6.4 Future Transportation Development Plan

6.4.1 Future Road Network Development Plan Toward 2030

(1) Road Network Toward 2030

The road network comprises of north-south axis road, two ring roads, five radial roads, and other urban roads.

Proposed road network toward 2030 is shown in Figure 6.4.1.

Figure 6.4.1 Proposed Future Road Network

Total length of road network consisting of main/secondary roads and urban roads is currently 131 km and could increase to 303 km in 2030. The road density shall increase from 0.3 km/km^2 (current land area: 393 km^2) in 2009 to 0.64 km/km^2 (2030 land area: 468 km^2) in 2030.

Table 6.4.1 Road Development Length in the Target Year 2030

(Unit: km)

Road Type	2009	2030				
	Existing	New Construction	Widening of road	Improvement	* No Investment	Total
Main/Secondary Road	18.6	43.1	35.3	18.2	61.7	158.3
Urban Road	65.1	25.5	29.0	36.7	25.2	116.4
Primary Community Road	47.4	1.0	0.0	19.5	23.7	44.2
Total	131.1	69.6	64.3	74.4	110.6	318.9

Note: * No additional investment, operation-and-maintenance works required
Source: JICA Study Tea

(2) Road Development for Old Town Area in 2030

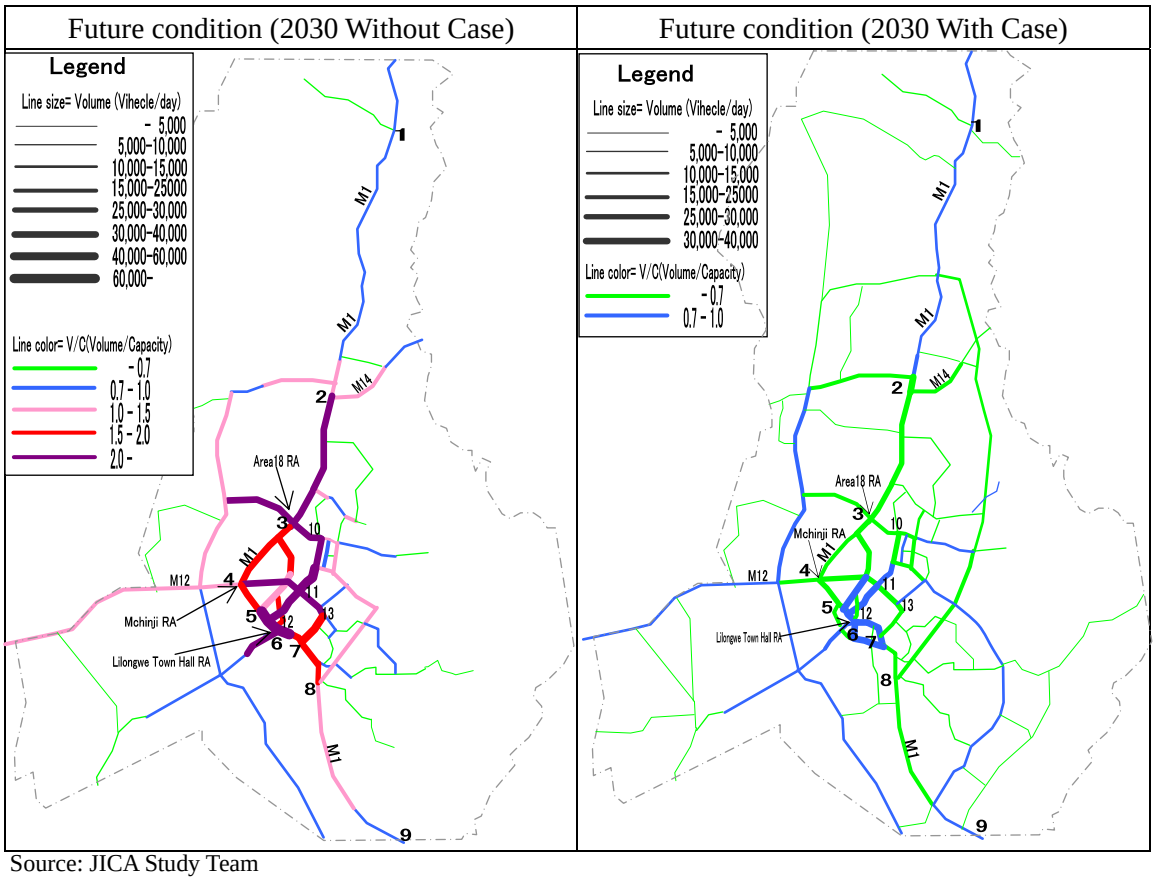
The Lilongwe Town Hall (Glyn Jones) roundabout is the most serious bottleneck, exceeding the road capacity of M1 in the City. Accordingly, special attention shall be paid to M1 section from Kenyatta Road to Malangalanga Road.

Table 6.4.2 and Figure 6.4.2 show traffic volume at the roundabouts in the cases of without road development and with road development in 2030.

Table 6.4.2 Traffic Volume at Roundabouts with and without Road Development

Major road	Traffic volume		
	2009	2030	
		Without Case	With Case
1.**M1** Airport Roundabout	3,800 - 4,000	12,000 - 14,000	12,000 - 14,000
2. Salima Road Junction	10,600 - 12,300	25,000 - 28,000	15,000 - 18,000
3. Area 18 Roundabout	10,300 - 10,400	31,000 - 34,000	24,000 – 26,000
4. Mchinji (Cross Road) Roundabout	9,000 - 9,500	30,000 - 35,000	26,000 - 27,000
5. Kenyatta Road Junction	9,500 - 15,500	35,000 - 74,000	27,000 - 36,000
6. Lilongwe Town Hall (Glyn Jones) Roundabout	15,500 - 27,000	74,000 - 83,000	36,000 - 38,000
7. Malangalanga Alt. Road Junction	10,100 - 27,000	71,000 - 74,000	35,000 - 38,000
8. Chidzanja Road Junction	5,400 - 8,000	35,000 - 28,000	30,000 - 18,000
9. City border	3,500 - 5,400	16,000 - 38,000	16,000 - 18,000
10.**Presidential Drive**	8,000 - 9,100	28,000 - 33,000	24,000 - 28,000
11.**Kenyatta Road** (Central Hospital Round about)	10,500 - 13,100	38,000 - 46,000	31,000 - 32,000
12.**Murray Road**	5,500 – 6,500	18,000 – 20,000	24,000 - 26,000
13.**Mizumba Road** (Central Hospital Roundabout)	11,400 - 11,600	39,000 - 42,000	29,000 - 32,000

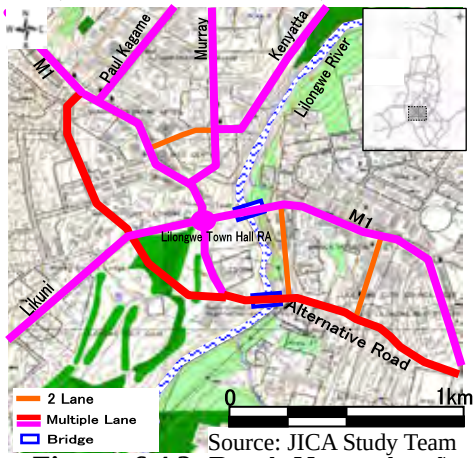
Source: JICA Study Team



Source: JICA Study Team

Figure 6.4.2 Traffic Volume of Main Road in 2030 (without & with Case)

In the case of without road development, traffic volume of more than 70,000 vehicles/day, exceeding the capacity of a 4-lane road will be diverted to M1 section between Kenyatta road and Malangalanga Alternative Road. In the case of with road development, traffic volume on the same M1 section will be less than 40,000 vehicles per day in 2030. This is because traffic volume of about 70,000 vehicles per day shall be distributed to M1 with a 4-lane capacity (40,000 vehicles) and another 4-lane road (30,000 vehicles) to be developed. Another 4-lane road is shown in red colour in Figure 6.4.3.



Source: JICA Study Team

Figure 6.4.3 Road Network of the Old Town Area in 2030

(3) Road Development Programs

1) North-South Axis (M1)

The projects related to the M1 road in North-South Axis comprised of six sections from the intersection at Kaund Road in Kanengo to the intersection at the City border as shown in Table 6.4.3.

<u>Conceivable project</u>: Preparation of North - South Axis (M1).

Table 6.4.3 Project List for North - South Axis (M1)

ID No.	Project	Description
RD01	Widening of M1 Kanengo	Widening to 4-lane road Kaunda Road - Salima Road (M14)
RD02	Widening of M1 Area18 Roundabout North	Widening to 4-lane road Salima road (M14) - Area 18 Roundabout
RD03	Widening of M1 Area 18 Roundabout - Mchinji Roundabout	Widening to 4-lane road Area 18 Roundabout - Mchinji Roundabout
RD04	Widening of M1 Old Town Area	Widening to 4-lane road Mchinji Roundabout - Kawale Road (Community Centre)
RD05	Widening of M1 Community Centre - Chidzanja Road	Widening to 4-lane road Community Centre in Area 1 - Chidzanja Road
RD06	Widening of M1 South	Widening to a 4-lane road Chidzanja Road - City border

Source: JICA Study Team

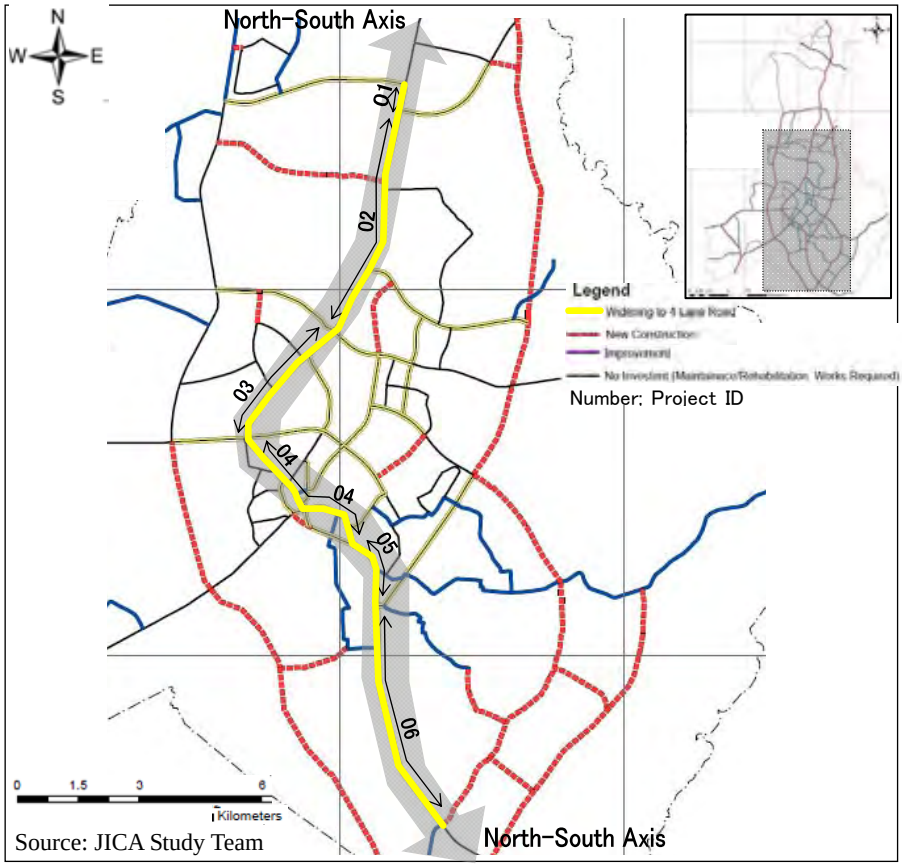


Figure 6.4.4 Proposed North-South Axis Development

2) Ring Roads

Two ring road projects are proposed. One is the outer ring road which is primarily intended to bypass traffic movement that otherwise passes through central area of the City. The other is the Inner Ring Road whose purpose is to disperse congested traffic in the most built-up areas of commercial and administration functions.

The inner ring road projects are comprised of three sections; i) Chayamba Road and its extension section (RD07), ii) Chizanjya Road Extension section (RD09), and iii) new construction and Chayamba Road widening (RD08).

The outer ring road projects meanwhile comprised of four sections; i) Western Bypass Mchiji Road – northern part of Area 25 section (RD10), ii) North-western Arch Area 25 - M1-Salima Road-Chyamba Road section (RD11), iii) South-western Arch (RD12) and iv) Western Bypass access road (RD13).

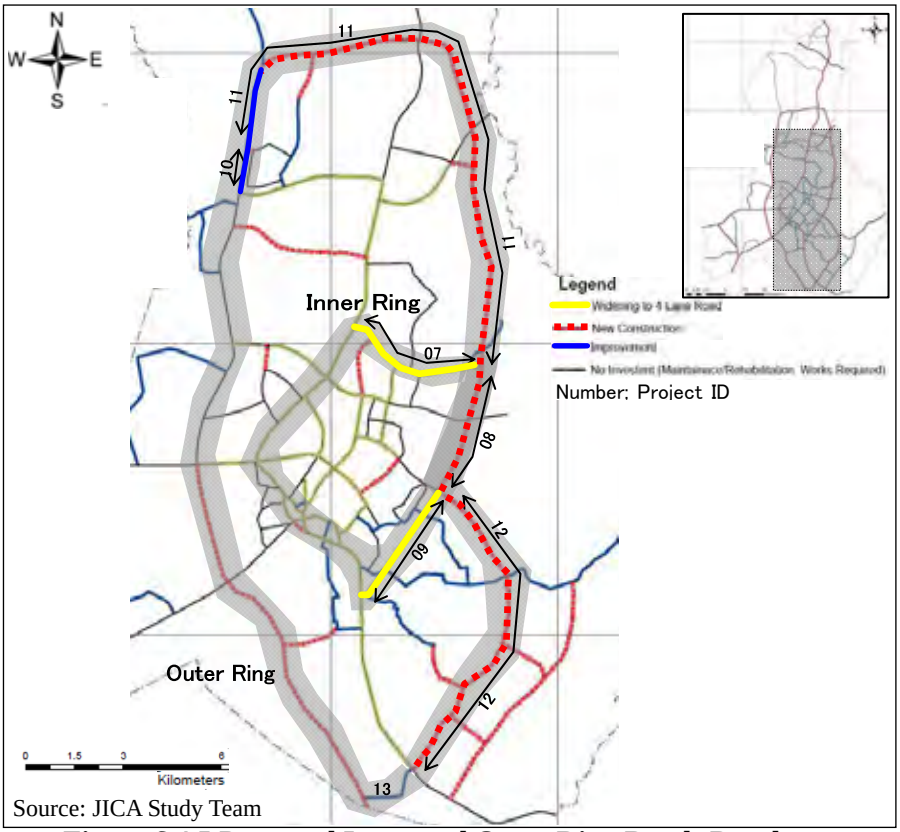
Table 6.4.4 shows the components of the ring road projects.

Conceivable project: Preparation of Inner and Outer Ring Roads.

Table 6.4.4 Project List for Inner and Outer Ring Roads

ID No.	Project	Description
RD07	Widening & Extension of Chayamba Road for Inner & Outer Ring Roads	Widening to a 4-lane road M1 - Outer Ring road in Area 10, 12 & 20
RD08	Extension of Chidzanjya Road for Inner Ring Road	Construction of 2-lane road, Widening into a 4-lane road Chayamba Road - Youth Drive
RD09	Widening of Chidzanjya Road for Inner Ring road	Widening to a 4-lane road Youth Drive - M1Area 8
RD10	Improvement of Northern Outer Ring Road I	Pavement work Kaunda Road - Market area, existing road in Area 25, northern part of Kaunda road
	Improvement of Northern Outer Ring Road II	Upgrading (2-lane road) Market area - new construction section, existing road in Area 25, northern part of Kaunda road
RD11	Construction of North Western Arch of Outer Ring Road	Construction of 2-lane road Area 25 - M1 - Salima Road - Chyamba Road
RD12	Construction of South Western Arch of Outer Ring Road	Construction of 2-lane road Chidzanjya Road - T363, Area 23 - City border, M1
RD13	Improvement of Western Bypass Access Road for Outer Ring Road	Upgrading of urban road (2-lane) City border - M1in Area 60

Source: JICA Study Team



Source: JICA Study Team

Figure 6.4.5 Proposed Inner and Outer Ring Roads Development

3) Radial Roads

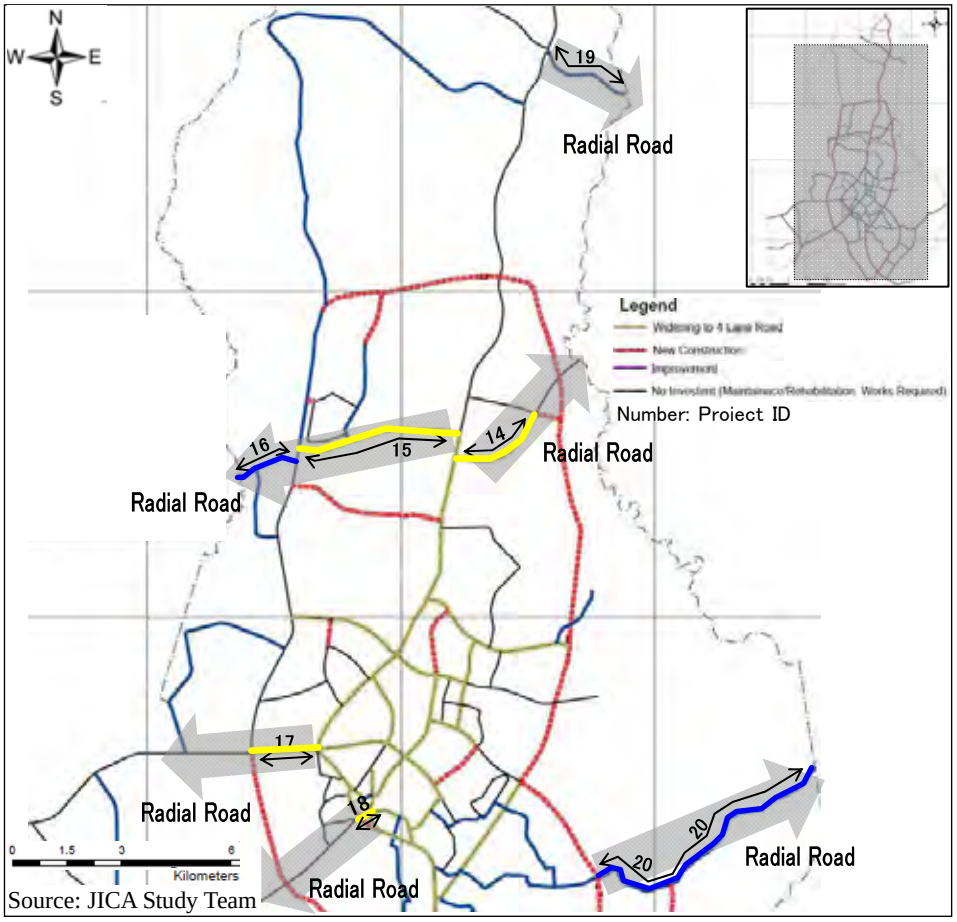
The seven radial road-related projects are proposed including four widening projects and three improvement projects as shown in the following table.

Conceivable project: Preparation of Radial Road.

