> <ul style="list-style-type: none"> <li>• Good peace and order is maintained.</li> <li>• Responsible agency for operation and maintenance has sufficient capacity.</li> </ul> <b>Preconditions</b> <ul style="list-style-type: none"> <li>• Necessary fund is prepared.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>• Project Implementation : Ministry of Public Works</li> <li>• Operation : Ministry of Public Works</li> <li>• Maintenance : Ministry of Public Works</li> </ul>  | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>• “Rehabilitation of Monrovia City Street Project” will be a part of rehabilitation program.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>• Construction:</li> <li>• Total Cost: <span style="float: right;">USD 48.28 mln.</span></li> </ul>   |    |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| <b>Implementation Schedule</b> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Package 1</td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Package 2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> </tr> <tr> <td>Package 3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>  |  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Package 1 |  |  |  |  |  |  |  |  |  |  | Package 2 |  |  |  |  |  |  |  |  |  |  | Package 3 |  |  |  |  |  |  |  |  |  |  |  |
|  | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| Package 1  |  |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| Package 2  |  |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |
| Package 3  |  |      |      |      |      |      |      |      |      |      |      |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |           |  |  |  |  |  |  |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: TR-5 Intersection Improvement Project   |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
|---|--|------|------|------|------|------|------|------|------|------|------|------|--------------|--|--|--|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|--|---|---|--------|--|--|--|--|--|--|--|--|--|
| <p><b>Background of the Project</b></p> <p>Intersections are critical point to be considered when improving traffic flow in general. In Monrovia, traffic signals were destroyed during civil conflict and traffic congestion are observed at many intersection. Although policemen are controlling the traffic flow at major intersections, traffic conditions are yet to be solved.</p> <p>The primary roads with busy traffic, i.e. Tubman Boulevard, Ganta Highway and UN Drive, have connections with secondary roads and major feeder roads. Most intersections are not provided with channelization and/or left turn lane. In particular waiting vehicles for turning left narrows the number of carriageway and disturb smooth traffic flow on the main roads. The geometric improvement shall be recommended to solve such problems.</p> <p>Inside the Central Business District (CBD), there are many major intersections and minor junctions. However, no traffic signal is re-installed yet. The unsustainable power supply is also the problem of signal operation. Therefore this project is formulated for the medium term target.</p> | <p><b>Effects of the Project</b></p> <p>Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>• Whole population of Greater Monrovia of about 1 million</li> </ul> <p>Effects:</p> <ul style="list-style-type: none"> <li>• Vehicle operation cost savings and travel time reduction</li> <li>• Exact operation of public transport</li> <li>• Increase of safe at intersection</li> <li>• Reduction of energy loss and exhaust fume</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| <p><b>Objectives of the Project</b></p> <ul style="list-style-type: none"> <li>• To mitigate traffic congestion</li> <li>• To provide safe at intersection for road users</li> </ul>  | <p><b>Evaluation of the Project</b></p> <p><b>Economic Viability</b></p> <ul style="list-style-type: none"> <li>• Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.</li> <li>NPV : USD 6.1 mln</li> <li>B/C : 2.16</li> <li>EIRR: 23.4 %</li> </ul> <p><b>Financial Soundness</b></p> <ul style="list-style-type: none"> <li>• Necessary budget allocation</li> </ul> <p><b>Environmental Impact: Category B</b></p> <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Reduce traffic congestion and mitigate CO2 emission gas<br/>Improve traffic safety on road users</li> <li>• Negative Impacts<br/>Land acquisition or involuntary resettlement due to the improvement of corner is required</li> </ul> |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| <p><b>Location of the Project</b></p> <ul style="list-style-type: none"> <li>• Central Monrovia, Sinkor, Old Town, Congo Town, New Kru Town, Logan Town and Paynesville District in Greater Monrovia</li> </ul>   | <p><b>External Conditions</b></p> <ul style="list-style-type: none"> <li>• Good peace and order is maintained.</li> <li>• Responsible agency for operation and maintenance has sufficient capacity.</li> </ul> <p><b>Preconditions</b></p> <ul style="list-style-type: none"> <li>• Necessary fund is prepared.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| <p><b>Scope of the Project</b></p> <p>Construction of:</p> <ul style="list-style-type: none"> <li>• Expanding carriage way to provide left turn lane</li> <li>• Installation of traffic signal</li> <li>• Provide proper road marking</li> </ul>  | <p><b>Relationship with other projects</b></p> <ul style="list-style-type: none"> <li>• “Somalia Drive Improvement Project” will be cover the improvement of intersections along that road.</li> <li>• “Rehabilitation of Monrovia City Streets Project” will be effective to improve traffic condition inside CBD together with this project.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| <p><b>Agencies Responsible</b></p> <ul style="list-style-type: none"> <li>• Project Implementation : Ministry of Public Works</li> <li>• Operation : Ministry of Public Works</li> <li>• Maintenance : Ministry of Public Works</li> </ul>  |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| <p><b>Estimated Cost</b></p> <ul style="list-style-type: none"> <li>• Construction: <ul style="list-style-type: none"> <li>Intersection: USD 0.70 mln.</li> <li>Traffic Signal: USD 4.60 mln.</li> </ul> </li> <li>• Total Cost: USD 5.30 mln.</li> </ul>   |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| <p><b>Implementation Schedule</b></p> <table border="1"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Design &amp; bid</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Intersection</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>■</td> <td>■</td> </tr> <tr> <td>Signal</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>■</td> </tr> </tbody> </table>  |  |      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Design & bid |  |  |  |  |  |  |  |  |  |  | Intersection |  |  |  |  |  |  |  |  | ■ | ■ | Signal |  |  |  |  |  |  |  |  |  |
|   | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| Design & bid  |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| Intersection  |  |      |      |      |      |      |      |      | ■    | ■    |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |
| Signal  |  |      |      |      |      |      |      |      |      | ■    |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |   |   |        |  |  |  |  |  |  |  |  |  |

## Project Profile


| <b>Project No. and Project Name: TR-6 Bus Terminal &amp; Bus Stop Facilities Construction Project</b>   |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
|---|--|------|------|------|------|------|------|------|------|------|------|------|--------------|--|--|--|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|
| <b>Background of the Project</b><br>Taxis are the most popular transport mode in Monrovia at present. But buses shall become the most common public transport to increase person trip and reducing traffic congestion in near future.<br>The facilities for bus service are not yet well-developed. In fact, there is no bus terminal for inter city bus and long distance bus. In addition, the bus stop facilities are very poor. This is one of the reasons why people prefer to use taxis. The lack of bus stops causes disturbance of traffic flow on main lane and facilitates traffic congestion. Therefore, development of facilities for bus services is strongly suggested.<br>Introduction of lay-by for the bus stops will separate stopping bus from main lane to clear the carriageway to avoid choking traffic flow. The introduction of bus terminal creates new users of bus service by enhancing convenient transfer from taxis to buss and vice-versa. The shift of transport mode will promote better public transport, traffic flow and environmental condition. | <b>Effects of the Project</b><br>Target Beneficiaries : <ul style="list-style-type: none"> <li>• Whole population of Greater Monrovia of about 1 million</li> </ul> Effects: <ul style="list-style-type: none"> <li>• Provision of convenient bus service</li> <li>• Mitigation of traffic congestion</li> <li>• Reduction of energy loss and exhaust fume</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>• To provide better public transport service</li> <li>• To create movement to shift of transport mode</li> </ul>  | <b>Evaluation of the Project</b><br>Economic Viability <ul style="list-style-type: none"> <li>• Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.<br/>NPV : USD 0.7 mln<br/>B/C : 1.21<br/>EIRR: 28.1%</li> </ul> Financial Soundness <ul style="list-style-type: none"> <li>• Necessary budget allocation</li> </ul> Environmental Impact: <b>Category B</b> <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve public transport service<br/>Enhance to mitigate CO2 emission gas<br/>Reduce traffic congestion caused by taxies</li> <li>• Negative Impacts<br/>Loss of job opportunity for the taxi drivers<br/>Partial land acquisition adjacent to the bus terminal boundary is assumed</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>• Whole area in Greater Monrovia</li> </ul>   | <b>External Conditions</b> <ul style="list-style-type: none"> <li>• Good peace and order is maintained.</li> <li>• Responsible agency for operation and maintenance has sufficient capacity.</li> </ul> <b>Preconditions</b> <ul style="list-style-type: none"> <li>• Expand sustainable bus services</li> <li>• Necessary fund is prepared.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>• Lay-by for bus stop and shade for waiting passengers, 101 locations</li> <li>• Bus terminal including taxi bay and shopping booth, 3 locations</li> </ul>  | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>• “Somalia Drive Improvement Project” will be covered the construction of bus stop facilities along the road.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>• Project Implementation : Ministry of Public Works</li> <li>• Operation : Ministry of Transport</li> <li>• Maintenance : Ministry of Transport</li> </ul>   |    |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>• Construction:                             <ul style="list-style-type: none"> <li>Bus Stop: USD 3.20 mln.</li> <li>Bus Terminal: USD 1.40 mln.</li> </ul> </li> <li>• Total Cost: USD 4.60 mln.</li> </ul>  | <table border="1"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Design &amp; bid</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bus Terminal</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> </tr> <tr> <td>Bus Stop</td> <td></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> <td style="background-color: black;"></td> </tr> </tbody> </table> |      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Design & bid |  |  |  |  |  |  |  |  |  |  | Bus Terminal |  |  |  |  |  |  |  |  |  |  | Bus Stop |  |  |  |  |  |  |  |  |  |  |
|   | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| Design & bid  |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| Bus Terminal  |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |
| Bus Stop  |  |      |      |      |      |      |      |      |      |      |      |      |              |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |  |  |  |  |  |




## Project Profile

| Project No. and Project Name: TR-7 Traffic Safe Management Project  |   |      |      |      |      |      |      |      |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
|---|---|------|------|------|------|------|------|------|------|------|------|------|-------------|--|--|--|--|--|---|---|---|--|--|-------------|--|--|--|--|--|---|---|---|--|--|-----------|--|--|--|--|--|--|--|---|--|
| <b>Background of the Project</b><br><p>The number of registered vehicles is increasing year by year in Liberia. Most of these vehicles are operating in Greater Monrovia and the traffic is concentrated on major roads and in the Central Business District (CBD). The Government has implemented improvement and rehabilitation measures for major roads and deteriorated road condition. The running speed of vehicles on the primary roads became higher than before. However, traffic control facilities and safety facilities on the roads, i.e. traffic signal, road marking, road sign, guard fence and so on, are very poor.</p> <p>The increased traffic and heavily congesting road condition enhanced the stress of the road users, and moral &amp; manner of drivers are worsened. Given this situation, the increase in traffic accidents is one of the most important social issues.</p> <p>To solve these problems, a good traffic management is required by the Liberia National Police and Ministry of Public Works. However, their knowledge and experience of management were absent during civil conflict period. Therefore, capacity development of the staffs of related agencies is necessary. Through the training of staffs, execution of proper traffic management, fair enforcement and installation of adequate facilities are expected.</p> | <b>Effects of the Project</b><br><b>Target Beneficiaries :</b> <ul style="list-style-type: none"> <li>• Counter Part, i.e. Ministry of Public Works, Ministry of Transport &amp; Liberia National Police</li> <li>• Whole population of Greater Monrovia of about 1 million</li> </ul> <b>Effects:</b> <ul style="list-style-type: none"> <li>• To improve engineering capacity of traffic management</li> <li>• To improve education capacity for traffic safety training</li> <li>• To improve enforcement ability for traffic regulation &amp; safety instruction</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>• To reinforce the ability to execute regulation of traffic, control of intersection and education of drivers by the agencies.</li> </ul>   | <b>Evaluation of the Project</b><br><b>Economic Viability</b> <ul style="list-style-type: none"> <li>• Although no economic analysis is done, it is expected to improve the transport system for residents, decrease traffic congestion, ensure traffic safety and improve social environment.</li> </ul> <b>Financial Soundness</b> <ul style="list-style-type: none"> <li>• Necessary budget allocation</li> </ul> <b>Environmental Impact</b> <ul style="list-style-type: none"> <li>• Positive Impact<br/>Improve the traffic safety</li> <li>• Negative Impacts<br/>Specific negative impact is not found</li> </ul> |      |      |      |      |      |      |      |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>• Whole area in Greater Monrovia</li> </ul>   |   |      |      |      |      |      |      |      |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| <b>Scope of the Project</b><br><b>Technical transfer of:</b> <ul style="list-style-type: none"> <li>• Traffic control management at intersection</li> <li>• Know-how of education for traffic safety and educational activities</li> <li>• Regulation of traffic and instruction of traffic safety</li> </ul>   | <b>External Conditions</b> <ul style="list-style-type: none"> <li>• Good peace and order is maintained.</li> <li>• Counter part agencies for the project have sufficient capacity to get training.</li> </ul> <b>Preconditions</b> <ul style="list-style-type: none"> <li>• Necessary fund is prepared.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>• Project Implementation : Monrovia City Corporation</li> <li>• Counter Part : Ministry of Public Works, Ministry of Transport &amp; Liberia National Police</li> <li>• Operation : Ministry of Public Works, Ministry of Transport &amp; Liberia National Police</li> </ul>   | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>• "Intersection Improvement Project" will be implemented by counterpart of this project by using the knowledge and experience.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>• Project Implementation: USD 2.00 mln.</li> <li>• Total Cost: USD 2.00 mln.</li> </ul>  |   |      |      |      |      |      |      |      |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| <b>Implementation Schedule</b> <table border="1"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Engineering</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>■</td> <td>■</td> <td>■</td> <td></td> <td></td> </tr> <tr> <td>Enforcement</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>■</td> <td>■</td> <td>■</td> <td></td> <td></td> </tr> <tr> <td>Education</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>■</td> <td></td> <td></td> </tr> </tbody> </table>  |   |      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Engineering |  |  |  |  |  | ■ | ■ | ■ |  |  | Enforcement |  |  |  |  |  | ■ | ■ | ■ |  |  | Education |  |  |  |  |  |  |  | ■ |  |
|   | 2010  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| Engineering   |   |      |      |      |      | ■    | ■    | ■    |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| Enforcement   |   |      |      |      |      | ■    | ■    | ■    |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |
| Education   |   |      |      |      |      |      |      | ■    |      |      |      |      |             |  |  |  |  |  |   |   |   |  |  |             |  |  |  |  |  |   |   |   |  |  |           |  |  |  |  |  |  |  |   |  |


## Project Profile

| Project No. and Project Name: TR-8 Vai Town Bridge Reconstruction Project   |   |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
|---|---|----------------|----------------|------------|---------------|----------------------|---------------|------|------|------|------|---------------|--|--|--|--|--|--|--|--|--|--|----------------|--|--|--|--|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|--|--|--|
| <b>Background of the Project</b><br>Vai Town Bridge was the only way linking the city center and the northern suburban areas until 1978 and was an economic life-blood, an asset, and a crucial factor of people's livelihood. Also during the civil conflict, the Bridge allowed the flow of people and goods.<br>In late 2006, the important Vai Town Bridge collapsed. The bridge was operated together with Gabriel Tucker Bridge. These two bridges were the only ways to cross over the Mesurado wetland.<br>Fortunately, Gabriel Tucker Bridge is still in good condition and the access to CBD crossing the wetland is secured. All road users are concentrated on Gabriel Tucker Bridge at present and the Bridge is congested not only by vehicles but also by pedestrians during the whole day time. In particular, a long queue of the vehicles coming from the northern areas is observed during morning peak hours. Original carriageway was 2 lanes for both directions, but the lanes are now divided into 3 lanes, 2 lanes for south direction and 1 lane for north direction, in the morning on weekday. The traffic volume of the bridge is already beyond its capacity.<br>Given this traffic situation, the recovery of original double-bridge operation is urgently required to solve the present heavy traffic congestion. Therefore, reconstruction of Vai Town Bridge is necessary to recover the capital function including economic activities and social environment. | <b>Effects of the Project</b><br>Target Beneficiaries : <ul style="list-style-type: none"> <li>• Whole population in Greater Monrovia of about 1 million</li> </ul> Effects: <ul style="list-style-type: none"> <li>• Recovery of original road network around CBD</li> <li>• Mitigation of traffic congestion between CBD and Free Port</li> <li>• Reduction of energy loss and exhaust fume</li> </ul>  |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>• To recover the original road network around city center.</li> </ul>   | <b>Evaluation of the Project</b><br>Economic Viability <ul style="list-style-type: none"> <li>• Total benefits including vehicle-km and vehicle-hour are calculated in the "without" and "with" case.<br/>                             NPV : USD 10.5 mln<br/>                             B/C : 1.65<br/>                             EIRR: 22.8 %</li> </ul> Financial Soundness <ul style="list-style-type: none"> <li>• Committed Grant by World Bank</li> </ul> Environmental Impact <ul style="list-style-type: none"> <li>• Positive Impacts<br/>                             Improve travel speed and mitigate CO2 emission gas<br/>                             Improve accessibility to social/public facilities</li> <li>• Negative Impacts<br/>                             Involuntary resettlement is required in Via Town<br/>                             Negative impact against Mesurado wetland</li> </ul> |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>• Central Monrovia and Clara Town Districts in Gerater Monrovia</li> </ul>  | External Conditions <ul style="list-style-type: none"> <li>• Good peace and order is maintained.</li> <li>• Responsible agency for operation and maintenance has sufficient capacity.</li> </ul> Preconditions <ul style="list-style-type: none"> <li>• Necessary land is secured.</li> <li>• Construction site can be occupied</li> </ul>  |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>• Demolish debris and existing bridge</li> <li>• 240 m bridge on the same alignment with broken bridge</li> <li>• Approach road on both sides of bridge</li> </ul>   | Relationship with other projects <ul style="list-style-type: none"> <li>• "Johnson Street Bridge Improvement Project" will reinforce the road network around CBD and mitigate traffic congestion.</li> </ul>  |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>• Project Implementation : Ministry of Public Works</li> <li>• Maintenance : Ministry of Public Works</li> <li>• Operation : Ministry of Public Works</li> </ul>   |   |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>• Construction                             <table style="margin-left: 20px;"> <tr> <td>Bridge :</td> <td>USD 11.50 mln.</td> </tr> <tr> <td>Approach :</td> <td>USD 1.00 mln.</td> </tr> <tr> <td>Demolish of Bridge :</td> <td>USD 2.50 mln.</td> </tr> </table> </li> <li>• Total Cost: USD 15.00 mln.</li> </ul>  |   | Bridge :       | USD 11.50 mln. | Approach : | USD 1.00 mln. | Demolish of Bridge : | USD 2.50 mln. |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| Bridge :  |   | USD 11.50 mln. |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| Approach :  | USD 1.00 mln.   |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| Demolish of Bridge :  | USD 2.50 mln.   |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
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|   | 2010  | 2011           | 2012           | 2013       | 2014          | 2015                 | 2016          | 2017 | 2018 | 2019 |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| Sub structure   |   |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| Superstructure  |   |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |
| Approach Road   |   |                |                |            |               |                      |               |      |      |      |      |               |  |  |  |  |  |  |  |  |  |  |                |  |  |  |  |  |  |  |  |  |  |               |  |  |  |  |  |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: TR-9 Rehabilitation of Monrovia City Streets Project   |  |      |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
|--|--|------|------|------|------|------|------|------|------|------|------|------|--------------|---|---|--|--|--|--|--|--|--|--|------------|---|---|--|--|--|--|--|--|--|
| <p><b>Background of the Project</b></p> <p>During the civil conflict, the Ministry of Public Works lost their capacity to manage its functions. Almost no road maintenance has been carried out from 1986 to 2006. As a result, most roads are in very poor condition even in the Central Business District (CBD) of Monrovia city.</p> <p>Aging pavement in the CBD has many cracks and potholes. The potholes are becoming larger and deeper day by day, especially during rain seasons. Drivers of vehicles drive zigzag beyond center line to avoid such holes on the road. Such road condition gives damage to the vehicles and many old cars suffer troubles frequently.</p> <p>This project will rehabilitate major city streets. Number of streets is 23 sections and total length is close to 24 km, which formulate the city center streets network.</p> <p>The streets basically need asphalt concrete (AC) overlay over improved base course, while in some places there is need to remove present AC, repair the drainage and sewerage pipes and overlay it again. The works will also include major items related to repair of sidewalks, specifically where there are major pedestrian movements.</p> | <p><b>Effects of the Project</b></p> <p>Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>• Whole population in Greater Monrovia of about 1 million</li> </ul> <p>Effects:</p> <ul style="list-style-type: none"> <li>• Recovery of city streets network in CBD</li> <li>• Reduction of vehicle repair cost</li> <li>• Improvement of safe and convenience of pedestrians</li> <li>• Reduction of energy loss and exhaust fume</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
| <p><b>Objectives of the Project</b></p> <ul style="list-style-type: none"> <li>• To provide the city streets network in good condition</li> </ul>  | <p><b>Evaluation of the Project</b></p> <p><b>Economic Viability</b></p> <ul style="list-style-type: none"> <li>• Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.<br/>NPV : USD 33.7 mln<br/>B/C : 2.48<br/>EIRR: 26.7 %</li> </ul> <p><b>Financial Soundness</b></p> <ul style="list-style-type: none"> <li>• Committed Grant by World Bank</li> </ul> <p><b>Environmental Impacts</b></p> <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve travel speed and mitigate CO2 emission gas<br/>Improve accessibility to social/public facilities<br/>Enhance economic activity</li> <li>• Negative Impacts<br/>Specific negative impact is not found.</li> </ul> |      |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
| <p><b>Location of the Project</b></p> <ul style="list-style-type: none"> <li>• Central Monrovia in Greater Monrovia</li> </ul>   | <p><b>External Conditions</b></p> <ul style="list-style-type: none"> <li>• Good peace and order is maintained.</li> <li>• Responsible agency for operation and maintenance has sufficient capacity.</li> </ul> <p><b>Preconditions</b></p> <ul style="list-style-type: none"> <li>• Traffic control and temporal regulation shall be approved.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
| <p><b>Scope of the Project</b></p> <p>Construction of:</p> <ul style="list-style-type: none"> <li>• Rehabilitation of 23 streets in city center</li> <li>• Repair of buried pipes</li> <li>• Repair of sidewalks</li> </ul>  | <p><b>Relationship with other projects</b></p> <ul style="list-style-type: none"> <li>• “Johnson Street Bridge Improvement Project” and “Vai Town Bridge Reconstruction Project” will bring larger traffic to CBD.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
| <p><b>Agencies Responsible</b></p> <ul style="list-style-type: none"> <li>• Project Implementation : Ministry of Public Works</li> <li>• Maintenance : Ministry of Public Works</li> <li>• Operation : Ministry of Public Works</li> </ul>   |    |      |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
| <p><b>Estimated Cost</b></p> <ul style="list-style-type: none"> <li>• Construction USD 16.00 mln.</li> <li>• Consulting Service: USD 1.60 mln.</li> <li>• Total Cost: USD 17.60 mln.</li> </ul>  |  |      |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
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|  | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
| Construction   | ■  | ■    |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |
| Consulting   | ■  | ■    |      |      |      |      |      |      |      |      |      |      |              |   |   |  |  |  |  |  |  |  |  |            |   |   |  |  |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: TR-10 Caldwell Bridge Construction Project   |   |      |      |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
|--|---|------|------|------|------|------|------|------|------|------|------|--------------|--|---|---|---|--|--|--|--|--|--|------------|---|---|---|--|--|--|--|--|--|--|--|
| <b>Background of the Project</b><br>Caldwell bridge is located on the Caldwell Road and crosses the Stockton Creek. Although the Caldwell Road has wide carriageway for each direction, the bridge does not have enough width to provide 2 lanes. Therefore, single lane operation is insufficient. Vehicles are enforced to wait at the foot of the bridge until the vehicles passing from the opposite side are cleared from the bridge.<br>In addition, the bridge has a similar structure as the collapsed Vai Town Bridge, that is the capacity of traffic load may be smaller than the expected vehicle load. The steel members are rusted and may be dilapidated, and hence collapse may occur in the near future.<br>Given this situation, the existing bridge, about 120 m long, has been closed by the government for heavy vehicles i.e. trucks and heavy equipment, and only light vehicles, pedestrians and bicycle are allowed to use the bridge. The bridge connects two major sections of Monrovia City and its closure presents a major disturbance to the trade and commerce in this area of the City<br>A tentative identification of the candidate location of the bridge has been already selected among several alternatives and is close to the existing bridge. The new bridge will also require a new alignment for the bridge approach, each of about 300 to 500 m long. | <b>Effects of the Project</b><br>Target Beneficiaries : <ul style="list-style-type: none"> <li>Population of Caldwell , Barnesville and Johnsonville Zones of about 66 thousand</li> </ul> Effects: <ul style="list-style-type: none"> <li>To ensure permanent road service at Caldwell Bridge</li> <li>To secure social and economic activities</li> </ul>   |      |      |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>To secure traffic crossing across Stockton Creek on Caldwell Road</li> </ul>   | <b>Evaluation of the Project</b><br>Economic Viability <ul style="list-style-type: none"> <li>Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.<br/>NPV : USD 9.8 mln<br/>B/C : 2.58<br/>EIRR: 24.8 %</li> </ul> Financial Soundness <ul style="list-style-type: none"> <li>Committed Grant by World Bank</li> </ul> Environmental Impacts <ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve the living standard of residents<br/>Improvement of accessibility to social/public facilities for residents</li> <li>Negative Impacts<br/>Land acquisition and involuntary resettlement are necessary at the new approach road.</li> </ul> |      |      |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>Caldwell District in Gerater Monrovia</li> </ul>   | <b>External Conditions</b> <ul style="list-style-type: none"> <li>Good peace and order is maintained.</li> <li>Responsible agency for operation and maintenance has sufficient capacity.</li> </ul> <b>Preconditions</b> <ul style="list-style-type: none"> <li>Land for the construction shall be secured.</li> <li>Resettlement shall be completed.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>New bridge crossing Stockton Creek</li> <li>New approach road on both sides of bridge</li> </ul>  | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>“Road Rehabilitation Project” will improve Caldwell Road and connecting several roads to develop the road network around this area.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>Project Implementation : Ministry of Public Works</li> <li>Maintenance : Ministry of Public Works</li> <li>Operation : Ministry of Public Works</li> </ul>  |   |      |      |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>Construction: USD 6.00 mln.</li> <li>Consulting Service: USD 1.00 mln.</li> <li>Total Cost: USD 7.00 mln.</li> </ul>  |   |      |      |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| <b>Implementation Schedule</b><br><table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Construction</td> <td></td> <td>■</td> <td>■</td> <td>■</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Consulting</td> <td>■</td> <td>■</td> <td>■</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>   |   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Construction |  | ■ | ■ | ■ |  |  |  |  |  |  | Consulting | ■ | ■ | ■ |  |  |  |  |  |  |  |  |
|  | 2010  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| Construction   |   | ■    | ■    | ■    |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |
| Consulting   | ■   | ■    | ■    |      |      |      |      |      |      |      |      |              |  |   |   |   |  |  |  |  |  |  |            |   |   |   |  |  |  |  |  |  |  |  |

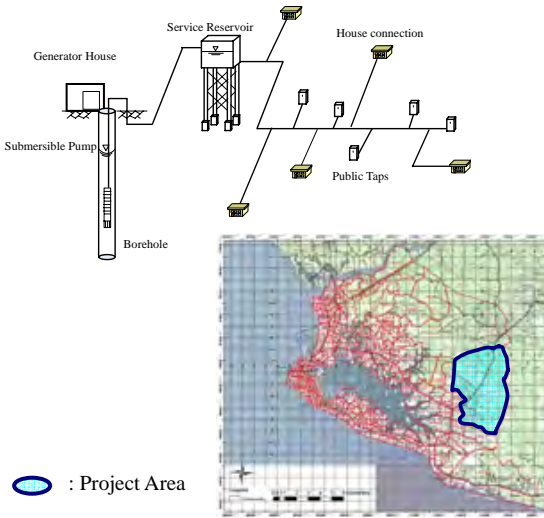
### **9.3.2 Water Supply Sector**

| Sector       | Project No. | Project Name   |
|--------------|-------------|--|
| Water Supply | WS-1        | Monrovia Water and Sanitation Rehabilitation Program (WSRP)  |
|              | WS-2        | Monrovia Expansion and Rehabilitation of Three County Capitals (ERTC)                              |
|              | WS-3        | Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (PEDW) |
|              | WS-4        | Expansion Project of White Plains Water Supply System (EPWS)                                       |
|              | WS-5        | Project for Expansion of Water Supply System at Paynesville in Greater Monrovia (PEWS) _Phase II   |
|              | WS-6        | Technical Cooperation Project of Groundwater Management (TCPGM)                                    |
|              | WS-7        | Technical Cooperation Project of Non-Revenue Water (TCPNR)   |