Table 6.4.5 Project List for Radial Road

ID No.	Project	Description
RD14	Widening of Salima Road (M14)	Widening to 4-lane road M1 - Access Road to Industrial Area in Area 29
RD15	Widening of S123 in Area 50 & 51	Widening to 4-lane road Kaunda Road – M1
RD16	Improvement of S123 in Area 50	Rehabilitation (2-lane road) Kaunda Road - Urban Road in Area 50
RD17	Widening of Mchinji Road (M12)	Widening to 4-lane road Mchinji Roundabout, M1 - Western Bypass
RD18	Widening of S124 (Likuni Road) in Area 3	Widening to 4-lane road Glyn Jones Roundabout, M1 - Colby Road in Area 3
RD19	Improvement of T361 in Area 53 & 54	Pavement Kamuzu International Airport Roundabout, M1 - City border
RD20	Improvement of T363 in Area 61	Pavement Outer Ring Road, Area 23 - City border

Source: JICA Study Team



Source: JICA Study Team

Figure 6.4.6 Proposed Radial Road Development

4) Urban Roads

There are 32 proposed urban roads projects, including widening and construction of missing links and improvement of primary community roads. The list is shown in the following table.

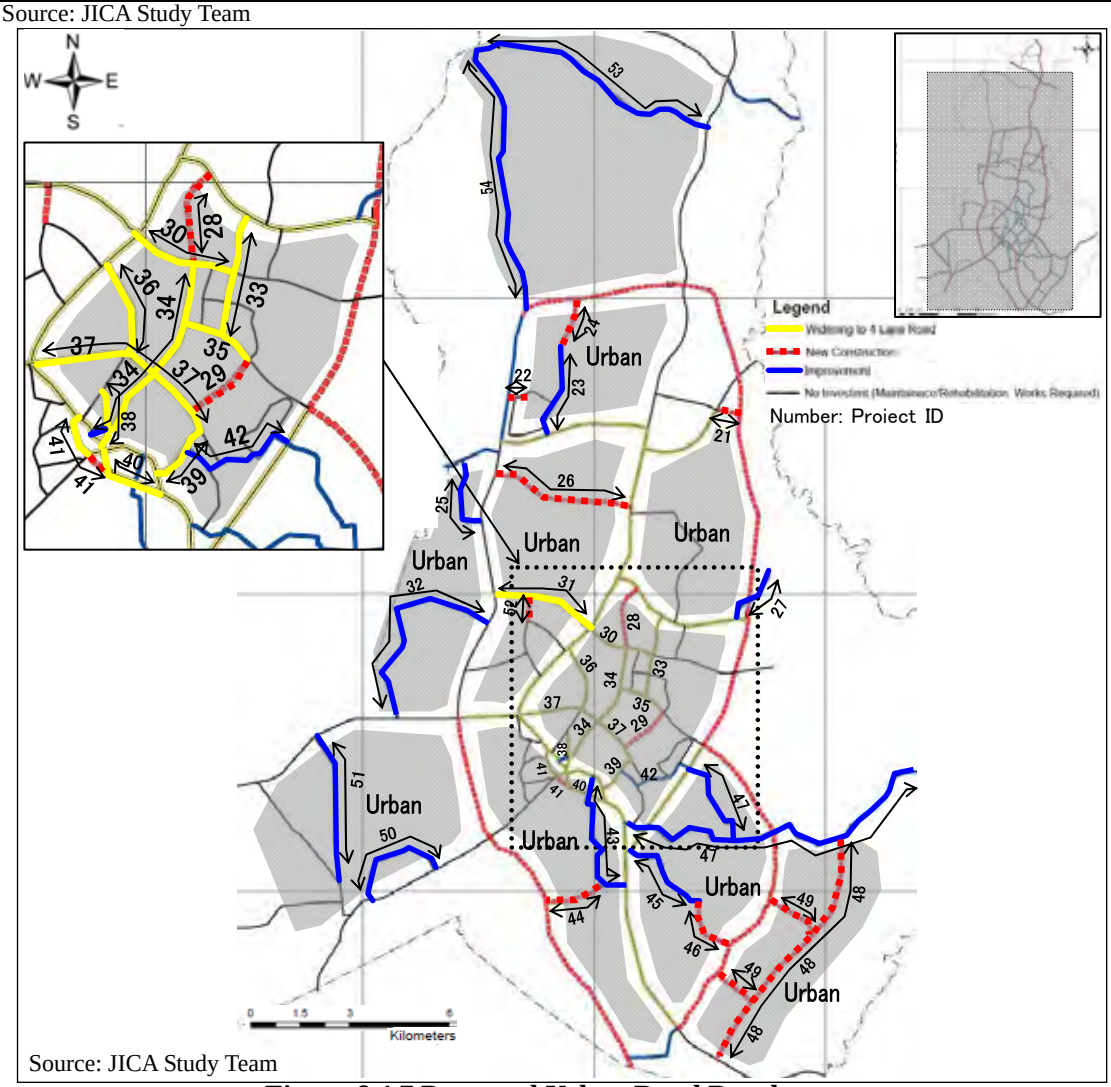
Conceivable project: Preparation of Urban Road.

Table 6.4.6 Urban Road Project List

ID No.	Project	Description
RD21	Construction of Connection Road with Outer Ring Road in Area 39	New construction (2-lane road) Salima Road - Outer Ring Road
RD22	Construction of Connection Road with Area 25 Market	New construction (2-lane road) Outer Ring Road - Inner urban road in Area 25
RD23	Improvement of Central Urban Road in Area 25	Pavement work Kauma Road - Northern area
RD24	Construction of Central Urban Road Extension in Area 25	New construction (2-lane road) Northern area in Area 25 - Outer Ring Road
RD25	Upgrading to Urban Road in Area 49	Upgrading community road to urban road (2-lane) Kaunda Road - S123
RD26	Construction of Urban Road in Area 50 & 28 (missing link)	New construction (2-lane road) M1 - Kaunda Road
RD27	Upgrading to Urban Road in Area 44 (to Kauma market)	Chyamba Road extension to Area 44 (2-lane road)
RD28	Construction of Parliament Circumferential Road in Area 14, 20 & 31	Presidential Drive - Chayamba Road (2-lane road)
RD29	Construction of Urban Road in Area 33	New construction (2-lane road) Youth Drive - Mzimba Street
RD30	Widening of Presidential Drive I	Widening to a 4-lane road M1 – Chilembwe road (Capital Hotel)
RD31	Widening of Presidential Drive II	Widening to a 4-lane road M1 - Kauma Road
RD32	Improvement of Urban Road in Area 56 & 62	Pavement (2-lane road) Kauma Road - Mchinji road section
RD33	Widening of Independence Drive & Chilembwe Road	Widening to a 4-lane road All sections of the both road
RD34	Widening and Improvement of Kenyatta Road	Widening to a 4-lane road, Upgrading in front of ShopRite (2-lane) All sections of the road
RD35	Widening of Youth Drive	Widening to a 4-lane road Kenyatta Road - Independence Drive section
RD36	Widening of Paul Kagame North Section	Widening to a 4-lane road M1 - Mzimba Road section
RD37	Widening of Mzimba Road Extension	Widening to a 4-lane road M1 – Paul Kagame section
RD38	Widening of Murray Road	Widening to a 4-lane road All section of Murray Road
RD39	Widening of Kawale Road	Widening to a 4-lane road M1 - Mzimba Road section
RD40	Construction of Glyn Jones Roundabout Related Road	New construction (4-lane road) Glyn Jones Roundabout - Bus terminal - Community Centre in Area 1
RD41	Widening of Colby Road & Extension	Widening to a 4-lane road M1 - Likuni Road for widening, Likuni Road - a bridge on the Lilongwe river to connect the RD32 road
RD42	Upgrading to Urban Road in Area 7 & 8	Upgrading from community road into urban road (2-lane) M1 - Kawale Road – Chidzamja Road section&road in Area 8
RD43	Upgrading to Urban Road in Area 36 & 37	Upgrading from community road into urban road (2-lane) Malangalanga Road - Area36 Market - M1

ID No.	Project	Description
RD44	Construction of Urban Road in Area 36	New construction (2-lane road) Area36 Market - Western Bypass
RD45	Upgrading to Urban Road in Area 22 & 24	Pavement (2-lane road) M1 - Chidzanja Road - Area 24 Market section
RD46	Construction of Connection Road Between Area 24 and Area 38	New construction (2-lane road) Area24 Market - Outer Ring Road in Area 23
RD47	Improvement Area 22 & Area 23 Connection road	Pavement (2-lane) M1 in Area 8 - Outer Ring Road in Area 23 & Area 23 Market road (600 m)
RD48	Construction of Circumferential Road in Area 61	New construction (2-lane road) M1 - T363
RD49	Construction of Outer Ring Road Connection Roads in Area 38 & Area 61	Pavement (2-lane) Circulation road in Area 57
RD50	Upgrading to Primary Community Road in Area 57	Pavement (2-lane) Circulation road in Area 57
RD51	Urban Road Improvement in Area 58 & 59	Improvement of 2-lane road M12 – S124
RD52	Construction of Primary Community Road to Presidential Drive in Area47	New construction (2-lane road) Connection with Presidential Drive in Area47
RD53	Improvement of Primary Community Road(for Agricultural) in Area55	Pavement of road M1 – Mpande village
RD54	Improvement of Primary Community Road(for Agricultural) in Area25&55	Pavement of road Mpande village – Outer Ring

Source: JICA Study Team



Source: JICA Study Team

Figure 6.4.7 Proposed Urban Road Development

5) Road Maintenance and Rehabilitation

Road maintenance and rehabilitation is one of the most important aspects in road development. The road condition should be monitored, and regular maintenance works are necessary to prevent road deterioration. On the other hand, Lilongwe City does not have any road inventory data to prioritize the maintenance and rehabilitation works. It is necessary to develop a road inventory database so that roads are improved and maintained in a cost-effective manner. Further, improvement of capacity in terms of road maintenance and rehabilitation works should be promoted for the efficient operation through the basic enhancement of skills and securing sufficient operation equipment. This capability building includes human resource development and improvement of management and know-how.

Table 6.4.7 Project Component of Road-Related Services

ID No.	Project	Description
RD55	Capacity Development for LCC's Road-Related Services	Improvement of capacity in terms of human resources, management, and reporting. Also includes equipment and know-how for proper operation
RD56	Road Maintenance Program	Routine and periodic maintenance works for all related roads
	Road Rehabilitation Program	Rehabilitation (pavement, installation of drainage, other repair works) for all related roads
RD57	Development of Road Inventory Database	Establishment of road inventory database for all roads to evaluate maintenance and rehabilitation works

Source: JICA Study Team

6) Local Roads and Streets in Residential Areas

In addition to the development of main urban roads and primary roads, there are vital needs to improve community roads and streets in the existing communities. This project is excluded from the master plan.

LCC mainly prepares such a road in an area. And, there is also a case where a road is prepared concurrently with field improvement by MOLHUD. The road in an area is connected in response to the surrounding road construction.

For example, as shown in the figure, the road in Area2 is constructed and maintained. It is made to newly connect from an area by construction (Kenyatta road etc.) of a surrounding road. However, in cases where it is shown in an example, since a road crosses a river, environment requires to be considered.

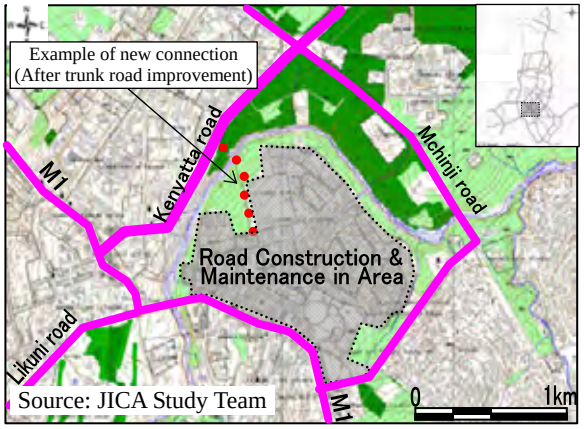


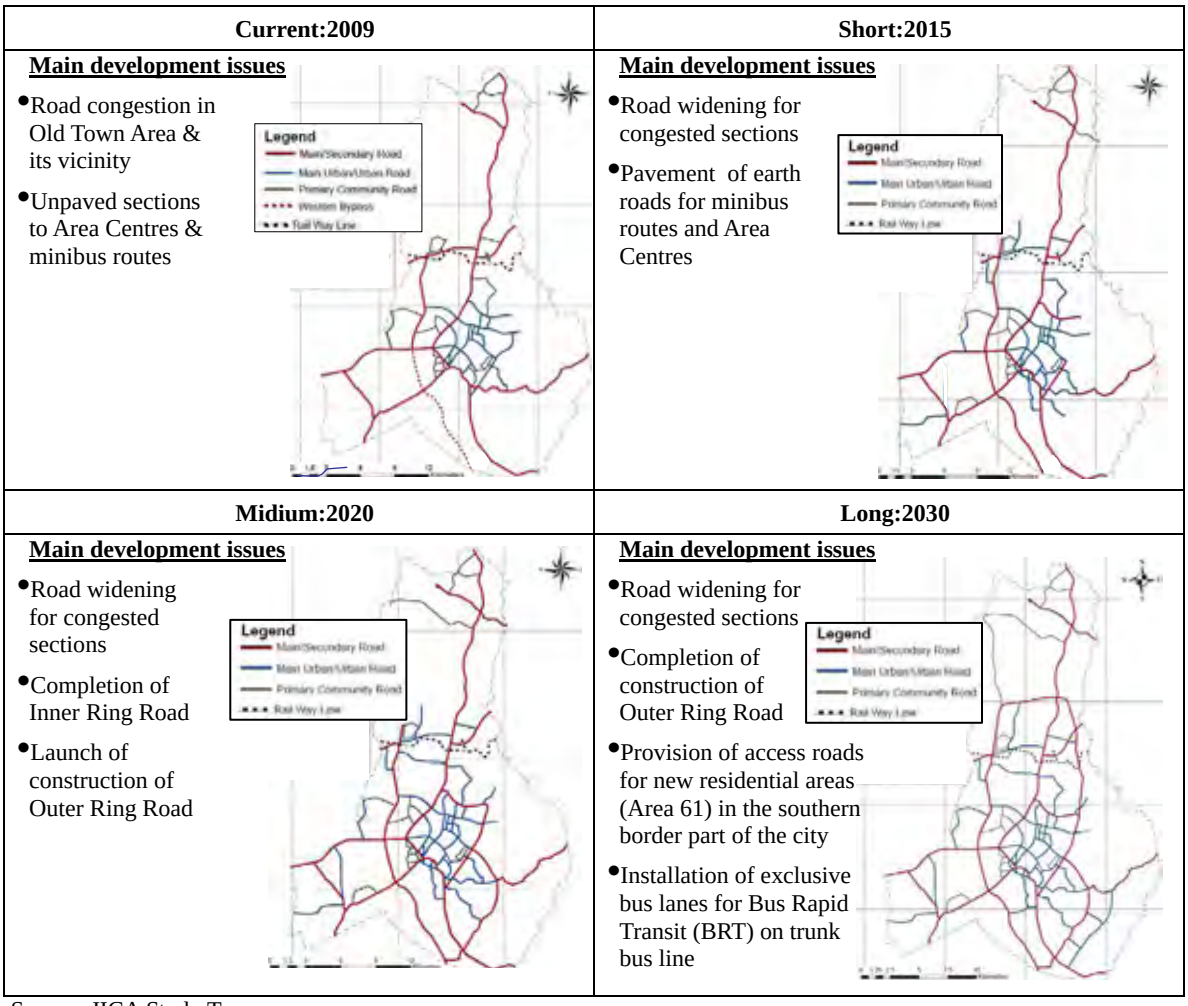
Figure 6.4.8 Example of a Connection Image with the Inside of Area

(4) Summary of Gradually Improvement Image of a Future Road

These road buildings are prepared gradually. In a short term, the congestion in Old Town prepares the intense section etc., and responds to an issue. And, a road database is built for operation and maintenance, and an engineer's technical capabilities are advanced. In a medium term, an inner ring road will be prepared to support growth expansion of a city area. In a long term, a city outline is supported and the outer ring

road for physical distribution transport will be prepared.

The proposed gradual road network development is shown in Figures 6.4.9.



Source: JICA Study Team

Figure 6.4.9 Proposed Gradual Road Network Development

6.4.2 Public Transport Development Plan

Transport development in Malawi appears to promote vehicle transportation without going through the step by step process from bicycle/motorcycle system. This section deals with the necessity of public transport system in Malawi.

(1) Operation System

The proposed bus lines comprised of trunk lines and feeder lines. Trunk lines are served by the medium- to large-sized buses as medium capacity transit. The section from Old Town to Capital Hill/City Centre (via Kenyatta Road) shall be operated as the primary route of trunk lines. The trunk lines link with the circular lines collecting passengers from feeder lines, served by minibuses within or between areas.

The trunk line buses will depart and arrive from/to two hub terminals in Old Town and City Centre. The new bus terminal in the Old Town is expected to handle bus services in the southern and central parts of the City. The new bus terminal in the City Centre is expected to handle bus services in the central and northern parts of the City.

The inner circular line will serve passenger traffic in the urbanized areas including Old Town and the City Centre. The outer circular line will serve passenger traffic in the western area of the City. Feeder lines operated by large buses or minibuses will serve passenger traffic in the suburban area like Likuni.

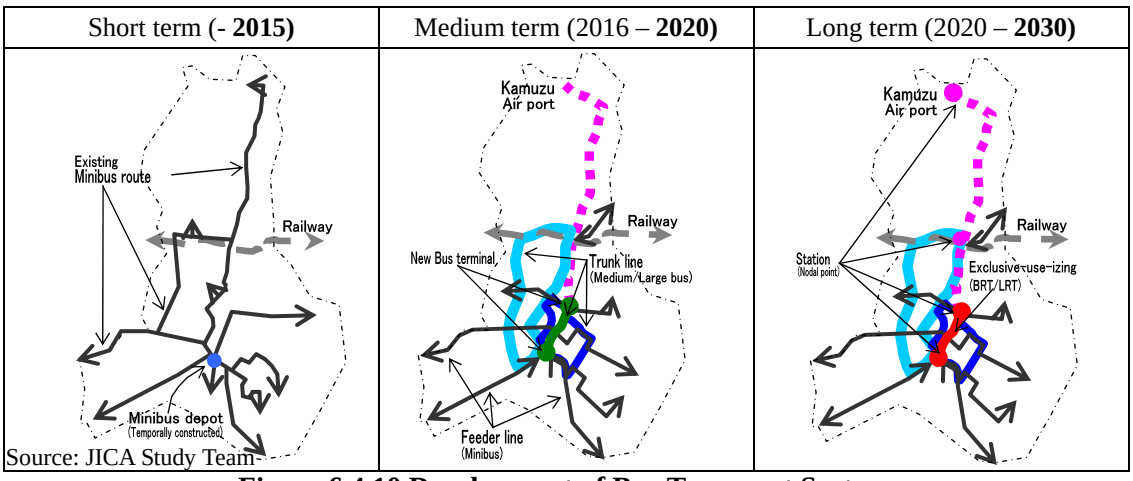
The bus network shall be expanded in the process of road development, construction of bus stops, and designation of new bus routes.

The development outline of the public transport operation is shown in Table 6.4.8. The future trunk bus system is shown in Figure 6.4.10.

Table 6.4.8 Development Plan of Bus Operation

	Outline
Route	Shuttle bus: Old Town, City Centre area and the northern part area are connected on priority/exclusive lanes Inner circular bus: Circulates through Old Town and Capital Hill/City Centre. Outer circular bus: Western bypass and M1 are used. Suburban route: From suburban to Old Town and City Centre area Feeder line: Main urban directions are connected by minibus
Diagram	Operation of the fixed time excluding minibus
Bus stop	Transport nodal point, feeder connection (Existing bus stop is also utilized)
Fee	Fixed fares (Connection is taken into consideration)
Vehicles	Large or medium size bus (Shuttle bus; BRT) for trunk routes Minibus or large size bus for feeder routes
Operation	MOAM members, Public, PPP:(Third sector/ PFI etc.); Governmental participation is preferable

Source: JICA Study Team.



Source: JICA Study Team

Figure 6.4.10 Development of Bus Transport System

Table 6.4.9 Staged Development for Bus Transport System

Stage	Bus Transport System	Characteristics
Short term Period (2010-2015)	Minibus operation under quality licensing. A new minibus depot will be temporarily constructed at the current minibus depot and to be expanded towards the river.	The non-member operators of MOAM shall be involved in the MOAM. The minibus routes will be reorganized under quality licensing.
Medium term Period (2015-2020)	Trunk line will start operation by an appropriate organization or concession which has an exclusive operation right for the service with large buses. New bus terminal will be developed.	Bus operation will be served along the trunk line by new organization of large buses. The existing minibuses will be operated on the trunk lines and mainly the suburban lines under the new licensing scheme.
Long term Period (2020-2030)	Establishment of trunk and feeder system. BRT or LRT will be introduced.	Trunk main route will be operated based on the priority lanes for BRT. After installation of exclusive lanes, BRT will start its operation based on exclusive lanes.

Source: JICA Study Team.

The step-wise development of a bus transportation system toward the introduction of Bus Rapid Transit (BRT) is presented in Table 6.4.9.

Table 6.4.10 shows the step-wise development of bus transport facilities for minibuses and large buses.

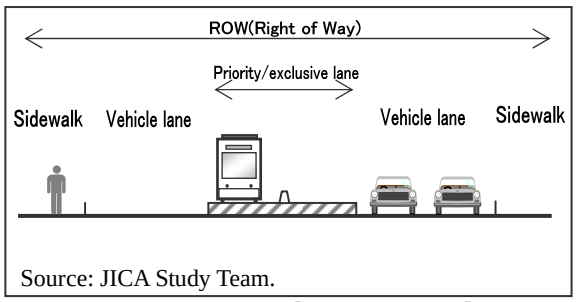
Table 6.4.10 Facility Development of Bus Transport System

Operation Vehicle	Road Facility	Role	Implementing Schedule
Minibus		Main public transport	Short term
		Supplemental/ main public transport	Medium term
		Feeder public transport	Long term
Large size bus	Priority lane for BRT under mixed use with general traffic.	Main public transport	Medium term
	Exclusive lane for BRT separated from general traffic	Main public transport	Long term

Source: JICA Study Team.

(2) Bus Lane (Priority/Exclusive Lane)

Priority/Exclusive Lane is prepared in the section with most demand from Old Town to a city centre.



Source: JICA Study Team.

Figure 6.4.11 Proposed Priority/Exclusive Lane Image

Either priority or exclusive lane shall be applied to BRT depending on the extent of passenger traffic. In case of road widening, land for the lanes shall be reserved. The exclusive lane will be located at central median strips. With the development of the northern industrial area (Kanengo), exclusive lane for BRT shall serve workers commuting from the central and southern part of the City.

Although it is Priority in the medium term when a large-sized bus is installed, it will be

set to Exclusive in the long term which many people use. It is changed by the increase in the number of users.

(3) Minibus Depot/ Bus Stop/Bus Terminals

Minibus depot

The current minibus depot area is always congested at the commuting time and prompt service is hard to realize. This is mainly because minibuses cannot start their operation until they are full of passengers. The current minibus depot should be improved to alleviate a congestion problem.

As shown in Figure 6.4.12, there is a need for i) paving the carriageways at the existing bus depot, ii) surface marking, and iii) a destination display board in the early stage. Further, the standardized destination display shall also be installed on each minibus vehicle.

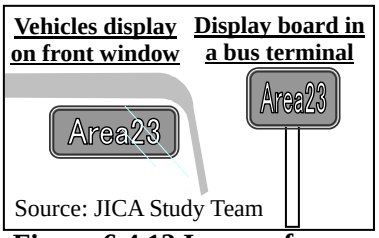
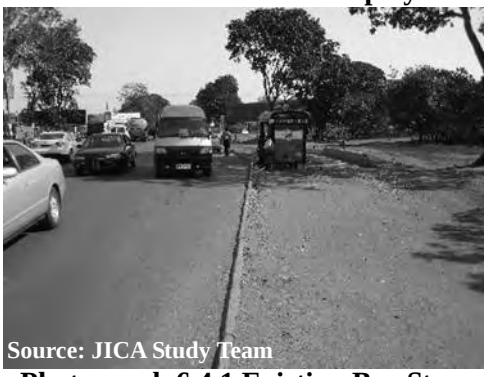


Figure 6.4.12 Image of Route Display

Bus Stops

As seen in Photograph 6.4.1, the exiting bus stops shall be effectively utilized. They shall be installed in 400-600 m interval in the busy routes.



Photograph 6.4.1 Existing Bus Stop

Bus Terminals

New bus terminals shall be constructed to strengthen the transport nodal point function by combining the exiting bus terminals near the Lilongwe Town Hall (Glyn Jones) Roundabout with the existing terminal in Old Town in 2020. Four bus terminals are planned to be constructed in the Old Town, City Centre, Kanengo and KIA.

The future image of a new bus terminal is shown in Image 6.4.1. In a bus terminal, minibuses and large buses (domestic, international) will be nodules. The stand-by place where vehicles wait for passengers is planned in the centre of the bus terminal.

New bus terminals will be developed as transport nodal points. The operation of large buses (inner city trip) and minibuses (feeder trip) will be concentrated at the new bus terminals.

Image 6.4.1 Future Bus Terminal

As shown in Table 6.4.11, about half of 16,000 residents and 140,000 workers within 1,000 m radius of the Old Town and City Centre are expected to use two bus terminal stations in said locations in 2030. From this viewpoint, both bus terminals would play a crucial role in serving the public transport system in the City.

Table 6.4.11 Estimation of Population and Workers within 500- and 1,000-m Radius of the Old Town and City Centre in 2030

Area	500m		1,000m		Main Function
	Population	Worker	Population	Worker	
Old Town	2,600	6,300	12,000	34,300	Commercial, Residence
City Centre	1,600	57,600	4,100	106,000	Public, Government

Note: The figures are estimated based on GIS data. Figures for workers include the informal sector employment.
Source: JICA Study Team

Figure 6.4.13 presents the bus terminal-related development projects.

Since the bus terminal will serve as a transport hub for collecting passengers from other transport mode in the Old Town, pedestrian bridges shall be installed from the terminal to the Bwaila Hospital, a town hall, etc. in order to secure traffic safety.

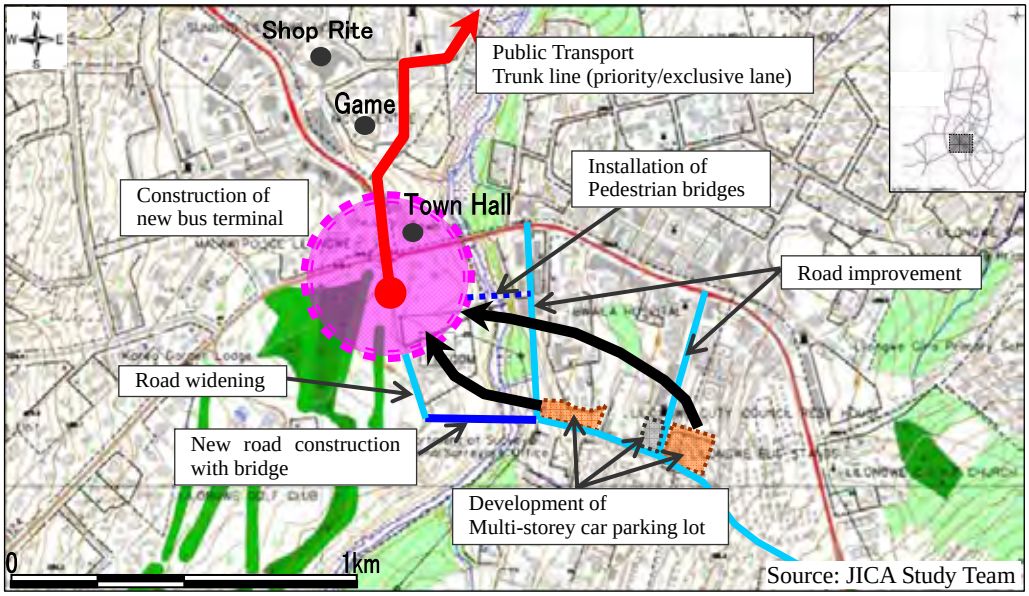


Figure 6.4.13 Proposed Future Situation around the Old Town Area

(3) Implementing Body of New Bus Company

Short term period (present to 2015)

Minibuses are mostly operated by small entrepreneurs registered at MOAM. The membership of MOAM, including operators that are not registered, shall be restructured to cope with the growing demand for public transport. Route allocation shall be arranged under the authority of MOAM.

Medium to long term period (2016-2030)

The trunk lines shall be operated by a new organization. The feeder routes might be assigned to licensed entrepreneurs under MOAM.

A new company shall be established either through the public private partnership (PPP)

system or private companies. The management system of the new company could be a challenging subject so that a feasibility study on the new type of public transport is recommended. Public subsidy to bus fares in the trunk lines can be one form of PPP.

(4) Public Transport Development Programs

A list of public transport projects are shown in Table 6.4.12.

Conceivable project: Preparation of Public Transport.

Table 6.4.12 A List of Projects for Public Transport

ID No.	Project	Description
PT01	Construction of New Bus Terminals	Two bus terminals in Old Town (2 ha) & City Centre (1 ha)
		Small bus terminal in Kanengo (0.5 ha)
PT02	Expansion of Minibus Depot in Old Town	Land preparation & related road construction
PT03	Construction & Improvement of Bus Stops	200 bus stops to be constructed
PT04	Review of Minibus Operation and Routes	Study on efficient route formation in terms of cost performance and users' convenience
PT05	Institutional strengthening of public transport sector introducing large buses	Study on pubic transport business using large buses in the areas of operation, finance, fares, subsidy, and eligibility of private companies undertaking the buses' operation
PT06	Bus Rapid Transit (BRT) Introduction Project	Purchasing vehicles and the related equipment, construction of bus stations
PT07	Establishment of New Bus Company (Third sector company)	Management system of a new company (i.e. PPP)

Source: JICA Study Team

6.4.3 Traffic Management and Other Projects

(1) Traffic Management

Traffic management issues encompass traffic congestion, the shortage of parking areas, illegal parking, poor traffic control system and the shortage of traffic safety measures.

Traffic management issues are explained focusing on Central Business District (CBD: Old Town and City Centre Area), central area and suburban area.

CBD

Traffic management in the CBD focuses on i) intersection geometry, ii) traffic signal, iii) car parking system, and iv) road markings inside the inner ring road. Further issues on traffic management include coordinated signal system and central signal control system with traffic detectors to cope with the increase in traffic volumes.

Central Area

Traffic management in central area focuses on i) intersection geometry, ii) traffic signal, iii) road marking, and iv) a coordinated signal system and a small area signal control system with traffic detectors on the arterial road (M1) in the central area.

Suburban area

Traffic management in these zones should focus not only on securing capacity but also the improvement of traffic safety.

(2) Parking Area Development

The issues for car parking development are summarized in Table 6.4.13.

Table 6.4.13 Development Issues for Parking Area Development

Parking Category	Type of Parking	Development Issues		
		Parking Facilities	Traffic Management	Institutional Measure
On-street	・ Illegal parking ・ Parking at designated space	・ Installation of road side parking space	・ Review of parking restriction sections ・ Introduction of time-zone parking	・ Strengthening of illegal parking control
Off-street	・ Parking at individual toll car park ・ Parking at ancillary parking facilities (public and private)	・ Development of car parking lot	・ Introduction of parking guidance system	・ Establishment of building construction code ・ Establishment of large-scale commercial facilities development code

Source: JICA Study Team

The following are the core areas that need parking area development:

Old Town Area

There appears to be little space for parking lots. Accordingly, many vehicles park on road shoulders and even carriageways.

After the relocation of the existing bus terminal and minibus depot, part of the relocation sites shall be utilized as temporary parking areas prior to implementation of the urban renewal development project including the neighboring area. Parking area development should be included in the urban renewal development plan during the planning stage.

An integrated bus terminal for both large buses and minibuses is proposed near the Lilongwe Town Hall (Glyn Jones) roundabout. Parking area development shall be included in the bus terminal plan.

City Centre Area

The City Centre currently has little capacity for accommodating parking cars, resulting in illegal parking cars impeding smooth traffic flow. The demand for parking area shall increase since the City Centre is to be developed with administration / commercial function, resulting in increasing inflow of vehicles into the City Centre. Therefore, parking area development shall be planned for the City Centre area.

In this connection, studies on parking area development shall be conducted for Old Town in the early stage and the City Centre during the medium term period.

(3) Traffic Management Development Programs

A list of traffic management projects are shown in Table 6.4.14.

Conceivable project: Preparation of Traffic Management.

Table 6.4.14 A List of Traffic Management Projects

ID No.	Project	Description
TM01	Improvement of Intersections	Installation of traffic signals at intersections without such system Improvement of existing traffic signals Signalization of roundabout Channelizing, lane rearrangement, widening
TM02	Introduction of Central Control System	Organizational setting Installation of traffic detectors Installation of communication facilities Installation of central signal control system Technical transfer to control system engineer
TM03	Improvement of Car Parking System	Parking guideline Study on car parking system Building code establishment to accommodate parking Legislation of building code Construction of parking facilities Enforcement of parking management

Source: JICA Study Team

(4) Traffic Safety and Vulnerable Road Users

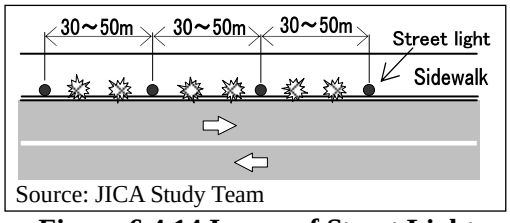
Traffic accidents have been increasing in Lilongwe City. Pedestrians are exposed to increased risks due to inadequate pedestrian and crossing facilities. Accidents have occurred involving bicycles running on roadways. The increase of cars passing through residential areas to avoid traffic congestions has led to a worsening living environment.

1) Master Plan for Traffic Safety

The Traffic Safety Master Plan is proposed because traffic safety covers various issues and needs a comprehensive approach. For the Master Plan, the four-E approach, i.e., "Engineering, Education, Enforcement, and Emergency" is proposed considering vulnerable road users.

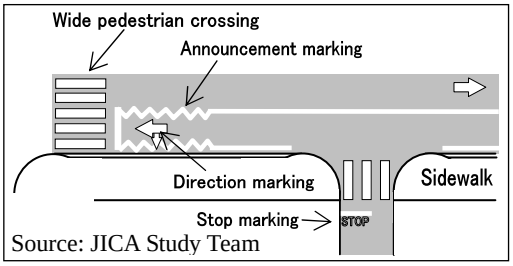
(a) Engineering (Traffic Safety Facility Development)

- Intersection geometry improvement
- Road safety facilities' installation (guardrails, median, street lights, road markings, traffic signs, and others)
- Provision of sidewalks and bicycle lanes



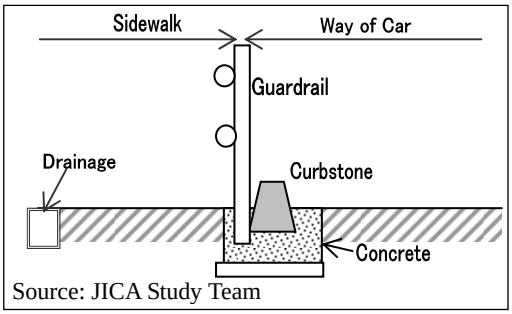
Source: JICA Study Team

Figure 6.4.14 Image of Street Light



Source: JICA Study Team

Figure 6.4.15 Clarification Image of Road Marking



Source: JICA Study Team

Figure 6.4.16 Image of Separation

(b) Education

- Primary school education program
- Printing of publications to facilitate understanding on safety awareness

(c) Enforcement (Traffic Control and Enforcement)

- Review of enforcement measures issued by the National Road Safety Council of Malawi
- Enforcement for installation of displays and signs for handicapped pedestrians

(d) Emergency (Emergency Medical Care)

- Development of emergency medical centre

The following measures shall also be taken into account:

(a) Database and standards:

- Establishment of traffic accident databases and
- Improvement of safety-oriented design standards.

(b) Safety measures:

- Establishment of an effective safety audit system.

(c) Institutional strengthening:

- Strengthening of the National Road Safety Council of Malawi in their management capacities; and
- Improvement of agency coordination on traffic safety.

(d) Budget appropriation for the Traffic Safety Master Plan.

2) Improvement of Pedestrian Network

Pedestrians are often exposed to uncontrolled traffic safety. Transport vehicles and pedestrians vulnerable to risky conditions should be segregated. The following measures should therefore be formulated.

(a) Pedestrian facilities

Pedestrian crossings should be provided at schools for preschool children and disabled people, and in sections on arterial roads where high volume of vehicle transportation is observed.

(b) Sidewalk network

The sidewalk network should be provided along arterial roads where traffic accidents involving pedestrians frequently take place. The target areas are commercial and residential areas along the main roads and main urban roads, and the inner ring road area.

(c) Bicycle road network

The overall environment for the use of bicycles such as exclusive bicycle lanes and networks should be developed to facilitate safe and proper use of bicycles as a

mode of transportation. The role and positioning of bicycles as an urban transport facility along the roads should be provided and suitable to users considering the terrain condition. The target areas are commercial and residential areas along the main roads and main urban roads, and the inner ring road area on flat to undulating areas.

(5) Traffic Safety Development Programs

Table 6.4.15 shows a list of projects to promote traffic safety.

Conceivable project: Preparation of Traffic Safety.

Table 6.4.15 A List of Projects for Traffic Safety

ID No.	Project	Description
TS01	Improvement of Safety Traffic Master Plan	Study on Safety Traffic Master Plan Planning of - Review of road traffic law - Accident database system development - Revision of road design guidelines
TS02	Development of Safe Pedestrian Network	Sidewalk installation and/or widening at heavy pedestrian traffic sections Pedestrian crossing installation at intersections Pedestrian bridge installation at intersections and road widening Pedestrian signal installation at intersections and road widening
TS03	Development of Cycle Road Network	Study on cycle road network system Installation of cycle roads Construction of cycle roads

Source: JICA Study Team

(6) Other Transport Related Programs

1) Air Transportation

The present terminal building of KIA was constructed 28 years ago. The problem is that the navigation system does not meet international security standards. The airport passenger demand will exceed its design passenger capacity of 1.1 million/year after 2025 and cargo handling capacity of 6,000 ton/year after 2015, respectively, according to the Study Team's estimates (annual growth rate of 8-10% for passenger and 7-8% for cargo respectively).

The handling capacity of the belt conveyor for hand-carried baggage and its baggage claim area should be immediately improved.

Considering the above conditions, projects for the freight transport are proposed as shown in the following Table 6.4.16.

Conceivable project: Preparation of Air Transportation.