## Project Profile

| Project No. and Project Name: WS-1 Monrovia Water and Sanitation Rehabilitation Program (WSRP)  |  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
|---|--|---------------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|--|--|--|--|--|--|--|--|
| Background of the Project   | Effects of the Project   |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| <p>The existing water supply facilities in Greater Monrovia were damaged and the associated equipments were stolen by thieves, and therefore the facilities have become inoperative. Whereas, the White Plains purification treatment plant was constructed in 1966 and 1982, and the rising and distribution facilities were laid from 1950 to 1970 so that some parts of facilities have been deteriorated.</p> <p>Based on this background, in order to urgently recover the function of the existing water supply facilities, LWSC has been carrying out this project since 2008.</p> | <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 750,000 inhabitants in Greater Monrovia</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of quality of life</li> <li>Promotion of work activities</li> </ul>   |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
|   | Objectives of the Project  | Evaluation of the Project |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | <p>Economic Viability:</p> <ul style="list-style-type: none"> <li>NPV : USD 90.0 mln</li> <li>B/C : 2.51</li> <li>EIRR : 36.0%</li> </ul> <p>Financial Soundness:</p> <ul style="list-style-type: none"> <li>Committed by WB, EU, DIFID, AfDB</li> </ul> <p>Environmental Impact:</p> <ul style="list-style-type: none"> <li>Positive Impacts                             <ul style="list-style-type: none"> <li>Improve hygiene service and living standard</li> </ul> </li> <li>Negative Impacts                             <ul style="list-style-type: none"> <li>Specific negative impact is not found</li> </ul> </li> </ul> |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| Location of the Project   | External Conditions  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Greater Monrovia</li> </ul>  |  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| Scope of the Project  | Preconditions  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| <p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Rehabilitation of intake pumps</li> <li>Rehabilitation of the White Plains treatment plant (especially, replacement of mechanical equipments)</li> <li>Rehabilitation of booster pump stations</li> <li>Rehabilitation of rising main and distribution pipelines</li> <li>Cleaning of two (2) service reservoirs</li> <li>Procurement of generators in the White Plains treatment plant</li> </ul>   |  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| Agencies Responsible  | Relationship with other projects   |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> <li>Operation: LWSC</li> <li>Maintenance: LWSC</li> </ul>   | <ul style="list-style-type: none"> <li>There are five (5) projects for supplying safe and stable water to Greater Monrovia. This project is one of them for the year of 2011.</li> </ul>   |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| Estimated Cost  | Remarks  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Implementation/Construction Cost (including design, construction supervision cost) : USD 38.50 mln.</li> <li>Total Cost : USD 38.50 mln.</li> </ul>  |  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| Implementation Schedule   | <p>Legend:</p> <ul style="list-style-type: none"> <li><span style="color: green;">■</span> : Project Area</li> <li><span style="color: blue;">■</span> : Project Area requested to Japanese side in 2009</li> <li><span style="color: purple;">■</span> : Project Area under study by AfDB</li> </ul>  |                           |       |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th>Project</th> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>WSRP</td> <td>4.75</td> <td>9.75</td> <td>24.00</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Unit: mln USD</p>  |  | Project                   | 2009  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | WSRP | 4.75 | 9.75 | 24.00 |  |  |  |  |  |  |  |  |
| Project   | 2009   | 2010                      | 2011  | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |      |      |      |       |  |  |  |  |  |  |  |  |
| WSRP  | 4.75   | 9.75                      | 24.00 |      |      |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |  |  |  |  |  |

## Project Profile


| Project No. and Project Name: WS-2 Monrovia Expansion and Rehabilitation of Three County Capitals (ERTC)   |  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
|--|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|--|--|--|--|--|--|--|--|
| <b>Background of the Project</b><br>The capacity of the existing White Plains Water Supply System will be restored to be about 16MGD (60,000m <sup>3</sup> /day) by 2011 through Monrovia Water and Sewer Rehabilitation Program (WSRP), which is currently being conducted by the funding of W.B., AfDB and other donors. However, water production is about 3MGD (11,000m <sup>3</sup> /day) short of the estimated water demand for overall Greater Monrovia in 2014. Water shortage in Paynesville especially becomes a serious problem, as Paynesville is predicted to be developed as residential areas based on the urban planning in this Master Plan Study without a distribution network except for the pipelines along trunk road. Accordingly, water supply system utilizing rich groundwater which does not depend on the White Plains water supply system is urgently required in Paynesville zone. LWSC commenced a study with the fund of AfDB targeting four (4) communities in the northern parts of Paynesville zone in 2009. | <b>Effects of the Project</b><br>a) Target Beneficiaries :<br>• About 70,000 inhabitants in Paynesville zone<br><br>b) Effects of the Project :<br>• Reduction of water-borne disease<br>• Improvement of quality of life<br>• Promotion of work activities  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
| <b>Objectives of the Project</b><br>• To raise the living standard of the residents.<br>• To improve environmental hygiene of residents.   | <b>Evaluation of the Project</b><br>Economic Viability:<br>• NPV : USD 1.3mln<br>B/C : 0.92<br>EIRR : 8.9%<br>Financial Soundness:<br>• Committed by AfDB<br>Environmental Impact:<br>• Positive Impacts<br>Improve hygiene service and living standard<br>• Negative Impacts<br>Alternative well site must be provided when the considerable decrease of groundwater level is serious |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
| <b>Location of the Project</b><br>• Paynesville Zone   |  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>The project includes the following items :<br>• Construction of 85 boreholes with about 60 submersible pumps and generators (20-30kVA)<br>• Construction of 35 elevated water tanks with a capacity of 70m <sup>3</sup><br>• Laying of rising pipelines from boreholes to service reservoirs and distribution pipelines from service reservoirs to public taps and households (PVC/GS, 100-200mm x 120km)<br>• Installation of about 230 taps (6 faucets per tap)   | <b>External Conditions</b><br>• O&M cost of the water supply system shall be covered by beneficiaries.<br>• Land acquisition for boreholes and service reservoirs (elevated water tanks)<br>• Initial fund shall be established in water committees.   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
| <b>Agencies Responsible</b><br>• Project Implementation: Liberia Water and Sanitation Corporation (LWSC)<br>• Operation: Communities to be served<br>• Maintenance: LWSC and communities to be served  | <b>Preconditions</b><br>• Responsible organizations such as LWSC and water committees of served communities have sufficient capabilities for operating and maintaining water supply system.<br>• Good peace and order is maintained.   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
| <b>Estimated Cost</b><br>• Implementation/Construction Cost (including design, construction supervision cost) : USD 16.28 mln.<br>• Contingency: USD 2.96 mln.<br>• Total Cost : USD 19.24 mln.  | <b>Relationship with other projects</b><br>• There are five (5) projects for supplying safe and stable water to Greater Monrovia. This project is one of them but focuses on Paynesville zone for the year of 2014.  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
| <b>Implementation Schedule</b><br><table border="1"> <thead> <tr> <th>Project</th> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>ERTC</td> <td>3.00</td> <td>8.12</td> <td>8.12</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> Unit: mln USD   | Project  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | ERTC | 3.00 | 8.12 | 8.12 |  |  |  |  |  |  |  |  | <b>Remarks</b><br> |
| Project  | 2009   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |      |      |      |  |  |  |  |  |  |  |  |  |
| ERTC   | 3.00   | 8.12 | 8.12 |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |

## Project Profile

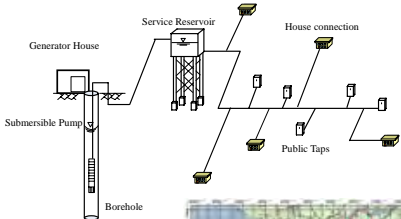
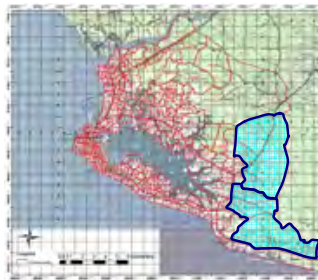
| Project No. and Project Name: WS-3 Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (PEDW)   |  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
|---|--|------|------|------|------|------|------|------|------|------|------|------|------|-----|------|------|------|-----|-----|-----|-----|-----|-----|-----|
| Background of the Project   | Effects of the Project   |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| <p>The capacity of the existing White Plains Water Supply System will be restored to be about 16MGD (60,000m<sup>3</sup>/day) by 2011 through Monrovia Water and Sewer Rehabilitation Program (WSRP), which is currently being conducted by the funding of W.B., AfDB and other donors. However, water production is about 3MGD (11,000m<sup>3</sup>/day) short of the estimated water demand for overall Greater Monrovia in 2014. However, water production is about 3MGD (11,000m<sup>3</sup>/day) short of the estimated water demand for overall Greater Monrovia in 2014.</p> <p>Water shortage in Paynesville especially becomes a serious problem, as Paynesville is predicted to be developed as residential areas based on the urban planning in this Master Plan Study without a distribution network except for the pipelines along trunk road.</p> <p>Accordingly, development of water supply system utilizing rich groundwater which does not depend on the White Plains water supply system is urgently required in Paynesville zone.</p> <p>LWSC made a request to Japanese side for developing water supply system targeting five (5) communities in South parts of Paynesville zone in 2009.</p> | <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 60,000 inhabitants in Paynesville zone</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of quality of life</li> <li>Promotion of work activities</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| Objectives of the Project   | Evaluation of the Project  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | <p>Economic Viability:</p> <ul style="list-style-type: none"> <li>NPV : USD 1.3 mln</li> <li>B/C : 0.90</li> <li>EIRR : 8.4%</li> <li>FIRR: 3.33%</li> </ul> <p>Financial Soundness:</p> <ul style="list-style-type: none"> <li>Requested Japan's Grant Aid</li> </ul> <p>Environmental Impact: <b>Category B</b></p> <ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve hygiene service and living standard</li> <li>Negative Impacts<br/>Alternative well site must be provided when the considerable decrease of groundwater level is serious</li> </ul> |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| Location of the Project   | External Conditions  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| <ul style="list-style-type: none"> <li>Paynesville Zone</li> </ul>  | <ul style="list-style-type: none"> <li>O&amp;M cost of the water supply system shall be covered by beneficiaries.</li> <li>Land acquisition for boreholes and service reservoirs (elevated water tanks)</li> <li>Initial fund shall be established in water committees.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| Scope of the Project  | Preconditions  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| <p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Construction of 73 boreholes with about 50 submersible pumps and generators (20-30kVA)</li> <li>Construction of 26 ground service reservoirs and two (2) elevated water tanks</li> <li>Laying of rising pipelines from boreholes to service reservoirs and distribution pipelines from service reservoirs to public taps and households (PVC/GS, 100-200mm x 100mm)</li> <li>Installation of about 200 taps (6 faucets per tap)</li> </ul>   | <ul style="list-style-type: none"> <li>Responsible organizations such as LWSC and water committees of served communities have sufficient capabilities for operating and maintaining water supply system.</li> <li>Good peace and order is maintained.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| Agencies Responsible  | Relationship with other projects   |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> <li>Operation: Communities to be served</li> <li>Maintenance: LWSC and communities to be served</li> </ul>  | <ul style="list-style-type: none"> <li>There are five (5) projects for supplying safe and stable water to Greater Monrovia. This project is one of them but focuses on Paynesville zone for the year of 2014.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| Estimated Cost  | Remarks  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| <ul style="list-style-type: none"> <li>Implementation/Construction Cost (including design, construction supervision cost) : USD 14.00 mln.</li> <li>Contingency: USD 2.50 mln.</li> <li>Capacity building: USD 0.10 mln.</li> <li>Total Cost : USD 16.60 mln.</li> </ul>  | <p>○ : Project Area</p>  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| Implementation Schedule   |  |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |     |     |     |     |     |     |     |
| <table border="1"> <thead> <tr> <th>Project</th> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>PEDW</td> <td>---</td> <td>2.50</td> <td>7.10</td> <td>7.00</td> <td>---</td> <td>---</td> <td>---</td> <td>---</td> <td>---</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>Unit: million USD</p>   | Project  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | PEDW | --- | 2.50 | 7.10 | 7.00 | --- | --- | --- | --- | --- | --- | --- |
| Project   | 2009   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |      |     |      |      |      |     |     |     |     |     |     |     |
| PEDW  | ---  | 2.50 | 7.10 | 7.00 | ---  | ---  | ---  | ---  | ---  | ---  | ---  |      |      |     |      |      |      |     |     |     |     |     |     |     |



## Project Profile

| Project No. and Project Name: WS-4 Expansion Project of White Plains Water Supply System (EPWS)   |  |      |      |      |       |       |       |       |       |       |      |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
|---|--|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|-----|-----|-----|-----|-------|-------|-------|-------|-------|-------|------|--|
| <p><b>Background of the Project</b></p> <p>The capacity of the existing White Plains Water Supply System will be restored to be about 16MGD (60,000m<sup>3</sup>/day) by 2011 through Monrovia Water and Sewer Rehabilitation Program (WSRP), which is currently being conducted by the funding of WB., AfDB and other donors.</p> <p>In addition, in order to supply water of about 2.4 MGD (9,000m<sup>3</sup>/day) to about 70% of the total population of Paynesville zone with the highest population out of Greater Monrovia zones, two projects such as Monrovia Expansion and Rehabilitation of Three County Capitals (ERTC) and Project for Emergency Development of Water Supply System in Paynesville in Greater Monrovia (PEDW) have been planned for the target year of 2014. However, even if ERTC and PEDW are implemented as scheduled for the year of 2014, water production is about 12MGD (45,000m<sup>3</sup>/day) short of the estimated water demand for overall Greater Monrovia in 2019. Since the amount of was for the un-served dwellers of Paynesville zone accounts for about 2.0MGD (7,500m<sup>3</sup>/day) out of 12MGD of water demand for the total population of the zone., development of the satellite water supply system like PEDW and ERTC utilizing groundwater shall be considered for supplying water of 2.0MGD to Paynesville zone for the year of 2019.</p> <p>Accordingly, water production for the balance of 10MGD (38,000m<sup>3</sup>/day) is required for covering future water demand through the expansion of the capacity of the White Plains water supply system. At the same time, in order to supply stable water, isolation of the existing service area is required with more service reservoirs in addition to the existing service reservoirs.</p> | <p><b>Effects of the Project</b></p> <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 1.1million inhabitants in Greater Monrovia</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of quality of life</li> <li>Promotion of work activities</li> </ul>   |      |      |      |       |       |       |       |       |       |      |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
| <p><b>Objectives of the Project</b></p> <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | <p><b>Evaluation of the Project</b></p> <p><b>Economic Viability:</b></p> <ul style="list-style-type: none"> <li>NPV : USD 103.3 mln</li> <li>B/C : 1.97</li> <li>EIRR : 21.3%</li> </ul> <p><b>Financial Soundness:</b></p> <ul style="list-style-type: none"> <li>Necessary the budget allocation</li> </ul> <p><b>Environmental Impact: Category B</b></p> <ul style="list-style-type: none"> <li>Positive Impacts                             <ul style="list-style-type: none"> <li>Improve hygiene service and living standard</li> </ul> </li> <li>Negative Impacts                             <ul style="list-style-type: none"> <li>Land acquisition for the new service station will be required</li> </ul> </li> </ul> |      |      |      |       |       |       |       |       |       |      |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
| <p><b>Location of the Project</b></p> <ul style="list-style-type: none"> <li>Greater Monrovia</li> </ul>  | <p><b>External Conditions</b></p> <ul style="list-style-type: none"> <li>O&amp;M cost of the water supply system shall be covered by beneficiaries.</li> <li>Land acquisition for service reservoirs is required.</li> </ul>   |      |      |      |       |       |       |       |       |       |      |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
| <p><b>Scope of the Project</b></p> <p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Expansion of the White Plains treatment plant and intake (Max. capacity: 32MGD)</li> <li>Expansion of rising main pipelines of 500-800mm (about 44.0km)</li> <li>Expansion of six (6) ground service reservoirs (Capacity: 800-8,500m<sup>3</sup>) and seven (7) elevated storage tanks (Capacity: 1,000-1,500m<sup>3</sup>)</li> <li>Expansion of centrifugal surface pumps of 3MGD x 4sets and 4MGD 2sets, and generators (2,500kVA)</li> <li>Expansion of distribution main pipelines of 40-600mm (about 215km)</li> </ul>   | <p><b>Preconditions</b></p> <ul style="list-style-type: none"> <li>Responsible organizations such as LWSC and water committees of served communities have sufficient capabilities for operating and maintaining water supply system.</li> <li>Intentional budgetary arrangements for construction are required annually.</li> <li>Good peace and order is maintained.</li> </ul>   |      |      |      |       |       |       |       |       |       |      |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
| <p><b>Agencies Responsible</b></p> <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> <li>Operation: LWSC</li> <li>Maintenance: LWSC</li> </ul>  | <p><b>Relationship with other projects</b></p> <ul style="list-style-type: none"> <li>There are five (5) projects for supplying safe and stable water to Greater Monrovia. This project is one of them for the year of 2019.</li> </ul>  |      |      |      |       |       |       |       |       |       |      |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
| <p><b>Estimated Cost</b></p> <ul style="list-style-type: none"> <li>Implementation/Construction Cost (including design, construction supervision cost) : USD 98.94 mln.</li> <li>Contingency: USD 29.68 mln.</li> <li>Total Cost : USD 128.62 mln.</li> </ul>   | <p><b>Remarks</b></p> <p>The following areas are exclusive of this project area.</p>    |      |      |      |       |       |       |       |       |       |      |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
| <p><b>Implementation Schedule</b></p> <table border="1"> <thead> <tr> <th>Project</th> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>EPWS</td> <td>---</td> <td>---</td> <td>---</td> <td>---</td> <td>17.09</td> <td>17.09</td> <td>25.17</td> <td>22.66</td> <td>22.67</td> <td>15.87</td> <td>8.08</td> </tr> </tbody> </table> <p>Unit: mln USD</p>   | Project  | 2009 | 2010 | 2011 | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018 | 2019 | EPWS | --- | --- | --- | --- | 17.09 | 17.09 | 25.17 | 22.66 | 22.67 | 15.87 | 8.08 |  |
| Project   | 2009   | 2010 | 2011 | 2012 | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019 |      |      |     |     |     |     |       |       |       |       |       |       |      |  |
| EPWS  | ---  | ---  | ---  | ---  | 17.09 | 17.09 | 25.17 | 22.66 | 22.67 | 15.87 | 8.08 |      |      |     |     |     |     |       |       |       |       |       |       |      |  |

## Project Profile

| Project No. and Project Name: WS-5 Project for Expansion of Water Supply System at Paynesville in Greater Monrovia (PEWS) Phase II  |   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
|---|---|------|------|------|------|------|------|------|------|------|------|------|-----------------|-----|-----|-----|-----|------|------|------|------|-----|-----|-----|--|
| Background of the Project   | Effects of the Project  |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| In order to supply water of about 2.4 MGD (9,000m <sup>3</sup> /day) to about 70% of the total population of Paynesville zone with the highest population out of Greater Monrovia zones, two (2) projects such as Monrovia Expansion and Rehabilitation of Three County Capitals (ERTC), and Project for Emergency Development of Water Supply System in Paynesville in Greater Monrovia (PEDW) have been planned for the year of 2014. Further water production of about 1.9MGD (7,000m <sup>3</sup> /day) is required for covering all the population in Paynesville zone for the year of 2019. Out of 1.9MGD, it is proposed that water production of about 1.4MGD (5,200m <sup>3</sup> /day) is covered by this project, while about 0.5MGD (1,800m <sup>3</sup> /day) is covered by the CM-1 Community Infrastructure Reconstruction Project.<br>Paynesville zone has also the largest area in Greater Monrovia, but water pipelines have not been developed yet in most of areas. Therefore, even if sufficient water is produced from Saint Paul river, which is currently being utilized through the White Plains water supply system, it will take time to lay the rising main and distribution pipelines in Paynesville zone.<br>Accordingly, development of water supply system utilizing rich groundwater which does not depend on the White Plains water supply system is urgently required, in Paynesville zone for the year of 2019. | a) Target Beneficiaries :<br>• About 80,000 inhabitants in Paynesville zone<br><br>b) Effects of the Project :<br>• Reduction of water-borne disease<br>• Improvement of the quality of life<br>• Promotion of work activities  |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| Objectives of the Project   | Evaluation of the Project   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| • To raise the living standard of the residents.<br>• To improve environmental hygiene of residents.  | Economic Viability:<br>• NPV : USD 5.1 mln<br>B/C : 0.76<br>EIRR : 7.5%<br>Financial Soundness:<br>• Necessary budget allocation<br>Environmental Impact: <b>Category B</b><br>• Positive Impacts<br>Improve hygiene service and living standard<br>• Negative Impacts<br>Alternative well site must be provided when the considerable decrease of groundwater level is serious |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| Location of the Project   | External Conditions   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| • Paynesville Zone  | • O&M cost of the water supply system shall be covered by beneficiaries.<br>• Land acquisition for boreholes and service reservoirs (elevated water tanks)<br>• Initial fund shall be established in water committees.  |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| Scope of the Project  | Preconditions   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| The project includes the following items :<br>• Construction of 100 boreholes with about 70 submersible pumps and generators (20-30kVA)<br>• Construction of 40 elevated water tanks with a capacity of 70m <sup>3</sup><br>• Laying of rising pipelines from boreholes to service reservoirs and distribution pipelines from service reservoirs to public taps and households (PVC/GS, 100-200mm x 140km)<br>• Installation of about 290 taps (6 faucets per tap)  | • Responsible organizations such as LWSC and water committees of served communities have sufficient capabilities for operating and maintaining water supply system.<br>• Good peace and order is maintained.  |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| Agencies Responsible  | Relationship with other projects  |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| • Project Implementation: Liberia Water and Sanitation Corporation (LWSC)<br>• Operation: Communities to be served<br>• Maintenance: LWSC and communities to be served  | • Water service coverage of Paynesville zone shall be improved to 100% in 2019 by this project after implementation of 'Monrovia Expansion and Rehabilitation of Three County Capitals (ERTC)' and 'Project for Emergency Development of Water Supply System in Paynesville in Greater Monrovia (PEDWW)', which were targeted for 2014.   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| Estimated Cost  | Remarks   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| • Implementation/Construction Cost (including design, construction supervision cost) : USD 19.35 mln.<br>• Contingency: USD 3.52 mln.<br>• Total Cost : USD 22.87 mln.  | <br>   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| Implementation Schedule   |   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
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| Project   | 2009  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| PEWS (Phase II)   | ---   | ---  | ---  | 2.5  | 8.14 | 5.64 | 5.64 | 5.64 | ---  | ---  | ---  |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |
| Unit: mln USD   |   |      |      |      |      |      |      |      |      |      |      |      |                 |     |     |     |     |      |      |      |      |     |     |     |  |

## Project Profile

| Project No. and Project Name: WS-6 Technical Cooperation Project of Groundwater Management (TCPGM)   |   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
|--|---|------|------|------|------|------|------|------|------|------|------|------|-------|--|--|--|------|------|------|--|--|--|--|--|--|
| Background of the Project  | Effects of the Project  |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| <p>Conventionally, shallow and dug wells have been used by the dwellers in Greater Monrovia as an alternative water source of the White Plains water supply system. Most of such wells were developed for residential purpose as an emergency measures during the civil conflict or later on. However, their wells are not registered or monitored by LWSC and MLME, due to lack of registration system. Therefore, well conditions such as water quality, water production yield, groundwater level, etc. have not been verified by responsible organizations such as LWSC and MLME.</p> <p>For the future, since development of public water supply system such as Monrovia Expansion and Rehabilitation of Three County Capitals (ERTC), Project for Emergency Development of Water Supply System in Paynesville in Greater Monrovia (PEDW), and Project for Expansion of Water Supply System at Paynesville in Greater Monrovia (PEWS) are planned, groundwater management is crucial to sustain the performance of the wells appropriately.</p> | <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 1.5mln inhabitants (for the target year of 2019) in Paynesville zone</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of the quality of life</li> <li>Improvement on technical management of LWSC and MLME</li> </ul> |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| Objectives of the Project  | Evaluation of the Project   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> <li>To enhance capabilities of operation &amp; maintenance in responsible organization</li> </ul>   | <p>Economic Viability:</p> <ul style="list-style-type: none"> <li>Although no economic analysis is done, it is expected to improve the groundwater system and environmental hygiene for citizens.</li> </ul> <p>Financial Soundness:</p> <ul style="list-style-type: none"> <li>Necessary budget allocation</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| Location of the Project  | External Conditions   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Greater Monrovia</li> </ul>   | <ul style="list-style-type: none"> <li>LWSC has fundamental capability for operating and maintaining water supply system.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| Scope of the Project   | Preconditions   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| <p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Training on the regular monitoring of static water level of boreholes and its evaluation measurements.</li> <li>Training on a regular analysis of water quality such as pH, total E-Coli, Turbidity, Color, EC, etc., and its evaluation measurements.</li> <li>Training on an establishment of rules and regulations on registration required for developing groundwater.</li> </ul>   | <ul style="list-style-type: none"> <li>Staff of the technical, operation division of LWSC and hydrogeology division of MLME is required to be involved in the project.</li> <li>Good peace and order is maintained.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| Agencies Responsible   | Relationship with other projects  |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)<br/>Ministry of Land, Mines and Energy (MLME)</li> </ul>  | <ul style="list-style-type: none"> <li>In order to sustain public water supply system, which might be developed through Monrovia Expansion and Rehabilitation of Three County Capitals (ERTC), and the Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (PEDWW), these projects shall be followed up by this technical cooperation.</li> </ul>     |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| Estimated Cost   | Remarks   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Technical cooperation for groundwater and water quality control: USD 0.20 mln.</li> <li>Water quality analysis equipments, operating expenses, etc: USD 0.12 mln.</li> <li>Total Cost : USD 0.32 mln.</li> </ul>  |   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| Implementation Schedule  |   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
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| Project  | 2009  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| TCPGM  |   |      |      | 0.10 | 0.11 | 0.11 |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |
| Unit: mln USD  |   |      |      |      |      |      |      |      |      |      |      |      |       |  |  |  |      |      |      |  |  |  |  |  |  |