Table 6.4.16 Projects for Air Transportation

ID No.	Project	Description
AT01	Modernization of Navigation System	Standardization of the navigation system
AT02	Improvement of Baggage Handling System and Its Area Expansion	Installation of Baggage Handling System equipment and its area expansion

Source: JICA Study Team

6.5 Preliminary Cost Estimate and Implementation Outline

6.5.1 Preliminary Cost Estimate

(1) Road Development Cost

The road development cost of proposed projects and program is estimated based on the unit costs from the "Road Sector Programme -Investment Programme for Road Sector in Malawi - , 2010 – 2020, October in 2009, MOTPI". These unit costs are adjusted by referring to the World Bank Data for Sub-Saharan Africa, Roads Authority's average contract prices in FY 2008/09 and the cost of the EU-funded Income Generating Public Works Programme (IGPWP).

Table 6.5.1 Unit Cost for Road Sector in FY 2009/10

(Unit: USD 1,000/km)

Type of Work	Type of Road			
	Trunk Road (Primary Main Road)	District Road (Secondary Main Road)	Urban Road (Urban Road)	Community Road (Community Road)
Routine maintenance on paved road	1.1	1.1	2.2	-
Routine maintenance and grinding on unpaved road	3.3	2.2	3.3	0.22
Periodic maintenance on paved road	96.8	36.3	132.0	-
Rehabilitation of paved road	330.0	132.0	275.0	-
Rehabilitation of unpaved road	27.5	5.5	27.5	-
Upgrading to Class I of unpaved road	687.5	-	687.5	-
Upgrading to Class II of unpaved road	565.4	0.0	565.4	-
Low-cost seals on unpaved road	192.5	192.5	-	-
New construction	1,100.0	-	1,711.6	-

Note: Class I: Primary main road, Class II: Other road excluding primary road and community road
The unit prices are indicated as 2010 prices (inflation rate of 2009/10:10%) by JICA Study Team.
Source: Road Sector Programme, Investment Programme for the Road Sector in Malawi, 2010 – 2020, MOTPI

(2) Other Cost

Other costs are calculated based on the following:

- The costs of the traffic equipment and vehicle purchases are calculated based on 2010 prices.
- The costs of the facility development are estimated based on actual cost as of 2010.
- For the capacity development of LCC's road-related engineering services, it is proposed that LCC hire an individual consultant for one year (about 0.4 million USD).

6.5.2 Implementation Outline

Indicative implementation schedule for the development plan is proposed as given in the table below, along with preliminary cost estimates and corresponding implementing agencies.

Table 6.5.2 Indicative Implementation Plan for North - South Axis (M1)

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
RD01	Widening of M1 Kanengo				0.5	RA
RD02	Widening of M1 Area18 Roundabout North				4.4	RA
RD03	Widening of M1 Area 18 Roundabout - Mchinji Roundabout				18.7	RA
RD04	Widening of M1 Old Town Area				22.4	RA
RD05	Widening of M1 Community Centre - Chidzanja Road				7.6	RA
RD06	Widening of M1 South				4.4	RA

Note: RA (Roads Authority)
Source: JICA Study Team

Table 6.5.3 Indicative Implementation Plan for Inner and Outer Ring Roads

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
RD07	Widening & Extension of Chayamba Road for Inner & Outer Ring Roads				3.4	RA
RD08	Extension of Chidzanjya Road for Inner Ring Road				9.9	LCC
RD09	Widening of Chidzanjya Road for Inner Ring road				3.0	RA
RD10	Improvement of Northern Outer Ring Road I				1.8	RA
	Improvement of Northern Outer Ring Road II				1.1	RA
RD11	Construction of North Western Arch of Outer Ring Road				13.5	RA
RD12	Construction of South Western Arch of Outer Ring Road				7.9	RA
RD13	Improvement of Western Bypass Access Road for Outer Ring Road				1.6	LCC

Note: RA (Roads Authority), LCC (Lilongwe City Council)
Source: JICA Study Team

Table 6.5.4 Indicative Implementation Plan for Radial Roads

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
RD14	Widening of Salima Road (M14)				2.1	LCC
RD15	Widening of S123 in Area 50 & 51				3.4	LCC
RD16	Improvement of S123 in Area 50				1.3	RA
RD17	Widening of Mchinji Road (M12)				1.4	LCC
RD18	Widening of S124 (Likuni Road) in Area 3				0.4	RA
RD19	Improvement of T361 in Area 53 & 54				1.5	RA
RD20	Improvement of T363 in Area 61				4.4	LCC, RA

Note: RA (Roads Authority), LCC (Lilongwe City Council)
Source: JICA Study Team

Table 6.5.5 Indicative Implementation Plan for Urban Roads

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
RD21	Construction of Connection Road with Outer Ring Road in Area 39				0.8	LCC
RD22	Construction of Connection Road with Area 25 Market				0.2	LCC
RD23	Improvement of Central Urban Road in Area 25				1.6	LCC
RD24	Construction of Central Urban Road Extension in Area 25				1.7	LCC
RD25	Upgrading to Urban Road in Area 49				1.4	LCC
RD26	Construction of Urban Road in Area 50 & 28 (missing link)				4.8	LCC
RD27	Extension of Urban Road in Area 44 (to Kauma market)				1.1	RA
RD28	Construction of Parliament Circumferential Road in Area 14, 20 & 31				2.2	LCC
RD29	Construction of Urban Road in Area 33				1.8	LCC
RD30	Widening of Presidential Drive I				2.5	RA
RD31	Widening of Presidential Drive II				2.4	RA
RD32	Improvement of Urban Road in Area 56 & 62				2.2	RA
RD33	Independence Drive & Chilembwe Road				1.9	LCC
RD34	Widening & Upgrading of Kenyatta Road				5.3	RA
RD35	Widening of Youth Drive				1.2	LCC
RD36	Widening of Paul Kagame North Section				1.5	LCC
RD37	Widening of Mzimba Road Extension				3.1	LCC
RD38	Widening of Murray Road				3.9	RA
RD39	Widening of Kawale Road				1.0	LCC
RD40	Construction of Lilongwe Town Hall Roundabout Related Road				1.7	LCC, RA
RD41	Widening of Colby Road & Extension				1.3	LCC
RD42	Upgrading to Urban Road in Area 7 & 8				1.1	LCC
RD43	Upgrading to Urban Road in Area 36 & 37				2.6	LCC
RD44	Construction of Urban Road in Area 36				2.0	LCC
RD45	Upgrading to Urban Road in Area 22 & 24				0.6	LCC
RD46	Construction of Connection Road Between Area 24 and Area 38				2.0	LCC
RD47	Improvement Area 22 & Area 23 Connection road				3.8	LCC
RD48	Construction of Circumferential Road in Area 61				8.8	LCC
RD49	Construction of Outer Ring Road Connection Roads in Area 38 & Area 61				3.4	LCC
RD50	Upgrading to Primary Community Road in Area 57				0.7	MOLHUD
RD51	Urban Road Improvement in Area 58 & 59				2.7	LCC
RD52	Construction of Primary Community Road to Presidential Drive in Area47				0.9	MOLHUD
RD53	Improvement of Primary Community Road(for Agricultural) in Area55				3.7	LCC
RD54	Improvement of Primary Community Road(for Agricultural) in Area25&55				3.7	LCC

Note: RA (Roads Authority), LCC (Lilongwe City Council), MOLHUD (Ministry of Land, Housing and Urban Development)
Source: JICA Study Team

Table 6.5.6 Indicative Implementation Plan for Capacity Development and Maintenance/Rehabilitation Programs

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
RD55	Capacity Development for LCC's Road Related Services				-*	LCC
RD56	Road Maintenance Program				34.5	LCC
	Road Rehabilitation Program				129.5	LCC, RA
RD57	Development of Road Inventory Database				0.6	LCC, RA

Note: RA (Roads Authority), LCC (Lilongwe City Council)
* Refer to Chapter 10.
Source: JICA Study Team

Table 6.5.7 Indicative Implementation Plan for Public Transport Development

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
PT01	Construction of New Bus Terminals				5.2 + 1.0	LCC, PPP
PT02	Expansion of Minibus Depot in Old Town				0.7	LCC
PT03	Construction & Improvement of Bus Stops				1.4	LCC
PT04	Review of Minibus Operation and Routes				0.1	LCC
PT05	Institutional Reform of Bus Operation				0.8	MOAM
PT06	Bus Rapid Transit (BRT) Introduction Program				19.5	LCC, MOAM
PT07	Establishment of New Bus Company (Third sector company)				-	LCC, MOAM

Note: LCC (Lilongwe City Council), MOAM (Minibus Owners Association of Malawi), PPP (Public-Private Partnership)
Source: JICA Study Team

Table 6.5.8 Indicative Implementation Plan for Traffic Management

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
TM01	Improvement of Intersections				3.0	RA, LCC
TM02	Introduction of Central Control System				8.5	LCC
TM03	Improvement of Car Parking System				1.8	LCC

Note: RA (Roads Authority), LCC (Lilongwe City Council)
Source: JICA Study Team

Table 6.5.9 Indicative Implementation Plan for Traffic Safety

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
TS01	Improvement of Safety Traffic Master Plan				1.0	NRSCM, LCC
TS02	Development of Safe Pedestrian Network				7.4	LCC
TS03	Development of Cycle Road Network				7.6	LCC

Note: RA (Roads Authority), LCC (Lilongwe City Council), NRSCM (National Road Safety Council of Malawi)
Source: JICA Study Team

Table 6.5.10 Indicative Implementation Plan for Air Transport Development

ID No.	Project/ Program	Implementation Schedule			Cost (m USD)	Implementing Agency
		Short	Medium	Long		
AT01	Modernization of Navigation System				6.0	MOTPI
AT02	Improvement of Baggage Handling System and Its Area Expansion				1.0	Department of Civil Aviation, MOTPI

Note: MOTPI (Ministry of Transport and Public Infrastructure)
* On-going project.
Source: JICA Study Team

6.6 Selection of Priority Projects

High priority projects/programs are selected based on ratings (low, middle, high) in accordance with the priority criteria shown below:

1) Urgency: Urgency implies traffic congestion, uncontrolled traffic and pedestrian safety that should be immediately improved.

2) Technical standards: Technical standards refer to the level of civil engineering/related techniques required for implementation of projects. This criterion is closely linked to the technical capabilities of the implementing agencies.

3) Economic benefits: Economic benefits means the reduction of vehicle operating cost (VOC), travel time saving and other direct benefits brought about by the projects. Benefits are qualitatively assessed by projects.

4) Consistency with urban development plans: This criterion focuses on the projects' consistency with the urban development plans in the light of land use and other related development plans.

5) Socio-environmental consideration: Projects with more positive and less negative socio-environmental impacts should be considered. Major impacts considered include natural environmental parameters like topography and geography, soil erosion, landscape, air, water and soil pollution, noise, waste, etc; and socio environment parameters like land acquisition, resettlement, employment, cultural heritage, women empowerment, etc.

Evaluation weight is given to "Urgency", "Economic benefits", and "Socio-Environmental Consideration". Projects scoring high rates are regarded as priorities.

The projects identified in the Road Development Plan are evaluated using the above selection criteria to select the priority projects as shown in the following Table 6.6.1 – 6.6.6. It is also proposed that large-scale projects should be implemented in phases considering the incremental needs and implementation requirements.

Table 6.6.1 Road Development Priority Projects for North - South Axis (M1)

ID No	Project	Urgency	Technical Viability	Cost Efficiency	Consistency with plans	Social environment		Priority Project	Implementation Schedule
						Positive	Negative*		
RD01	Widening of M1 Kanengo	C	B	B	B	B(s, n)	A	No	Long
RD02	Widening of M1 Area18 Roundabout North	B	B	B	B	B(s, n)	A	No	Medium
RD03	Widening of M1 Area 18 Roundabout - Mchinji Roundabout	A	B	A	A	A(s, n)	A	Yes	Short
RD04	Widening of M1 Old Town Area	A	B	A	A	A(s, n)	A	Yes	Short
RD05	Widening of M1 Community Centre - Chidzanja Road	A	B	A	A	C(s, n)	A	Yes	Short
RD06	Widening of M1 South	C	B	B	B	B(s, n)	A	No	Long

Note: Suitability/Acceptability index: A = High sustainability/acceptability. B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa

Source: JICA Study Team

Table 6.6.2 Road Development Priority Projects for Inner and Outer Ring Roads

ID No	Project	Urgency	Technical Viability	Cost Efficiency	Consistency with plans	Social environment		Priority Project	Implementation Schedule
						Positive	Negative*		
RD07	Widening & Extension of Chayamba Road for Inner & Outer Ring Roads	B	B	B	A	B(s, n)	A	No	Medium
RD08	Extension of Chidzanjya Road for Inner Ring Road	B	B	B	A	B(s, n)	A	No	Medium
RD09	Widening of Chidzanjya Road for Inner Ring road	B	B	A	B	A(s, n)	A	No	Medium
RD10	Improvement of Northern Outer Ring Road I	A	A	B	A	C(s, n)	A	Yes	Short
	Improvement of Northern Outer Ring Road II	C	B	B	A	B(s, n)	A	No	Long
RD11	Construction of North Western Arch of Outer Ring Road	C	B	B	A	B(s, n)	A	No	Long
RD12	Construction of South Western Arch of Outer Ring Road	C	B	B	A	B(s, n)	A	No	Long
RD13	Improvement of Western Bypass Access Road for Outer Ring Road	B	B	B	A	B(s, n)	A	No	Medium

Note: Suitability/Acceptability index: A = High sustainability/acceptability. B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa

Source: JICA Study Team

Table 6.6.3 Road Development Priority Projects for Radial Roads

ID No	Project	Urgency	Technical Viability	Cost Efficiency	Consistency with plans	Social environment		Priority Project	Implementation Schedule
						Positive	Negative*		
RD14	Widening of Salima Road (M14)	C	B	B	A	B(s, n)	A	No	Long
RD15	Widening of S123 in Area 50 & 51	C	B	B	B	B(s, n)	A	No	Long
RD16	Improvement of S123 in Area 50	A	A	B	A	B(s, n)	A	Yes	Short
RD17	Widening of Mchinji Road (M12)	C	B	B	B	B(s, n)	A	No	Long
RD18	Widening of S124 (Likuni Road) in Area 3	A	B	A	A	A(s, n)	A	Yes	Short
RD19	Improvement of T361 in Area 53 & 54	B	A	B	B	B(s, n)	A	No	Medium
RD20	Improvement of T363 in Area 61	C	A	C	B	B(s, n)	A	No	Long

Note: Suitability/Acceptability index: A =High sustainability/acceptability. B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa

Source: JICA Study Team

Table 6.6.4 Road Development Priority Projects for Urban Roads

ID No	Project	Urgency	Technical Viability	Cost Efficiency	Consistency with plans	Social environment		Priority Project	Implementation Schedule
						Positive	Negative*		
RD21	Construction of Connection Road with Outer Ring Road in Area 39	C	B	B	B	A(s, n)	A	No	Long
RD22	Construction of Connection Road with Area 25 Market	A	A	B	A	C(s, n)	A	Yes	Short
RD23	Improvement of Central Urban Road in Area 25	B	A	B	B	A(s, n)	A	No	Medium
RD24	Construction of Central Urban Road Extension in Area 25	C	A	C	B	B(s, n)	A	No	Long
RD25	Upgrading to Urban Road in Area49	B	A	C	A	C(s, n)	A	No	Medium
RD26	Construction of Urban Road in Area 50 & 28 (missing link)	B	A	C	A	C(s, n)	A	No	Medium
RD27	Upgrading to Urban Road in Area 44 (to Kauma market)	B	A	C	A	C(s, n)	A	No	Medium
RD28	Construction of Parliament Circumferential Road in Area 14, 20 & 31	B	B	B	B	B(s, n)	A	No	Medium
RD29	Construction of Urban Road in Area 33	B	B	B	A	A(s, n)	A	No	Medium

ID No	Project	Urgency	Technical Viability	Cost Efficiency	Consistency with plans	Social environment		Priority Project	Implementation Schedule
						Positive	Negative*		
RD30	Widening of Presidential Drive I M1 - Kenyatta Road Section	A	B	A	A	A(s, n)	A	Yes	Short
RD31	Widening of Presidential Drive II	B	B	B	A	A(s, n)	A	No	Medium
RD32	Improvement of Urban Road in Area 56 & 62	A	B	B	A	C(s, n)	A	Yes	Short
RD33	Widening of Independence Drive & Chilembwe Road	B	A	B	A	A(s, n)	A	No	Long
RD34	Widening & Upgrading of Kenyatta Road	A	B	B	A	B(s, n)	B(n)	Yes	Short
RD35	Widening of Youth Drive	B	B	A	A	C(s, n)	B(n)	No	Long
RD36	Widening of Paul Kagame North Section	C	B	B	B	A(s, n)	A	No	Medium
RD37	Widening of Mzimba Road Extension	B	B	A	A	A(s, n)	A	No	Medium
RD38	Widening of Murray Road	A	B	A	A	C(s, n)	A	Yes	Short
RD39	Widening of Kawale Road	B	B	A	A	C(s, n)	A	No	Long
RD40	Construction of Lilongwe Town Hall Roundabout Related Road	C	B	B	A	A(s, n)	A	No	Medium
RD41	Widening of Colby Road & Extension	B	B	B	A	A(s, n)	A	No	Long
RD42	Upgrading to Urban Road in Area 7 & 8	A	B	A	B	A(s, n)	A	Yes	Short
RD43	Upgrading to Urban Road in Area 36 & 37	A	A	B	A	A(s, n)	A	Yes	Short
RD44	Construction of Urban Road in Area 36	B	A	B	A	A(s, n)	A	Yes	Long
RD45	Upgrading to Urban Road in Area 22 & 24	A	A	B	B	B(s, n)	A	Yes	Short
RD46	Construction of Connection Road Between Area 24 and Area 38	B	B	A	A	A(s, n)	A	No	Medium
RD47	Improvement Area 22 & Area 23 Connection road	B	B	A	A	A(s, n)	A	No	Medium
RD48	Construction of Circumferential Road in Area 61	B	A	B	B	B(s, n)	A	No	Long
RD49	Construction of Outer Ring Road Connection Roads in Area38&Area61	C	A	B	B	B(s,n)	A	No	Long
RD50	Upgrading to Primary Community Road in Area 57	A	A	B	A	A(s,n)	A	Yes	Short
RD51	Urban Road Improvement in Area 58 & 59	B	B	B	B	B(s,n)	A	No	Medium
RD52	Construction of Primary Community Road to Presidential Drive in Area47	A	A	A	B	A(s,n)	A	Yes	Short
RD53	Improvement of Primary Community Road(for Agricultural) in Area55	B	A	C	A	A(s,n)	A	No	Medium
RD54	Improvement of Primary Community Road(for Agricultural) in Area25&55	C	A	B	B	B(s,n)	A	No	Long
RD55	Capacity Development for LCC's Road Related Services	A	C	B	A	A(s)	A	Yes	Short
RD56	Road Maintenance Program Road Rehabilitation Program	A	B	A	A	A(s,n)	A	Yes	Short
RD57	Development of Road Inventory Database	A	B	B	A	A(s)	A	Yes	Short

Note: Suitability/Acceptability index: A = High sustainability/acceptability. B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa

Source: JICA Study Team

Table 6.6.5 Public Transport Sub-sector Priority Projects

ID No	Project	Urgency	Technical Viability	Cost Efficiency	Consistency with plans	Social environment		Priority Project	Implementation Schedule
						Positive	Negative*		
PT01	Construction of New Bus Terminals	B	B	B	A	A(s,n)	A	No	Medium
PT02	Expansion of Minibus Depot in Old Town	A	B	A	A	A(s)	A	Yes	Short
PT03	Construction & Improvement of Bus Stops	B	B	A	A	A(s,n)	A	No	Medium
PT04	Review of Minibus Operation and Routes	A	B	A	B	A(s)	A	Yes	Short
PT05	Institutional Reform of Bus Operation	B	C	B	A	B(s)	A	No	Medium
PT06	Bus Rapid Transit (BRT) Introduction Program	C	C	B	A	A(s,n)	A	No	Long
PT07	Establishment of New Bus Company (Third sector company)	B	C	B	A	A(s)	A	No	Medium

Note: Suitability/Acceptability index: A = High sustainability/acceptability. B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa

Source: JICA Study Team

Table 6.6.6 Other Transport Sub-Sector Priority Projects

ID No	Project	Urgency	Technical Viability	Cost Efficiency	Consistency with plans	Social environment		Priority Project	Implementation Schedule
						Positive	Negative*		
TM01	Improvement of Intersections	A	C	A	A	A(s, n)	A	Yes	Short
TM02	Introduction of Central Control System	C	C	B	B	A(s, n)	A	No	Long
TM03	Improvement of Car Parking System	A	B	A	A	A(s, n)	A	Yes	Short
TS01	Improvement of Safety Traffic Master plan	A	B	B	A	A(s)	A	Yes	Short
TS02	Development of Safe Pedestrian Network	A	B	B	A	A(s)	A	Yes	Short
TS03	Development of Cycle Road Network	A	C	B	A	A(s)	A	Yes	Short
AT01	Modernization of Navigation System	A	C	A	A	A(s)	A	Yes	Short
AT02	Improvement of Baggage Handling System and Its Area Expansion	A	C	A	A	A(s)	A	Yes	Short

Note: Suitability/Acceptability index: A = High sustainability/acceptability. B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa

Source: JICA Study Team

6.7 Priority Projects

6.7.1 Projects for Road Development

(1) Priority Road Network Plan

The following roads are selected as priority projects for the short-term period.

North - South Axis (M1)

The arterial road of M1 serves as the spinal backbone in the north-south direction and connects with secondary arterial roads such as inter-regional road and inner ring road.

The roads selected as priority projects are shown as follows:

- Widening of M1 Area 18 Roundabout - Mchinji (Cross Road) Roundabout (Area 18 Roundabout - Paul Kagame Road); 3.9km
- Widening of M1 Old Town Area (Paul Kagame - Kawale Road (Community Centre)); 4.6km
- Widening of M1 Community Centre - Chidzanja Road (Community Centre - Chidzanja Road); 1.9km

Inner and Outer Ring Roads

The inner ring road serves as circumferential road that links the Old Town, shopping centres in Area 4 and Mchinji (Cross Road) roundabout, Capital Hill, City Centre and high density residential areas in Areas 7 and 8. It disperses traffic between residential areas and the CBDs, and between CBDs. This road consists of M1, Chyamba Road, Chidzanja Road.

The outer ring road mean while serve as circumferential road connecting the main urbanized areas in the City, including Area 47, 49, 25 26, 39, 21, 38. It consists of the western bypass, M1, Chidzanja Road Extension and Youth Drive Extension.

The roads selected as priority projects are shown as follows:

- Improvement of Northern Outer Ring Road I (Kaunda Road - Market area, existing road in Area 25, northern part of Kaunda Road); 1.5km

Radial Roads

Radial roads consist of M12, S124, T363, M14, and S123. They connect with M1 and a ring road. S123 and S124 are selected as the priority projects. S123 connects heavy/large industry areas in Area 29 and 51 (Kanengo), residential areas in Area 25, 49 and 59, and National Sport Complex in Area 48. This road extends from Salima roundabout on M1 to the city border to Njewa. S124 connects the residential and light industry areas in Area 3, 45, 46, 57 and 58. This road which crosses western bypass and S127, extends from Lilongwe Town Hall (Glyn Jones) roundabout on M1 to the city border of the Likuni.

The roads selected as priority projects are as follows:

- Improvement of S123 in Area 50 (Kaunda Road - Urban Road in Area 50); 1.8 km
- Widening of S124 (Likuni Road) in Area 3 (Lilongwe Town Hall (Glyn Jones) Roundabout, M1 - Colby Road in Area 3); 0.3 km

Urban Roads

Urban roads distribute traffic to urban areas and connect with the road of a higher rank.

Urban roads selected as priority projects are as follows:

- Construction of Connection Road with Area 25 Market (outer ring road - inner urban road in Area 25); 0.2 km
- Widening of Presidential Drive I (M1 - Kenyatta Road); 2.1 km
- Improvement of Urban Road in Area 56 & 62 (Kauma Road - Mchinji Road); 6.7 km
- Widening and Upgrading (In front of ShopRite) of Kenyatta Road; 0.3 km Upgrading plus Widening, 4.2 km
- Widening of Murray Road (Entire section); 1.1 km
- Upgrading to Urban Road in Area 7 and 8 (Kawale Road - Chidzamja Road); 1.9 km
- Upgrading to Urban Road in Area 36 and 37 (Malangalanga Road - Area36 Market - M1); 4.5 km
- Upgrading to Urban Road in Area 22 and 24 (Chidzanja Road - Area 24 Market); 3.1 km
- Upgrading to Primary Community Road in Area 57; 3.4 km
- Construction of Primary Community Road to link with Presidential Drive in Area 47; 0.8 km and 1 Bridge

Road Maintenance/Rehabilitation

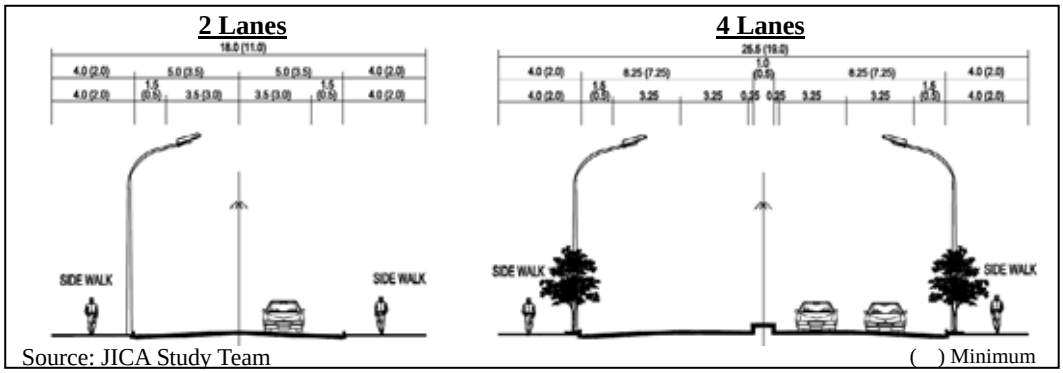
Road maintenance and rehabilitation includes capacity building of civil engineers, including development of road inventory database for O&M. Planned operation and maintenance is implemented in the future by achieving a database improvement & technical-capabilities upsurge necessary for operation and maintenance during short term.

The projects/programs selected as priority projects are as follows:

- Capacity Development for LCC's Road-Related Services:
  Improvement of capacity in terms of human resources, management, and reporting; also includes knowledge in equipment and skills for proper operation.
- Road Maintenance & Rehabilitation Program:
  Routine and periodic maintenance works for all related roads; Rehabilitation (pavement, drainage and repair works) of all roads.
- Development of Road Inventory Database;
  Road inventory database for all roads to evaluate maintenance and rehabilitation works.

(2) Future Road Development

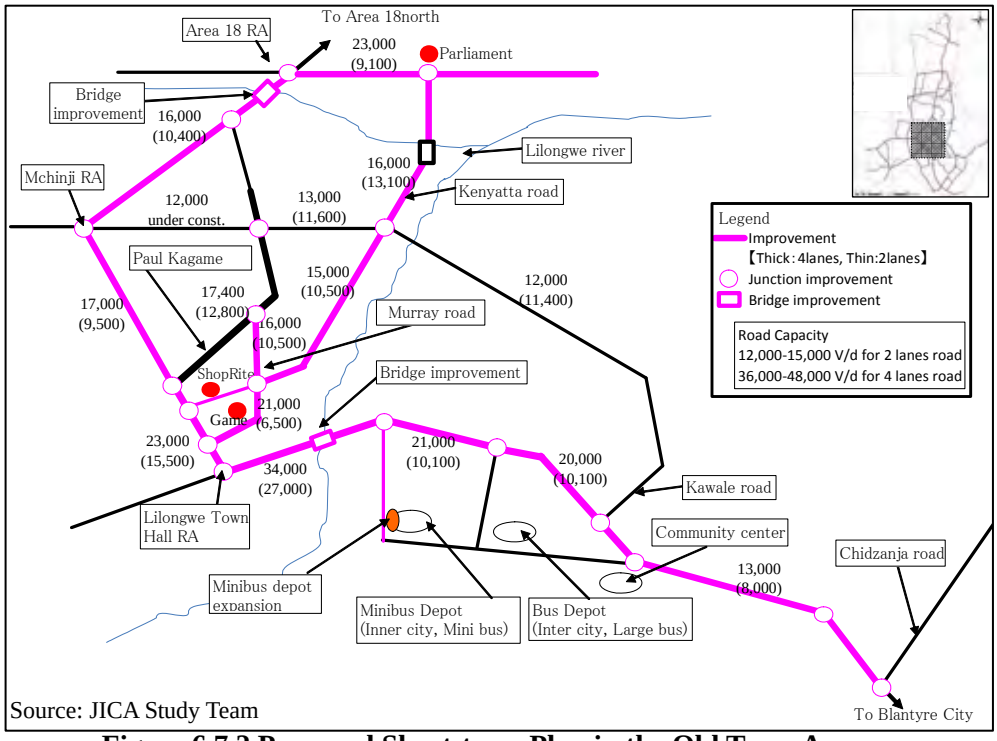
The typical cross section of the proposed road is shown in Figure 6.7.1. It is necessary to secure smooth road traffic and safe pedestrian environment. Figure 6.7.1 shows cross section of roads in commercial areas where many pedestrians are observed. Four meters is proposed as the standard width for sidewalk along roads in commercial areas.



Source: JICA Study Team ( ) Minimum

Figure 6.7.1 Proposed Future Road Typical Cross Section

As shown in Figure 6.7.2, traffic volume between M18 Roundabout and Chidzanja Road/Kenyatta Road and between Murray Road and Malangalanga Alternative Road (entrance road to minibus depot) will soon surpass road capacity.



Source: JICA Study Team

Figure 6.7.2 Proposed Short-term Plan in the Old Town Area

Traffic congestion always takes place on these sections during the day time. Traffic congestion brings about negative effects on the socio-economic activities in Lilongwe City. In addition, Game shopping centre is now under construction in front of Shoprite and traffic congestion is expected to get worse in the area.

Accordingly, in order to alleviate the traffic congestion, widening of the road to four lanes should be immediately implemented for these sections together with the improvement of intersection and traffic light provisions.

The subject area is the busiest place with its built-up commercial functions in Old Town and its significant number of pedestrians. Sidewalk width of four meters is proposed in this area.

Despite the provision of bus exclusive lanes in the future, the widening project can be implemented without any relocation since these sections have relatively sufficient reserves for road widening.

During the road widening implementing stage, special attention on the construction method shall be paid in order to avoid removing worthy old trees as much as possible along the subject section on M1.

6.7.2 Projects for Public Transport Development

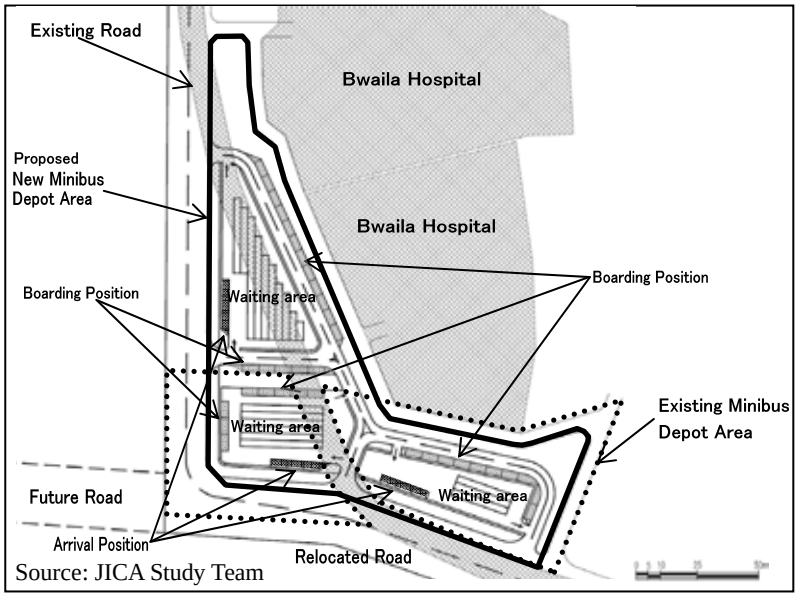
Expansion of Minibus Depot

During the short -term period, the existing minibus terminal shall be improved with the new minibus depot. This is intended to increase the capacity of the depot area and mitigate the chaotic condition of significant volume of vehicles on the road shoulders due to minibuses and traffic, including pedestrians on the carriageway.

The minibus depot expansion plan is shown as an example in the following figure. The expansion site is located at the west side of the existing depot, toward the river. The subject area consists of open spaces at present.

For the expansion, the Malangalanga Alternative Road should be relocated outside the new area, combining the existing depot with the expansion site. The alignment of the new road will be designed considering the proposed 4-lane road construction.

The inside part of the new depot shall be paved for smooth movement and will avoid the deteriorated route. The areas shall be marked to identify the routes, boarding/un-boarding areas and waiting area. The arrival and boarding areas are located separately to avoid complicated traffic, as shown in the image figure below. Minibuses come at the arrival area to unload passengers and then stand-by at the waiting area. When the order to proceed is received, the minibus moves to the boarding area to pick up passengers.



Source: JICA Study Team

Figure 6.7.3 Proposed Image of Temporary Minibus Depot Preparation

Review of Minibus Operation and Routes

A study on efficient route formation in terms of cost performance and users' convenience is essential for sustainable operation. Review of minibus operation and routing shall be carried out.

6.7.3 Projects for Other Transport Development Concerns

Traffic Management and Safety

Transport management project/program encompasses traffic control, parking control on road property, intersection improvement, etc.

Traffic safety programs include review of traffic laws, safety facility improvement, educational campaigns, safety bicycle and a pedestrian network development etc.

Traffic management and traffic safety projects/programs selected as priority projects are as follows.

- Improvement of intersections, including provision of signal lights to non-signalized intersections, improvement of existing traffic signals, signalization of roundabout, channelizing, lane rearrangement, and widening
- Improvement of car parking system
- Improvement of safety traffic master plan
- Development of safe pedestrian network
- Development of cycle road network

Airport

KIA is the primary gateway of both Malawi and the City, as the nation’s capital. The navigation system based on international standards shall be required immediately for safety operation. Moreover, improvement of the baggage handling system will be necessary so that it can respond to the increase in flight services.

Airport projects selected as priority are as follows:

- Modernization of Navigation System
- Improvement of Baggage Handling System and Its Area Expansion

6.7.4 Summary of Priority Projects

The following are the summary of the priority projects, including the suggested implementing agency.

Table 6.7.1 Summary of Priority Transport Sector Development Projects

ID No.	Project/Program	Description	Implementing Agency
RD03	Widening of M1 Area 18 Roundabout - Mchinji Roundabout	Widening to 4-lane road Area 18 Roundabout - Mchinji Roundabout	RA
RD04	Widening of M1 Old Town Area	Widening to 4-lane road Mchinji Roundabout - Kawale Road (Community Centre)	RA
RD05	Widening of M1 Community Centre - Chidzanja Road	Widening to 4-lane road Community Centre in Area 1 - Chidzanja Road	RA
RD10	Improvement of Northern Outer Ring Road I	Pavement work Kaunda Road - Market area, existing road in Area 25, northern part of Kaunda road	RA
RD16	Improvement of S123 in Area 50	Rehabilitation (2-lane road) Kaunda Road - Urban Road in Area 50	RA
RD18	Widening of S124 (Likuni Road) in Area 3	Widening to 4-lane road Glyn Jones Roundabout, M1 - Colby Road in Area 3	RA
RD22	Construction of Connection Road with Area 25 Market	New construction (2-lane road) Outer Ring Road - Inner urban road in Area 25	LCC
RD30	Widening of Presidential Drive I	Widening to a 4-lane road M1 – Chilembwe road (Capital Hotel)	RA
RD32	Improvement of Urban Road in Area 56 & 62	Pavement (2-lane road) Kauma Road - Mchinji road section	RA
RD34	Widening and Improvement of Kenyatta Road	Widening to a 4-lane road, Upgrading in front of ShopRite (2-lane) All sections of the road	RA
RD38	Widening of Murray Road	Widening to a 4-lane road All section of Murray Road	RA
RD42	Upgrading to Urban Road in Area 7 & 8	Upgrading from community road into urban road (2-lane) M1 - Kawale Road – Chidzamja Road section&road in Area 8	LCC
RD43	Upgrading to Urban Road in Area 36 & 37	Upgrading from community road into urban road (2-lane) Malangalanga Road - Area36 Market - M1	LCC
RD45	Upgrading to Urban Road in Area 22 & 24	Pavement (2-lane road) M1 - Chidzanja Road - Area 24 Market section	LCC
RD50	Upgrading to Primary Community Road in Area 57	Pavement (2-lane) Circulation road in Area 57	MOLHUD
RD52	Construction of Primary Community Road to Presidential Drive in Area47	New construction (2-lane road) Connection with Presidential Drive in Area47	MOLHUD
RD55	Capacity Development for LCC's Road Related Services	Improvement of capacity in terms human resources, management, and reporting. Also includes equipment and know-how for proper operation	LCC
RD56	Road Maintenance Program	Routine and periodic maintenance works for all related roads	LCC/RA
	Road Rehabilitation Program	Rehabilitation (pavement, installation of drainage, other repair works) for all related roads	LCC/RA
RD57	Development of Road Inventory Database	Formulation of road inventory database for all roads to evaluate maintenance and rehabilitation works	LCC/RA
PT02	Expansion of Minibus Depot in Old Town	Land preparation & related road construction	LCC
PT04	Review of Minibus Operation and Routes	Study on efficient route formation in terms of cost performance and users' convenience	MOAM
TM01	Improvement of Intersections	Signalization of non-signalized intersections, Improvement of existing traffic signals, signalization of roundabout, channelizing, lane rearrangement, widening	NRSCM/ LCC
TM03	Improvement of Car Parking System	Study on car parking system	LCC
TS01	Improvement of Safety Traffic Master plan	Study on traffic safety master plan	NRSCM/ LCC
TS02	Development of Safe Pedestrian Network	Improvement of urban pedestrian space environment and network.	LCC
TS03	Development of Cycle Road Network	Improvement of urban bicycle space environment and network.	LCC
AT01	Modernization of Navigation System	Standardization of the navigation system	MOTPI
AT02	Improvement of Baggage Handling System and Its Area Expansion	Installation of baggage handling system equipment and its area expansion	MOTPI

Note: LCC (Lilongwe City Council), MOLHUD (Ministry of Land, Housing and Urban Development), MOAM (Minibus Owners Association of Malawi), NRSCM (National Road Safety Council of Malawi),
Source: JICA Study Team