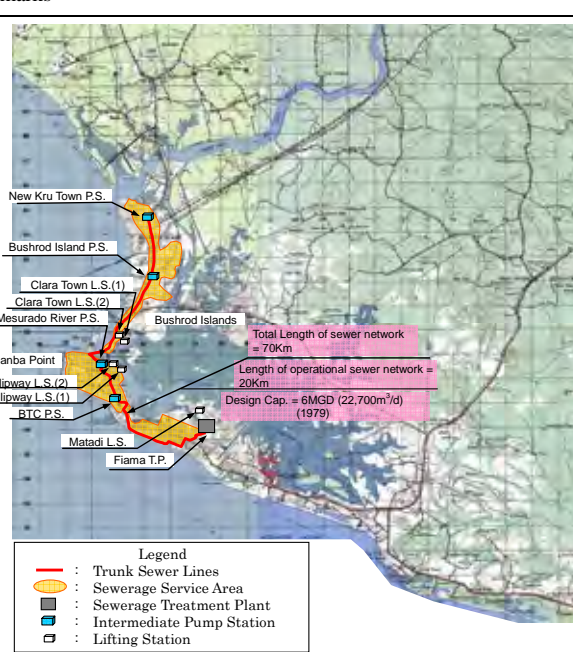
## Project Profile

| <b>Project No. and Project Name: WS-7 Technical Cooperation Project of Non-Revenue Water (TCPNR)</b>  |  |      |      |      |      |      |      |      |      |      |      |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
|---|--|------|------|------|------|------|------|------|------|------|------|------|-------|-----|-----|-----|------|------|------|-----|-----|-----|-----|-----|--|
| <b>Background of the Project</b><br>LWSC has faced serious problems on large amount of non-revenue water which has been caused by leakage on the existing pipelines of the White Plains water supply system, defection on water tariff system, faulty meters, etc. Hence, that the rate of revenue water in 2008 was extremely at low level of about 19%.<br>Through Monrovia Water and Sewer Rehabilitation Program (WSRP) which is currently being conducted by the fund of WB., AfDB and other donors, water leakage is expected to reduce. In addition, water tariff system is inadequate for sustaining financial management, as there are no water meters and/or even if there are water meters, they are inoperative. Therefore, non-revenue water is assumed to come from the gap between flat water rate and actual water consumption as well as water leakage. In order to sustain sound management of LWSC, countermeasures such as leakage detection, improving water tariff system, etc. are required for non-revenue water reduction.   | <b>Effects of the Project</b><br>a) Target Beneficiaries : <ul style="list-style-type: none"> <li>• About 1.5million inhabitants (for the target year of 2019) in Greater Monrovia</li> </ul> b) Effects of the Project : <ul style="list-style-type: none"> <li>• Reduction of water-borne disease</li> <li>• Improvement of quality of life</li> <li>• Sound management of LWSC</li> <li>• Contribution for formulating the future water supply rehabilitation plan</li> </ul> |      |      |      |      |      |      |      |      |      |      |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>• To raise the living standard of the residents.</li> <li>• To improve environmental hygiene of residents.</li> <li>• To enhance capabilities of operation &amp; maintenance in responsible organization</li> </ul>   | <b>Evaluation of the Project</b><br>Economic Viability: <ul style="list-style-type: none"> <li>• Although no economic analysis is done, it is expected to improve the groundwater system for citizens and environmental hygiene.</li> </ul> Financial Soundness: <ul style="list-style-type: none"> <li>• Necessary budget allocation</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>• Greater Monrovia</li> </ul>   | <b>External Conditions</b> <ul style="list-style-type: none"> <li>• LWSC has fundamental capability for operating and maintaining water supply system.</li> <li>•</li> </ul>   |      |      |      |      |      |      |      |      |      |      |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
| <b>Scope of the Project</b><br>The project includes the following items : <ul style="list-style-type: none"> <li>• Analysis of current situation such as water production, distribution water, non-revenue water</li> <li>• Verification on location of the existing network pipelines</li> <li>• Select pilot project.</li> <li>• Digitize network pipelines in pilot plot project area using GIS software.</li> <li>• Site reconnaissance for checking network pipelines.</li> <li>• Check installation condition of the existing water meters in pilot project area.</li> <li>• Check the minimum water flow at night in pilot project area.</li> <li>• Carry out leakage detection in pilot project area</li> <li>• Repair leakage points in pilot project area.</li> <li>• Check minimum water flow at night in pilot project area after repair of leakage points.</li> <li>• Improve water tariff system</li> </ul>   | <b>Preconditions</b> <ul style="list-style-type: none"> <li>• Staff of the technical, operation and finance division of LWSC is required to be involved in the project.</li> <li>• Good peace and order is maintained.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>• Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> </ul>   | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>• After completion of Monrovia Water and Sanitation Rehabilitation Program (WSRP), it is important for LWSC to examine the effect of the rehabilitation program through this project.</li> <li>• As the results of examination, some problems have to be issued and taken into consideration for making the future water supply improvement plan</li> </ul>                                       |      |      |      |      |      |      |      |      |      |      |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>• Technical cooperation for non-revenue reduction program, leakage detection ,management of water production and distribution water: USD 0.60 mil.</li> <li>• Equipments such as ultrasonic flow meter, ground detector, leakage detector, etc and operating expenses: USD 0.90 mln.</li> <li>• Total Cost : USD 1.50 mln.</li> </ul>  | <b>Remarks</b>   |      |      |      |      |      |      |      |      |      |      |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
| <b>Implementation Schedule</b><br><table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="font-size: small;">Project</th> <th style="font-size: small;">2009</th> <th style="font-size: small;">2010</th> <th style="font-size: small;">2011</th> <th style="font-size: small;">2012</th> <th style="font-size: small;">2013</th> <th style="font-size: small;">2014</th> <th style="font-size: small;">2015</th> <th style="font-size: small;">2016</th> <th style="font-size: small;">2017</th> <th style="font-size: small;">2018</th> <th style="font-size: small;">2019</th> </tr> </thead> <tbody> <tr> <td style="font-size: small;">TCPNR</td> <td style="font-size: small;">---</td> <td style="font-size: small;">---</td> <td style="font-size: small;">---</td> <td style="font-size: small;">0.50</td> <td style="font-size: small;">0.50</td> <td style="font-size: small;">0.50</td> <td style="font-size: small;">---</td> <td style="font-size: small;">---</td> <td style="font-size: small;">---</td> <td style="font-size: small;">---</td> <td style="font-size: small;">---</td> </tr> </tbody> </table> Unit: mln USD | Project  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | TCPNR | --- | --- | --- | 0.50 | 0.50 | 0.50 | --- | --- | --- | --- | --- |  |
| Project   | 2009   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |       |     |     |     |      |      |      |     |     |     |     |     |  |
| TCPNR   | ---  | ---  | ---  | 0.50 | 0.50 | 0.50 | ---  | ---  | ---  | ---  | ---  |      |       |     |     |     |      |      |      |     |     |     |     |     |  |

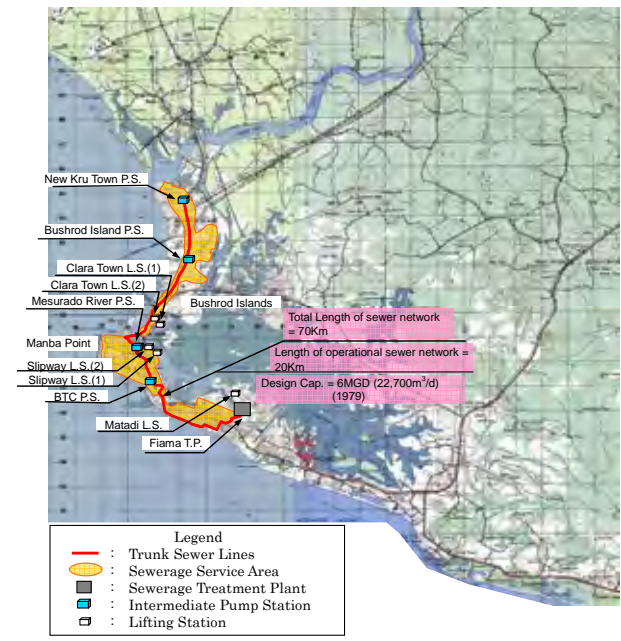
### **9.3.3 Sanitation Sector**

| Sector     | Project No. | Project Name   |
|------------|-------------|--|
| Sanitation | SN-1        | Monrovia Water and Sanitation Rehabilitation Program (WSRP)  |
|            | SN-2        | Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations |
|            | SN-3        | Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan for 2014  |
|            | SN-4        | Project for Reconstruction of Sewerage Treatment & Sludge Treatment Plant                          |
|            | SN-5        | Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan for 2019  |


## Project Profile

| Project No. and Project Name: SN-1 Monrovia Water and Sanitation Rehabilitation Program (WSRP)   |   |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
|--|---|------|------|------|------|------|------|------|------|--|--|--|--|--|--|--|--|------|------|------|--|--|--|--|--|
| <b>Background of the Project</b><br><p>The existing sewerage treatment plant with sludge lagoon constructed in 1979 is located in the wetland in the southern part of Greater Monrovia. Not only wastewater of households which is connected to sewer system, but also night soil drawn by vacuum tracks from other households that cannot use sewer system has been discharged into the sewerage treatment plant. However, the operation of sewerage treatment plant has been suspended for a long period and the wastewater and night soil have flown into the stabilization pond without any treatment. The channel for discharging night soil is small hand trench which is dug in cultivation land. The content of rehabilitation work, in order to facilitate a disposal of night soil discharged from vacuum tracks is restoration for the inlet of the stabilization pond of 26,000m<sup>2</sup> as immediate rehabilitation of the sewerage plant.</p> <p>In addition, the rehabilitation programs are composed of construction of 11 public toilets, rehabilitation of 30 existing public toilets, procurements of maintenance equipments such as vacuum tracks and jet cleaning vehicles.</p> | <b>Effects of the Project</b><br><p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 280,000 inhabitants in Busrod Islands, Central Monrovia</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of the quality of life</li> <li>Promotion of work activities</li> </ul> <p><b>Evaluation of the Project</b></p> <p><b>Economic Viability:</b></p> <ul style="list-style-type: none"> <li>NPV : USD 90.0 mln</li> <li>B/C : 2.51</li> <li>EIRR : 36.0%</li> </ul> <p><b>Financial Soundness:</b></p> <ul style="list-style-type: none"> <li>Committed by WB, EU, DIFID, AfDB</li> </ul> <p><b>Environmental Impact:</b></p> <ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve the hygiene service and living standard</li> <li>Negative Impacts<br/>Specific negative impact is not found</li> </ul> <p><b>External Conditions</b></p> <ul style="list-style-type: none"> <li>LWSC have sufficient capabilities for operating and maintaining the sewerage treatment system</li> </ul> |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | <b>Preconditions</b> <ul style="list-style-type: none"> <li>O&amp;M cost of the sewerage treatment system shall be covered by beneficiaries.</li> </ul>   |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>Central Monrovia</li> </ul>  | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>There are five (5) projects for sewerage and sanitary system for Greater Monrovia. This project is one of them for the year of 2011.</li> </ul>  |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
| <b>Scope of the Project</b><br><p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Construction of receptacle for septage</li> <li>Rehabilitation of screen channel with use of new pipe connection to link facultative pond</li> <li>Rehabilitation of ponds for sewage and septage</li> <li>Interconnection pipe work</li> </ul>  | <b>Remarks</b><br>  |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> <li>Operation: LWSC</li> <li>Maintenance: LWSC</li> </ul>  |   |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>Implementation/Construction Cost (including design, construction supervision cost) : USD 2.9 mln.</li> <li>Total Cost : USD 2.9 mln.</li> </ul>   |   |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
| <b>Implementation Schedule</b> <table border="1"> <thead> <tr> <th>Project</th> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> </tr> </thead> <tbody> <tr> <td>NO.1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>0.96</td> <td>0.96</td> <td>0.98</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Unit: mln USD</p>  | Project   | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | NO.1 |  |  |  |  |  |  |  |  | 0.96 | 0.96 | 0.98 |  |  |  |  |  |
| Project  | 2009  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
| NO.1   |   |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |
|  | 0.96  | 0.96 | 0.98 |      |      |      |      |      |      |  |  |  |  |  |  |  |  |      |      |      |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: SN-2 Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations   |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
|---|--|------|------|------|------|------|------|------|------|-----|-----|-----|--|--|--|--|--|
| Background of the Project   | Effects of the Project   |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| <p>The existing sewerage facilities were constructed in the 1950s and late 1960s. The sewer pipes were mainly laid in Bushrod Islands (New Kru Town, Logan Town, Clara Town), Central Monrovia, Sinkor and Old Road.</p> <p>Sewage generated from each area was transmitted through 4 pump stations of the New Kru Town (Duala) pump station, the Bushrod Island (Sayon Town ) pump station (Sayon town pump station), Mesurado River pump station and BTC pump station, and finally treated in the Fiama sewerage treatment plant (Design Capacity: 6MGD/day) located at Sinkor.</p> <p>However, most of the pump stations in the sewerage system have been seriously damaged and are not operative at present, because the pumps in four intermediate pump stations as mentioned above were stolen during the civil conflict. Then, most of the sewer pipes are blocked with sludge and debris.</p> <p>Accordingly, rehabilitation of the existing sewerage facilities such as 4 pump stations including 5 small size lifting stations and also de-sludge and cleaning the clogged pipelines is urgently required. SIU of MPW and LWSC commenced a study with the fund of WB to analyze the situations mentioned above.</p> | <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 280,000 inhabitants in Paynesville zone</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of quality of life</li> <li>Promotion of work activities</li> </ul>   |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
|   | Evaluation of the Project  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
|   | <p>Economic Viability:</p> <ul style="list-style-type: none"> <li>NPV : USD 10.3 mln</li> <li>B/C : 2.53</li> <li>EIRR : 28.4%</li> </ul> <p>Financial Soundness:</p> <ul style="list-style-type: none"> <li>Committed by WB</li> </ul> <p>Environmental Impact:</p> <ul style="list-style-type: none"> <li>Positive Impacts                     <ul style="list-style-type: none"> <li>Improve hygiene service and living standard</li> </ul> </li> <li>Negative Impacts                     <ul style="list-style-type: none"> <li>Possible resettlement at pumping stations where illegally occupied by vendors and kiosks</li> </ul> </li> </ul> |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
|   | External Conditions  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
|   | <ul style="list-style-type: none"> <li>LWSC have sufficient capabilities for operating and maintaining the sewerage treatment system</li> </ul>  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
|   | Preconditions  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
|   | <ul style="list-style-type: none"> <li>O&amp;M cost of the sewerage facilities shall be covered by beneficiaries.</li> </ul>   |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| Objectives of the Project   | Relationship with other projects   |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | <ul style="list-style-type: none"> <li>There are five (5) projects for sewerage and sanitary system for Greater Monrovia. This project is one of them for the year of 2011.</li> </ul>   |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| Location of the Project   | Remarks  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Paynesville Zone</li> </ul>  |    |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| Scope of the Project  |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| <p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>De-sludge, cleaning and rehabilitation of the existing clogged pipeline in Bushrod Islands (New Kru Town, Logan Town), Central Monrovia, Sinkor and Old Road areas.</li> <li>Rehabilitation of 4 pump stations of the New Kru Town (Duala) pump station, the Bushrod Island (Sayon Town ) pump station (Sayon town pump station), Mesurado River pump station and BTC pump station including 5 small lifting stations.</li> </ul>  |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| Agencies Responsible  |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> <li>Operation: Communities to be served</li> <li>Maintenance: LWSC and communities to be served</li> </ul>  |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| Estimated Cost  |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Implementation/Construction Cost (including design, construction supervision cost) : USD 4.1 mln.</li> <li>Contingency: USD 0.7 mln.</li> <li>Total Cost : USD 4.8 mln.</li> </ul>   |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| Implementation Schedule   |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th>Project</th> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> </tr> </thead> <tbody> <tr> <td>NO.2</td> <td>0.8</td> <td>2.0</td> <td>2.0</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>   | Project  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | NO.2 | 0.8 | 2.0 | 2.0 |  |  |  |  |  |
| Project   | 2009   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |      |      |     |     |     |  |  |  |  |  |
| NO.2  | 0.8  | 2.0  | 2.0  |      |      |      |      |      |      |     |     |     |  |  |  |  |  |
| Unit: mln USD   |  |      |      |      |      |      |      |      |      |     |     |     |  |  |  |  |  |

## Project Profile


| <b>Project No. and Project Name: SN-3 Community Sanitary System and Public Toilet Installation &amp; Vacuum Truck Procurement Plan for 2014</b>  |   |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
|--|---|------|------|------|------|------|------|------|------|-----|-----|------|------|------|------|-----|--|
| <b>Background of the Project</b><br><p>Current severe problems are observed in congested low-standard housing areas in Bushrod Islands and Central Monrovia to Sinkor. Most of these areas have no access to the sewer network and their means of service is limited to pit latrines or no facilities. During the wet seasons, the latrines are mostly flooded and cannot be used.</p> <p>The majority of residents in high density areas does not have access to facilities at all and are forced to waste by open defecation in the field and riverbed surrounding their houses due to the lack of public toilets.</p> <p>Most of the low-density areas are served by septic tanks. This system is an adequate solution for the wastewater disposal in areas with low population density and was found to operate effectively.</p> <p>Therefore, mostly in the areas where it is difficult to have private toilet, more public toilets shall be installed and also community sanitation system shall be installed in the area where are provided with private toilet in community.</p> <p>Accordingly, provision of vacuum trucks to transfer night soil and sludge generated from public toilets and community sanitation system to the sludge treatment plant is urgently required.</p> <p>This Project is planned to provide necessary public toilets, community sanitation systems and vacuum trucks urgently for the target year of 2014 for Greater Monrovia including the areas surrounding Bushrod Islands and Central Monrovia to Sinkor area to cover approx. 50% of population with sanitation in Greater Monrovia.</p> | <b>Effects of the Project</b><br><p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 270,000 inhabitants in Greater Monrovia</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of the quality of life</li> <li>Promotion of work activities</li> </ul>   |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
|  | <b>Evaluation of the Project</b><br><p><b>Economic Viability:</b></p> <ul style="list-style-type: none"> <li>Although no economic analysis is done, it is expected to improve the sewerage system for citizens and environmental hygiene.</li> </ul> <p><b>Financial Soundness:</b></p> <ul style="list-style-type: none"> <li>Necessary budget allocation</li> </ul> <p><b>Environmental Impact: Category C</b></p> <ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve hygiene service and living standard</li> <li>Negative Impacts<br/>Specific negative impact is not found</li> </ul> |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
|  | <b>External Conditions</b><br><ul style="list-style-type: none"> <li>Responsible organizations such as LWSC and Committees of served communities have sufficient capabilities for operating and maintaining sanitary systems.</li> </ul>  |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
|  | <b>Preconditions</b><br><p>O&amp;M cost of the sanitary systems shall be covered by beneficiaries.</p>  |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>There are five (5) projects for sewerage and sanitary system for Greater Monrovia. This project is one of them for the year of 2014.</li> </ul>  |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>Greater Monrovia</li> </ul>  | <b>Remarks</b><br><p>General Layout of Proposed System in Greater Monrovia</p>  |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
| <b>Scope of the Project</b><br><p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Construction of 66 Community Sanitary Systems (One Community size: approx. 3,000 houses)</li> <li>Construction of 225 public toilets (One toilets size: 8 seats)</li> <li>Provision of 8 vacuum trucks ( Capacity of one vehicle: approx. 7m<sup>3</sup>)</li> </ul>   |   |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li><b>Project Implementation:</b> Liberia Water and Sanitation Corporation (LWSC)</li> <li><b>Operation:</b> Communities to be served</li> <li><b>Maintenance:</b> LWSC and Communities to be served</li> </ul>  |   |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li><b>Implementation/Construction Cost</b> (including design, construction supervision cost) : USD 18.1 mln.</li> <li><b>Contingency:</b> USD 3.3 mln.</li> <li><b>Total Cost :</b> USD 21.4 mln.</li> </ul>   |   |      |      |      |      |      |      |      |      |     |     |      |      |      |      |     |  |
| <b>Implementation Schedule</b> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Project</th> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> </tr> </thead> <tbody> <tr> <td>NO.3</td> <td>---</td> <td>---</td> <td>5.35</td> <td>5.35</td> <td>5.35</td> <td>5.35</td> <td>---</td> </tr> </tbody> </table> <p>Unit: mln USD</p>   | Project   | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | NO.3 | --- | --- | 5.35 | 5.35 | 5.35 | 5.35 | --- |  |
| Project  | 2009  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |      |      |     |     |      |      |      |      |     |  |
| NO.3   | ---   | ---  | 5.35 | 5.35 | 5.35 | 5.35 | ---  |      |      |     |     |      |      |      |      |     |  |



## Project Profile

| Project No. and Project Name: SN-4 Project for Reconstruction of Sewerage Treatment & Sludge Treatment Plant   |   |       |       |       |       |       |      |      |     |       |       |       |       |       |  |
|--|---|-------|-------|-------|-------|-------|------|------|-----|-------|-------|-------|-------|-------|--|
| <p><b>Background of the Project</b></p> <p>The existing sewerage treatment plant with sludge lagoon constructed in 1979 is located in the wetland in the southern part of Greater Monrovia. Not only wastewater of households which is connected to sewer system, but also night soil drawn by vacuum trucks from other households that cannot use sewer system has been discharged into the sewerage treatment plant. However, the operation of sewerage treatment plant has been suspended for a long period and the wastewater and night soil have flown into the stabilization pond without any treatment.</p> <p>Therefore, rehabilitation of the existing sewerage facilities including pipelines, pump stations and sewerage treatment plant for Central Monrovia areas is urgently required.</p> <p>The rehabilitation of sewerage pipelines and pump stations in Bushrod islands and Central Monrovia to Sinkor area to recover the condition of pre-war are planned by WB as shown in Project File No.2 mentioned above.</p> <p>On the other hand, sludge and night soil generated from the Community Sanitary Systems and the public toilets in Greater Monrovia which are planned as mentioned in Project File No.3 and No.5 shall be urgently treated.</p> <p>Accordingly, construction of the sewerage and sludge treatment plants is urgently required.</p> | <p><b>Effects of the Project</b></p> <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 910,000 inhabitants in Greater Monrovia</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of the quality of life</li> <li>Promotion of work activities</li> </ul> <p><b>Evaluation of the Project</b></p> <p><b>Economic Viability:</b></p> <ul style="list-style-type: none"> <li>NPV : USD 17.1 mln</li> <li>B/C : 0.72</li> <li>EIRR : 6.4%</li> </ul> <p><b>Financial Soundness:</b></p> <ul style="list-style-type: none"> <li>Necessary budget allocation</li> </ul> <p><b>Environmental Impact: Category A</b></p> <ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve the hygiene service and living standard</li> <li>Negative Impacts<br/>Possible resettlement of commune locating within Fiamsa treatment plant<br/>Possible negative impact to Mesurado Wetland</li> </ul> <p><b>External Conditions</b></p> <ul style="list-style-type: none"> <li>Responsible organization LWSC has sufficient capabilities for operating and maintaining treatment plants.</li> </ul> |       |       |       |       |       |      |      |     |       |       |       |       |       |  |
| <p><b>Objectives of the Project</b></p> <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>   |   |       |       |       |       |       |      |      |     |       |       |       |       |       |  |
| <p><b>Location of the Project</b></p> <ul style="list-style-type: none"> <li>Greater Monrovia</li> </ul>   |   |       |       |       |       |       |      |      |     |       |       |       |       |       |  |
| <p><b>Scope of the Project</b></p> <p>The project includes the following items :</p> <ol style="list-style-type: none"> <li>Reconstruction of the sewerage treatment plant <ul style="list-style-type: none"> <li>Capacity of 6 MG/day (22,700m<sup>3</sup>/day) lagoon type treatment system to recover the condition of pre-war level taking into consideration that the existing sound underground pipelines will be left as it is without increasing pipe size after rehabilitation, de-sludge and cleaning.</li> </ul> </li> <li>Construction of sludge treatment plant <ul style="list-style-type: none"> <li>Capacity of 230m<sup>3</sup>/day sludge treatment plant shall be planned to treat sludge generated from Community Sanitary Systems and Public Toilets.</li> </ul> </li> </ol> <p>Both sewerage and sludge treatment plants will be constructed in the area for Fiamsa sewerage treatment plant.</p>  | <p><b>Preconditions</b></p> <ul style="list-style-type: none"> <li>O&amp;M cost of the treatment plants shall be covered by beneficiaries.</li> <li>Land use in Fiamsa sewerage treatment plant is required.</li> </ul> <p><b>Relationship with other projects</b></p> <ul style="list-style-type: none"> <li>There are five (5) projects for sewerage and sanitary system for Greater Monrovia. This project is one of them for the year of 2019.</li> </ul>   |       |       |       |       |       |      |      |     |       |       |       |       |       |  |
| <p><b>Agencies Responsible</b></p> <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> <li>Operation: LWSC</li> <li>Maintenance: LWSC</li> </ul>   |   |       |       |       |       |       |      |      |     |       |       |       |       |       |  |
| <p><b>Estimated Cost</b></p> <ul style="list-style-type: none"> <li>Implementation/Construction Cost (including design, construction supervision cost) : USD 63 mln.</li> <li>Contingency: USD 11.3 mln.</li> <li>Total Cost : USD 74.2 mln.</li> </ul>  |   |       |       |       |       |       |      |      |     |       |       |       |       |       |  |
| <p><b>Implementation Schedule</b></p> <table border="1"> <thead> <tr> <th>Project</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>NO.4</td> <td>---</td> <td>14.84</td> <td>14.84</td> <td>14.84</td> <td>14.84</td> <td>14.84</td> </tr> </tbody> </table> <p>Unit: mln USD</p>  | Project   | 2014  | 2015  | 2016  | 2017  | 2018  | 2019 | NO.4 | --- | 14.84 | 14.84 | 14.84 | 14.84 | 14.84 | <p><b>Treatment Process of Sludge and Sewage</b></p> |
| Project  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  |      |      |     |       |       |       |       |       |  |
| NO.4   | ---   | 14.84 | 14.84 | 14.84 | 14.84 | 14.84 |      |      |     |       |       |       |       |       |  |


## Project Profile

| Project No. and Project Name: SN-5 Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan for 2019   |  |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
|--|--|--|------|------|------|------|------|------|--|------|------|------|------|------|--|
| Background of the Project  | Effects of the Project   |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| <p>This Project has a close relation to No.3 Project mentioned above.</p> <p>This Project is planned to provide the necessary public toilets, community sanitation systems and vacuum trucks for the target year of 2019 for Greater Monrovia including the areas surrounding Central Monrovia and Bushrod islands to cover approx. 80% of population with sanitation in Greater Monrovia.</p> | <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 590,000 inhabitants in Greater Monrovia</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of water-borne disease</li> <li>Improvement of the quality of life</li> <li>Promotion of work activities</li> </ul> |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
|  | <p>Objectives of the Project</p> <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | <p>Evaluation of the Project</p> <p>Economic Viability:</p> <ul style="list-style-type: none"> <li>Although no economic analysis is done, it is expected to improve the sewerage system for citizens and environmental hygiene.</li> </ul> <p>Financial Soundness:</p> <ul style="list-style-type: none"> <li>Necessary budget allocation</li> </ul> <p>Environmental Impact: <b>Category C</b></p> <ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve the hygiene service and living standard</li> <li>Negative Impacts<br/>Specific negative impact is not found</li> </ul> |      |      |      |      |      |      |  |      |      |      |      |      |  |
| Location of the Project  | External Conditions  |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| <ul style="list-style-type: none"> <li>Greater Monrovia</li> </ul>   | <ul style="list-style-type: none"> <li>Responsible organizations such as LWSC and Committees of served communities have sufficient capabilities for operating and maintaining sanitary systems.</li> </ul>   |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| Scope of the Project   | Preconditions  |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| <p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Construction of 93 Community Sanitary Systems (One Community size: approx. 3,000 houses)</li> <li>Construction of 86 public toilets (One toilets size: 8 seats)</li> <li>Provision of 7 vacuum trucks ( Capacity of one vehicle: approx. 7m<sup>3</sup>)</li> </ul>                                   | <p>O&amp;M cost of the sanitary systems shall be covered by beneficiaries.</p>   |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| Agencies Responsible   | Relationship with other projects   |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| <ul style="list-style-type: none"> <li>Project Implementation: Liberia Water and Sanitation Corporation (LWSC)</li> <li>Operation: Communities to be served</li> <li>Maintenance: LWSC and Communities to be served</li> </ul>   | <ul style="list-style-type: none"> <li>There are five (5) projects for sewerage and sanitary system for Greater Monrovia. This project is one of them for the year of 2019.</li> </ul>   |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| Estimated Cost   | Remarks  |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| <ul style="list-style-type: none"> <li>Implementation/Construction Cost (including design, construction supervision cost) : USD 22.5 mln.</li> <li>Contingency: USD 4.1 mln.</li> <li>Total Cost : USD 26.6 mln.</li> </ul>  | <p>General Layout of Proposed System in Greater Monrovia</p>   |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| Implementation Schedule  |  |  |      |      |      |      |      |      |  |      |      |      |      |      |  |
| <table border="1"> <thead> <tr> <th>Project</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>NO.5</td> <td></td> <td>5.32</td> <td>5.32</td> <td>5.32</td> <td>5.32</td> <td>5.32</td> </tr> </tbody> </table> <p>Unit: mln USD</p>  | Project  | 2014   | 2015 | 2016 | 2017 | 2018 | 2019 | NO.5 |  | 5.32 | 5.32 | 5.32 | 5.32 | 5.32 |  |
| Project  | 2014   | 2015   | 2016 | 2017 | 2018 | 2019 |      |      |  |      |      |      |      |      |  |
| NO.5   |  | 5.32   | 5.32 | 5.32 | 5.32 | 5.32 |      |      |  |      |      |      |      |      |  |


### **9.3.4 Storm Water Drainage Sector**

| Sector                  | Project No. | Project Name   |
|-------------------------|-------------|--|
| Storm Water<br>Drainage | SW-1        | Improvement of Drainage System of Core Area                  |
|                         | SW-2        | Equipment Supply of Drainage Pipes Cleaning                  |
|                         | SW-3        | Establishment of Operation and Maintenance Management System |


## Project Profile

| Project No. and Project Name: SW-1 Improvement of Drainage System in Monrovia Core Area  |   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
|--|---|------|------|------|------|------|------|------|------|------|------|--|--|--|--|--|--|--|--|--|--|--|
| Background of the Project  | Effects of the Project  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| The storm water drainage system in Monrovia was constructed in the period 1955 to 1957. The immigrants moved into the empty spaces in town, building their houses without considering the natural drainage pattern. Along the Mesurado River and its southern branches, the houses have been built up even in the very low-lying areas which have always been subjected to inundation. During the civil conflict, the drainage structures almost has damaged and lost its drainage function. The Emergency Rehabilitation Programme is implemented by World Bank, and some rehabilitation of drainage structures is still ongoing. For the acceleration of restoration, additional improvement of drainage system in Monrovia Core Area (Bushrod Island, Central Monrovia, Sinkor, Lakpazee and Old Road zones) is required for the development economic activity of Capital Monrovia. | a) Target Beneficiaries :<br>• About 430,000 inhabitants in Monrovia Core Area<br><br>b) Effects of the Project :<br>• Development of capital function of Greater Monrovia<br>• Improvement of the quality of life<br>• Promotion of work activities  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Objectives of the Project  | Evaluation of the Project   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>To accelerate economic activity in Monrovia Core Area</li> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> </ul>  | Economic Viability:<br>• Although no economic analysis is done, it is expected to improve the drainage system for citizens and environmental hygiene.<br><br>Financial Soundness:<br>• Necessary the budget allocation<br><br>Environmental Impact: <b>Category C</b><br>• Positive Impacts<br>Improve the hygiene service and living standard<br>• Negative Impacts<br>Specific negative impact is not found |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Location of the Project  | External Conditions   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Monrovia Core Area (Bushrod Island, Central Monrovia, Sinkor, Lakpazee, Old Road)</li> </ul>  | •   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Scope of the Project   | Preconditions   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| The project includes the following items :<br><ul style="list-style-type: none"> <li>Cleaning and replace/repair of drainage pipes</li> <li>Furnishing of locally made inlet grating</li> <li>Cleaning and repair of manholes</li> <li>Replacement of concrete manhole cover</li> <li>Concrete lining of existing open channels</li> <li>Construction of concrete channels</li> </ul>  | <ul style="list-style-type: none"> <li>Operation Bureau, MPW is only drainage structures management authority in Monrovia.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Agencies Responsible   | Relationship with other projects  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Project Implementation: Ministry of Public Works (MPW)</li> <li>Operation: MPW</li> <li>Maintenance: MPW</li> </ul>   | <ul style="list-style-type: none"> <li>Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations, including drainage improvement is ongoing. The proposed project is supplementary to solve the inundation.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Estimated Cost   | Remarks   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Construction Cost USD 8.7 mln.</li> <li>Others (Administration, ES, Contingency etc) USD 3.6 mln.</li> <li>Total Cost USD 12.3 mln.</li> </ul>  |  <p>----- : Project Area</p>  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Implementation Schedule  |   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>  | 2009  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |  |  |  |  |  |  |  |  |  |  |  |
| 2009   | 2010  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |  |  |  |  |  |  |  |  |  |  |  |
|  |   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: SW-2 Equipment Supply of Drainage Pipes Cleaning  |   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
|---|---|------|------|------|------|------|------|------|------|------|------|--|--|--|--|--|--|--|--|--|--|--|
| Background of the Project   | Effects of the Project  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| In Monrovia Core Area, there are approximately 27 km underground pipes. After the civil conflict, the maintenance work of the pipes has not been sustained. In result, there are many blockages and damages in the underground pipes and manholes. During the rainy season, the drainage water flowing on the road surface by the blockage of the drain structures causes degradation of living environment for the inhabitants and breaching of the city road pavement. In addition, the commercial activity of the Core Area has been disturbed due to lack of drainage around the commercial buildings. For the keeping original function of the piped drainage, the equipment supply of drainage pipes cleaning is primary required. The capacity building of operation and maintenance activity is strengthened to the staff of MPW through the Project. | <p>a) Target Beneficiaries :</p> <ul style="list-style-type: none"> <li>About 160,000 inhabitants in Monrovia Core Area</li> </ul> <p>b) Effects of the Project :</p> <ul style="list-style-type: none"> <li>Reduction of inundation</li> <li>Improvement of the quality of life</li> <li>Promotion of commercial activity</li> </ul>   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Objectives of the Project   | Evaluation of the Project   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> <li>To strengthen the capacity building of operation and maintenance.</li> </ul>   | <p>Economic Viability:</p> <ul style="list-style-type: none"> <li>Although no economic analysis is done, it is expected to improve the drainage system for citizens and environmental hygiene.</li> </ul> <p>Financial Soundness:</p> <ul style="list-style-type: none"> <li>Necessary the budget allocation</li> </ul> <p>Environmental Impact: <b>Category C</b></p> <ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve the hygiene service and living standard</li> <li>Negative Impacts<br/>Specific negative impact is not found</li> </ul> |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Location of the Project   | External Conditions   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Monrovia Core Area (Bushrod Island, Central Monrovia, Sinkor, Lakpazee, Old Road) Zone</li> </ul>  | <ul style="list-style-type: none"> <li>Responsible organizations such as LWSC and water committees of served communities have sufficient capabilities for operating and maintaining water supply system.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Scope of the Project  | Preconditions   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <p>The project includes the following items :</p> <ul style="list-style-type: none"> <li>Procurement of equipment for drainage cleaning and others<br/>4 tons water jet cleaner :219L/min x 19.6 Mpa (1 unit)<br/>4 tons vacuum cleaner (lift type) :21 m<sup>3</sup>/min x 97 Kpa (1 unit)<br/>4 tons water tank :4.5 m<sup>3</sup>, Hauling Dump Truck, 4 tons Truck, and others (generator, pump)</li> <li>Preparation of drainage pipes cleanings plan</li> <li>Training of equipment operation</li> </ul>  | <ul style="list-style-type: none"> <li>Equipment operator shall be prepared by MPW.</li> <li>The space of garage and parking with roof shall be prepared by MPW.</li> <li>Fuel cost shall be fully supplied by MPW.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Agencies Responsible  | Relationship with other projects  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Project Implementation: Ministry of Public Works (MPW)</li> <li>Operation: MPW</li> <li>Maintenance: MPW</li> </ul>  | <ul style="list-style-type: none"> <li>Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations under WB, including drainage improvement is ongoing. The proposed project is out of the scope of WB project.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Estimated Cost  | Remarks   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Procurement of Equipment USD 0.9 mln.</li> <li>Others (Administration, ES, Contingency etc) USD 0.4 mln.</li> <li>Total USD 1.3 mln.</li> </ul>  |  <p>Project area</p>  |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| Implementation Schedule   |   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th>2009</th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>   | 2009  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |  |  |  |  |  |  |  |  |  |  |  |
| 2009  | 2010  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |  |  |  |  |  |  |  |  |  |  |  |
|   |   |      |      |      |      |      |      |      |      |      |      |  |  |  |  |  |  |  |  |  |  |  |

## Project Profile

| Project No. and Project Name: SW-3 Establishment of Operation and Maintenance Management System  |  |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
|--|--|------|------|------|------|------|------|------|------|------|------|--|--|---|---|--|--|--|--|--|--|--|------|------|------|------|------|------|------|------|------|------|------|--|--|---|---|--|--|--|--|--|--|--|------|------|------|------|------|------|------|------|------|------|------|--|--|---|---|---|---|--|--|--|--|--|--|
| <b>Background of the Project</b><br>Primary function of the drainage is to flow the storm water in the rainy season. However, some blocking and drained water stagnation in the channel by the sludge and debris often can be seen in Soniwein River and it makes poor hygiene for living environment of the inhabitants. The cleanings of the channel or demolish of the solid waste shall be required before the rainy season starting.<br><br>Generally, operation and maintenance work on a routine basis shall be done to achieve the objectives of drainage system through fulfilling of functions of drainage facilities such as drainage channel, underground drainage pipes, manholes and culverts.<br><br>To perform the operation and maintenance work, the technical cooperation programme to strengthen the capacity of the organization of Operation Bureau, MPW shall be required.  | <b>Effects of the Project</b><br>a) Target Beneficiaries :<br><ul style="list-style-type: none"> <li>About 430,000 inhabitants in Monrovia Core Area</li> </ul> b) Effects of the Project :<br><ul style="list-style-type: none"> <li>Reduction of inundation</li> <li>Improvement of the quality of life</li> <li>Promotion of work activities</li> </ul>   |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| <b>Objectives of the Project</b><br><ul style="list-style-type: none"> <li>To raise the living standard of the residents.</li> <li>To improve environmental hygiene of residents.</li> <li>To reduce the inundation</li> </ul>   | <b>Evaluation of the Project</b><br>Economic Viability:<br><ul style="list-style-type: none"> <li>Although no economic analysis is done, it is expected to improve the drainage system for citizens and environmental hygiene.</li> </ul> Financial Soundness:<br><ul style="list-style-type: none"> <li>Necessary the budget allocation</li> </ul> Environmental Impact<br><ul style="list-style-type: none"> <li>Positive Impacts<br/>Improve the hygiene service and living standard</li> <li>Negative Impacts<br/>Specific negative impact is not found</li> </ul> |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| <b>Location of the Project</b><br><ul style="list-style-type: none"> <li>Monrovia Core Area<br/>(Bushrod Island, Central Monrovia, Sinkor, Lakpazee, Old Road)</li> </ul>  | <b>External Conditions</b><br>   |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>The project includes the following items :<br><ul style="list-style-type: none"> <li>Preparation of operation and maintenance manual and guidance</li> <li>Preparation of drainage structures inventory</li> <li>Preparation of recording on maintenance work</li> <li>Plan preparation of public relations activities</li> </ul>   | <b>Preconditions</b><br><ul style="list-style-type: none"> <li>Operation Bureau, MPW has the fully responsibility of operation and maintenance activity for the drainage structures in Monrovia.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| <b>Agencies Responsible</b><br><ul style="list-style-type: none"> <li>Project Implementation: Ministry of Public Works (MPW)</li> <li>Operation: MPW</li> <li>Maintenance: MPW</li> </ul>  | <b>Relationship with other projects</b><br><ul style="list-style-type: none"> <li>Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations under WB, including drainage improvement is ongoing. The proposed project is out of the scope of WB project.</li> </ul>   |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| <b>Estimated Cost</b><br><ul style="list-style-type: none"> <li>Personal Cost USD 0.2 mln.</li> <li>Others (Per diem, etc) USD 0.08 mln.</li> <li>Total USD 0.28 mln.</li> </ul>   | <b>Remarks</b><br> <p>Project area</p>   |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| <b>Implementation Schedule</b><br><table border="1" style="width: 100%; text-align: center;"> <tr> <th>2009</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th><th>2019</th> </tr> <tr> <td></td><td></td><td>■</td><td>■</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>2009</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th><th>2019</th> </tr> <tr> <td></td><td></td><td>■</td><td>■</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>2009</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th><th>2019</th> </tr> <tr> <td></td><td></td><td>■</td><td>■</td><td>■</td><td>■</td><td></td><td></td><td></td><td></td><td></td> </tr> </table> | 2009   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |  |  | ■ | ■ |  |  |  |  |  |  |  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |  |  | ■ | ■ |  |  |  |  |  |  |  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |  |  | ■ | ■ | ■ | ■ |  |  |  |  |  |  |
| 2009   | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
|  |  | ■    | ■    |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| 2009   | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
|  |  | ■    | ■    |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
| 2009   | 2010   | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |
|  |  | ■    | ■    | ■    | ■    |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |  |  |  |  |  |  |  |      |      |      |      |      |      |      |      |      |      |      |  |  |   |   |   |   |  |  |  |  |  |  |

### **9.3.5 Community Infrastructure Improvement Project**

In this Study, “Public Awareness Survey” was carried out to get information on the present conditions of water supply and sanitation and opinions by interviewing representatives of 163 communities within Greater Monrovia Area. In the water supply sector and sanitation sector restoration and improvement needs are identified through analysis of present natural and social and conditions referring to the Results of Public Awareness Survey.

On the other hand in road sector inventory survey was conducted on sub-contract basis to acquire detailed information and data. The restoration and improvement needs were assessed to formulate projects in road sector. In the implementation of road rehabilitation projects culverts and open channels to deal with storm water drainage are also expected to restore/reconstruct and improve.


All above restoration/improvement and improvement of the infrastructure in water supply, sanitation and road falls into the category of basic social service improvement of community. Therefore in this Study multi-components (road, water supply and sanitation) are integrated into one packaged program as Community Infrastructure Improvement Project so that timely implementation and effective procedure of the implementation can be achieved.

Such community development projects were historically conducted by NGOs relatively on a small scale and also by international agencies as a labor-intensive project.

Recently importance of such community development is recognized among international donor agencies and organizations including TICAD\*, and new schemes are already provided. Implementation of this project shall be promoted through positive utilization of donor schemes of international organizations and NGOs. Also promotion of local construction industry and labor-based construction for job creation shall be encouraged in the planning and construction through competition to economize project cost.

The role and function of the community should be clarified distinguishing them from those of governments. The governments should play the principal roles in development of basic physical and social infrastructures along the urban development plan to be formulated by the governments. However, there is room for community to participate in the development of basic infrastructures to be basically implemented by the governments.

## Project Profile

| Project No. and Project Name: CM-1 Community Infrastructure Improvement Project   |   |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
|---|---|------|------|------|------|------|------|------|------|------|------|-----------------------|--|--|--|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|--|--|--|--|
| <b>Background of the Project</b><br>Restoration/improvement and improvement needs of the infrastructure of water supply, sanitation and road falls into the category of basic social service improvement of communities. Multi-components (road, water supply and sanitation) are integrated into one packaged program as Community Infrastructure Reconstruction Project so that timely implementation and effective procedure of the implementation can be achieved.<br>On the other hand, community-based project implementation is expected to contribute to enhance skills of residents, community empowerment, and job creation.<br>The project can also be divided into small projects according to area to make NGOs and donor country participate in its implementation. | <b>Effects of the Project</b><br><b>Target Beneficiaries :</b> <ul style="list-style-type: none"> <li>The residents living in the communities where the Project is implemented. (approximately 240,00 residents)</li> </ul> <b>Effects:</b> <ul style="list-style-type: none"> <li>Vehicle operation cost savings &amp; travel time reduction</li> <li>Reduction of damages on the vehicle</li> <li>Improvement of accessibility</li> <li>Increase of maintainable road sections</li> <li>Improvement of sanitary condition</li> <li>Improvement of safe water access</li> <li>Job creation</li> <li>Skill up of community workers</li> <li>Community empowerment</li> </ul>  |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| <b>Objectives of the Project</b> <ul style="list-style-type: none"> <li>To enhance community living standard</li> <li>Community empowerment</li> <li>To create jobs</li> <li>To rehabilitate damaged community roads in Greater Monrovia</li> <li>To secure the access from/to village</li> <li>To secure safe water supply</li> <li>To secure sanitation</li> </ul>  | <b>Evaluation of the Project</b><br><b>Economic Viability</b> <ul style="list-style-type: none"> <li>Total benefits including vehicle-km and vehicle-hour are calculated in the “without” and “with” case.</li> <li>NPV : USD 123 mln</li> <li>B/C : 0.76 - 4.08</li> <li>EIRR: 7.5 - 42.4 %</li> </ul> <b>Financial Soundness</b> <ul style="list-style-type: none"> <li>Necessary budget allocation</li> </ul> <b>Environmental Impact: Category B</b> <ul style="list-style-type: none"> <li>Positive Impacts                             <ul style="list-style-type: none"> <li>Improve sanitation condition of the community</li> <li>Improvement of accessibility to social/public facilities for residents</li> </ul> </li> <li>Negative Impacts                             <ul style="list-style-type: none"> <li>Land acquisition to build new road or to widen roads, to construct deep well and toilet</li> </ul> </li> </ul> |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| <b>Location of the Project</b> <ul style="list-style-type: none"> <li>Communities in the urbanizing area with gross population density of 40 - 80 pop./ha.</li> </ul>   | <b>External Conditions</b> <ul style="list-style-type: none"> <li>A good peace and order situation is maintained.</li> <li>Responsible community for operation and maintenance has sufficient capacity</li> </ul>   |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| <b>Scope of the Project</b><br>Construction of: <ul style="list-style-type: none"> <li>100 road sections</li> <li>20 deep wells and public kiosk</li> <li>138 Public toilet</li> </ul> Technical cooperation shall be included.   | <b>Preconditions</b> <ul style="list-style-type: none"> <li>Necessary fund is prepared.</li> </ul>  |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| <b>Agencies Responsible</b> <ul style="list-style-type: none"> <li>Project Implementation : Ministry of Public Works, LWSC and Community</li> <li>Operation : Community</li> <li>Maintenance : Community</li> </ul>   | <b>Relationship with other projects</b> <ul style="list-style-type: none"> <li>“TR-4 Road Network Rehabilitation”, “WS-5 Project for Expansion of Water Supply System at Paynesville in Greater Monrovia”, “SN-3 Community Sanitary System and Public Toilet Installation &amp; Vacuum Truck Procurement Plan for 2014”, and “SN-5 Community Sanitary System and Public Toilet Installation &amp; Vacuum Truck Procurement Plan for 2019”</li> </ul>  |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| <b>Estimated Cost</b> <ul style="list-style-type: none"> <li>Construction:                             <ul style="list-style-type: none"> <li>Road: USD 16.09 mln.</li> <li>Water supply: USD 4.69 mln.</li> <li>Sanitation: USD 7.01 mln.</li> </ul> </li> <li>Total Cost: USD 27.79 mln.</li> </ul>   | <b>Target Communities for the Project</b><br>   |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| <b>Implementation Schedule</b> <table border="1"> <thead> <tr> <th></th> <th>2010</th> <th>2011</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Technical Cooperation</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Construction</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>  |   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Technical Cooperation |  |  |  |  |  |  |  |  |  |  | Construction |  |  |  |  |  |  |  |  |  |  |  |
|   | 2010  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| Technical Cooperation   |   |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |
| Construction  |   |      |      |      |      |      |      |      |      |      |      |                       |  |  |  |  |  |  |  |  |  |  |              |  |  |  |  |  |  |  |  |  |  |  |



## **CHAPTER 10 SOCIAL AND ENVIRONMENTAL ASSESSMENT**

### **10.1 Environmental Condition**

Present natural and social condition is described in Section 2.1 Natural Condition and Section 2.2 Socio-economic Condition, CHAPTER 2 PRESENT CONDITION AND ISSUES OF THE STUDY AREA

### **10.2 Liberian EIA System**

#### **10.2.1 History of Environment Management in Liberia**

Environmental concerns in Liberia were of no consequence prior to the 1992 Rio Conference on Environment and Development. At this time, environment was only talked about in connection with the need to conserve natural resources, primarily forests and wildlife resources.

After Presidential elections in 1997, as people began to rebuild their lives and shattered economy, environmental pollution and deforestation became national development issues. Concerns were also raised about the scope and complexity of environmental issues and their impact on national socio-economic development, lack of a national institution for the management of the environment and the lack of a national policy and framework law on environmental protection.

In 1999 the Government of Liberia established the National Environmental Commission of Liberia (NECOLIB) and charged it with exclusive authority overall programs and activities relating to environmental matters in the country. NECOLIB has evolved into the Environmental Protection Agency (EPA).

#### **10.2.2 Environmental Protection Agency**

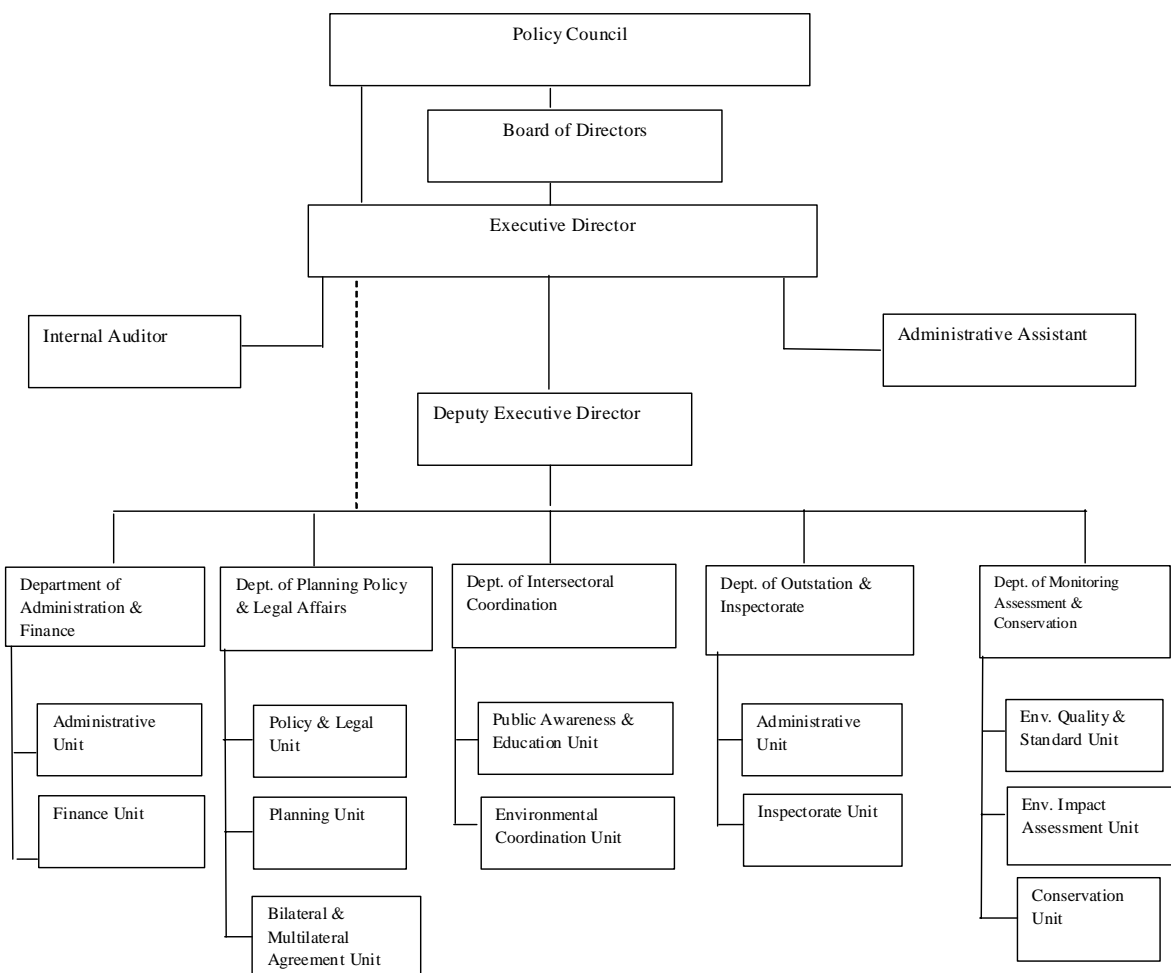
The principal agency for the management of the environment in Liberia is the Environmental Protection Agency (EPA). The Act creating EPA was approved on 26th November 2002. The EPA has been officially functional since February 2004 under an interim management team, but not fully operational until 2006, after the inauguration of Madam Ellen Johnson-Sirleaf as the President of Liberia.

The mandate of the EPA is to coordinate, monitor and supervise all activities in the field of the environment. The EPA is placed under the office of the President and holds one of the highest positions of all public institutions in the country. This is intended to enable it to voice its concerns on environment at high levels of decision making and policy formulation and to give it the necessary political clout. The key functions of the EPA are:

- Co-ordinate, integrate, harmonize and monitor the implementation of environmental policy and decisions of the Policy Council by the Line Ministries,
- Propose environmental policies and strategies to the Policy Council and ensure the integration of environmental concerns in overall national planning,
- Collect, analyze and prepare basic scientific data and other information pertaining to pollution, duration and on environmental quality, resource use and other environmental protection and conservation matters and undertake research and prepare and publish every two years a report on the state of the environment in Liberia,
- Ensure the preservation and promotion of important historic, cultural and spiritual values of national resources heritage and, in consultation with indigenous authority, enhance indigenous methods for effective natural resource management,
- Encourage the use of appropriate environmentally sound technologies and renewable sources of energy and natural resources,

- Establish environmental criteria, guidelines, specifications and standards for production processes and the sustainable use of natural resources for the health and welfare of future generations,
- Review and approve Environmental Impact Statements and Environmental Impact Assessment,
- Initiate and co-ordinate actions required in a state of environmental emergency or any other situation which may pose serious threat to the environment and public health,
- Function as the national clearinghouse for all activities relating to regional and international environment-related conventions, treaties and agreements, and as national liaison with the secretariat for all such regional and international instruments, and
- Advise the state and participate in the process of negotiating, ratifying or acceding to relevant regional and international environmental agreements.

The organization chart of EPA is shown in Figure 10.2-1.



**Figure 10.2-1 Organization Chart of EPA**

### 10.2.3 Major Legal Framework to Support Environmental Impact Assessment

In order to ensure a coordinated and participatory approach to environment management the following three compose the pillars of administrative management.

- **National Environmental Policy:** The first policy on the environment which took effect in 2003. It requires all national government agencies as well as private corporations, firms and

entities to ensure a sound management of resources and the environment, and will attempt to avoid any exploitation of national and social resources in a manner that might cause irreparable damage to the environment.

- **Environment Protection Law:** In the same year when the National Environmental Policy has announced, this Law was proclaimed to establish a legal framework for the sustainable development, management and protection of the environment by the EPA in partnership with regulated Ministries and organizations and in close and responsive relationship with the people of the country, and to provide high quality information and advise on the state of the environment.
- **Environmental Impact Assessment Procedural Guidelines:** This manual is prepared in 2006 to clarify the provisions stated in the Law. The intension is to provide the EPA, sector agencies, private sectors, NGOs, Project Affected Persons (PAPs) and consultants a set of approved guidelines for the conduct and review of Environmental Impact Assessment (EIA) in the country.

#### 10.2.4 Other Key Information other than the Mandate of EPA

- **Forestry Development Authority (FDA):** This Agency which is responsible for implementing the forestry laws and regulations was established in 2003 in order to enhance the biodiversity conservation.
- **Designated Ramsar Sites:** Liberia presently has five sites designated as Wetlands of International Importance with a surface area of 95,879 hectares

**Table 10.2-1 Designated Ramsar Sites**

| Serial Number | Name of Wetland | Type               | Size (hectare) | Conservation Status                                 |
|---------------|-----------------|--------------------|----------------|---|
| 1             | Lake Piso       | Coastal Lacustrine | 76,091         | Announced as Ramsar site no. 1306 on 2nd Jul. 2003  |
| 2             | Marshall        | Inland Riverine    | 12,168         | Announced as Ramsar site no. 1630 on 24th Aug. 2006 |
| 3             | Mesurado        | Coastal            | 6,760          | Announced as Ramsar site no. 1631 on 24th Aug. 2006 |
| 4             | Gbedin          | Inland Swamp       | 25             | Announced as Ramsar site no. 1628 on 24th Aug. 2006 |
| 5             | Kpatawee        | Inland Riverine    | 835            | Announced as Ramsar site no. 1629 on 24th Aug. 2006 |

Among those designated sites, Mesurado Wetlands is located within the Study area in which capital city Monrovia and the site is particularly important for three mangrove species (*Rhizophara harrisonii*, *R. mangle* and *Avicennia africana*), which are threatened by intense charcoal burning and fuel wood collection. It provides a favorable habitat and feeding ground for several species of birds including the African spoonbill *Platalea alba*, Common Pratincole *Glareola nuchaltis* and Curlew *Numenius arquata*. It also hosts the vulnerable African dwarf crocodile, the Nile crocodile and the African sharp-nosed crocodile and plays an important role in shoreline stabilization and sediment trapping. The site is currently used as a dumping site, for car washing and fishing with fish and crustaceans sold to the people of Monrovia. An additional threat comes from illegal building of residence due to the centralization of population as well as from pollution caused by economic activities around the site.



*At the upstream of Mesurado Rv.*



*Swamp is invaded along Mesurado Rv.*

**Figure 10.2-2 Designated Ramsar Sites of The Mesurado River**

- **Protected Areas:** Liberian protected area network has been based on terrestrial ecosystems. There are no marine protected areas. The country has two categories of protected areas; fully protected area and partially protected areas. Fully protected areas are Sapo National Park and East Nimba Nature Reserve which cover a total area of 192,081 ha or 1.86 % of the land area of the country.

There are eleven partially protected national forest reserves where timber concession can be leased out, but activities such as hunting, farming, fishing and human settlement are prohibited. The Study area is not involved within the Protected Areas. The map of protected areas is shown in Figure 10.2-5 as **Land Use Suitability Map for Commercial, Conservation and Community Forest**.

- **Historical Heritage:** Liberian historical heritage finds expressions in buildings, monuments, sites, and archives. Most of them are locating in the city of Monrovia.
- **Buildings of Historical Significance:** Two historical buildings which were constructed from the middle of the nineteenth century with American south design are locating in the urban center. One of them is the Residence of President William David Coleman located on Gurley and Sao Boso Sterrets and another is the Law Library on Ashmun Street.



*Residence of President William D. Coleman.*

**Figure 10.2-2 Buildings of Historical Significance**

- **Historic Sites:** Like historic buildings, many of the historic sites are found in urban centers along the coast as result of the Americo-Liberians as shown below.