Table 6.7.2 Cost Summary of Priority Transport Sector Development Projects

ID No.	Project/Program/	Length (km)	Cost (USD Million)			
			Short	Medium	Long	Total
RD03	Widening of M1 Area 18 Roundabout - Mchinji Roundabout	3.9	18.7			18.7
RD04	Widening of M1 Old Town Area	4.6	22.4			22.4
RD05	Widening of M1 Community Centre - Chidzanja Road	1.9	7.6			7.6
RD10	Improvement of Northern Outer Ring Road I	1.5	1.8			1.8
RD16	Improvement of S260 in Area 50	1.8	1.3			1.3
RD18	Widening of S124 (Likuni Road) in Area 3	0.3	0.4			0.4
RD22	Construction of Connection Road with Area 25 Market	0.2	0.2			0.2
RD30	Widening of Presidential Drive I	2.1	2.5			2.5
RD32	Improvement of Urban Road in Area 56 & 62	6.7	2.2			2.2
RD34	Widening & Upgrading of Kenyatta Road	4.2	5.3			5.3
RD38	Widening of Murray Road	1.1	3.9			3.9
RD42	Upgrading to Urban Road in Area 7 & 8	1.9	1.1			1.1
RD43	Upgrading to Urban Road in Area 36 & 37	4.5	2.6			2.6
RD45	Upgrading to Urban Road in Area 22 & 24	3.1	0.6			0.6
RD50	Upgrading to Primary Community Road in Area 57	3.4	0.7			0.7
RD52	Construction of Primary Community Road to Presidential Drive in Area47	0.8	0.9			0.9
RD55	Capacity Development for LCC's Road Related Services		0.4			0.4
RD56	Road Maintenance Program		9.5	10.8	14.2	34.5
	Road Rehabilitation Program		21.7	26.3	81.5	129.5
RD57	Development of Road Inventory Database		0.6			0.6
PT02	Expansion of Minibus Depot in Old Town		0.7			0.7
PT04	Review of Minibus Operation and Routes		0.1			0.1
TM01	Improvement of Intersections		1.6	0.4	1.0	3.0
TM03	Improvement of Car Parking System		0.9	0.9		1.8
TS01	Improvement of Safety Traffic Master plan		1.0			1.0
TS02	Development of Safe Pedestrian Network		1.5	5.9		7.4
TS03	Development of Cycle Road Network		0.8	2.3	4.6	7.6
AT01	Modernization of Navigation System		6.0			6.0
AT02	Improvement of Baggage Handling System and Its Area Expansion		1.0			1.0

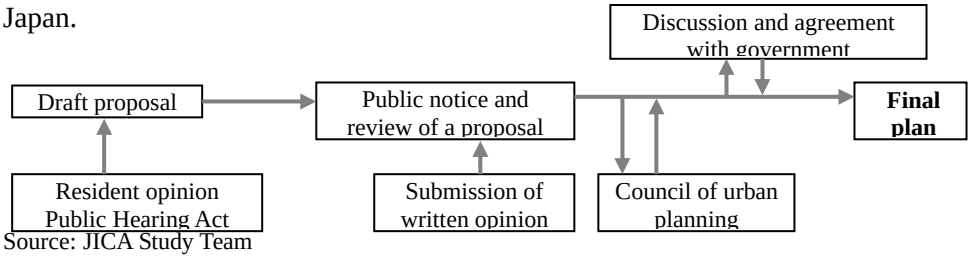
Source: JICA Study Team

6.7.5 Issues for Implementation of Projects

(1) Land Acquisition

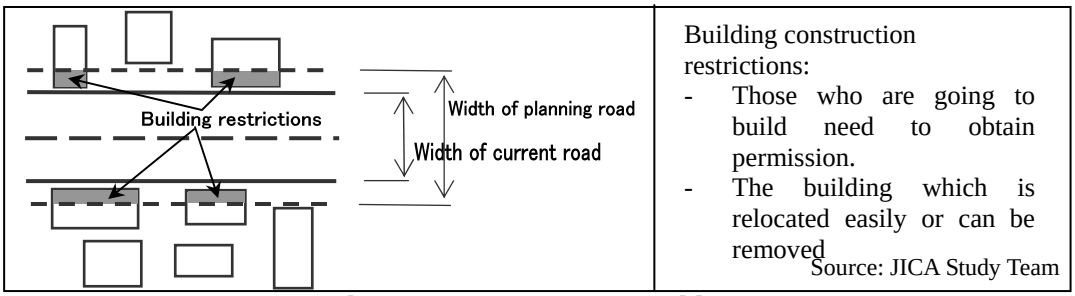
Land to be acquired for road widening or improvement shall be administratively managed and restricted by Roads Authority and/or LCC.

Figure 6.7.4 shows the urban planning process involving public opinion while Figure 6.7.5 shows an image of building restrictions in land acquisition areas conducted in Japan.



Source: JICA Study Team

Figure 6.7.4 Urban Planning Process Conducted in Japan



Source: JICA Study Team

Figure 6.7.5 Image Showing Restrictions in Building Construction

(2) Public Transport Operation

Shuttle buses, buses routing the inner and outer ring roads, including a proposed new bus terminal, would need high level of operation and management skills for MOAM. The appropriate implementation system such as PPP shall be needed together with the strengthening of MOAM. Implementation system of public transportation shall be subject to further study.

(3) Budget Appropriation for Urban Transport

Urban transport development consisting of road development and public transportation could need a sizable amount of public investment. Development schemes and the budget shall be incorporated into the MGDS. The question would be, “to what extent the central government and local government (the LCC) would take the responsibilities for the O&M of projects” since the decentralization policy designates the city/district assemblies as those responsible for the O&M of national projects.

(4) Capacity Development for LCC's Road-Related Services

Thus, capacity building is a prerequisite of any future development. The number of engineers is currently insufficient. Many road developments are necessary for the city’s growth in the future. Therefore, preparation for human resource development, management, reporting, equipment, and other related skills would be required.

CHAPTER 7

WATER SUPPLY SYSTEM DEVELOPMENT

CHAPTER 7 WATER SUPPLY SYSTEM DEVELOPMENT

7.1 Planning Concept

7.1.1 Planning Objective

Lilongwe is a fast growing urban centre where population growth is primarily taking place in lower income areas, which exist both within the urban centre limits as well as in the urban periphery. This growth pattern puts enormous strain on safe water supply and basic sanitation services. It is usually difficult for any utility to provide services to poorer areas because of lesser tariff generation potential and administrative problem of serving unauthorized area.

Future planning should have the objectives of enhancing the socio-economic growth and promoting better living standards of the city residents. The water supply plan should especially focus on the existing poor living and insanitary conditions in areas outside coverage of water supply services. A better water and sanitation program planning will also reduce the number of people suffering from water related diseases, minimize resource requirement, and improve health and productivity.

The main objective of the urban environmental sector master plan is to formulate projects to:

- provide healthy living environment,
- promote favourable urban development,
- ensure sustainability of the selected measures,
- assure pro-poor strategy,
- focus on disadvantageous populations, and
- comply with local standards and practices.

Specific planning objectives for water supply are as follows:

- Development objective is to provide potable water to the entire city population either independently or communally.
- Environmental objective is to reduce waterborne diseases leading to public health improvement.

7.1.2 Planning Strategy

The Lilongwe Water Board (LWB) claims that the current water supply coverage is about 75% of the city population although the JICA Study Team (JST) estimates the coverage to be 38% (Table 3.3.1). People without access to LWB water use tube well, borehole, or unsafe sources like river or unprotected wells. The primary target of the current Plan is to cover the entire city population by the target year of 2030 except people living in indigenous villages located in agriculture and forestry zones. These villages are scattered and providing piped water supply is not feasible from technical and economic justification. These villages should continue using groundwater.

In the planning target area, services will be provided through mixed service types,

similar to the current practice, which include house connection, yard connection or kiosk. The population by each connection type is estimated based on socio-economic conditions. It may be noted here that house connection is defined as a service wherein water is available at multiple faucets inside the house including bathroom, toilet, kitchen, laundry, wash basin, etc. Yard connection is a service where water is provided at only one point within the yard, thereby reducing water consumption by limiting or preventing the use of shower, flush toilet and other appliances. Kiosks are communal water points from where water must be hauled; therefore unit consumption is lowest in this case.

In this Plan, more priority is given in providing the population with safe water supply system than improving the service level (for example, providing access through kiosk, at least, is given more priority than upgrading from kiosk to yard connection or from yard to house connection).

Individual tube well is not considered in this Plan to comply with the prevailing law except for the indigenous villages. However, localized ground water tapping for industrial or commercial use should be investigated.

Also, the Plan would ensure the continuous supply of water to prevent back flow, thereby reducing health risks. Reduction of non revenue water (NRW) is also set as an important aspect of this Plan.

7.1.3 Demand Projection Method

Among the various available methods, two methods namely, production extrapolation based on historical data and consumption estimation based on socioeconomic situation, are widely used for water demand projection. However, no method is absolutely perfect.

LWB uses both methods for demand estimation. For the production extrapolation method, LWB has utilized historical data since 1990 in the demand projection. The history of average daily production for each month is translated to an average annual growth. It is generally noted that the average daily production grew by about 2,000 m^3 per year since 1990. Utilizing this method, the 2025 projected demand is about 110,000 m^3/d (LWB Corporate Plan, 2009/10). According to this projection, the demand will exceed the current treatment capacity by 2013.

Using the 1998 socio-economic data, the demand projection prepared by LWB shows that the demand will be 110,000 m^3/d in 2009 and 271,000 m^3/d in 2025 (LWB Corporate Plan 2009/10). Hence, LWB demand projections from these two methods show extreme variations.

Demand projection based on historical data is widely used in many countries like Australia and New Zealand. However, this method may not be suitable for a developing country like Malawi due to the following reasons:

- According to LWB Business Plan (2009/10), 467 kiosks serve 23,350 households. Since the kiosk service cannot satisfy consumer's demand up to full satisfaction level, production is a reflection of suppressed demand.
- Climate correction is an important step in this method that often utilizes 100 years of climate data. This has not been carried out in LWB's projection due to the limited availability of such long historical climate data.

On the other hand, the demand projection by consumption estimation needs accurate socio-economic data and prudent socio-economic growth forecast. The major limitations of this method are the reliabilities of population growth and economic development projections. Nevertheless, this method is used in the present Study hoping that this would lead to a more realistic projection than the production extrapolation method.

7.1.4 Water Supply Service Planning Area and Service Type

(1) Service Coverage and Type

As explained above, the planning target is to cover the entire city population by or before 2030. However, people living in indigenous villages within the agriculture and forestry areas have been excluded from the planning service area. This will result in a 97.5% effective coverage in terms of the population in 2030. The target coverage in the different planning horizon is given in Table 7.1.1 below.

Table 7.1.1 Target Water Supply Service Coverage

Planning Horizon	Total Population Projected*	Water Supply Coverage Target
2015	972,000	96.8%
2020	1,160,000	97.1%
2030	1,580,000	97.5%

* = Adopted from socio-economic frame given in Chapter 4
Source: JICA Study Team

The service will be provided through a combination of house connections, yard connections and kiosks depending on the socioeconomic condition of a given area.

(2) Service Type by Area

As explained in Chapter 5, five types of residential land use patterns are proposed. The principal current and proposed water supply service types according to each land use area type are given in Table 7.1.2 below. The rationale of the proposed service type is explained subsequently.

Table 7.1.2 Water Supply Service Type by Area

Area Type	Normative Target Density*	Current Main WS Service	2030 Main WS Service
Low density	30 p/ha	House connection	House connection
Medium density	50 p/ha	House connection	House connection
High rise flat	70 p/ha	New area type proposed	House connection
High density	80 – 90 p/ha	- Current high density permanent mostly have house connections - Current THAs have yard connections and kiosks	- House connection - Yard connection/ house connection
Quasi residential	90 – 100 p/ha	Current informal areas are mostly not served, few kiosks are available	Kiosks

* = Adopted from land use plan given in Chapter 5
Source: JICA Study Team

The socioeconomic condition of high rise flat is similar to that of the medium density area (Chapter 5). Thus, house connection is the proposed service type for high rise flat similar to the medium density area. The future high density area will combine two current residential types, i.e., high density permanent and high density traditional housing areas. The difference in socioeconomic conditions between these 2 areas is

expected to be minimal in 2030 (Chapter 5). However, uniform service quality cannot be ensured by 2030, thus, high density areas will have a mixture of house and yard connections.

Service extension to the urban poor is one of the strong aspects of this plan. Thus, it is proposed that quasi residential areas must be covered at least by kiosks over the planning horizon.

7.1.5 Planning Conditions

The future water demand for Lilongwe City is estimated based on the following preconditions:

- The future population and land use determined in this Study are applied;
- Total water demand = domestic/residential demand + public sector (office) demand + institutional demand + commercial demand + industrial demand + water system loss (non revenue water, NRW);
- The daily maximum water consumption ratio is set at 1.25; and
- The hourly maximum water consumption ratio is set at 1.5 of the average hourly water consumption.

It should be noted that the daily maximum water consumption ratio is used to determine the treatment plant capacity. The supply system in Lilongwe uses storage reservoirs, thus, the extraction and treatment requirement is equal to the average daily demand. The hourly maximum demand should be used for determining the pipe size.

7.2 Demand Projection

7.2.1 Unit Consumption

(1) Residential Unit Consumption

Malawi has no standard for unit residential water consumption. Currently, LWB uses 3 tiers of unit consumption, namely: 150, 80 and 25 L/capita/day (L/c/d) for low, medium and high density areas. It may be mentioned here that 25 L/c/d is rather low compared to the WHO recommendation of 35 L/c/d for refugee camps in non-conflict zone. The UN recommendation for minimal water supply is 50 L/c/d.

As an example, the residential unit water consumption standard of the neighbouring Zambia, where socioeconomic and geographic conditions are similar, is given in Table 7.2.1 below.

Table 7.2.1 Unit Water Demand for Domestic Uses in Zambia

No.	Housing Category	Per Capita Demand (L/c/d)
1	High Cost Housing	280
2	Medium Cost Housing	150
3	Low Cost Housing	100
4	Informal Housing	40

Source: Zambia Standard for Water Supply System.

Considering cultural and geographic proximity, it can be said that the Zambia standard can help as a guideline in determining the unit consumption for Lilongwe subject to some required modifications. Based on Lilongwe's present water usage, future development pattern proposed in this Study, and the Zambian example, four levels of unit residential consumptions in 2030 are proposed, namely: 200, 150, 100 and 50 L/c/d for low, medium, and high density areas and kiosks, respectively. Instead of the uniform unit consumption adopted in many countries, multiple levels of unit consumption are applied for Lilongwe due to the wide differences of prevailing socio-economic conditions.

(2) Residential Unit Consumption by Area

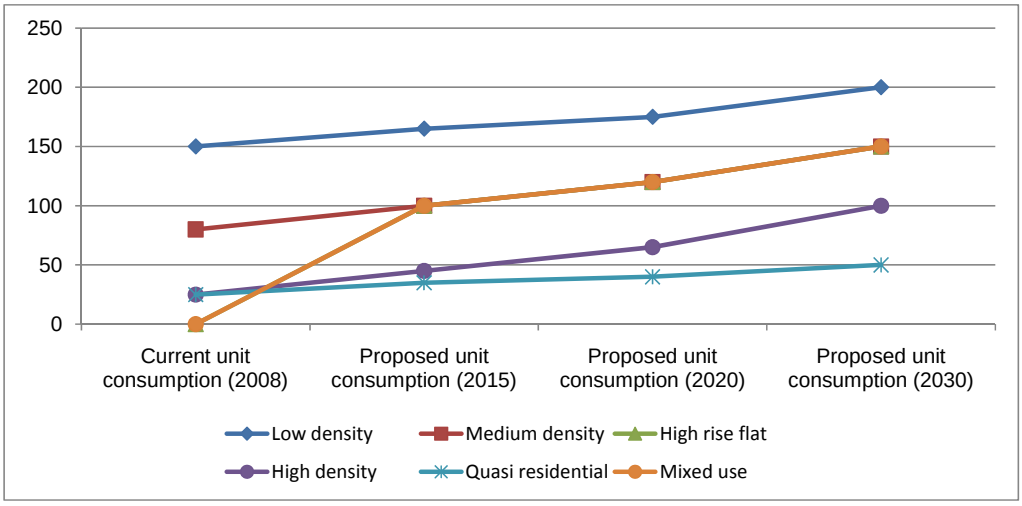
Based on the unit demand proposed above, the current and proposed unit demands by area type are given in Table 7.2.2 including the intermediate demands in 2015 and 2020. It is expected that the unit demand will gradually rise from its current level to the proposed level in 2030.

In the proposed land use plan (Chapter 5), mixed use is promoted in which residents are proposed within commercial, industrial and office areas. It is expected that the socioeconomic condition of these residents will be closer to that in medium density area. Thus, the unit demand for mixed area is considered similar to that for medium density area.

Table 7.2.2 Unit Consumption by Area (in L/c/d)

Area Type	Current unit consumption	Proposed unit consumption (2015)	Proposed unit consumption (2020)	Proposed unit consumption (2030)
Low density	150	165	175	200
Medium density	80	100	120	150
High rise flat	N/A	100	120	150
High density	25	45	65	100
Quasi residential	25	35	40	50
Mixed use	N/A	100	120	150

Source: JICA Study Team



Source: JICA Study Team

Figure 7.2.1 Unit Consumption by Area

(3) Non Residential Unit Consumption

Malawi has no standard for either residential or non residential unit consumption. In the absence of reliable data, it is widely practiced to assume these demands as percentages of the domestic demand. Typically, in developing countries, the total non residential water demand in places with no exceptional tourism and industrial activities is around 15% of domestic demand.

For public sector (office) use, the Zambian standard is 30 L/staff/day. Because of similar socioeconomic and geographic conditions, this is applied in the Study. The informal sector's employee demand is assumed to be included in its domestic demand.

For institutional use, the Zambian standard is 25 L/pupil/day for primary, 30 L/pupil/day for secondary and 120 L/student/day for secondary educational institutions. For medical facilities, it is 10 L/patient/day for outdoor and 365 L/patient/day for indoor facilities. However, it is assumed that institutional water demand is 3% of the domestic demand since future growth projections for such institutions in Lilongwe are not available.

The Japanese standard of 12 L/employee/day for commercial water consumption is applied because of unavailability of a Zambian standard.

According to the Zambian Standard for water supply system, the industrial water demands are set as follows: i) 30,000 L/ha/day for light industry; and ii) 90,000 L/ha/day for heavy industry. However, the water quality required for industrial purpose

varies and most water does not need to meet drinking water quality. Thus, industries with large requirements of inferior quality water are expected to have a separate source. For conventional/light industry use, the demand is proposed to be 10% of domestic demand.

(4) NRW Water

Non-revenue water (NRW) includes both technical and management losses. The NRW is 30% in the 4th quarter of 2008, 37% in the 1st quarter and 44% in the 2nd quarter of 2009 (Table 3.3.1). The on-going EU/EIB-financed Malawi Peri-urban Water and Sanitation Project (MPUWSP) has a loss reduction component (Section 3.3.5 (2)). Assuming such projects will continue on a regular basis, the NRW is set at 25% of the total demand before loss in 2030. The loss is expected to gradually reduce from the current 44% to 40% in 2015, 35% in 2020 and finally reaching 25% in 2030.

7.2.2 Demand Estimation

Water demand:

The basis for water demand estimation of the different categories is shown in the following Table 7.2.3:

Table 7.2.3 Estimation Basis for Demand Projection

No.	Category	Basis for Demand Growth Estimate
1	Domestic Use	Population basis
2	Public sector (office) Use	Population basis
3	Institutional Use	As percentage of domestic use
4	Commercial Use	Population basis
5	Industrial Use	As percentage of domestic use
6	NRW Water	As percentage of total demand (total of 1 to 5)

Source: JICA Study Team

The domestic water demand is about 145,000 m^3/day in 2030. The calculation details are shown in Table 7.2.4.