**Table 10.2-2 Historic Sites**

| Serial Number | Name of Historic Site                     | Characteristics  |
|---------------|---|--|
| 1             | Intersection of Ashmun and Center streets | Scene of the Battle of the Fort Hill between a handful settlers and a horde of natives |
| 2             | Government square                         | Monument as a memory of Matilda Newport  |
| 3             | The Obelisk                               | The tomb of Liberian eighteenth and longest serving president, William V.S. Tubman     |

### 10.2.5 Land Issue

Urban areas are faced with the severe population pressures, for example the city of Monrovia which had a population of 400,000 inhabitants, has experienced a gradual growth in population over the year. An estimated inhabitant is over 1,000,000 now. This rapid increase in population is severely exerting pressure on not only limited resource/infrastructure but also issues such as illegal occupation, local/individual disputes and squatter.

- **Land Tenure History:** Land tenure is the legal, contractual and customary arrangement, whereby individual or organization gain access to economic and social opportunities through land. There are rules and procedures, which govern the rights and responsibilities of both individuals and groups in the use and control over basic land resources. In Liberia, the land ownership is based on land held under three systems or rights. They are:

**Table 10.2-3 History of Land Tenure System**

| Land Tenure System                       | Characteristics  |
|--|--|
| <i>Customary land tenure system</i>      | The land ownership is based on oral history of family members and council of elders. This system began with the ancestors who formulated an unwritten policy of giving joint ownership to families or tribe for farming and development towns and villages. This system prohibited the direct sale of land as an economic resource. This system still widely accepted in the hinterlands |
| <i>Anglo-American land tenure system</i> | This is the system where land is formally surveyed. There is both public and private ownership. The birth of this system marked the beginning of the record system for land ownership. All land is considered to be the property of the state, with the President as the chief custodian or trustee  |
| <i>Land registration system</i>          | This is a UNDP supported system introduced to prevent fraud, through a titling process. Prior to 1973, lands were deeded, but were not registered. Under this system, all lands deeded as private or public are registered in national archives.   |

The confusion over land tenure dates back to the arrival of the settlers who introduced the Anglo-American land tenure system, which was contrary to the customary system practiced by the indigenous people. For example, under customary law the amount of land under cultivation for agriculture purposes was small. The settlers wanted large tracts of land, so instituted a new land law. As evidence of ownership right, individuals or groups were issued a title deed. This Anglo-American system of land ownership deprived the indigenous people of much of their land.

Although land ownership was communal, the system of registration of communal right has existed since 1822. But because land was never viewed as a saleable commodity, the idea of a title ownership was alien to the indigenous people. With the expansion of agricultural settlement and development of the rural economy, however, illegal land occupation for the purpose of economic activity, squatters for resident purpose and conflicts over ownership and land-use are increased.



*Illegal Occupation along Somalia Drive*

**Figure 10.2-3 Illegal Occupation along Somalia Drive**

### **10.2.6 Institutional and Policy Framework for Land Management**

The administration and management of land is the statutory responsibility of some Ministries and Agencies of Government. They are:

- **Ministry of Internal Affairs:** The Ministry is responsible for local government administrations and Government functionaries within local and urban areas. It is the overseer of all chiefdoms and clans and has custodianship over all private and public properties within the territorial confines of country, including all disputes arising from sale and ownership of land.
- **Ministry of Agriculture:** The Ministry is responsible for the planning, executing, administration management and supervision of agriculture programs. It is involved with local farmers in the identification of suitable land to encourage improved varieties of for food security.
- **Ministry of Lands, Mines and Energy:** The Ministry has the statutory responsibility for the development of minerals, water and energy resources of the country. It is the principle administrator of land and including survey of private and public land and issuance of deeds for all lands.
- **Forestry Development Authority:** The FDA is responsible for sustainable management of the forest and associated resources, including forest land. It provides medium and long term planning within the forest sector, as well as the preparation a promulgation of forest policy, law and administration. It is responsible for all forest concession agreements, monitors activities of timber companies and is in charge of protected area programs, wildlife and national parks.

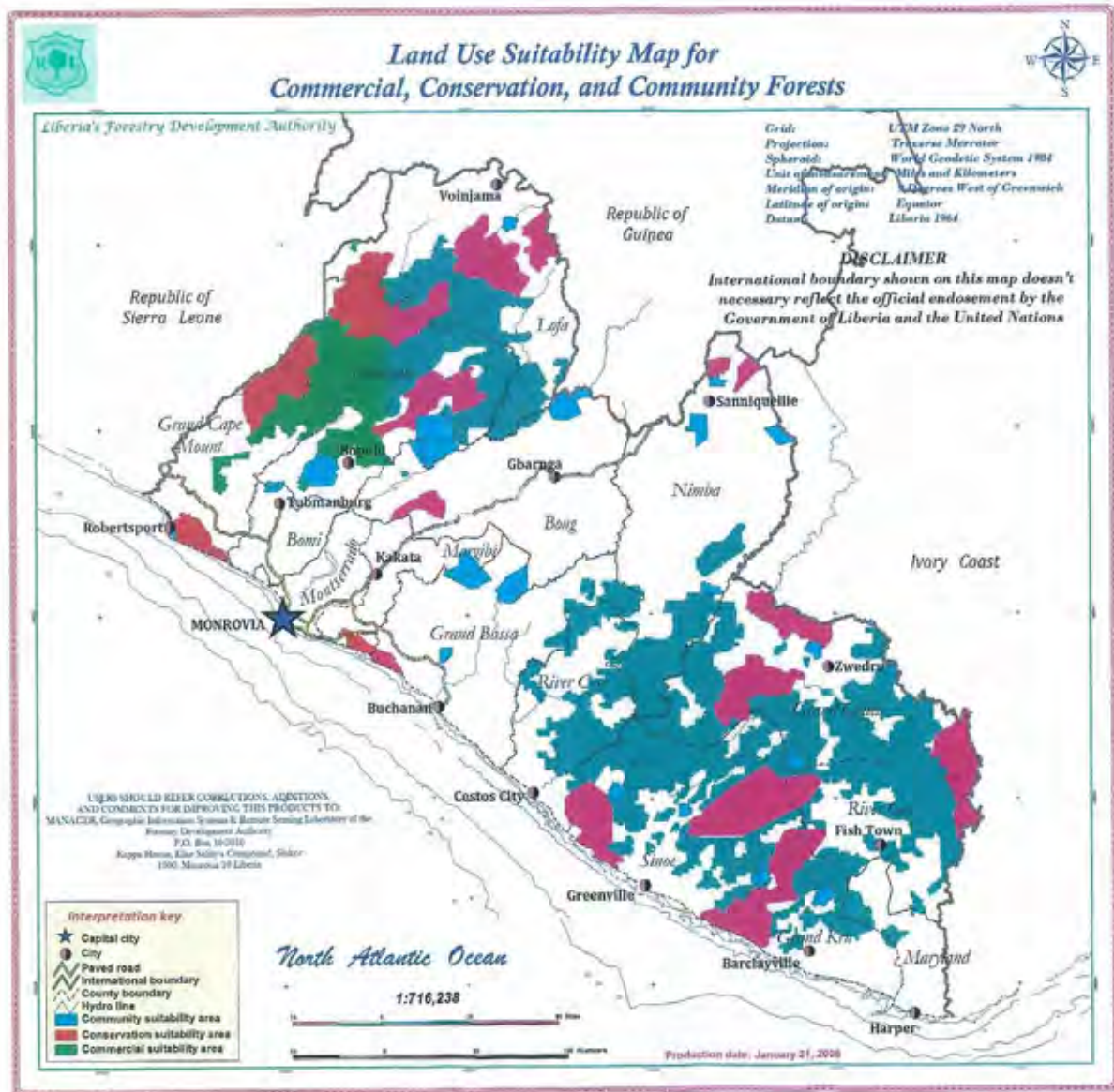


Figure 10.2-4 Land Use Suitability Map for Commercial

### 10.3 Measures to Clear Requirements








Under the Annex 1 (Section 6) of Environment Protection Law, those Construction and expansion/upgrading of Roads, Waste Water Treatment on Municipality Sewage and Water Supply projects are considerable to require EIA. However, according to the comments made by the environment specialist of MPW, full scale of EIA will not be required those the rehabilitation/improvement of existing facility are planned, and process from the preparation to prepare EMP is required.





Table 10.3-1 shows the flow of activities for EIA Application, indicating each stage of the process, its sub-stages, timelines, and brief descriptions/remarks on each item. The maximum number of days for EIA application is 3 months from the submission of the EIA Report.

**Table 10.3-1 Flow of Activities for EIA Application**

| Stage/Sub-Stage   | Activity  | Remarks/Timeline   |
|---|---|--|
| <b>1.0 Application</b>  |   |  |
| <p>1.1 Application for EIA Permit/License<br/>↓</p> <p>1.2 Submission of Project Brief<br/><br/>↓</p> <p>1.3 Comments by line Ministry/Agency<br/>↓</p>                                   | <p>◇ Proponent submits an Application for EIA permit/license</p> <p>◇ Proponent submits to EPA Project Brief which contains the following Information:</p> <ul style="list-style-type: none"> <li>- The nature of the Project</li> <li>- The location of the Project and the county under whose jurisdiction it is situated and reasons for proposed Project in the area</li> <li>- The activities that shall be undertaken during and after the development of the Project</li> <li>- The design of the Project</li> <li>- The materials to be used in the Project, including during construction</li> <li>- The possible products or by-products anticipated and their environmental consequences including the potential mitigation methods and measures</li> <li>- The number of people the project shall employ</li> <li>- The Projected area of land, air and water that may be affected</li> <li>- Any other pertinent evidence and analysis which the Agency may require for decision making</li> </ul> <p>◇ When the Project Brief is presumed completed, a copy of Project Brief will be transmitted to individual relevant line Ministry/Agency for comments</p> | <p>Proponent-driven activity; No timeline prescribed by EPA<br/>Proponent shall bear a specified fee for the Project review</p> <p><i>Ten (10) days after its submission</i></p> |
| <b>2.0 SCREENINGS</b>   |   |  |
| <p>2.1 Evaluation of the Project Brief by EPA<br/>↓</p> <p>2.2 Evaluation of the Project Brief by Ministries/Agencies<br/>↓</p> <p>2.3 Determination of the Project Impact<br/><br/>↓</p> | <p>◇ EPA evaluates and transmits a copy with comments to the relevant line Ministries/Agencies</p> <p>◇ The sector Ministries/Agencies review and submit to EPA their comments</p> <p>◇ The following determination may be made from the screening process</p> <ul style="list-style-type: none"> <li>- Certificate of approval issued to the proponent where EPA considers that the Project will not have a significant environmental impact; or that the project discloses sufficient mitigation measures to the anticipated impacts</li> <li>- When further study is necessary to determine the level of EIA required, the proponent needs to prepare an Initial Environmental Examination (IEE)</li> <li>- The proponent is required to prepare environmental impact study if the project will have a significant impact on the environment</li> </ul>  | <p><i>Within ten (10) days of receiving a copy</i></p> <p><i>Twenty five (25) days from submitted day</i></p>  |



| Stage/Sub-Stage   | Activity   | Remarks/Timeline  |
|---|--|---|
| <b>3.0 NOTICE OF INTENT</b>   |  |   |
| 3.1 Preparation and Publication<br><br><div style="text-align: center;"></div>   | <ul style="list-style-type: none"> <li>◇ Proponent who undertakes EIA must prepare and publish Notice of Intent through the media</li> <li>◇ Information in the Notice of Intent must include               <ul style="list-style-type: none"> <li>- The nature of the Project</li> <li>- County, district, and community where the Project activity is to be carried out, or is likely to have a significant environmental impact</li> <li>- The activities that shall be undertaken</li> <li>- The proposed timeframe for the Project or activity</li> <li>- Copy of the application is available for inspection at the Registry of the Agency</li> </ul> </li> </ul>  | Proponent-driven activity; No timeline prescribed by EPA. However, these activities are preferably done one-time on site or in the region of the Project location |
| <b>4.0 SCOPING</b>  |  |   |
| 4.1 Public Consultation<br><br><div style="text-align: center;"></div> 4.2 Identify the TOR<br><br><div style="text-align: center;"></div> 4.2 Approval of TOR<br><br><div style="text-align: center;"></div> 4.3 Qualified Consultant<br><br>4.4 Scoping Report<br><br><br><div style="text-align: center;"></div> | <ul style="list-style-type: none"> <li>◇ Proponent carries out public consultation to identify the possible impact arisen from the Project, and considers the alternatives</li> <li>◇ Identify the term of reference for the preparation of Environmental Impact Statement</li> <li>◇ TOR takes into account issues contained in Annex-C of the Guideline and results of the Public Consultation</li> <li>◇ EPA approves the TOR prior to commencement of EIA study</li> <li>◇ Consultant for EIA must meet the qualification criteria set by the Agency, and be in its Registry</li> <li>◇ The scoping report must include the following:               <ul style="list-style-type: none"> <li>- A review or profile of proposal, the environment and community that is likely to be affected</li> <li>- Description of the scoping process used</li> <li>- Possible alternatives</li> <li>- Range of potential impacts</li> <li>- Geographical area(s) and the timeframe(s) for the impact analysis</li> <li>- The policy and institutional frameworks under which EIA will be conducted</li> <li>- Existing information sources, gaps and constrains on methodology</li> <li>- The scheduling of EIA study, and the allocation of resources and responsibility</li> <li>- Identification of all authorities involved in the Project or activities</li> <li>- Identification of interested and affected persons</li> <li>- Terms of Reference developed</li> </ul> </li> </ul> | Proponent-driven activity; No timeline prescribed by EPA. However, these activities are preferably done one-time on site or in the region of the Project location |
| <b>5.0 EIA REPORT</b>   |  |   |
| 5.1 Preparation and Submission<br><br><div style="text-align: center;"></div> 5.2 Mitigation Strategy and Timeframe<br><br><div style="text-align: center;"></div>  | <ul style="list-style-type: none"> <li>◇ Proponent prepares an EIA report which includes Environmental Impact Statement (EIS) and Environment Management Plan (EMP)</li> <li>◇ Must be agreed between proponent and the Agency in connection with line Ministries</li> </ul>   | Proponent-driven activity; Submit ten (10)copies and electronic version (PDF) of the report   |

| Stage/Sub-Stage   | Activity   | Remarks/Timeline  |
|---|--|---|
| 5.3 Review of EIA Report<br>                         | ◇ EPA studies and distributes copies to the relevant and sector ministries/agencies, and communities for comments  | <i>Comments from the public are received within thirty (30) days</i>  |
| 5.4 Public Hearing<br>                               | ◇ EPA determines the needs for Public Hearing at a location suitable to Project Affected Persons (PAPs)  |   |
| 5.5 Review by Environmental Assessment Committee<br> | ◇ EPA constitutes Environmental Assessment Committee to review a report  | Consists of EPA, sector Ministries/Agencies, proponent and representative of PAPs                             |
| <b>6.0 DECISION ON EIA REPORT</b>   |  |   |
| 6.1 Decision Making<br>                              | ◇ EPA decides four (4) alternative decisions<br>- Approve the Project unconditionally<br>- Approve the Application conditionally<br>- Request for further study and/or submission of additional data<br>- Reject the Project if it causes significant or irreversible damages to the environment |   |
| <b>7.0 ENVIRONMENTAL LICENSE/PERMIT</b>   |  |   |
| 7.1 Issue EIA License/Permit  | ◇ EPA issues the License/Permit within the time period for different categories of projects<br>- The Project not requiring EIA<br><br>- The Project requiring EIA  | <i>Fifteen days (15) from the decision</i><br><br><i>Three (3) months following the receipt of EIA report</i> |

(Source: Modified from Environmental Impact Assessment Procedural Guidelines, 2006)

The procedure on EIA application and role of each stakeholder is illustrated in Figure 10.3-1

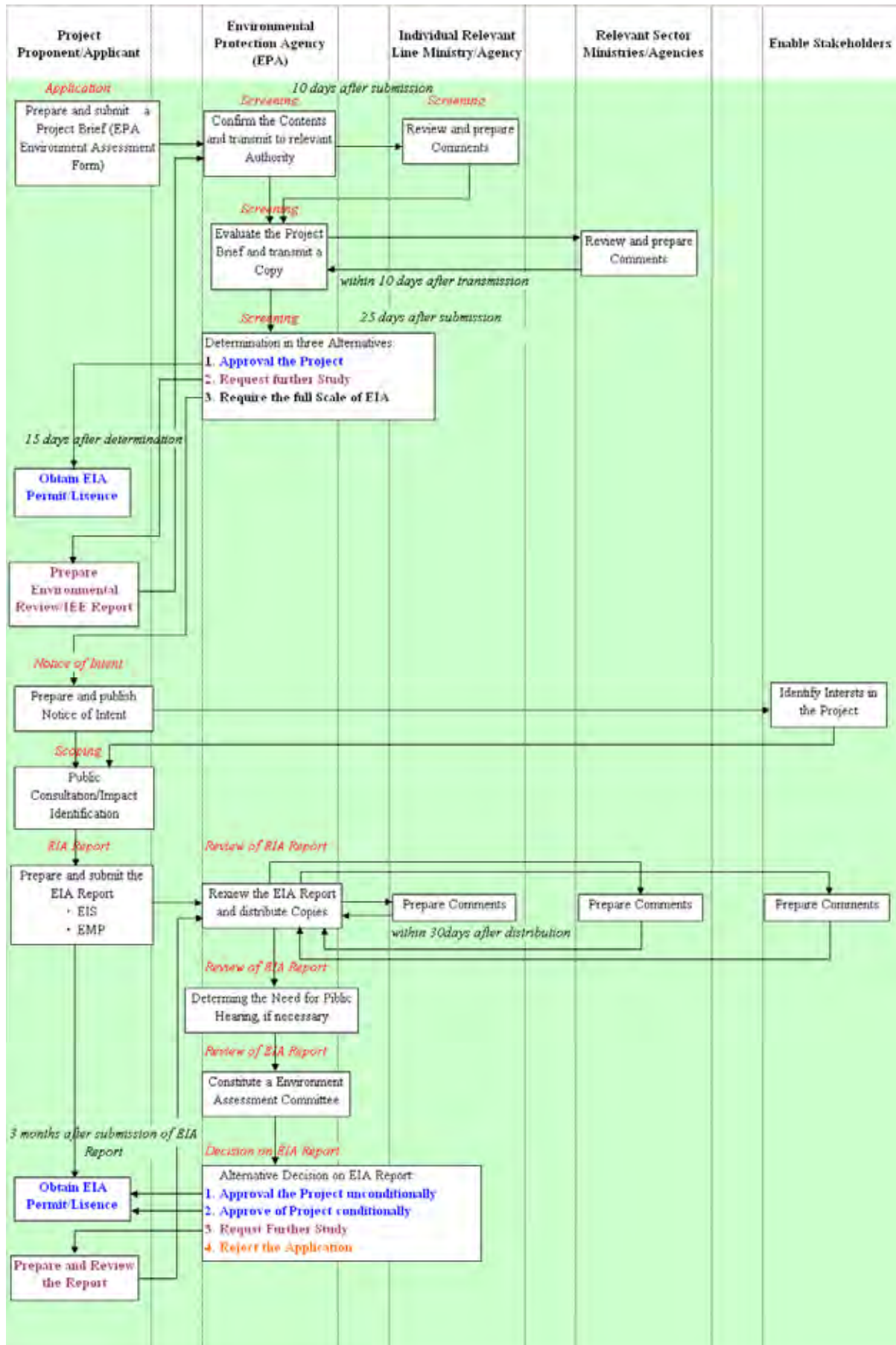


Figure 10.3-1 Illustrated Procedure on EIA Application

## 10.4 Environmental Management by MPW

### 10.4.1 SIU (Special Implementation Unit)

SIU is under the management of Deputy Minister of Technical Services and SIU is responsible for all projects in MPW. Eight officials headed by Mr. David L. Wiles are engaged in the service. The position of SIU in MPW is illustrated in following Figure 10.4-1;

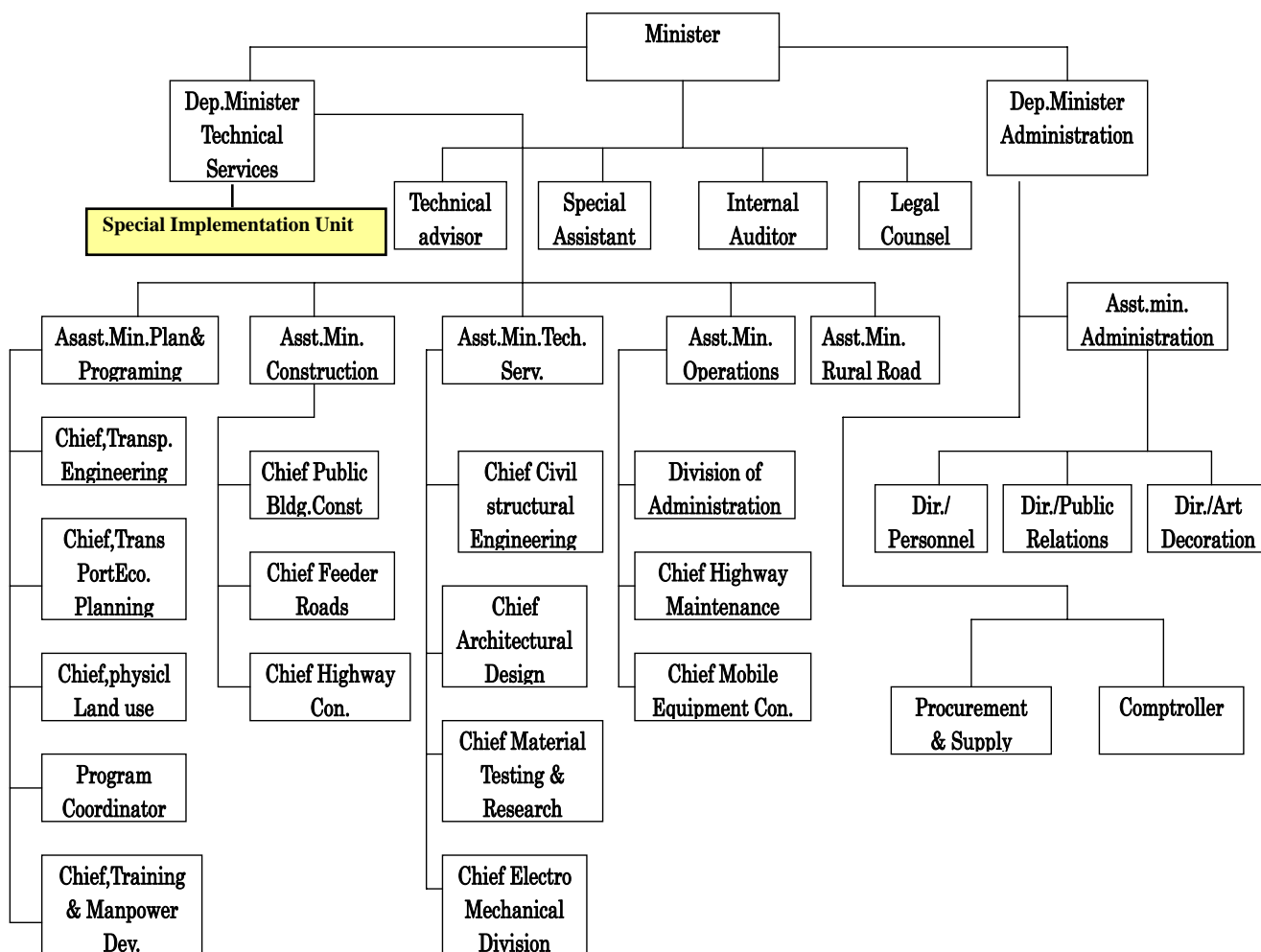


Figure 10.4-1 Illustrated Position of SIU

### 10.4.2 Environmental Management Budget accorded to SIU

The fiscal year in Liberia starts on the 1<sup>st</sup> of July and close on the 30<sup>th</sup> of June. The request for the resettlement budget is carried out by submitting EMP (Environmental Management Plan) with attaching the RAP (Resettlement Action Plan) to MOF (Ministry of Finance) by each project base. MOF, by receiving EMP, evaluates and transfers the budget to MPW within four-six months after its submission.

Inclusive RAP is not applied in Liberia at present.

The budget of environmental management accorded to on-going or completed project in the fiscal year 2009 is shown in Table 10.4-1. Total of USD 1,023,000 includes contracts with the Environmental Consultants, resettlement costs

**Table 10.4-1 Environmental Budget in 2009**

| No. | Name of Project  | Amount of Budget (USD) | Donor | Environmental Activity | Remarks.               |
|-----|--|------------------------|-------|------------------------|------------------------|
| 1   | Emergency Infrastructure Project, Grant No. H236                         | 250,000                | WB    | EMP/RAP                | Urban work             |
| 2   | Emergency Infrastructure Project Supplementary Component, Grant No. H505 | 210,000                | WB    | EMP                    | Road                   |
| 3   | Liberia Infrastructure Rehabilitation Project, Grant No. TF057072        | 150,000                | WB    | EMP                    | Solid waste disposal   |
| 4   | Agriculture and Infrastructure Development Project Grant No. H327        | 225,000                | WB    | EMP/RAP                | Vai Town Bridge        |
| 5   | Urban and Rural Infrastructure Rehabilitation Project Grant No. 4780     | 188,000                | WB    | EMP/RAP                | Cotton Tree-Bokay Town |

### 10.5 IEE on Selected Projects

IEE has carried out to the selected Projects those had resulted from the Master Plan Study. The categorized environmental impacts after screenings activity and assumed major scoping are summarized in Table 10.5-1. Furthermore, detailed IEE on the requested Grant Aid Projects are attached to Appendix-15 IEE on Requested Projects.

**Table 10.5-1 Comprehensive IEE on selected Projects**

#### Project List on Road Sector

| Projects   | Source of Funds                | Types of Projects | Impacts  | Category | Mitigation/Enhancement Measure   |
|--|--------------------------------|-------------------|--|----------|--|
| <b>1. Road Sector</b>                                |                                |                   |  |          |  |
| <b>1.1 Johnson Street Bridge Improvement Project</b> | <b>Requested to Japan Gov.</b> | <b>Facility</b>   | <ul style="list-style-type: none"> <li>• <b>Positive Impacts</b><br/>Improve the travel speed and mitigate CO2 emission gas</li> <li>Improve the accessibility to social/public facilities</li> <li>• <b>Negative Impacts</b><br/>Involuntary resettlement is required in Clara Town</li> <li>Possible negative impact against Mesurado wetland</li> </ul> | <b>A</b> | <ul style="list-style-type: none"> <li>◇ Select the alignment that enables to minimize the affected lands</li> <li>◇ Compensation will be accorded to affected landowners prior to the construction of the requested facility</li> <li>◇ Specifying the distribution of precious plants around project site is necessary</li> <li>◇ Specifying the distribution of precious wildlife species, particularly birds, fishes and crocodiles within the wetland is necessary</li> <li>◇ Further EIA is required to assess the magnitude of negative impacts and prepare the mitigation measure</li> </ul> |
| <b>1.2 Somalia Drive Reconstruction Project</b>      | <b>Requested to Japan Gov.</b> | <b>Facility</b>   | <ul style="list-style-type: none"> <li>• <b>Positive Impacts</b><br/>Improve the travel speed and mitigate CO2 emission gas</li> <li>Improve the accessibility to social/public facilities</li> </ul>  | <b>A</b> | <ul style="list-style-type: none"> <li>◇ MPW and MCC should consider the smooth agreement with PAPs such as vendors, owners of kiosk, building owners</li> </ul>   |

| Projects  | Source of Funds         | Types of Projects | Impacts   | Category | Mitigation/Enhancement Measure  |
|---|-------------------------|-------------------|---|----------|---|
|   |                         |                   | <p><b>Enhance the economic activity</b></p> <ul style="list-style-type: none"> <li>• <b>Negative Impacts</b><br/>Involuntary resettlement such as permanent structures, temporary kiosks and vendors those locate within ROW is required along the alignment</li> </ul>   |          | <p><b>within ROW</b></p> <ul style="list-style-type: none"> <li>◇ Based on this Master Plan Study, MCC is advised to set up Regional Development Plan and solve the issues such as small kiosks and taxies which constitute majority of illegal occupancy by providing permanent market area</li> <li>◇ Further EIA is required to assess the magnitude of negative impacts and prepare the mitigation measure</li> </ul> |
| 1.3 Reconstruction of Bridges on Missing Link Project       | Requested to Japan Gov. | Facility          | <ul style="list-style-type: none"> <li>• <b>Positive Impacts</b><br/>Improve the living standard of village people<br/>Improve the accessibility to social/public facilities for residents</li> <li>• <b>Negative Impacts</b><br/>Specific negative impact is not found.</li> </ul>   | B        | <ul style="list-style-type: none"> <li>◇ Select the alignment that enables to minimize the affected lands</li> <li>◇ Compensation will be accorded to affected landowners prior to construction of the requested facilities.</li> </ul>   |
| 1.4 Road Rehabilitation Project                             | Proposed                | Facility          | <ul style="list-style-type: none"> <li>• <b>Positive Impacts</b><br/>Improve the living standard of village people<br/>Improve the accessibility to social/public facilities for residents</li> <li>• <b>Negative Impacts</b><br/>Negative impact to Mesurado wetland at Package 3<br/>Land acquisition to build new road or widening activity</li> </ul> | A and B  | <ul style="list-style-type: none"> <li>◇ Select the alignment that enables to minimize the affected lands</li> <li>◇ Compensation will be accorded to possibly affected landowners prior to construction of the requested project</li> </ul>  |
| 1.5 Intersection Improvement Project                        | Proposed                | Facility          | <ul style="list-style-type: none"> <li>• <b>Positive Impacts</b><br/>Reduce the traffic congestion and mitigate CO2 emission gas<br/>Improve the traffic safety on road users</li> <li>• <b>Negative Impacts</b><br/>Land acquisition or involuntary resettlement due to the improvement of corner is required</li> </ul>                                 | B        | <ul style="list-style-type: none"> <li>◇ Select the alignment that enable to minimize the affected lands</li> <li>◇ Compensation will be accorded to possibly affected landowners prior to construction of the requested project</li> </ul>   |
| 1.6 Bus Terminal & Bus Stop Facilities Construction Project | Proposed                | Facility          | <ul style="list-style-type: none"> <li>• <b>Positive Impacts</b><br/>Improve the public transport service<br/>Enhance to mitigate CO2 emission gas<br/>Reduce the traffic</li> </ul>  | B        | <ul style="list-style-type: none"> <li>◇ Compensation will be accorded to possible affected landowners prior to construction of the requested</li> </ul>  |

| Projects   | Source of Funds | Types of Projects     | Impacts  | Category | Mitigation/Enhancement Measure   |
|--|-----------------|-----------------------|--|----------|--|
|  |                 |                       | <p>congestion caused by taxis</p> <ul style="list-style-type: none"> <li>• Negative Impacts<br/>Loss of job opportunity for the taxi drivers</li> </ul> <p>Partial land acquisition adjacent to the bus terminal boundary is assumed</p>   |          | project  |
| 1.7 Traffic Safety Management Project              | Proposed        | Technical Cooperation | <ul style="list-style-type: none"> <li>• Positive Impact<br/>Improve the traffic safety</li> <li>• Negative Impacts<br/>Specific negative impact is not found</li> </ul>   | C        | ◇ Special attention is not necessary.  |
| 1.8 Vai Town Bridge Reconstruction Project         | WB, On-going    | Facility              | <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve the travel speed and mitigate CO2 emission gas<br/>Improve the accessibility to social/public facilities</li> <li>• Negative Impacts<br/>Involuntary resettlement is required<br/>Possible negative impact against Mesurado wetland</li> </ul>   | —        | <ul style="list-style-type: none"> <li>◇ Compensation will be accorded to affected landowners prior to construction of the requested project</li> <li>◇ Specifying the distribution of plants around project site is necessary</li> <li>◇ Specifying the distribution of precious wildlife species, particularly birds, fishes and crocodiles within the wetland is necessary</li> </ul> |
| 1.9 Rehabilitation of Monrovia City Street Project | WB, On-going    | Facility              | <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve the travel speed and mitigate CO2 emission gas<br/>Improve the accessibility to social/public facilities<br/>Enhance the economic activity</li> <li>• Negative Impacts<br/>Specific negative impact is not found.</li> </ul>                     | —        | ◇ Special attention is not necessary.  |
| 1.10 Caldwell Bridge Construction Project          | WB, Committed   | Facility              | <ul style="list-style-type: none"> <li>• Positive Impacts<br/>Improve the living standard of residents<br/>Improvement of accessibility to social/public facilities for residents</li> <li>• Negative Impacts<br/>Land acquisition and involuntary resettlement are necessary due to the new approach road.</li> </ul> | —        | ◇ Compensation will be accorded to possibly affected landowners prior to construction of the requested project   |

Project List on Water Supply, Sewer and Storm Water Drainage Sector

| Projects  | Source of Funds               | Types of Projects     | Impacts  | Category | Mitigation/Enhancement Measure   |
|---|-------------------------------|-----------------------|--|----------|--|
| <b>2. Water Supply Sector</b>   |                               |                       |  |          |  |
| 2.1 Monrovia Water and Sanitation Rehabilitation Program  | WB, EU, DIFID, AfDB, On-going | Facility              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the hygiene service and improve the living standard</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>                            | —        | ◇ Special attention is not necessary.  |
| 2.2 Monrovia Expansion and Rehabilitation of Three County Capitals  | AfDB, On-going                | Facility              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the hygiene service and improve the living standard</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>                            | —        | ◇ Alternative well site must be provided when the considerable negative impacts are serious. |
| 2.3 The Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (Phase 1)   | Requested to Japan Gov.       | Facility              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the hygiene service and improve the living standard</li> <li>• Negative Impacts Possible impact on decrease of existing groundwater level</li> </ul>        | B        | ◇ Alternative well site must be provided when the considerable negative impacts are serious. |
| 2.4 The Project for Expansion Development of the White Plain Water supply System and isolation of service areas | Proposed                      | Facility              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the hygiene service and improve the living standard</li> <li>• Negative Impacts Land acquisition for the new service reservoir will be required.</li> </ul> | B        | ◇ Special attention is not necessary.  |
| 2.5 The Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (Phase 2)   | Proposed                      | Facility              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the hygiene service and improve the living standard</li> <li>• Negative Impacts Possible impact on decrease of existing groundwater level</li> </ul>        | B        | ◇ Alternative well site must be provided when the considerable negative impacts are serious. |
| 2.6 Assistance on Groundwater Management Plan   | Proposed                      | Technical Cooperation | <ul style="list-style-type: none"> <li>• Positive Impact Improve the capacity on management</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | —        | ◇ Special attention is not necessary.  |
| 2.7 Non-revenue Water Improvement Plan  | Proposed                      | Technical Cooperation | <ul style="list-style-type: none"> <li>• Positive Impact Improve the capacity on management</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | —        | ◇ Special attention is not necessary.  |
| <b>3. Sanitation Sector</b>   |                               |                       |  |          |  |
| 3.1 Monrovia Water and Sanitation Rehabilitation Program  | WB, EU, DIFID, AfDB, On-going | Facility              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the sanitation</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | —        | ◇ Special attention is not necessary.  |
| 3.2 Urban Infrastructure Construction and Rehabilitation of Monrovia Sewerage Network Pumping Stations          | WB                            | Facility              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the sanitation</li> <li>• Negative Impacts Possible land acquisition for</li> </ul>   | —        | ◇ Land acquisition for the service pump stations will be provided.                           |



| Projects   | Source of Funds | Types of Projects        | Impacts  | Category | Mitigation/Enhancement Measure  |
|--|-----------------|--------------------------|--|----------|---|
|  |                 |                          | service pumping station  |          |   |
| 3.3 Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan | Proposed        | Facility and Procurement | <ul style="list-style-type: none"> <li>• Positive Impact Improve the sanitation</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | C        | ◇ Special attention is not necessary.   |
| 3.4 The Project for Reconstruction of Sewage Treatment & Sludge Treatment                    | Proposed        | Facility                 | <ul style="list-style-type: none"> <li>• Positive Impacts Improve the sanitation</li> <li>• Negative Impacts Involuntary resettlement within the Facility Possible negative impact against Mesurado wetland due to the reconstruction of outlet structure</li> </ul> | A        | <ul style="list-style-type: none"> <li>◇ MPW and LWSC should consider to mitigate the negative impact to re-settlers those living within Fiama Treatment Plant</li> <li>◇ Further EIA is required to assess the magnitude of negative impacts and prepare the mitigation measure</li> </ul> |
| 3.5 Community Sanitary System and Public Toilet Installation & Vacuum Truck Procurement Plan | Proposed        | Facility and Procurement | <ul style="list-style-type: none"> <li>• Positive Impact Improve the sanitation</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | C        | ◇ Special attention is not necessary.   |
| <b>4. Storm Water Drainage Sector</b>  |                 |                          |  |          |   |
| 4.1 Improvement of Drainage System of Core Area  | Proposed        | Facility                 | <ul style="list-style-type: none"> <li>• Positive Impact Improve the sanitation</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | C        | ◇ Special attention is not necessary.   |
| 4.2 Equipment Supply of Drainage Pipes Cleaning  | Proposed        | Procurement              | <ul style="list-style-type: none"> <li>• Positive Impact Improve the sanitation</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | C        | ◇ Special attention is not necessary.   |
| 4.3 Establishment of Operation and Maintenance Management System                             | Proposed        | Technical Cooperation    | <ul style="list-style-type: none"> <li>• Positive Impact Improve the capacity on management</li> <li>• Negative Impacts Specific negative impact is not found</li> </ul>   | C        | ◇ Special attention is not necessary.   |

## **10.6 Stakeholder Meeting on Selected Projects**

Inviting the related Ministries/Agencies and international donors, the 1<sup>st</sup> stakeholder meeting was held on 26th March 2009 and the 2nd stakeholder meeting was held on 14th July 2009, respectively,.

Participants to the meetings were; Ministry of Public Works, Ministry of Foreign Affairs, Ministry of Planning and Economic Affairs, Ministry of Land, Mine & Energy, Ministry of Transport, Environmental Protection Agency, Monrovia City Corporation, Liberia Water and Sewer Corporation.

In terms of questions about the future visions on road and water sector, Liberian side expressed that the Government has been carrying on rehabilitation programs on both sectors those assisted by international donors. Those programs should be realistic and justified based on the budgetary capacity of Government and the other studies.

The Study Team replied that budgetary frame and possible donor's funds should be taken into account for preparing the implementation plans.

Liberia side commented that since the international donors such as the World Bank, EC, etc have been assisting Liberia; the Master Plan Study should be prepared in cooperation with these donors.

The Study Team agreed that the Master Plan shall be formulated in close coordination with other donors as well as Liberian Government.

On 15<sup>th</sup> July, joint field workshop was carried out and visited following site:

- Communities in Peace Island and Pagos Island those located in the wetland which designated as Ramsar Wetland.
- Illegal housing zone at Clara Town in Mesurado Wetland
- Johnson Street Bridge Improvement Project site
- Somalia Drive Reconstruction Project site
- The Project for Emergency Development of Water Supply System at Paynesville in Greater Monrovia (Phase 1), Paynesville site

The Land Use Plan prepared by the Study Team was assessed, and justification of the Plan was confirmed through the field workshop.

## **10.7 Measures to be Taken by the Liberian Government prior to Project Implementation**

Measures to be taken by the Liberian Government for the realization of the Projects are shown in Table 10.7-1, however full scale of EIA will not be required those of the rehabilitation/improvement of existing facility are planned, and the process from the preparation of the EMP is required.

**Table 10.7-1 Measures/Activities to be Undertaken by the Government of Liberia**

| Stage                        | Activity   | Schedule/Duration                            | Remarks         |
|------------------------------|--|--|-----------------|
| <b>Engineering Operation</b> | <b>1. Application</b>  | <i>When Project is committed/appraised</i>   |                 |
|                              | a. Proponent submits an Application for EIA permit/license                 |  | Submit to EPA   |
|                              | b. Proponent submits an Project Brief                                      |  | Submit to EPA   |
|                              | <b>2. Screening</b>  |  |                 |
|                              | a. EPA evaluates and transfers a copy to relevant line Ministries/Agencies |  |                 |
|                              | b. The sector Ministries/Agencies review and transfer the comments         | <i>Within 10 days after receiving a copy</i> | Transfer to EPA |

| Stage | Activity  | Schedule/Duration                 | Remarks   |
|-------|---|-----------------------------------|---|
|       | c. Evaluates and determines the Project Brief   | <i>25 days from submitted day</i> | By EPA  |
|       | <ul style="list-style-type: none"> <li>◇ Certificate of approval issued to the proponent where EPA considers that the Project will not have a significant environmental impact; or that the project discloses sufficient mitigation measures to the anticipated impacts</li> <li>◇ When further study is necessary to determine the level of EIA required, the proponent needs to prepare an Initial Environmental Examination (IEE)</li> <li>◇ The proponent is required to prepare environmental impact study if the project will have a significant impact on the environment</li> </ul> |                                   |   |
|       | <b>3. Notice of Intent</b>  |                                   |   |
|       | a. Preparation and Publication  |                                   | Through the media   |
|       | <b>4. Scoping</b>   |                                   |   |
|       | a. Public Consultation  |                                   |   |
|       | b. Identify the TOR   |                                   | Base on the results of Public Consultation and the Guideline          |
|       | c. Approval of TOR  |                                   | By EPA  |
|       | d. Qualified Consultant   |                                   | Meet the qualification criteria set by the EPA and be in its Registry |
|       | e. Scoping Report   |                                   | By the Consultant   |
|       | <b>5. EIA Report</b>  |                                   |   |
|       | <b>a. Preparation and Submission</b> <ul style="list-style-type: none"> <li>◇ EIS Report</li> <li>◇ EMP Report</li> </ul>   |                                   |   |
|       | b. Review of EIA Report   | <i>Within 30 days</i>             | Comments from the public  |
|       | c. Public Hearing   |                                   | At a location suitable to PAPs  |

| Stage | Activity   | Schedule/Duration  | Remarks   |
|-------|--|--|---|
|       | d. Review by Environmental Assessment Committee  |  | Consists of EPA, sector Ministries/Agencies, proponent and representative of PAPs |
|       | <b>6. Decision on EIA Report</b>   |  |   |
|       | a. EPA decides 4 alternative decisions<br><ul style="list-style-type: none"> <li>◇ Approve the Project unconditionally</li> <li>◇ Approve the Application conditionally</li> <li>◇ Request for further study and/or submission of additional data</li> <li>◇ Reject the Project if it cause significant or irreversible damage to the environment</li> </ul> |  |   |
|       | <b>7. Environmental License/Permit</b>   |  |   |
|       | a. EPA issues the License/Permit within the time period for different categories of the projects<br><ul style="list-style-type: none"> <li>◇ The Project not requiring EIA</li> <li>◇ The Project requiring EIA</li> </ul>   | <i>15 days from the decision</i><br><br><i>3 months following the EIA report</i> |   |
|       | <b>8. Environmental &amp; RAP Monitoring</b>   |  |   |

## **CHAPTER 11                    OPERATION AND MAINTENANCE PLAN**

### **11.1 Road and Transportation Sector**

In August 2008, the Ministry of Public Works issued “National Transport Policy and Strategy & Investment Plan”. Within the document, the Government suggests several strategies to solve the current issues.

Until 2006 when the new Government was inaugurated, the responsibility for managing the national road network was divided between two Ministries: a) the Ministry of Public Works - responsible for the primary and secondary roads and b) the Ministry of Rural Development – responsible for the feeder and farm-to-market roads. The new Government transferred all road infrastructure responsibilities to the Ministry of Public Works.

Within Ministry of Public Works, there is a Bureau of Operation. The primary and secondary roads are maintained by Highway Maintenance Division belonging to the Bureau. The Ministry is going to re-organize the maintenance system at present. The present maintenance system is operated with 16 Maintenance Districts in 15 counties in the country. Each Maintenance District has the construction equipment and conducts the maintenance of roads which they are in charge. The feeder roads are managed by Feeder Road Division under Bureau of Construction.

New organization will consist of 5 Maintenance Regions, which will have responsibility for 3 counties each. Each Region has one base camp setting up the construction equipment for individual operation. Present garage of headquarter will be the central station of the equipment for the periodical regular maintenance and repair work.

However, the density of road network in Greater Monrovia is quite high compared with the other counties. The own labor force of the Ministry is too small a group to look after all roads in Monrovia, so the other maintenance system is necessary to be covered whole.

#### **11.1.1 Operating System**

Even though there are a lot of feeder roads and community alleys in Greater Monrovia, the Ministry recognizes not all of them. First, it is necessary to develop the data base of roads where the Ministry is going to maintain. The number of road sections in Monrovia may be over few thousands and it is necessary to exercise judgment during the preparation of the list whether the road is public asset or private utilization. There is similar suggestion in NTPS that community roads, which are roads, tracks, paths within the village and those providing access from the village to farms and other socio-economic activities, shall be responsible by village council or community based organization (communal or private).

Once developed the list, it shall be divided into small zones such as districts and/or communities for a unit of maintaining area. It is recommended the introduction of private sector instead of MPW’s own labor force for the operation of maintenance work in each zone. Involvement of private sector is highly expected to realize the small Government in accordance with the National Policy. The advantage of private sector involvement can be perceived in terms of lower running costs, increasing efficiency in performance and reducing investment in the equipment. One contract is awarded for one zone for a year or reasonable period by performance based remuneration. It will also contribute to the growth of the construction industry of Liberia and realize an adequate competitive bidding system.

As mentioned above, the recommendation of this study is the utilization of private sector in Greater Monrovia and the operation by owned labor force by each Maintenance Region outside of Monrovia. The management of maintenance work will be the task of central station. Otherwise new small units shall be organized in Bureau of Operation.

#### **11.1.2 Financing Plan**

The most critical and important issue for executing proper maintenance of the road network is

insufficient budget of the Ministry and the Bureau. Factual expenditure for the maintenance work of the whole county is approximately USD 1mln in fiscal year 2007/2008. The financing assistances by the several donors are concentrated to the reconstruction, rehabilitation and recovery work. Therefore, maintenance cost has to be secured by the Government.

In many countries, a concept of “road user tax” is introduced. Typical example of road user tax is fuel tax. The basic philosophy of this tax is that the beneficiaries or users pay the expenses. The fund sources in this category are fuel tax, vehicle tax (collected periodically) and vehicle registration fee (collected at the time of registration and at the time of transfer of ownership). The revenue from these taxes/fees are spent on construction, improvement and maintenance of road network.

Other miscellaneous revenue such as fines for traffic violation are often used in traffic safety facilities such as traffic signals and road signs. However, the amount of such revenue is relatively small and can finance only a part of the expenses of such facilities.

It is recommended that the following four (4) measures to be adopted and/or firmly controlled by the Government for the purpose of self financing for the maintenance and development of road infrastructure.

#### **11.1.2.1 Fuel Tax**

This tax is the most expected revenue by the Government and it is also mentioned in NTPS. However, the factual assessments and activities to be realize are not observed yet.

The popular rate of fuel tax is between 20% and 50% depend on the economic situation of the countries. The proper rate shall be examined with that of neighbor countries. The revenue so collected through gas stations are treated as general budgetary revenue and spent by the Government for general expenditure under the present tax system. Therefore, it is necessary to be it the purpose specific tax limited to utilize road infrastructure. Some countries established independent organization to collect taxes and distribute them to road managing body.

#### **11.1.2.2 On-Street Parking Fee**

The road is a public asset and parking vehicle on the road space shall pay parking fee for the private occupancy. The management of the system is preferred to operate by MCC including collection of charge. First, it shall decide parking free zone and parking allowable zone to cooperate with traffic police. A driver parking on non parking zone shall be enforced fine by police and the vehicle on the parking lots shall be collected parking fee by MCC.

The revenue by this system is limited born inside Monrovia city and it shall be the purpose specific tax to utilize road infrastructure of Monrovia City.

#### **11.1.2.3 Vehicle Tax**

The vehicle tax is generally charged once a year in Liberia as the registration fee of the vehicle. Usually the fee is decided by displacement of engine, purpose of utilization, net weight of the vehicle, size of vehicle and so on. In many countries, it adopted the sticker system placed on the front window as the evidence of registration. The vehicle expired the effective registration period shall be enforced fine by the police.

This system generally includes vehicle inspection at the time of registration whether the vehicle is in good condition. In case the vehicle does not satisfy the criteria of the inspection, the application of registration shall be denied.

#### **11.1.2.4 Transit Fee**

Some international traffic do not stop in Liberia and pass trough to the neighbor country. Those transit vehicles in particular big cargo tracks are got benefit by the road infrastructures developed by

the Government of Liberia ,but they left only negative impact such as damage of pavement, exhaust fume and so on.

Even it is transit purpose, the vehicle is one of the road users. According to the basic philosophy of road user tax, international traffic shall expense their benefit to Liberia. Thus, transit fee shall be collected by border of the nation. The fee is preferred depending on the payload of the vehicle, which is generally related with negative impact.

The Introduction of these taxes shall be coordinate with related officials such as Ministry of Finance, Ministry of Transport, Monrovia City Corporation, Liberia National Police and so on.

## 11.2 Water Sector

In order to operate and maintain water supply system, and sustain it effectively, O&M plans are proposed in this study.

O&M plans in terms of two (2) types of water supply systems such as the White Plains water supply system and the satellite water supply system are stated in this section.

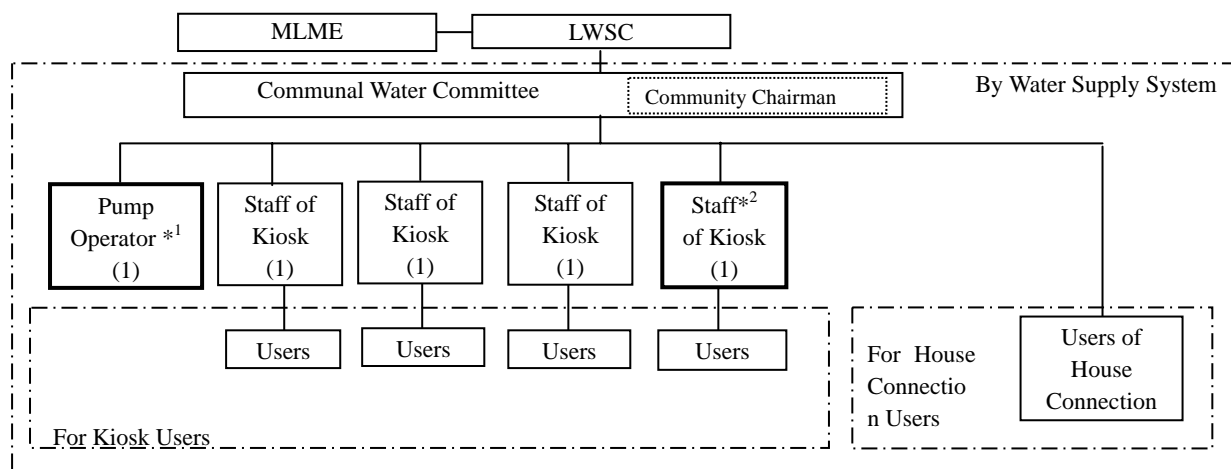
### 11.2.1 Satellite Water Supply System

As stated in Section 5.3.2, development of the satellite water supply system utilizing groundwater is proposed targeting Paynesville zone. This system is independent of the White Plains water supply system.

#### 11.2.1.1 Role and Responsibilities of Relevant Organization

Figure 11.2-1 shows a relation between relevant organization and water users on O&M for the satellite water supply system. LWSC is entirely responsible for the satellite water supply system, which is its property as well as the White Plains water supply system. In terms of some troubles such as clogging on the wells, LWSC takes countermeasures in cooperation with MLME.

Two (2) types of users who receive water from kiosks and individual house connections depend on the satellite water supply system. Bothe of the kiosks and house connections are directly managed by communal water committees. Members of communal water committee to be established for each satellite water supply system are composed of a community chairman, pump operator and staff of kiosks. The community chairman is responsible for all the communal water committees.



\*1: Person for operating pump, generator and valve control, etc.

\*2: Representative Staff of Kiosks

Note: '( )' shows number of staff.

**Figure 11.2-1 Conceptual Organization Structure on O&M by Satellite Water Supply System**

## **(1) LWSC**

Operation division of LWSC is responsible for all the O&M on satellite water supply system (see Figure 2.5-1). LWSC also has a relation with MLME on technical matters for maintaining wells. In order to sustain water supply system to be operated appropriately, general activities and responsibilities of LWSC are proposed as follows:

- Periodically monitor water quality of groundwater used as water source (Water quality analysis, its items and frequency of monitoring are followed by the regulations of LWSC and WHO guideline).
- Periodically inspect the following systems:
  - Water level of wells
  - Performance condition (vibration, sound, etc.) of generator and submersible pumps
- Request the suppliers on overhaul or major inspection of facilities and equipments for every one (1), five (5), ten (10) years.
- Repair, change the damaged parts and change/replenish consumable items with the exception of fuel.
- Restore the damaged equipments and facilities.
- Weekly collect water tariff from the communal water committee.
- Monthly collect water tariff from 30%<sup>1</sup> of the residence depending on house connection.
- Train the staff of communal water committee about O&M including water reading, billing, etc. for water supply system.

## **(2) Communal Water Committee**

Community chairman is top responsible for communal water committee, while a pump operator (manager) and staff of kiosk are in charge of pump operation and valve control, and each kiosk management respectively. Out of staff of kiosk management, one person is selected as a representative staff of kiosk. In order to manage water supply system, the general activities of the communal water committee are proposed as follows:

- Daily operate water supply system.
- Weekly pay LWSC water tariff collected from dwellers depending on kiosks.
- Read water meters at house connections, and monthly pay LWSC water tariff collected from dwellers depending on house connections.
- Daily inspect and keep security of all the water supply system as follows:
  - Leakage points of storage tanks, pipelines, gate valves, flow meters and air valves
  - Handle performance of gate valves and faucets
  - Performance (vibration, sound, etc.) of generator and submersible pumps
  - Miscellaneous damage on facilities
- Maintain equipments, parts or fuel which may be stored in generator house.
- Procure fuel and charge it to generator.

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<sup>1</sup> 30% of residence depending on house connection pays LWSC directly, while 70% of that transfers LWSC through bank.



- Feed chlorine to the storage tank for disinfection if necessary.
- Record daily revenue and water flow at kiosk.
- Record the operation log (water level of wells, water pressure at wells, etc.) and submit it to LWSC.
- Report on trouble of water supply system to LWSC.
- Restore water supply system with minor failure.

### 11.2.1.2 Preparation to be Done Prior to the beginning of Water Supply Operation

Before the beginning to operate satellite water supply system for the first time, it is required that the LWSC and beneficiaries (community) take actions to start the system effectively and smoothly as shown in Table 11.2-1 and Table 11.2-2:

**Table 11.2-1 Actions of LWSC**

| Actions  | Purpose  |
|--|--|
| • Support beneficiaries to establish communal water committee.   | • Establish water committee of community level                         |
| • Define water service area for each kiosk, and prepare water service area map.                        | • Equalize number of water users at kiosks                             |
| • Establish water tariff system (unit price)   | • Sustain water supply system by community level                       |
| • Prepare forms of record (for water tariff collection, and fuel procurement and other data)           | • Collect water tariff systematically and check fuel procurement, etc. |
| • Train manager and staff of water committee about operation, maintenance and water tariff collection. | • Operate and maintain water supply system by community level          |

Source: JICA Study Team

**Table 11.2-2 Actions of Community**

| Actions   | Purpose   |
|---|---|
| • Establish communal water committee  | • Operate water supply system and collect water tariff  |
| • Select manager for O&M, and staff for each kiosk, and representative staff for kiosk management | • Operate water supply system and collect water tariff  |
| • Establish the water fund in communal water committee  | • Collect initial cost of fuel at the beginning of operation and repair the water supply system |
| • Purchase fuel and calcium-hypochlorite  | • Regularly operate the water supply system   |

Source: JICA Study Team

### 11.2.1.3 O&M Cost Estimates

A model of operation cost for satellite water supply system by which 1,200 beneficiaries (8gcd [30LCD]) are covered accounts USD1,780 as shown in Table 11.2-3. The consumable cost such as fuel is covered by all the beneficiaries. Unit operation cost per jerry can (6gal) accounts USD0.037. In case of average household size of 5 persons, water tariff of about USD7 is paid by each household monthly. This is payable cost for beneficiaries in Paynesville zone as the results of Public Awareness Survey in this study.

Furthermore, LWSC has conventionally collected management fee which is 60% of the monthly total water tariff from each water committee. However, it is proposed that 42% of the total water tariff should be paid for LWSC, because wages of personnel such as the water committee members, cost of fuel and calcium-hypochlorite must be covered by community level with the rest of 58%.