Table 7.2.4 Domestic Water Demand Estimation for 2030

Area Type	Land Area (ha)*	2030 Coverage Population*	Target density (persons/ha)*	2030 unit consumption (L/c/d)	2030 total consumption (m^3/day)
Low Density	2,670	80,090	30	200	16,018
Medium Density	1,987	99,335	50	150	14,900
High Rise Flat	1,155	80,876	70	150	12,131
High Density	6,795	591,230	80 – 90	100	59,123
Quasi Residential	6,171	600,047	90 – 100	50	30,002
Mixed use	5,562	88,412	02 – 30	150	13,262
Total	**24,341**	**1,539,990**			**145,437**

* = Adopted from land use plan given in Chapter 5
Source: JICA Study Team

The non-domestic water consumption is 23,000 m^3/day or about 15.6% of the domestic demand, which is very close to the typical value of 15%. Total demand before NRW loss is therefore 168,000 m^3/day. Hence, the total water demand including NRW in 2030 is estimated at 210,000 m^3/day. The calculation details are shown in Table 7.2.5.

Table 7.2.5 Estimated Water Demand in 2030

Demand type	2030 Coverage Population*	2030 unit consumption (L/c/d)	2030 total consumption (m^3/day)
Domestic demand	1,539,990	Table 7.2.4	145,437
Public Sector (office) demand	60,000	30	1,800
Institutional Demand	3% of domestic demand		4,363
Commercial Demand	171,700	12	2,060
Industrial Demand	10% of domestic demand		14,544
Total non-domestic demand			22,767
Total Demand before loss			*168,204*
NRW Loss	25% of total demand		42,051
Total Demand			**210,255**

* = Adopted from land use plan given in Chapter 5
Source: JICA Study Team

A similar principle is applied to estimate the intermediate demands based on intermediate populations, unit demands and NRW. The water demands in 2015 and 2020 are estimated at 79,000 m^3/day and 119,000 m^3/day, respectively.

Number of service connections and kiosks:

The numbers of connections and kiosks are estimated based on average family size and number of families served by one kiosk. The current average family size is reported as 4.4 and the current trend suggests that it is expected to fall in the future (NSO, 2008). It is assumed that the average family size will reduce by 0.1 every 5 years, becoming 4.0 in 2030. The number of families served by one kiosk is considered to be 50, similar to the current practice. As proposed in Table 7.1.2, people in quasi-residential area would be served by kiosks at least until 2030. The required numbers of connections and kiosks are calculated in the following Table 7.2.6.

Table 7.2.6 Estimation for Water Connections and Kiosks

	Current	2015	2020	2030
Service Population (house and yard connections)	(150,000)#	499,544	637,593	939,943
Average Family Size	4.4	4.3	4.2	4.0
Total service connection*	34,000	116,173	151,808	234,986
Service Population (Kiosk)	(99,000)#	440,850	488,261	600,047
Total Number of Families (Kiosk)	(22,500)#	102,523	116,253	150,012
Total Kiosks	450	2,050	2,325	3,000
Kiosk coverage (%)	(15)#	45	42	38

* = Assuming one connection per family
# = Estimated values
Source: JICA Study Team

Summary:

The summary of demand projection is given in Table 7.2.7 and Figure 7.2.2 below.

Table 7.2.7 Summary of Demand Projection

	Current	2015	2020	2030
Water demand (m^3/day)	78,000	79,000	119,000	210,000
NRW ratio (%)	44	40	35	25
Number of connections	33,900	116,200	151,800	235,000
Number of kiosks	450	2,050	2,330	3,000
Kiosk coverage (%)	(15)#	45	42	38
Safe water supply coverage (%)	**38[1] – 75[2]**	**97**	**97**	**98**

# = Estimated values
1 = JST estimate
2 = LWB claim (LWB Business plan 2009/10)
Source: JICA Study Team

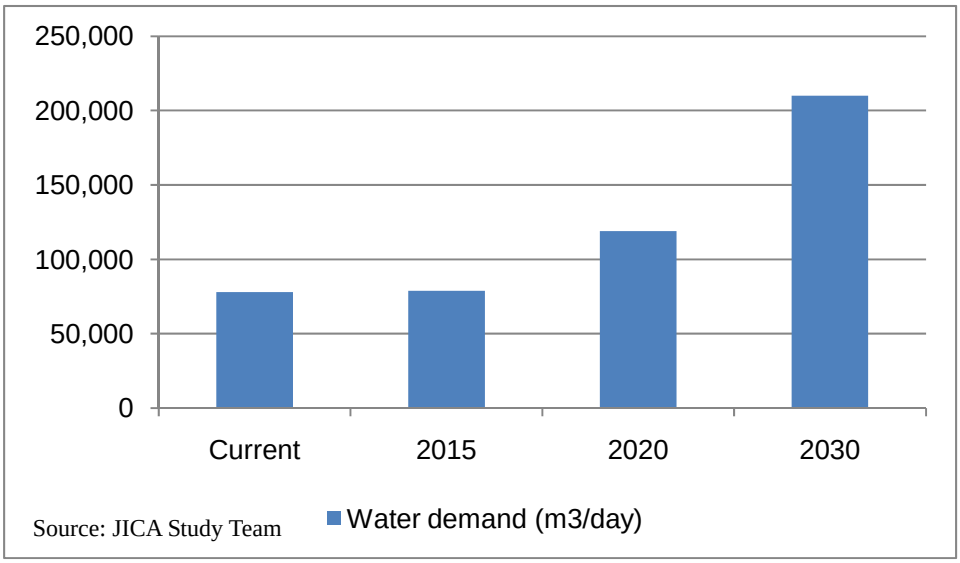


Figure 7.2.2 Summary of Demand Projection

7.3 Development Concept for the Water Supply System

7.3.1 Development Strategy

In principle, the current water supply master plan (Third Lilongwe Water Supply Plan, TLWSP prepared by Safege for LWB with WB finance, 2002) will serve as the basis of the future plan.

After due consideration of the available water resources in Lilongwe City and its adjoining areas and the required future demand, surface water is proposed to be utilized as the main water source for the city. However, it is still required to develop the groundwater resource in order to supplement the demand especially for isolated villages and for limited industrial purposes. In this context, a management program to attain sustainability is necessary.

NRW reduction should be given prime importance before the development of new water supply infrastructure. An assets management program and rehabilitation will be necessary to tackle NRW issues, both for physical leakages and management losses. This program should continue for the long term to achieve the target level.

Production and treatment capacity will be developed stage-wise, based on the financial and management capability of LWB.

7.3.2 Water Source

(1) Requirement

There are currently two dams located in Lilongwe River that serve as water sources for the water supply in the city, namely, Kamuzu I and Kamuzu II. According to LWB (Table 3.3.1), the maximum planned water supply volume from these two dams is 85,000 m^3/day. Thus, the shortfall in 2030 is 125,000 m^3/day, for which new sources need to be secured.

Table 7.3.1 Water Source Requirements

Target Year	Future Demand (m^3/day)	Current Maximum Extraction (m^3/day)	Requirement (m^3/day)
2015	79,000	85,000	No requirement
2020	119,000	85,000	34,000
2030	210,000	85,000	125,000

Source: JICA Study Team

It is observed from the above Table 7.3.1 that a new source will not be required in 2015.

(2) Surface Water

The region around Lilongwe is well-endowed with surface water resources. The challenge is to identify which sources should be developed in order to meet the projected requirements at an economical cost, while respecting the needs of other consumers and the environment.

TLWSP (2002) carried out meteorological and hydrological studies for the comparative analysis of alternative surface water schemes. The summary result of the alternative

analysis for new sources from that study is given in Table 7.3.2 below:

Table 7.3.2 Alternatives of Surface Water Source

No.	Site	River	Expected Safe Yield (m^3/day)	Conclusion
1	Upper Diamphwe	Diamphwe	125,000	Recommended
2	North Lilongwe	Ntofu	15,000	Recommended
3	Lilongwe 3	Lilongwe	65,000	Not Recommended
4	Likuni	Lilongwe	54,000	Not Recommended

Source: TLWSP, 2002, Compiled by JICA Study Team

TLWSP (2002) mentioned that Upper Diamphwe has better potential because it can be developed with comparatively short dam embankment between rocky hill features on both sides and it has extensive rock outcropping for spillway foundations. The flat grade of the river upstream leads to a large reservoir capacity for a moderate height dam.

The proposed Diamphwe Dam, with its total capacity of 125,000 m^3/day, can meet the 2030 new source requirement. Raw water is proposed to be carried to the treatment site by gravity though a canal. The length of the canal is 16 km with a conveyance capacity of 1,500 L/s.

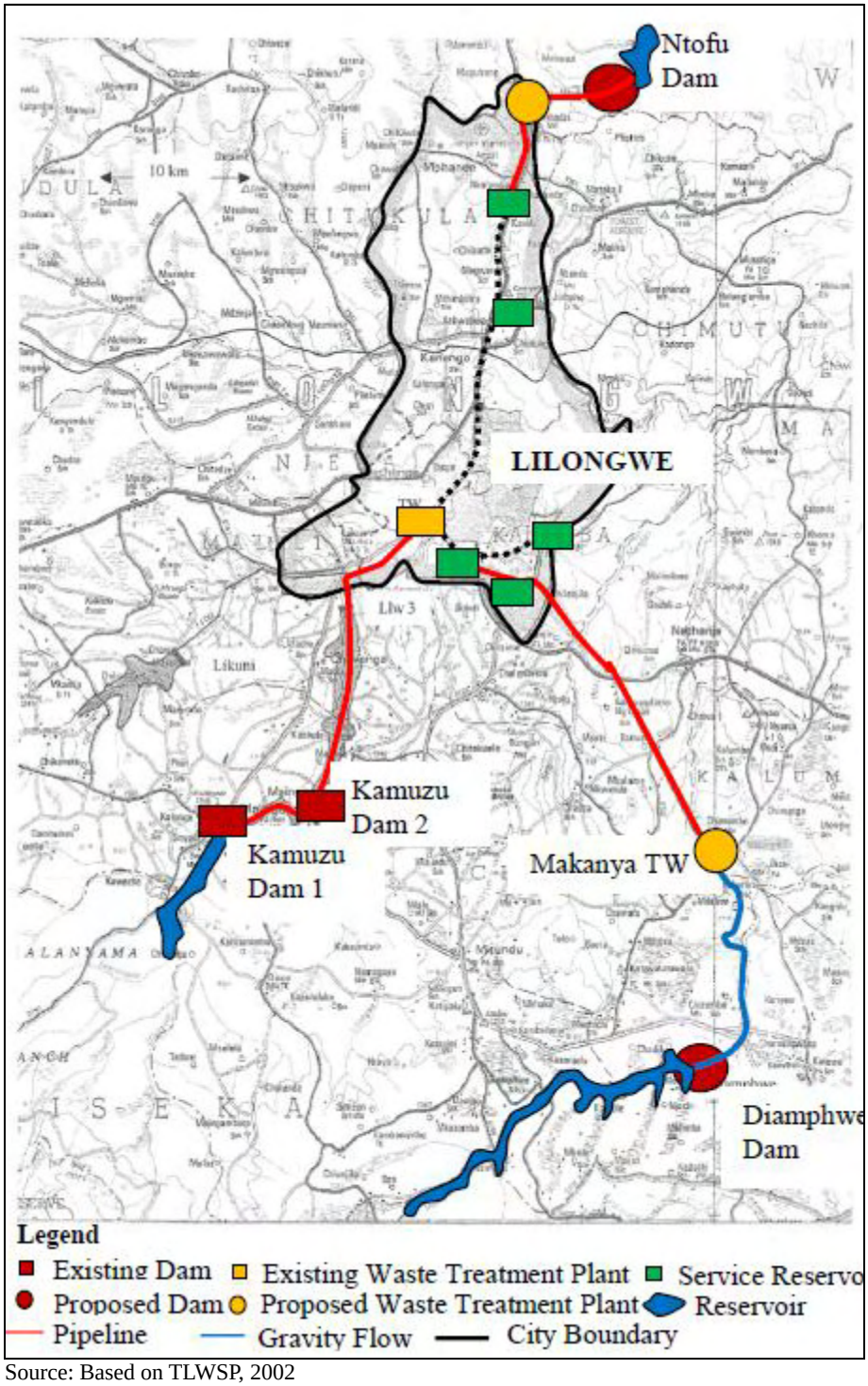
The feasibility study for new source identification is included in NWDP II. The location of the proposed dam site is shown in Figure 7.3.1.

Conceivable project: Development of Diamphwe Dam as new source.

The projected additional requirement in 2030 is 125,000 m^3/day, which is the same as the expected yield from the Diamphwe Dam. For various reasons, the expected yield might not be fully realized. In that case, there is a risk of water shortage before 2030. As a result, additional source should be identified.

Following the recommendation of TLWSP (2002), the development of Ntofu Dam is proposed to be investigated. Since the supply area of LWB is very extensive, this dam can be used for potential supply to the northern part. Ntofu dam may be viable to increase the supply to the northern part of the city when justified by local demand. This can economize the pumping and distribution costs over the supply from the south. The location of the proposed dam site is shown in Figure 7.3.1.

Conceivable project: Study on the development of Ntofu Dam.



Source: Based on TLWSP, 2002

Figure 7.3.1 Location of Water Supply Facilities

(3) Groundwater Development

It has been observed that many private wells are currently used in Lilongwe City for domestic (mostly in informal areas) and industrial uses. However, it was not possible to obtain reliable data on extraction and quality. Moreover, there is a lack of monitoring system for these groundwater extractions, which is supposed to be conducted by both

LWB and MIWD.

The Water Resources Development Plan (NIRAS for LWB, 2001) mentioned that groundwater resources are generally scarce, with a scale that would not significantly contribute to the city's supply, and can only be exploited for consumption by smaller, isolated centres. Although the development of groundwater resources is possible for isolated purposes, further careful investigation is still required.

The NIRAS study showed that the existing boreholes in the area are between 20 m and 80 m in depth, averaging about 40 m. These boreholes had yields varying between 0.1 m^3/h and 13.7 m^3/h, with a mean of 3.7 m^3/h. To obtain a supply of 15,000 m^3/day, for example, would require 170 boreholes spaced over an area of 150 km^2. Water quality is generally good, except for fluoride, with a few isolated exceptions.

The occurrence of fluoride in groundwater has been reported in "A Study of Fluoride Groundwater Occurrence in Nathenje, Lilongwe, Malawi" (by Msonda, Masamba and Fabiano, published in Physics and Chemistry of the Earth, Vol 32, 2007). According to this paper, more than 50% of the boreholes showed a fluoride concentration of more than the WHO maximum permissible limit of 1.5 mg/L.

The major issues on groundwater resources development in Lilongwe are indicated as follows:

- Determination of extraction capacity: It is necessary to determine the actual quantity of groundwater that can be extracted. It is proposed that MIWD in cooperation with LCC and LWB should carry out a "Hydro-Census" to determine the actual situation of groundwater extraction potential in Lilongwe City and its neighboring areas. This will help in issuing licenses and determining extraction amounts.
- Water quality: It is also necessary to determine the quality of available groundwater. Inferior quality groundwater can be used for non potable industrial purpose to lessen the burden on the public water system.

Conceivable project: Study on comprehensive groundwater management.

7.3.3 Water Treatment

(1) Requirement

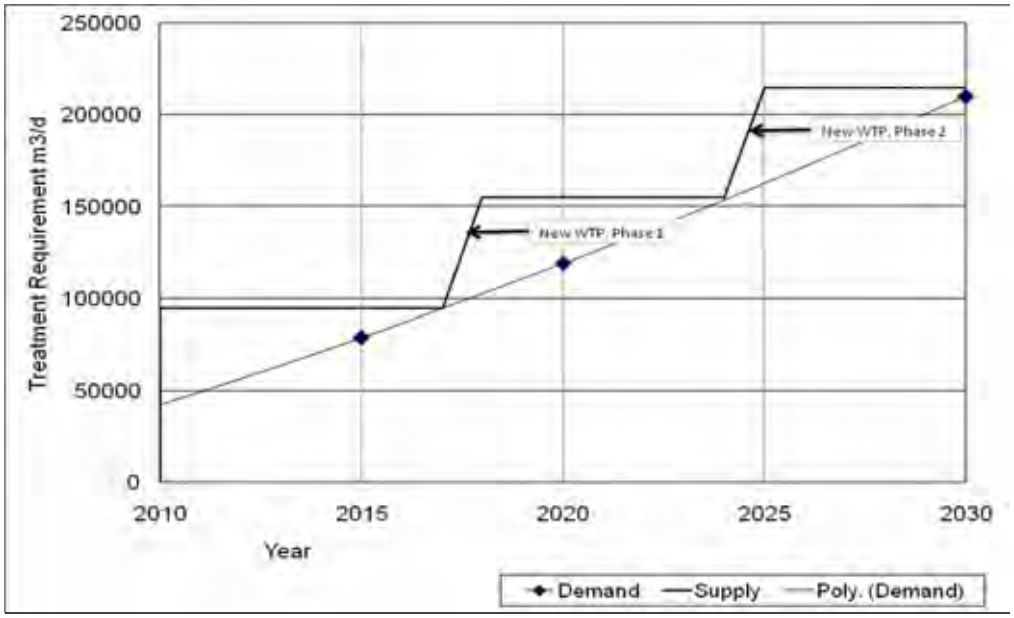
Currently, there are two water treatment plants (WTP) located at Likuni. According to LWB (Table 3.3.1 and 3.3.4), the installed capacity of these WTPs is 95,000 m^3/day. Thus, the shortfall in 2030 is 115,000 m^3/day, for which a new WTP needs to be constructed.

(2) System Development

The location of a WTP depends on the water source location. TLWSP (2002) proposed a location for a new WTP based on the Diamphwe Dam development.

It would be costly to construct a pipeline from the proposed dam to the old WTP to tap the remaining capacity of 10,000 m^3/day only, from an already aging plant. Therefore, it is proposed that the capacity of the new WTP should be equal to the new source

capacity less leakage provision. The capacity of the new WTP is thus set at 120,000 m^3/day. It would be implemented in two stages, each with a production capacity of 60,000 m^3/day. The demand supply of water treatment is shown in Figure 7.3.2.



Source: JICA Study Team

Figure 7.3.2 Demand/Supply of Water Treatment

The study on the new WTP is included in NWDP II. The location of the proposed WTP site is shown in Figure 7.3.1.

Conceivable project: Development of new water treatment plant.

7.3.4 Distribution System

(1) Requirement

To achieve the target set in this Study, new service reservoirs, booster pump stations and distribution mains have to be constructed. The exact requirement depends on the final dam site location and its elevation, final location of the WTP, main lift pump location and its lifting head, and the expansion scheme.

(2) System Development

The main components of this project include service reservoirs, booster pumps, and trunk and branch pipelines. TLWSP (2002) proposed the extension and development of the distribution system as follows:

- A new pumping station at Mwenda,
- A 5.5 km transmission main between Mwenda and Chikungu,
- A new lift station at Chikungu and the improvement of Tsabango lift station,
- A reservoir at Chikungu (5000 m^3),
- An elevated tank at Chikungu (2000 m^3),

- Other reservoirs,
- New primary and secondary mains with around 27.2 km length, and
- New tertiary distribution mains with around 61.4 km length

However, the above components have to be updated when the locations of water source and treatment plant have been finalized.

For determining the reservoir size, TLWSP (2002) proposed a storage with an average demand capacity of 17 hours.