**Table 11.2-3 Monthly Operation Cost for the Satellite Water Supply System**

| Items   | Unit Cost (USD) | Quantity | Cost (USD)               | Remarks                  |
|---|-----------------|----------|--------------------------|--------------------------|
| <b>Operation Cost</b>   |                 |          |                          |                          |
| Personnel (Tariff Collection, Management of Account Book)       | 3.0             | 120      | 360                      | 4 persons x 30days       |
| Personnel (Operation, Procurement of Fuel, Maintenance)         | 3.0             | 30       | 90                       | 1 person x 30days        |
| Diesel Fuel (Litter)  | 0.9             | 672      | 577                      | 2.8L/hr x 8hr x 30days   |
| Calcium-Hypochlorite for Disinfection (Set)                     | 3.0             | 1        | 3                        | USD3/month               |
| <b>Sub-Total</b>  |                 |          | <b>1,030</b>             |                          |
| Depreciation including technical assistance of LWSC             |                 | 1        | 750                      | 5% of equipment cost     |
| <b>Operation Cost Total</b>                                     |                 |          | <b>1,780</b>             |                          |
| Items   | Quantity        |          | Cost                     | Remarks                  |
| <b>Water Tariff Estimates</b>                                   |                 |          |                          |                          |
| Beneficiaries   | 1,200 persons   |          |                          |                          |
| Numbers of households   | 240 households  |          |                          |                          |
| Household Size  | 5 persons       |          |                          |                          |
| Daily Water Consumption per Capita per Day                      | 30LCD           |          |                          |                          |
| Monthly Water Consumption per household                         | 4,500Litter     |          |                          |                          |
| Monthly the Required Payment per household                      |                 |          | <b>USD7</b>              |                          |
| Monthly the Required Numbers of Jerry Cans (6gal) per Household | 198             |          |                          |                          |
| Water Tariff per Jerry Can                                      |                 |          | <b>USD0.037 (LRD2.6)</b> | 6gal                     |
| Water Tariff per 100gal   |                 |          | <b>USD0.61</b>           | 100gal                   |
| The Proposed Allocation of the Fund Shared                      |                 |          | <b>USD750</b>            | <b>42% for LWSC</b>      |
|   |                 |          | <b>USD1,030</b>          | <b>58% for Community</b> |

Source: JICA Study Team

## 11.2.2 White Plains Water Supply System

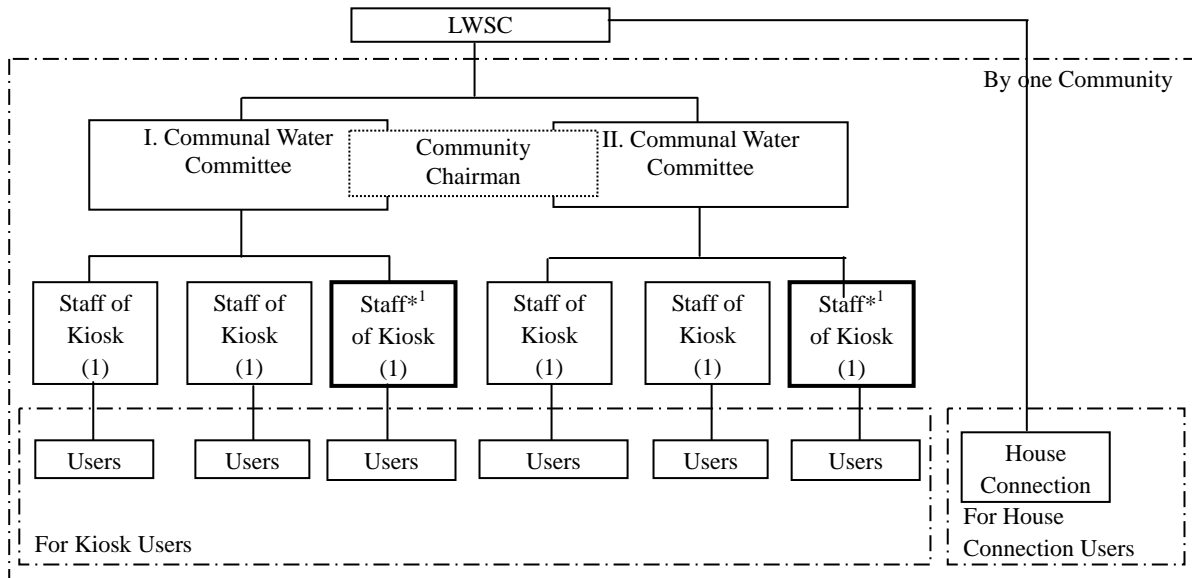
As described in Section 5.3.2 as well as satellite water supply system, development of the White Plains water supply system utilizing raw water lifted from Saint Paul River is proposed targeting overall Grater Monrovia with the exception of some parts of Paynesville zone, where is planned to be covered by the satellite water supply system.

### 11.2.2.1 Role and Responsibilities of Relevant Organization

A relation between relevant organization and water users on O&M for the White Plains water supply system is similar to that for the satellite water supply system. Their different points are as follows:

- Satellite Water Supply System: Relevant organization by the water supply system
- White Plains water supply: Relevant organization by the community level

Two (2) types of users who receive from kiosks and individual house connections depend on the White Plains water supply system. These types of users depending on the White Plains water supply system are as same as that depending on the satellite water supply system. Members of a communal water committee established for each community are composed of a community chairman and staff of kiosks. The community chairman is responsible for all the communal water committees.



\*1: Representative Staff of Kiosks  
Note: '( )' shows number of staff.

**Figure 11.2-2 Conceptual Organization Structure on O&M by Community**

### (1) LWSC

Operation division of LWSC is responsible for all of the O&M on the White Plains water supply system as well as the satellite water supply system. In order to sustain the White Plains water supply system to be operated appropriately, general activities and responsibilities of LWSC are proposed as follows:

- Periodically monitor water quality of Saint Paul River and treated water at the White Plains treatment plant (Water quality analysis, its items and frequency of monitoring are followed by the regulations of LWSC and WHO guidelines).
- Daily inspect and keep security of all the water supply system as follows:
  - Leakage points of service reservoirs, pipelines, gate valves, flow meter and air valves
  - Handle performance of gate valves and faucets
  - Water pressure on rising pumps
  - Performance (vibration, sound, etc.) of generator, rising pumps and booster pumps
  - Miscellaneous damage on facilities
- Request the suppliers on overhaul or major inspection of facilities and equipments for every one (1), five (5), ten (10) years.
- Repair, change the damaged parts and change/replenish consumable items.
- Restore the damaged equipments and facilities.
- Record the operation log (water pressure on rising main pipes, water flow, etc.)
- Weekly collect water tariff from the communal water committee.
- Monthly collect water tariff from 30%<sup>2</sup> of the residence depending on house connection

<sup>2</sup> The remained 70% of residence depending on house connection transfers LWSC through banks.

- Train the staff of communal water committee about O&M including water reading, billing, etc. for water supply system

**(2) Communal Water Committee**

Community chairman is top responsible for communal water committee, while staff of kiosk is in charge of each kiosk management. Out of staff of kiosk management, one person is selected as a representative staff of kiosk. In order to manage water supply system, the general activities of the communal water committee are proposed as follows:

- Weekly pay LWSC water tariff collected from dwellers depending on kiosks.
- Daily inspect and keep security of all the water supply system as follows:
  - Leakage points of pipelines, gate valves, water meters and air valves
  - Miscellaneous damage on facilities
- Daily record revenue and water flow at kiosk.
- Report on trouble of water supply system to LWSC.

**11.2.2.2 Preparation by Community to be Served Newly**

Prior to the dwellers are provided from the White Plains water supply system for the first time, it is required that the beneficiaries (community) take actions for starting the system effectively and smoothly as shown in Table 11.2-4.

**Table 11.2-4 Actions of Community**

| Actions  | Purpose   |
|--|---|
| <ul style="list-style-type: none"> <li>• Establish communal water committee</li> </ul>   | <ul style="list-style-type: none"> <li>• Sustain water supply system</li> </ul> |
| <ul style="list-style-type: none"> <li>• Select staff for each kiosk, and representative staff for kiosk management</li> </ul> | <ul style="list-style-type: none"> <li>• Collect water tariff</li> </ul>        |

Source: JICA Study Team

**11.2.2.3 O&M Cost Estimates**

Table 11.2-5 to Table 11.2-7 show bases for estimating O&M cost. As stated in Table 11.2-5, LWSC has controlled to reduce staff as a restructure of LWSC in the past three (3) years. However, LWSC needs to secure the staff for the future because of capacity of water supply system to be increased through the expansion projects. Staff of LWSC in 2014 and 2019 was estimated to be 260 and 440 persons based on the rate (3,363 beneficiaries per staff) of staff that LWSC focuses on 110 persons required for service population in 2009 (see Table 11.2-5).

Table 11.2-6 shows future personnel cost of LWSC, which was estimated representing USD0.47mln (2014) and USD0.79mln (2019) based on average current cost per staff. Historical and the estimated cost of fuel and chemicals are summarized as shown in Table 11.2-7. Amounts of fuel and chemicals for the future were estimated to be about USD7.1mln (2014) and USD11.0mln (2019) based on specification of facilities.

Future O&M cost shall be estimated as shown in Table 11.2-8. The O&M cost of the White Plains water supply system to be expanded is estimated to be about USD10.5mln for 3,406MG (12.9mln m<sup>3</sup>) of yearly water production and USD16.5mln for 6,387MG (24.2mln m<sup>3</sup>) in 2014 and 2019 respectively. The largest items of the O&M cost is fuel charges, making up about 60% of total O&M cost in 2014 Unit cost of O&M accounts USD0.31 per 100gal (USD0.81 per m<sup>3</sup>) and USD0.26 per 100gal (USD0.68 per m<sup>3</sup>) in 2014 and 2019 respectively.

**Table 11.2-5 Trend of Service Population and LWSC Staff**

| Items                      | 2007    | 2008    | 2009          | 2014    | 2019      |
|----------------------------|---------|---------|---------------|---------|-----------|
| Service Population         | 350,000 | 370,000 | 370,000       | 888,800 | 1,470,000 |
| Staff of LWSC              | 179     | 148     | 140 (110)     | 260     | 440       |
| Service Population / Staff | 1,955   | 2,500   | 2,642 (3,363) | -       | -         |

Source: LWSC and JICA Study Team

Note: '( )' shows that LWSC recommends appropriate number of staff for 2009.

**Table 11.2-6 Future Personnel Cost**

| Items                | 2007    | 2014    | 2019    |
|----------------------|---------|---------|---------|
| Personnel Cost (USD) | 321,689 | 468,000 | 792,000 |
| Number of Staff      | 179     | 260     | 440     |
| USD/month            | 150     | -       | -       |

Source: LWSC and JICA Study Team

**Table 11.2-7 Chemical and Fuel Cost**

(Unit: USD)

| Items        | 2006           | 2007           | 2014             | 2019              |
|--------------|----------------|----------------|------------------|-------------------|
| Chemical     | 123,333        | 196,667        | 707,000          | 1,415,000         |
| Fuel         | 261,667        | 391,069        | 6,363,000        | 9,545,000         |
| <b>Total</b> | <b>385,000</b> | <b>587,736</b> | <b>7,070,000</b> | <b>10,960,000</b> |

Source: LWSC and JICA Study Team

**Table 11.2-8 Unit Cost of O&M for White Plains Water Supply System**

| Item  | 2006           |            | 2007             |            | 2014              |            | 2019              |            |
|---|----------------|------------|------------------|------------|-------------------|------------|-------------------|------------|
| Revenue Water*1<br>(Million gal)  | 196            | -          | 243              | -          | 3,406             | -          | 6,387             | -          |
| Personnel   | 168,833        | 23.0%      | 321,689          | 24.9%      | 468,000           | 4.4%       | 792,000           | 4.8%       |
| Chemicals   | 123,333        | 16.8%      | 196,667          | 15.2%      | 707,000           | 6.7%       | 1,415,000         | 8.6%       |
| Power (Fuel)  | 261,667        | 35.7%      | 391,069          | 30.2%      | 6,363,000         | 60.3%      | 9,545,000         | 58.0%      |
| Administrative, maintenance,<br>depreciation, other<br>miscellaneous cost*2 | 180,000        | 24.5%      | 383,430          | 29.7%      | 3,230,571         | 28.6%      | 5,036,571         | 28.6%      |
| <b>O&amp;M Cost (USD)</b>   | <b>733,833</b> | <b>100</b> | <b>1,292,855</b> | <b>100</b> | <b>10,553,200</b> | <b>100</b> | <b>16,452,800</b> | <b>100</b> |
| <b>Unit Cost for O&amp;M<br/>(USD/100gal)</b>                               | <b>0.37</b>    |            | <b>0.53</b>      |            | <b>0.31</b>       |            | <b>0.26</b>       |            |
| <b>Unit Cost for O&amp;M (USD/m<sup>3</sup>)</b>                            | <b>0.98</b>    |            | <b>1.40</b>      |            | <b>0.81</b>       |            | <b>0.68</b>       |            |

Source: LWSC and JICA Study Team

Note:

\*1: Water production which may be produced depending on satellite water supply system is excluded from this water production.

\*2: 40% of the cost of personnel, chemicals and fuel was applied based on the historical trends of year 2006 and 2007.

### 11.2.3 Recommendation on Water Supply Management

#### (1) Improvement on Water Quality Analysis

LWSC conducts water quality analysis of the White Plains treatment plants. Parameters of water quality analysis are very limited and pH, color, turbidity and residual chlorine have currently been analyzed. In addition, water quality control system such as daily monitoring system, communication system in case of emergency on water quality has not been established in LWSC.

In order to control water quality appropriately, the following countermeasures are proposed:

- Procure apparatus to analyze water parameters following by the WHO.
- Develop water quality management system
  - Clarify water analysis parameters, analysis frequency, sampling points to sampling points
  - Record water analysis data
  - Examine the water quality trends
  - Take action for emergency situation

## **(2) Improvement on Rate of Revenue Water**

LWSC recognizes that reduction of the leakage water and protection of leakage and/or water robbery for eliminating non-revenue water contributes to improve water supply service management. However, it is most important to study condition of the existing pipelines and repeatedly to take an action to repair leakage points as quickly as it is discovered. Procurements of leakage detectors and tools of repairs are required and their management system and institution on their fund expenses in case of emergency should be developed.

In addition, water robbery can be reduced due to an establishment of strict penalty robbery and its excursion.

## **(3) Reform of Water Tariff System**

As shown in Table 11.2-8, cost for O&M can be covered by at least USD0.31 per 100gal (USD0.81 per m<sup>3</sup>) and USD0.26 (USD0.68 per m<sup>3</sup>) in 2014 and 2019 respectively. If commercial power is provided for operating water supply system, power cost shall be cut to 40-50% of the estimated fuel cost. Even though diesel fuel is utilized for pump operation, the unit cost of O&M for future is lower than current unit cost of O&M. Furthermore, LWSC has undertaken the flat rate water tariff system as well as the metered water tariff system, because there are many users who have no water meters or inoperative meters in their compounds. This has also caused a drop of revenue water.

Therefore, water tariff collection based on flat rate system must be eliminated as much as possible, and in order to make dwellers understand about circumstances of water service management, review of overall water tariff system which corresponds to the future O&M cost is required.

## **(4) Improvement of Water Tariff Collection Rate**

Since water supply service management is affected by water tariff collection rate, water tariff collection rate is concerned in the water service planning. LWSC has enforced to collect water tariff since 2006. Water tariff collection rate has achieved at least 75% in 2006 and 112% in 2007. As LWSC received all the arrears for government office, water tariff collection rate made up over 100%.

In order to sustain water tariff collection, the followings are key points on management.

- Provide water supply service in which users are satisfied.
- Sustain an appropriate function of water meters
- Conduct regular meter reading by meter readers of LWSC and kiosk operators
- Regularly collect water tariff in the day predicted by LWSC or kiosk operators.
- Perseveringly remind of users and collect water tariff in case of even late payment.

## **(5) Rationalization of LWSC Staff**

It is very difficult to rationalize staff working in any governmental organization in developing countries, because it is issued that most of staff is conserved much despite the level of economic development.

Under deficit water service management of LWSC in the past, LWSC assured that their staff exceeded adequate numbers of the staff, and decided to downsize the staff since 2006. In 2009, LWSC has the staff of 140 persons and, LWSC insists to downsize from 140 to 110 persons taking into consideration of current water production.

After the rehabilitation of the White Plains water supply is completed in 2011, since the capacity of the water production increases, it is proposed that LWSC increases the staff of 140 to about 260.

## **11.3 Sanitation Sector**

In order to conduct maintenance and operation (O&M) of the sewerage and sanitation facilities properly, O&M plan is proposed in this study.

O&M plan is proposed for the sewerage and sanitation facilities to be constructed for the target years of 2014 and 2019.

### 11.3.1 Sewerage and Sanitation Facilities at Present and in Future

As mentioned in Chapter 6, current situation and future development for sewerage and sanitation facilities, O&M of which will be conducted by LWSC, are summarized in Table 11.3-1.

**Table 11.3-1 Current Situation and Future Development for Sewerage and Hygiene Facilities**

| Stage                | Category         | Contents   | Remarks  |
|----------------------|------------------|--|--|
| At present<br>(2009) | Sewerage System  | Fiama Sewage Treatment Plant (STP) with the design capacity of 22,700m <sup>3</sup> /day<br>Four (4) sewage relay pump stations<br>Five (5) lifting pump stations<br>Sewer network with 70km in length | Fiama STP is disrepair and in no use.<br>Almost all the pumping stations are disrepair and in no use.<br>Most of the sewer pipelines are clogged with sludge and debris. |
|                      | Hygiene Facility | 100 public toilets   | Foul water is mainly evacuated by private company's vacuum trucks.   |
| For 2010             | Hygiene Facility | Rehabilitation of 20 to 30 public toilets by WB<br>Construction of 11 public toilets by DFID and AfDB<br>Procurement of 1 vacuum truck   |  |
| For 2014             | Sewerage System  | Restoration work for sewer network: under study by foreign aid organizations   |  |
|                      | Hygiene Facility | [Proposed in this study]<br>Installation of 66 community sanitation systems<br>Installation 225 public toilets<br>Procurement of 8 vacuum trucks   | Total number of public toilets: 336 (100+11+225) - including the existing ones   |
| For 2019             | Sewerage System  | [Proposed in this study]<br>Restoration of Fiama STP with sludge treatment facilities<br>Restoration of sewage relay pump stations and lifting pump stations<br>Restoration of sewer network           |  |
|                      | Hygiene Facility | [Proposed in this study]<br>Installation of 93 community sanitation systems<br>Installation 86 public toilets<br>Procurement of 7 vacuum trucks  | Total community sanitation system: 159<br>Total public toilet: 422<br>Total vacuum truck: 16 (1+8+7)   |

Source: JICA Study Team

### 11.3.2 Communal Sanitary Committee and Public Toilet Committee

#### (1) Communal Sanitary Committee

##### (a) Establishment of Committee

In order to conduct proper maintenance of community sanitation system, communal sanitary committee shall be established in each community sanitation system. The committee will make an agreement with LWSC for tariff collection and maintenance.

##### (b) Roles of Committee

Roles of the committee will be as follows:

Collecting user charge for community sanitation system from the customers

Securing remuneration for community representative

Paying the collected charge to LWSC

Conducting proper maintenance for connection pipes to main sewer or collecting pit

**(c) Estimation of User Charge**

User charge for community sanitation system is estimated as follows:

**Table 11.3-2 Estimation of User Charge for Community Sanitation System**

| Item  | Unit                | Target Year |       |
|---|---------------------|-------------|-------|
|   |                     | 2014        | 2019  |
| Number of Community Sanitation System               | Place               | 66          | 159   |
| Sludge Volume from all the on-site facilities       | m <sup>3</sup> /day | 125         | 230   |
| Trip by Vacuum Truck for all the on-site facilities | trip/day            | 18          | 32    |
| Trip for Community Sanitation System                | trip/day            | 7           | 17    |
| Collection Tariff per Trip                          | USD/trip            | 100         | 100   |
| Collection Tariff per Day                           | USD/day             | 700         | 1,700 |
| User Charge by each Community                       | USD/day             | 10.6        | 10.6  |
| User Number for each Community                      | Person              | 3,000       | 3,000 |
| Monthly Charge for each User                        | USD/month/user      | 0.11        | 0.11  |
| Monthly Charge for each Household                   | USD/month/HH        | 0.55        | 0.55  |

Source: JICA Study Team

Note: Construction cost for the community sanitation system shall be borne by LWSC or foreign aid organizations.

As shown in the above table, estimated monthly charge for each user is 0.11USD/month. Therefore, one household will have to pay 0.55USD/month (0.11 x 5 persons). Since this is only 0.4 percent for the average household income of 150USD/month, users for community sanitary system will be able to afford to pay the user charge.

**(2) Public Toilet Committee**

**(a) Establishment of Committee**

In order to conduct proper maintenance of public toilets, public toilets committee shall be established in each public toilet. The committee will make an agreement with LWSC for tariff collection and maintenance.

**(b) Roles of Committee**

Roles of the committee will be as follows:

Collecting user charge for public toilets from the customers

Securing remuneration for community representative

Paying the collected charge to LWSC

Conducting proper maintenance of public toilet

**(c) Estimation of User Charge**

User charge for public toilets is estimated as follows:



**Table 11.3-3 Estimation of User Charge for Public Toilet**

| Item  | Unit                | Target Year |       |
|---|---------------------|-------------|-------|
|   |                     | 2014        | 2019  |
| Number of public toilet                             | Place               | 336         | 422   |
| Sludge Volume from all the on-site facilities       | m <sup>3</sup> /day | 125         | 230   |
| Trip by Vacuum Truck for all the on-site facilities | trip/day            | 18          | 32    |
| Trip for Public Toilets                             | trip/day            | 11          | 15    |
| Collection Tariff per Trip                          | USD/trip            | 100         | 100   |
| Collection Tariff per Day                           | USD/day             | 1,100       | 1,500 |
| User Charge by each Public Toilet                   | USD/day             | 3.4         | 3.4   |
| User Number for each Public Toilet                  | Person              | 480         | 480   |
| Monthly Charge for each User                        | USD/month/user      | 0.21        | 0.21  |
| Monthly Charge for each Household                   | USD/month/HH        | 1.05        | 1.05  |

Source: JICA Study Team

Note: Construction cost for the public toilets shall be borne by LWSC or foreign aid organizations.

As shown in the above table, estimated monthly charge for each user is 0.21USD/month in average. Therefore, one household will have to pay 1.05USD/month (0.21 x 5 persons). Since this accounts for only 0.7 percent for the average household income of 150USD/month, users for public toilets will be able to afford to pay the user charge.

### 11.3.3 Proposed Organization for O&M of Sewerage Facilities in LWSC

#### (1) Required Staff for Future Facilities

Required staff members for future facilities are proposed as follows:

**Table 11.3-4 Required Staff Members for Future Facilities**

| Facility  | Target Year |      |
|---|-------------|------|
|   | 2014        | 2019 |
| [Fiama Sewage & Sludge Treatment Plant]           |             |      |
| 1. Plant manager                                  | 0           | 1    |
| 2. Technician for mechanical equipment            | 0           | 1    |
| 3. Technician for electrical equipment            | 0           | 1    |
| 4. Operator for sewage treatment system           | 0           | 3    |
| 5. Operator for sludge treatment system           | 0           | 3    |
| 6. Worker for maintenance                         | 0           | 2    |
| 7. Security                                       | 0           | 2    |
| Total   | 0           | 13   |
| [Sewer Relay & Lifting Pump Stations]             |             |      |
| 1. Operator                                       | 4           | 4    |
| [Sewer Network]                                   |             |      |
| 1. Worker for sewer pipe maintenance              | 8           | 8    |
| [Community Sanitation Systems and Public Toilets] |             |      |
| 1. Driver & operator for vacuum truck             | 9           | 16   |
| 2. Assistant operator                             | 9           | 16   |
| Total   | 18          | 32   |
| Grand Total                                       | 30          | 57   |

Source: JICA Study Team

#### (2) Current and Future Situation for Staff

Out of 43 staff members for operation and maintenance of water supply and sewerage systems, 8 staff members are currently allocated for O&M of sewerage system.

These staff members are working mainly for cleaning of clogged sewer lines and evacuation of overflow sewer lines and manholes. LWSC has currently three (3) vacuum trucks which are mainly used for these purposes.

LWSC staff in future is proposed in this study as follows:

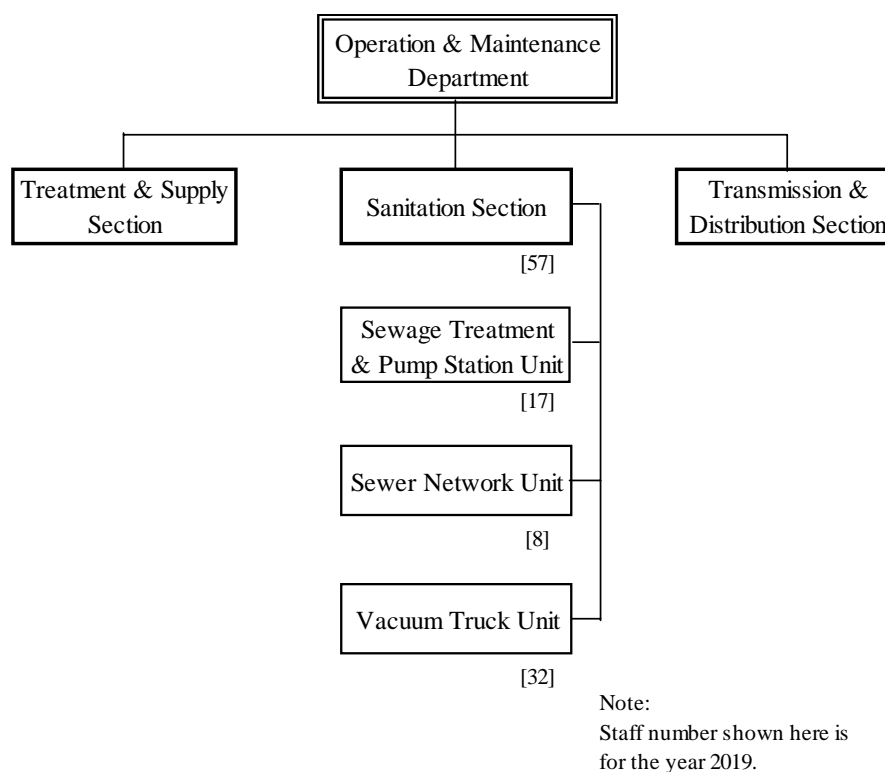
**Table 11.3-5 Required Number of LWSC Staff for O&M in Future**

| Item                          | At Present<br>(2009) | 2014 | 2019 |
|-------------------------------|----------------------|------|------|
| Total staff                   | 140                  | 260  | 400  |
| O&M staff                     | 43                   | 78   | 120  |
| O&M staff for sewerage system | 8                    | 30   | 57   |

Source: JICA Study Team

### (3) Proposed Organization

Organization for LWSC in the sanitation section is proposed taking into account the restoration of Fiamia sewage & sludge treatment plant, pumping stations, sewer network and construction of community sanitation systems & public toilets. It is shown in Figure 11.3-1.



Source: LWSC and JICA Study Team

**Figure 11.3-1 Organization for O&M of Sewerage Facilities in LWSC (for the year 2019)**

Three units are proposed in the sanitation section and the roles for each unit will be as follows:

**Sewage Treatment & Pump Station Unit:** Conducting O&M for Fiamia STP, sewer relay pump stations and lifting pump stations

**Sewer Network Unit:** Conducting cleaning of clogged sewer lines, repair of damaged sewer pipes, etc.

**Vacuum Truck Unit:** Conducting collection of night soil from community sanitation system and public toilets.

#### 11.3.4 Estimation of O&M Cost

O&M cost for the year 2019 is estimated for the following facilities:

Fiamia Sewage and Sludge Treatment Plant

Sewage Relay and Lifting Pump Stations

Sewer Network

Community sanitary system and public toilet

**Table 11.3-6 Estimation of O&M Cost for Sewerage Facilities (for the year 2019)**

| Facility  | Cost<br>(USD/Year) | Remarks                   |
|---|--------------------|---------------------------|
| [Fiama Sewage & Sludge Treatment Plant  |                    |                           |
| 1. Personnel Cost   | 24,000             | 13 x 150USD/month         |
| 2. Fuel Cost  | 530,000            | For generator             |
| 3. Maintenance Cost (spare parts)   | 80,000             | 4% of M&E equipment price |
| [Sewage Relay & Lifting Pump Station]   |                    |                           |
| 1. Personnel Cost   | 7,200              | 4 x 150USD/month          |
| 2. Fuel Cost  | 1,150,000          | For generator             |
| 3. Maintenance Cost   | 16,000             | 4% of M&E equipment price |
| [Sewer Network]   |                    |                           |
| 1. Personnel Cost   | 15,000             | 8 x 150USD/month          |
| 2. Fuel Cost  | 3,800              | For vehicles              |
| 3. Maintenance Cost   | 18,000             | 4% of vehicle price       |
| [Community Sanitation System and Public Toilets]  |                    |                           |
| 1. Personnel Cost   | 58,000             | 32 x 150USD/month         |
| 2. Fuel Cost  | 836,000            | For vehicles              |
| 3. Maintenance Cost   | 96,000             | 4% of vehicle price       |
| Total   | 2,834,000          |                           |
| [Conditions for estimation]<br>Fuel cost: 3.1USD/Gal<br>Fuel consumption rate per vehicle: 1.3km/Gal<br>Cleaning for sewer lines: 1 time per week per vehicle = 3 times per week = 156 times per year<br>Driving mileage: 10km per vehicle per trip for sewer network and 30km for community sanitation systems and public toilets<br>Vehicle price: 150,000USD/vehicle<br>Mechanical and electrical equipment price for Fiama STP: USD 2,000,000<br>Mechanical and electrical equipment price for pump stations: USD 400,000 |                    |                           |

Source: JICA Study Team

## 11.4 Storm Water Drainage Sector

At present, MPW gives the mandate of drainage operation and maintenance (O&M) to the Operation Bureau. The Bureau is charge with the mandate to rehabilitate all Public Highways, Bridges and City Streets. The Bureau includes the Highway Maintenance Division, Mobile Equipment Division and Administration Division. These three (3) Divisions carry out separate functions, which correspond to the overall function of the Bureau. A special unit for drainage O&M is not yet established in the Bureau. For operation and maintenance of storm water drainage sector, the information is insufficiently obtained from MPW. In this study, tentative operation and maintenance plan are proposed below.

### 11.4.1 Staff Requirements and Budget

The staffing plan and budget for the operation and maintenance is developed and proposed to support activities aiming to keep existing assets for cleaning of surface drainage channels and underground pipes. At the open drainage site, 10 personnel for technician including operator and 6 personnel for plumber/laborer are required. For the underground pipes cleaning, 6 personnel operator for a jet cleaning car, a vacuum car, 2 water tank trucks, and 2 sludge hauling trucks are required. In addition, 3 personnel of plumber/Laborer for horse arrangement and jet nozzle arrangement are also required. An engineer for operation plan and an accounting for the procurement of consumption articles manage the operation and maintenance team. Table 11.4.1 lists the number of personnel and required budget per month. Annual staff cost is required approximately USD 64,200.

**Table 11.4-1 Staffing Plan and Budget for Operation and Maintenance**

|                 | Engineer | Accountant | Technician | Plumber/<br>Laborer | Staff Cost<br>(USD/Month) |
|-----------------|----------|------------|------------|---------------------|---------------------------|
| Monrovia        | 1        | 1          | 15         | 9                   |                           |
| (Unit Cost/Mon) | 400      | 300        | 250        | 100                 | 5,350                     |

#### 11.4.2 Running Cost

The running cost for the vehicles of vacuum truck, jet cleaning truck, and water tank truck etc. for sludge dredging of the channel and underground pipes cleaning is estimated on the basis of following condition.

- 286 working days per year
- fuel cost of USD 3.3 per gallon
- A fuel consumption of 100 L/day for the vehicles

For the two pick-truck, an average use of 50km per working day is assumed and a fuel consumption of 10km/L.

The contingency for other consumption articles is added by 10% to cover the running costs of the vehicles.

The running costs of the vehicles per annual is equivalent to approximately USD 195,000 and summarized in Table 11.4.2

**Table 11.4-2 Running Cost for Operation and Maintenance**

| Operation and Maintenance Cost                                      | USD/Annual     |
|---|----------------|
| Vehicles for Drainage Channel Cleaning & Underground Pipes Cleaning | <b>192,256</b> |
| Pickup-Truck (2)  | <b>2,747</b>   |
| Total   | <b>195,003</b> |

#### 11.4.3 Recommendation for Establishment of Operation and Maintenance Unit

To solve the inundation problem around the storm water drainage channel, the sustainable operation and maintenance unit in MPW or other Government agencies is required without any delay. In this section, some points of concern for the unit establishment are summarized below.

##### (1) Organization

To perform the drainage structures, a sustainable organization shall be established as soon as possible, considering the following points:

- An organization with sufficient manpower for execution of O&M duties should be established
- Use of manpower should be adequately and rationally arranged according to capacity and qualification
- A system to cope with emergencies should be established.
- Possibility of the consigning O&M work may be studied if it is considered advantageous in term of economy and efficiency.
- Positive consideration should be given to the possibility of local residents' participation.

##### (2) Scope of O&M

O&M duties should be execution of general affairs related to drainage, budget execution, asset management, etc.; guidance for drainage connections; monitoring and guidance on storm-water drainage, and inventory management, recording, environmental conservation, emergency measures, and public relations activities.

##### (3) Personnel Training

Training should be in diligence to support operation and maintenance. The greatest obstacle to

personnel training is a distinct job classification system that creates substantial gaps in terms of treatment and duties. It causes failure of conveyance of technologies to other personnel and the retention ratio of staff that has mastered more technologies tends to drop. It is therefore essential to ensure conveyance of technologies equally to all staffs concerned.

**(4) Procurements and Storage of Material and Equipment**

The procurement method should be established to adequately secure the material and equipment, with efforts made to develop storage places and inventory control.

**(5) Drainage System Inventory and Records**

**(a) Development of Inventory**

- To conduct proper operation and maintenance, the inventory showing current conditions of the drainage system shall be prepared.
- Also to realize high-level information management, with the development of labor saving measures the structuring of various database system and GIS shall be developed, then upgrade and communization of information can be achieved

**(b) Storages and Updating of Inventories**

- Storage of the inventory should be strict and spares should be provided.
- In case of changes of facilities dimension, the inventories should be corrected immediately and without fail.

**(c) Preparation and Management of Records**

It is recommended to prepare and manage the following records so that they can be referenced any time.

- Maintenance and inspection records
- Operation records
- Activity records of dredging, desilting, and declogging
- Accident and complaints records

**(6) Operations and Maintenance of Drainage Channels (Waterways)**

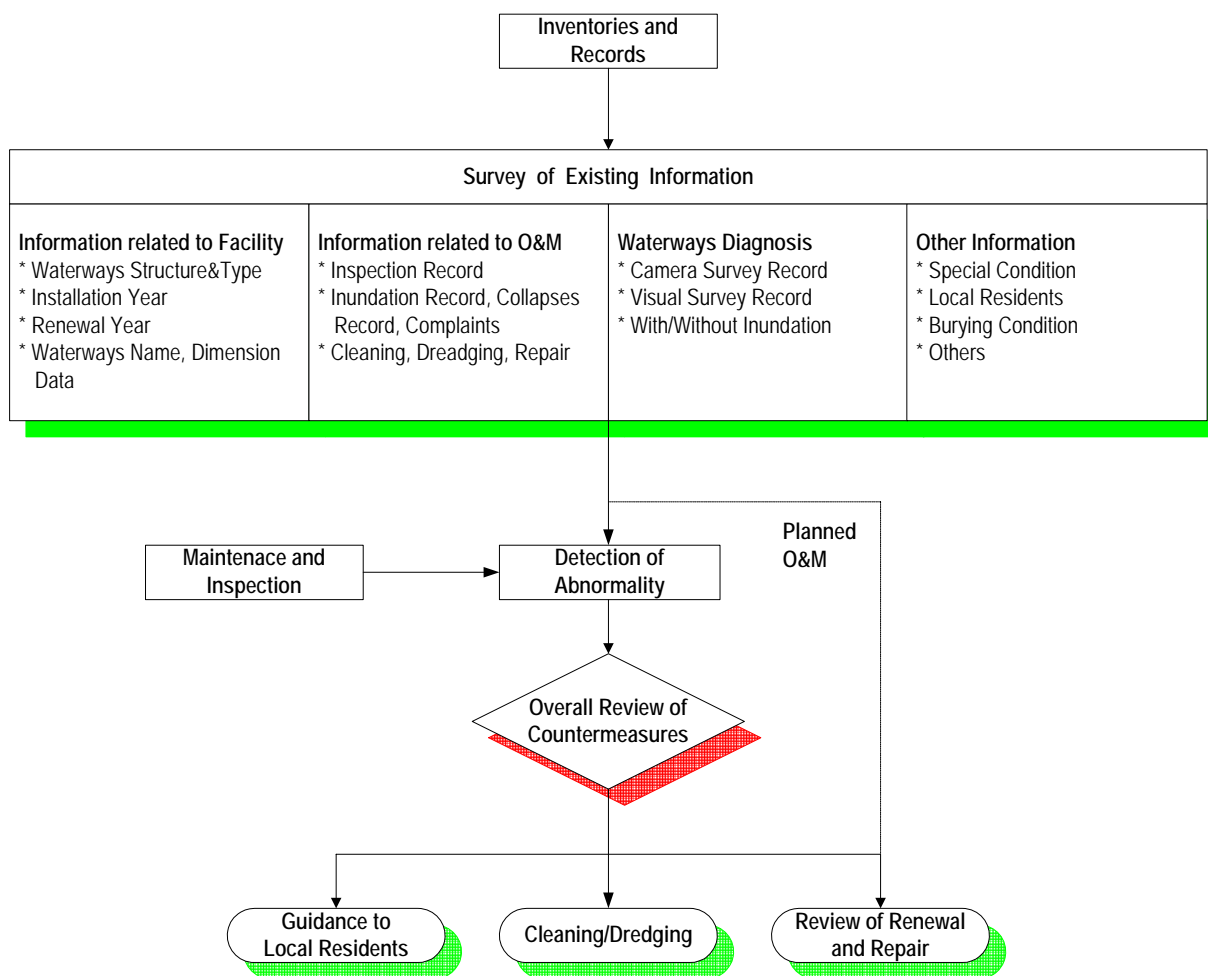
Any abnormality in the waterways causes accidents directly affecting city activities and civil life, such as inundation of sanitary wastewater, road collapse, etc.

Objectives of O&M of the waterways are as follows:

- Securing of flow capacity
- Prevention of accident caused by damage to facilities
- Extension of practical service life
- Prevention of damage to the facilities due to other construction work

**(a) O & M Flow of Drainage Structures**

Operation and maintenance of drainage structures involves adequate implementation of maintenance inspections, renewal, and repair along a flow series illustrated in Fig.11.4.1.



**Figure 11.4-1 Operation and Maintenance Flow**

**(b) Maintenance and Inspection**

- Inspection of drainage structures (underground drainage pipe, inlet grating, manhole, and waterways) should be made periodically because that scouring, sedimentation and trees growing in the waterways shall give a serious effect on flow capacity and drainage facilities.
- Inspection should be made with an eye out for cross and illegal connections as well as on physically matters such as siltation, dumping of waste materials, damage of drainage structures, etc.
- Inspection result should be recorded.
- Insufficient discharge capacity should be grasped with attention paid to hydrological survey result and the drainage plans.

**(c) Cleaning and Desilting**

- Sediment should be removed as indicated by inspection and surveys.
- In particular, sediment in principal drainage waterways should be removed before the rainy season.
- Cleaning and desilting methods of culvert and conduit
- Cleaning with water-jetting cleaner requires due attention for heavily decayed pipes/conduits with insufficient durability. Cleaning may damage these pipes/conduits.
- Manual cleaning: Workers enter the manhole and



perform cleaning using a truck crane when cleaning with sludge suction machine is difficult.

**(d) Renewal and Repair of Drainage Structures**

- Implementation plans for renewal and repair should be established on the basis of inspection, survey, and study.
- The plan should be established while taking into account active preventive measures from the viewpoint of life cycle.
- Renewal and repair should be implemented according to the plan.

**(e) Protection and Prevention**

Positive protection/prevention steps should be taken to prevent damage to drainage structures by other construction works in the neighborhood

**(f) Road Drainage Connection**

- The importance of adequate control of road drainage connections should be fully understood by related authorities, consultants and contractors.
- Completion and regular inspections of road drainage connections should be made to prevent cross and illegal connections.

## **CHAPTER 12 CONCLUSION AND RECOMMENDATION**

### **12.1 Conclusion**

#### **12.1.1 Overall Master Plan**

##### **(1) Large Amount of Fund Requirement for Restoration and Improvement of Projects**

Already large amount of fund is required for the implementation of projects proposed in PRS. In this Study urban facilities restoration and improvement plan in the confined sectors including road and transportation, water supply, sanitation and storm water drainage to attain MDGs, and it was clarified that still large additional amount of fund for the project implementation is required.

##### **(2) Multi-sectoral Project Proposals**

It became apparent that in the urbanizing areas spreading outwards in Greater Monrovia Area infrastructure is insufficient in each sector. Therefore project formulation in this Study is not confined within a sector. Multi-sectoral comprehensive project is formulated.

##### **(3) Confined Infrastructure Restoration and Improvement Master Plan**

It should be noted that this study covers four infrastructure sectors and other important sectors like power supply is not covered. Regarding four major pillars referred to in the PRS, Governance & Rules of Law pillar is not much studied. Environmental sector's necessity of regeneration of natural swampy sites and shore protection are referred as the needs arose, however projects are not formulated in this Study.

##### **(4) Community-based Project Proposals**

In the restoration and reconstruction period much is expected from community to identify infrastructure needs, plan restoration and reconstruction plan, efficient implementation of projects, and to create jobs. Therefore to positively utilize community is proposed.

##### **(5) Additional Surveys to be Implemented**

Additional surveys will be conducted in this Study for the smooth and quick implementation of proposed projects. Since underground water potential is identified high at Paynesville, water supply project by drilling deep wells is proposed. For more detailed information on underground water potential at Paynesville additional survey will be conducted in this Study. Also as quick project implementation of Johnson St. Bridge improvement is desirable, environmental impact assessment will carried out in this Study.

##### **(6) Land Use Zoning Proposals**

A new land use zoning map proposing Urbanization Promotion Area and Urbanization Control Area was prepared as a base for restoration and improvement master plan to replace the previous zoning map lost during the strife. In the process of preparation of new zoning map not only informal settlements but also the areas where infrastructure restoration and reconstruction project is barely possible are identified.

#### **12.1.2 Road and Transportation Sector**

##### **(1) Goal of Restoration and Improvement Plan**

Road restoration and reconstruction plan was formulated targeting 100% of road restoration and reconstruction rate.

##### **(2) Emergency Restoration and Improvement Project Proposals towards Future Vision**

For the attainment of the two goals to restore and reconstruct roads to meet basic human needs and to recover dilapidated economy, some projects to be urgently implemented are identified and emphasized. For instance restoration and reconstruction of access road to educational, health and medical facilities in the rainy season is urgently needed for the residents in the peripheral communities.



### **(3) Data base Building for Planning**

Road inventory survey, traffic surveys and person trip survey were conducted in this Study and very detailed data on present road condition, present traffic situation and transport demand was acquired.

#### **12.1.3 Water Supply Sector**

##### **(1) Goal of Restoration and Improvement Plan**

Water supply restoration and reconstruction plan was formulated targeting 100% coverage of households within Greater Monrovia by river water supply system and ground water supply system for the target year of 2019.

##### **(2) Water Supply Restoration and Improvement Plan in accordance with Characteristics of the Area**

Water supply plan by deep well is formulated for Paynesville area because of expected high ground water potential. For other areas Water supply plan by river water supply system is formulated due to insufficient underground water potential as a result of the analysis of data acquired from surveys including VES survey. However as normally the life expectancy of deep well is some 15 to 20 years, water supply system after 2019 shall be studied to identify financial and economic feasibility of alternatives such as substituting deep well construction and expansion of coverage area by WTP.

##### **(3) Database Building for Planning**

Water Quality Survey and Public Awareness Survey were conducted in this Study and very detailed data on present water supply condition and water supply demand was acquired.

#### **12.1.4 Sanitation Sector**

##### **(1) Goal of Restoration Plan**

Sanitation restoration and reconstruction plan was formulated targeting 68%(MDGs achievement base) coverage of households within Greater Monrovia Area by sanitation system in the old districts and on-site facilities for the target year of 2019. After 2019 the coverage area shall be gradually expanded.

##### **(2) Sanitation Restoration Plan in accordance with Characteristics of the Area**

Sanitation plan for old districts and on-site facilities for peripheral areas are proposed. Expansion of sanitation coverage area after 2019 shall basically depend on on-site facilities.

#### **12.1.5 Storm Water Drainage Sector**

##### **(1) Goal of Restoration Plan**

Restoration and reconstruction plan of drainage facilities (open channels, underground drainage pipes and manholes) for the old districts centered by Central Monrovia up to 2014 is proposed. For the flood prone peripheral areas, restoration plan to construct drainage facility (culverts) in the road rehabilitation project is proposed.

##### **(2) Manual and Guidelines for Operation and Maintenance**

As the drainage capacity is reduced by silted earth and sand in the drainage, cleaning of drainage before rainy season is recommendable. Preparation of manual and guidelines for the establishment of sustainable operation and maintenance organization is proposed.

##### **(3) Monitoring of Project Implementation**

Although drainage restoration project on a small scale funded by the World Bank is already being implemented. However the project is not well recognized within MPW, so importance of project monitoring is stressed in the Master Plan.

## **12.2 Recommendations**

### **12.2.1 Recommendations related to Planning/ Implementation**

#### **(1) Authorization of the Master Plan and Reflection into National/Regional Development Plan**

It is vital for the Master Plan on Urban Facilities Restoration and Improvement formulated under this Study to be authorized as a Master Plan for short and medium terms up to the year 2014 and 2019, in order to systematically urge the restoration and reconstruction of Greater Monrovia suitable to function as the capital of Liberia, integrating all efforts toward the same goals. The proposed Master Plan shall be at first submitted to and approved by the Committee on Infrastructure & Basic Services as a Pillar stipulated in the “Poverty Reduction Strategy chaired by the Minister of MPW. Then the proposed Master plan shall be submitted to and approved by the Liberian Reconstruction and Development Committee (LRDC) chaired by the Minister of MPEA. And LRDC shall submit the Master Plan to the Cabinet chaired by the President of Liberia to get approval. Following those steps after the approval of the Cabinet, the proposed Master Plan is officially authorized.

The authorized Master Plan shall be given force as a guideline for all restoration, reconstruction and development activities by not only public sectors but also private sectors.

The projects/programs in the Master Plan should be included in the national/regional restoration and reconstruction plans in accordance with PRS to make sure the implementation of the plan with budgetary arrangement and manpower. Resolution on implementation of the projects other than those committed by the international organizations proposed in the Master Plan shall be made by the Parliament to secure the Governmental budget.

#### **(2) Timely Implementation of Feasibility Studies**

The Master Plan gives only concepts and draft features of the projects. The details of the projects will be determined in the feasibility studies, including the project scope, construction method and schedule, cost, and technical/economical/financial/environmental analyses. To materialize the proposed projects as scheduled, feasibility studies shall timely be implemented.

#### **(3) Securing/Raising of Funds**

Realization of the Master Plan requires a huge amount of fund. Presently overseas development assistance and tax are the major sources of the Government budget. Already the LRTF has received from the World Bank, German Government, EC, US, AfDB and other donor countries and organizations are also funding projects in the infrastructure sector by their own schemes.

The prospect of the future amount of the official development assistance after the reconstruction period is, however, obscure. Also much is not expected to the private sector investment under the present circumstances. As a result, the Government might have to bear most of the budgetary burden for realization of the restoration and reconstruction plan.

Various measures for raising funds shall be examined and introduced including promotion of private sector investment, increase in tax revenue based on the beneficiary-pay principle, utilization of communities’ resources, and so on.

To promote the private sector investment in the form of PPP or other similar scheme and private sector participation for the projects is expected to gain revenue. For such purpose improvement of environment for investment is vital, including market development, taxation preference policy, development of related infrastructure, and so on.

Such policies as beneficiary-pay and pay for damage and wear, and refurbishment of fare and taxation systems for public services are worthwhile to examine and introduce, especially to secure operation, management and maintenance funds. Since in Greater Monrovia, general people are not well aware of the beneficiary-pay principle for public services due to the past customary access thereto, the beneficiary-pay principle should be carefully introduced because it is apt to be against low income group to access to basic public services and against social redistribution of wealth.

As stated later, it is recommended to effectively utilize the communities’ resources. This is effective in

saving the expenditure and restraining the outward flow of fund rather than raising the fund as well as redistributing wealth.

#### **(4) Adoption of Labour-based Construction for Job Creation**

Since presently in Greater Monrovia and Liberia, job opportunity is very limited except employment of the Governmental agencies, creation of job opportunities is of vital importance, especially for IDP returnees who agglomerate to form informal settlement. One of the practical ways is to absorb unemployment population in the construction industry. One way of increasing job opportunities in the construction project is to introduce the labour-based construction method. In general, the labour-based construction method is more applicable to small scaled projects. It is recommended to take measures to encourage the adoption of the labour-based construction method to the projects suitable for this method, such as stipulating in the conditions of contract that the use of equipment be restricted.

Table 12.2-1 shows the characteristics of the labour-based construction method as compared with other methods.

**Table 12.2-1 Comparison of Construction Methods**

| Item                              | Labour-intensive Construction Method                                 | Labour-based Construction Method  | Mechanized Construction Method                       |
|-----------------------------------|--|-----------------------------------|--|
| Composition of Labour & Equipment | Mainly labourers with tools  | Labourers with minimum equipment  | Mainly equipment with labourers                      |
| Quality                           | Not high in general  | Finished by equipment if required | High in general                                      |
| Required Time                     | Long   | Medium                            | Short  |
| Cost                              | Not inexpensive in many cases  | Relatively inexpensive            | Economical in case of large scaled construction      |
| Example of Suitable Work          | Low class road construction/maintenance, Low cost house construction |                                   | Large scaled project like highway, bridge, dam, etc. |

#### **(5) Execution of Adequate Maintenance**

Adequate maintenance is very important. The purposes and effects of the maintenance are as follows:

- To keep the facilities in good operational condition, otherwise the expected benefits are not fully gained.
- To prevent the facilities from deteriorating to the conditions requiring extensive rehabilitation or to the extent that they cannot be economically rehabilitated.
- To prolong the usable life of the facilities.
- As a result, to minimize the life cycle cost of the facilities.

#### **(6) Promotion of Local Construction Industries**

Not so many construction companies have so far been involved in restoration/reconstruction projects in Greater Monrovia due to insufficient techniques, machines and skills. Considerable money thereof is going to foreign construction companies except payment to locally hired unskilled workers. Encouragement of local construction industry is important for the social and economic development of the area, resulting in many effects such as the activation of the local economy and creation of employment opportunities.

The following types of construction industries are possible to be developed:

- Consulting engineering company (undertaking consulting services such as feasibility study, detailed engineering design, construction supervision, etc., solely or jointly with foreign consultants)
- Construction company (contracting to carry out construction works, solely or jointly with foreign construction companies)
- Construction material supplier (supplying crushed aggregate, cement, pre-mixed concrete,

pre-cast concrete product, pre-mixed asphalt concrete, etc.)

- Engineering survey company (carrying out topographic survey, geotechnical investigation, material quality/strength tests, etc.)
- Educational service company (rendering educational services such as skill training on construction equipment operation, etc.)
- Construction supporting industry (treating construction supporting services such as equipment lease, bond/insurance, financing/banking, etc.)

Following government interventions are desirable:

- To establish a construction equipment lease market system
- To provide bond facilities to locally based enterprises of small to medium size
- To establish a financing system to locally based enterprises
- To conduct skill trainings and establish an official qualification system for special technicians, mechanics, equipment operators, etc.
- To introduce tenders giving preference or limiting to locally based enterprises (or joint ventures with foreign firms)

It is a practical way to form joint ventures with foreign firms at first, then gradually increase the share of local firms.

### **(7) Amendment of the Plan According to Situation Changes**

The Master Plan is formulated on the assumption of the future social and economic condition including population, extent of urbanized area, economic activities, urban structure, land use, etc. The plan shall be reviewed on occasions and adjusted according to the future change in social and economic condition by responsible organizations including MPW and MPEA.

## **12.2.2 Recommendations related to Social and Environmental Considerations**

### **(1) Conduct of Social and Environmental Assessments**

Environmental laws have been formulated in Liberia but actual application of those and implementation is still on the process of evolution. In consideration of the implementation of the projects funded as ODA, such comprehensive environmental laws shall be promptly applied to the project implementation, especially for environmentally critical projects such as transport, water supply, sanitation, solid waste treatment, power supply, resettlement of inhabitants, etc.

In case Liberian Government is expected to shoulder the Environmental Impact Assessment and mitigation measures in the ODA scheme, resolution at Parliament (Legislative) shall be made at early stage of the project implementation to secure the necessary budget.

In the process of conducting the environmental impact assessment, public consultation or stakeholder meetings and information publication are important to build a public consensus on the project.

### **(2) Authorization of Land Use Plan**

In the period of restoration and reconstruction, arbitrary building activities, development occur due to lack of laws, plans, personnel, and so on. Especially in the Greater Monrovia area lack of zoning map based on the Zoning Act is crucial. Also lack of infrastructure become serious due to the lack of fund and capacity of personnel and relevant organizations. Consequently informal settlement and spontaneous market emerge and expand caused by the influx of returnees to the capital spurred by high unemployment rate. Such informal settlement or spontaneous market lead to low living standards, encroachment of natural land, traffic congestion, and epidemic of diseases. Although the land zoning map proposed in this Study is a draft but based on the analysis of present situation and forecast results of land demand. It is recommended that authorized zoning map to guide and control building and development activities be formulated referring to the proposed draft zoning map in this Study.

MPEA is responsible for the preparation of Land Use Zoning Map for Greater Monrovia Area together with MPW and Monrovia City Corporation.

### **(3) Reconsideration of Ramsar Site**

In this Study field workshop on urban structure, land use and Ramsar site area was held with participation of personnel from relevant organizations. At the field workshop it was confirmed that some swampy areas where informal settlements exist were not good for living and such informal settlement should be resolved, at the same time built-up area with high altitude above sea level locating in the Ramsar site. And the necessity of reconsideration of existing Ramsar site designation was agreed. Indeed Ramsar site sometimes becomes the crucial condition to restrict prompt implementation of the projects in the field of infrastructure. Revision of Ramsar site should be immediately geared to the official environmental program.

#### **12.2.3 Recommendations for Institutional Matters**

##### **(1) Enhancement of Administrative Organization and Capacity Building**

Present problems in administrative organization are as follows:

- Demarcation of roles and duties between Ministry of Public Works and Monrovia City Corporation as well as among Ministries is in the transitional period and often ambiguous.
- Many staff members except high officers are unfamiliar with their works. Furthermore, the capacity enhancement of staff is needed together with the lack of equipment and materials.

Since most of the present staff are not familiar with their works and recruitment of competent personnel is difficult, the capacity development of staff is urgently needed. The capacity development shall be done by various means such as appointment of advisors/in-house consultants, on-the-job training through collaborative works with foreign experts in the project implementation, training of the staff in foreign countries, etc. as well as implementation of capacity development programs.

##### **(2) Taxation Preferences to Construction Equipment/Materials**

In the present situation where high demand for restoration/reconstruction exists but construction equipment/materials are insufficient, project costs are excessively high due to high costs for their transportation. As a way to mitigate such expansion of project cost, it is desirable to reduce both physical and institutional barriers to the imported equipment/materials. It is recommendable to introduce the taxation preference policy, adopting tax and duty free policy in some cases.

#### **12.2.4 Recommendations for Community Development**

##### **(1) Formulation of Own Community Development Plan**

Government should establish definitely the policy and strategy for community development, demarcating the roles of the governments and communities, and take necessary measures for enhancement of the implementing capacity of the communities, i.e. capacity development.

It is desirable for each community to prepare its own community development plan along the government's basic policy. The community development plan will be prepared through the following procedure:

- 1) Identification of problems/challenges
- 2) Formulation of projects/programs to solve the problems
- 3) Planning of implementation way of individual projects/programs (including managing/implementing bodies, project/program type, funding way, etc.)
- 4) Consideration on urgencies/priorities of the projects/programs
- 5) Preparation of an implementation program including the implementation way and schedule of component projects/programs

The plan may include both community's own projects/programs such as construction/ improvement of community facilities, and government-lead projects/programs such as development of infrastructure.

## **(2) Communities' Participation in Government Projects**

In case of infrastructure development project which is a typical government-lead project, the community can participate in the following forms:

- **Construction Stage**

It is possible for the community to participate in the projects at the construction stage in the following ways.

Provide the labor force (both unskilled and skilled) for construction.

Organize a construction unit in the community and make a construction contract with the government as an implementing body. For realizing it, trained man-power and procurement of equipment are necessary. This idea will be applicable to small-scaled projects.

- **Operation/Maintenance Stage**

For water/power supply projects, the community can directly manage the operation by creating the proper organization like a water management union in the community and being entrusted by the government for the operation.

For maintenance work, the community can participate in the projects in similar way to the construction, i.e. providing labor force for maintenance work and/or organizing a maintenance unit in the community and being entrusted for the maintenance work. Creation of the maintenance unit will be easier than creation of the construction unit.