For determining the distribution network's size, LWB follows some rules. The minimum diameter of all distribution mains is normally 63 mm unless justified by hydraulic analysis. Any pipeline designed to provide fire flow must have a diameter of at least 150 mm for AC pipe and 160 mm for PVC and Poly Ethyl (PE) pipes. For the hydraulic analysis, the system must be capable of delivering the peak hourly demand (PHD) at the required pressure of 40 m head at every existing and proposed service connection. If fire flow should be provided, the distribution pipelines must also be capable of delivering the maximum day demand (MDD) rate, in addition to the fire flow, at the required pressure of 30 m head throughout the distribution system. The design of the distribution mains should not exceed a maximum velocity of 2.5 m/s under peak conditions, unless otherwise specified by the pipe manufacturer. Pressure in the distribution system should not exceed 150 m head, unless the design engineer can justify the need for the excessive pressure (e.g., to reduce pumping costs, to increase fire flow reliability, etc.) and verify that the pipe material is appropriate for this use.

Conceivable project: Extension and development of distribution system.

7.3.5 Service Provision

(1) Requirement

To achieve the target set in this Study, new service connections and kiosks must be provided. From the estimates shown in Table 7.2.6, the required number of connections and kiosks is calculated in the following Table 7.3.3.

Table 7.3.3 Requirement for Water Connections and Kiosks

	Current	2015	2020	2030
Total service connection required	34,000	116,000	152,000	235,000
Shortfall (approximate)	-	82,000	118,000	201,000
Total kiosk required	450	2,050	2,330	3,000
Shortfall (approximate)	-	1,600	1,880	2,550

* = Assuming one connection per family
Source: JICA Study Team

(2) System Development

A continuous program for new service connection and construction of new kiosks is required. The provision of water meter is necessary in both cases. Kiosk management committees should be provided with training for better management. No interest revolving fund can be used as an incentive for new connections in lower income areas.

A five-year service connection and kiosk extension program is included in MPUWSP. The procurement of water meters and funds for service extension are also included in NWDP II.

Conceivable project: Service extension and development.

7.3.6 NRW Reduction

(1) Requirement

The current NRW is 44% (Table 3.3.1). Reduction of NRW will not only reduce the load on the source and treatment plant but also reduce the operation cost and increase efficiency. Demand estimation has been carried out based on the assumption that NRW will be reduced by 5% every five years, reaching to 25% in 2030.

(2) System Development

A continuous program is essential to ensure that NRW reaches the desired level. The program should include leak detection, asset management, SCADA telemetry, pipe repair and pressure monitoring.

A five-year NRW reduction program is included in MPUWSP.

Conceivable project: NRW reduction program.

7.3.7 Water Supply System Development Plan

To achieve the development targets and goals, a huge number of programs and projects need to be implemented. The necessary programs and projects related to the water supply sector plan, which were considered and selected, are summarized in Table 7.3.4 below. The programs and projects included in the list cannot be implemented at once, not only due to the financial issues but also because of technical aspects.

Table 7.3.4 Water Supply System Development Program

ID No	Projects	Project Outline	Remarks
WS1	Development of Diamphwe Dam as New Source	H=22 m, Yield = 125,000 m^3/day; Raw water canal from dam site to WTP with capacity = 1,500 L/s and L = 16 km	An F/S is now ongoing as part of the WB-funded NWDP II
WS2	Study on the Development of Ntofu Dam	To investigate the possibility of tapping this source for northern city area and as a future source	
WS3	Study on Comprehensive Groundwater Management	Hydro-census: Study on groundwater potential and quality	
WS4	Development of New Water Treatment Plant	WTP capacity = 120,000 m^3/day; Develop in 2 phases; most civil structures in phase 1 will be for final capacity; Transmission line = 20.7 km of 800 mm diameter; Transmission reservoir and transmission lift pump.	Feasibility study is included in NWDP II.
WS5	Extension and Development of Distribution System	New distribution network including main and branch pipelines; New service reservoirs and booster pumps	

ID No	Projects	Project Outline	Remarks
WS6	Service Extension and Development	New service connection = 201,000 (in 2030); New kiosk = 2,550 (in 2030); Water meter; Revolving fund to help new connection	Procurement of 5,000 water meters and reserved fund for new connections are included in NWDP II. Construction of 372 kiosks and 16,300 connections are included in MPUWSP.
WS7	NRW Reduction Program	Both administrative and physical loss detection and reduction program; Asset management; Scada telemetry	Five-year program is on-going under the EU-funded MPUWSP.

Source: JICA Study Team

7.4 Preliminary Cost Estimate and Implementation Outline

7.4.1 Preliminary Cost Estimate

Under the NWDP II, the allocated consultancy for new source development is US$1.6 million. This consultancy also includes the required study for the new treatment plant. TLWSP (2002) has estimated the direct cost of the dam construction including road and canal at US$7.5 million. Compensation cost has been estimated at US$2.7 million. Adding the detailed design and supervision cost, contingency and price escalation, the total cost of the new source development is expected to reach US$14.0 million. This will be finalized after the completion of the current feasibility study.

For the study on the Ntofu dam development, the proposed cost in TLWSP (2002) was only US$0.4 million. It is anticipated that it might cost US$1.0 million.

For the study on groundwater management, the consultancy cost is assumed to be US$1.0 million.

The direct construction cost of the new water treatment plant (WTP) during phase 1 has been estimated at US$6 million (TLWSP, 2002). The extension in phase 2 has also been estimated at US$6 million. Considering the detailed design and supervision cost, contingency and price escalation, the total cost of the new water treatment plant is expected to reach US$16.0 million. This will be finalized after the completion of the current feasibility study.

For the extension and development of the distribution system, the detailed scope should be fixed after the final confirmation of the dam and WTP sites. However, TLWSP (2002) has reported some estimation based on assumed dam and WTP locations. The direct cost has been estimated at US$19 million for phase 1 and US$31 million for phase 2. Considering the detailed design and supervision cost, contingency and price escalation, the total cost of this component is expected to reach US$65 million.

Service expansion and development should be a continuous program. Under the EU-funded MPUWSP, about EUR 2.2 million, which is equivalent to US$3.0 million (February 2010 exchange rate of 1 EUR = 1.4 US$), is allocated. The scope includes 372 kiosks and 16,300 new service connections. The unit price of kiosk used is EUR 1,175 (US$1,645). Thus, the total cost of 2,550 new kiosks until 2030 is estimated at US$4.2 million. The cost for new service connection in the MPUWSP project is EUR 1.7 million (US$2.4 million). For the estimated new 201,000 connections until 2030, the estimated cost is US$29.6 million. Thus, the total cost for this project is US$34 million.

NRW reduction should be a continuous program although it should be intensive in the beginning. The EU-funded MPUWSP project has allocated EUR 1.1 million, equivalent to US$1.6 million. This allocation does not include administrative cost. Thus, the cost of this program for the first five years is assumed at US$2.0 million. After that, a similar amount is expected after every five years. Thus, the total cost would be US$8.0 million.

7.4.2 Implementation Outline

The indicative implementation schedule for the development plan along with the preliminary cost estimates is proposed in the following Table 7.4.1 .

Table 7.4.1 Indicative Implementation Plan of Water Supply System Development

ID No	Projects	Implementation Schedule			Cost (million US$)
		Short	Medium	Long	
WS1	Development of Diamphwe Dam as New Source				14
WS2	Study on the Development of Ntofu Dam				1
WS3	Study on Comprehensive Groundwater Management				1
WS4	Development of New Water Treatment Plant			2nd Phase	16
WS5	Extension and Development of Distribution System			2nd Phase	65
WS6	Service Extension and Development				34
WS7	NRW Reduction Program				8

Source: JICA Study Team

7.5 Selection of Priority Projects

From the projects listed in Table 7.3.4, priority projects are selected based on the following criteria:

1) Urgency: This is the most important criteria. The development of new source is a must when the current source cannot meet the demand. If a project is currently ongoing, this also indicates its urgency. It is given the highest weight in the priority project selection process.

2) Technical viability: Some of the projects are easy to implement while others may pose challenges. The conceived projects are all proven in local context, thus they can be considered viable.

3) Cost efficiency: It is equivalent to investment return. For example, the NRW reduction program provides better return per unit cost compared to dam construction.

4) Consistency and contribution to urban land use and other related plans: No project should be implemented if it is not consistent with the proposed plans. Water supply development plan fully integrated with the future land use plan.

5) Socio-environmental considerations: Projects with more positive and less negative socio-environmental impacts should be considered. Major impacts considered include natural environmental parameters like topography and geography, soil erosion, hydrologic condition, bio-diversity, etc; pollution parameters like air, water and soil pollution, noise, odour, waste, etc; and socio environment parameters like land acquisition, resettlement, employment, cultural heritage, women empowerment, etc.

The projects identified in the Water Supply System Development Plan (Table 7.3.4) are evaluated using the above selection criteria to select the priority projects as shown in the following Table 7.5.1. It is also proposed that large-scale projects should be implemented in phases considering the incremental needs and implementation requirements.

Table 7.5.1 Water Supply System Priority Projects

ID No	Projects	Urgency	Technical viability	Cost efficiency	Consistency with plans	Socio-environmental		Priority Project
						Positive	Negative*	
WS1	Development of Diamphwe Dam as New Source	A	A	B	A	A	C (n, s)	YES
WS2	Study on the Development of Ntofu Dam	C	A	A	A	A	A	No
WS3	Study on Comprehensive Groundwater Management	C	A	A	A	A	A	No
WS4	Development of New Water Treatment Plant	A	A	A	A	A	B (n, s)	YES

ID No	Projects	Urgency	Technical viability	Cost efficiency	Consistency with plans	Socio-environmental		Priority Project
WS5	Extension and Development of Distribution System	B	A	B	A	A	B (n, s)	No
WS6	Service Extension and Development	A	A	A	A	A	B (n, s)	YES
WS7	NRW Reduction Program	A	A	A	A	A	A	YES

Note: Suitability/Acceptability index: A = High sustainability/acceptability.
B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa
Source: JICA Study Team

7.6 Priority Projects

7.6.1 Development of Diamphwe Dam as New Source

A feasibility study is now on-going for new source development under the WB-funded NWDP II. The study named "Feasibility Studies and Preliminary Design for Lilongwe's New Water Source" is carried out by Sogreah. The inception report has been submitted in November 2009 and the Study is expected to be completed by the third quarter of 2010. The study will revisit the alternatives proposed in TLWSP (2002) before concluding on the new source. The scope also includes preliminary design and safeguard analysis.

The water source development project is expected to include the following: (i) dam structure; (ii) water transmission pipeline (or canal), water treatment plant, reservoir(s) and pumping station(s) if required, to produce and convey drinking water to the city (or to convey raw water and to treat it in the city before distribution); and (iii) all facilities required to enable abstraction of water from the source for other possible uses.

In this study, the consultant undertakes the following:

- Topographic survey of the recommended dam site, future reservoir area and new treatment works site
- Topographic survey of the transmission pipeline/canal
- Geotechnical survey of the recommended dam site
- Geophysical survey of the recommended dam site
- Update of the design criteria
- Hydraulic calculations
- Development of the preliminary design for the different components of the project: dam and/or intake, water treatment plant, transmission pipeline/canal, reservoir(s), pumping station(s), if needed
- Preparation of the capital cost estimate of each project on the basis of the preliminary design
- Environmental and social impact assessment
- Economic and financial analysis

Subject to the final outcome of the ongoing study, the most suitable alternative appears to be the Diamphwe scheme. With the Diamphwe scheme, only one major pumping station is needed. The elevation at the Upper Diamphwe site will enable the conveyance of water by gravity to a high point in the distribution network (Tsabango tank) with a consequential saving in the pumping costs.

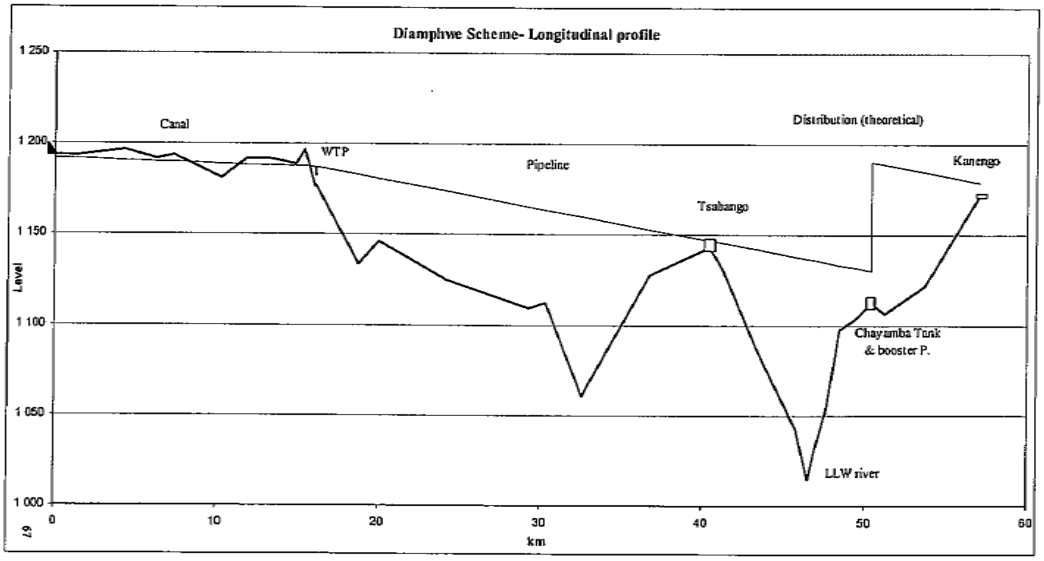
With 22 m height, Diamphwe can have a live volume of 90 million m^3. The expected safe yield is 125,000 m^3/day. The dam embankment is proposed to be a homogeneous earthfill with a crest width of 8 m. The overall length of the proposed dam is 400 m. A 16 km long canal with a capacity of 1,500 L/s is required to convey raw water to the proposed treatment plant.

7.6.2 Development of New Water Treatment Plant

The location and facility plan of the new WTP depends on the location and capacity of the new source. As explained above, the feasibility study of the new WTP is also included in the ongoing new source study under NWDP II.

Subject to the final outcome of the ongoing study, the most suitable alternative source appears to be the Diamphwe scheme. The November 19, 2008 water quality data at the proposed dam site of Chankhwatha on Diamphwe River show a TDS of 82 mg/L, F of 0.3 mg/L, Fe of 0.21 mg/L, total hardness of 59 mg/L and turbidity of 0.6 NTU (Central Water Laboratory, MIWD, 2009). These represent good water quality and accordingly, the conventional treatment process will be sufficient.

A theoretical longitudinal profile from the proposed Diamphwe Dam to Kanengo passing through the proposed WTP is given in Figure 7.6.1 below.



Source: TLWSP, 2002

Figure 7.6.1 Theoretical Longitudinal Profile from Proposed Diamphwe Dam to Kanengo

In Phase 1, half of the final capacity should be attained (60,000 m^3/day). The appurtenant structures required with the WTP include a lifting pump (with +5 m head) and a 24.5-km transmission main to the service reservoir at Tsabango (additional capacity of 4000 m^3) through 800 mm diameter pipes.

7.6.3 Service Extension and Development

Under the ongoing EU-funded MPUWSP project, the service extension and development component is included. The scope includes 372 kiosks and 16,300 new service connections. One more related investment is the procurement of 5,000 water meters under the WB-funded NWSP II.

The service contractor (Vitens-Evides International of Netherlands) has been mobilized on November 1, 2009 to commence a four-year service contract with LWB. Service extension and development is one of the scopes of the service contract. LWB has also

signed a partnership agreement with WaterAid as the NGO partner to implement this work.

7.6.4 NRW Reduction Program

Under the ongoing EU-funded MPUWSP project, the NRW component is included. Its scope includes:

- Equipment and tools for leak detection,
- SCADA telemetry system,
- Data loggers with data transfer capabilities,
- Pipe work repair material, and
- Pressure monitoring and control valves.

7.6.5 Summary of Priority Projects

The following Table 7.6.1 shows the summary of priority projects together with the suggested implementing agency.

Table 7.6.1 Summary of Water Supply System Development Priority Projects

ID No	Priority Projects	Project Outline	Implementing Agency
WS1	Development of Diamphwe Dam as New Source	Feasibility study & preliminary design (ongoing) Detailed design and supervision, Land acquisition and resettlement compensation, Construction of dam and associated structures like road and canal, Dam H = 22 m, Yield = 125,000 m^3/day, Raw water = 1,500 L/s, L = 16 km	LWB
WS4	Development of New Water Treatment Plant, Phase 1	Capacity = 60,000 m^3/day, Detailed design and supervision, Land acquisition and resettlement compensation, Transmission line, reservoir and lift pump	LWB
WS6	Service Extension and Development	New service connection = 201,000 (in 2030), New kiosk = 2,550 (in 2030), Ongoing MPUWSP includes 372 kiosks and 16,300 connections, Ongoing NWDP II includes 5,000 water meters and revolving fund to help new connection.	LWB
WS7	NRW Reduction Program	Both administrative and physical loss detection and reduction program, asset management, SCADA telemetry	LWB

ID No	Priority Projects	Cost (million US$)			
		Short	Medium	Long	Total
WS1	Development of Diamphwe Dam as New Source	14*	-	-	14
WS4	Development of New Water Treatment Plant, Phase 1	8	-	(8)#	8
WS6	Service Extension and Development	3	11	20	34
WS7	NRW Reduction Program	2	2	4	8

Note: Shaded cells denote that funds are already secured.
* = For WS1, only the study cost of US$1.6 million is secured.
# = This is not included in the priority project list, but this amount is necessary when the plant is expanded to meet future demand
Source: JICA Study Team

CHAPTER 8

SEWERAGE/SANITATION SYSTEM DEVELOPMENT

CHAPTER 8 SEWERAGE/SANITATION SYSTEM DEVELOPMENT

8.1 Planning Concept

8.1.1 Planning Objectives

The overall planning objectives of the urban environmental sector plan are given in Section 7.1.1. The specific planning objectives for the sewerage/sanitation management sector are as follows:

- Development objective is to provide suitable sewerage management options in line with population densities.
- Environmental objective is to reduce wastewater discharges to ambient water bodies.

8.1.2 Planning Strategy

Currently, only 29% of the population has access to safe sanitation (Section 3.3.3). Out of this, 9% of the population have access to piped sewer service while 20% use septic tank as on-site sanitation measure. In addition, there are very few ventilated improved pit (VIP) latrines, which are considered as safe sanitation method. The commonly available pit latrines in Lilongwe are not safe sanitation measures as they lack ventilation or water seal.

Hence, it is proposed that the foremost target should be to bring the entire population under a safe sanitation net, at least by providing sanitary latrine.

Population density is the key parameter in determining the appropriate level of excreta disposal system in a given area. Low population density areas should be excluded from the planning sewerage service area due to both technical and financial reasons. The required self cleaning velocity to serve a low density area leads to increasingly deeper installation of sewers often requiring lifting pumps. This will make both installation and operation complex and costly. It is rather difficult at a later stage to change the sewers initially designed with the self cleaning velocity required for low density area when its density increases. On the other hand, wastewater generated in a low density area can be managed through on-site systems at a much lower investment with an equivalent health benefit. A guideline is given in Table 8.1.1, suggesting that sewer system works best for areas with densities more than 40 persons/ha while sanitary latrine can be applied for areas with low densities (less than 10 persons/ha). Areas with medium densities can be served with on-site options like septic tank systems. It should be noted that this is only a general guideline and the actual selection of excreta disposal system for a certain area depends on the area's specific characteristics.

Table 8.1.1 Excreta Disposal Service Selection Guideline

Population density	Range	Target
High	more than 40 person/ha	Sewer System
Medium	11-39 person/ha	On-site Sanitation System
Low	less than 10 person/ha	Sanitary Latrine

Source: Sanitation Master Plan for Haiphong, Vietnam, JICA, 2001

Besides the population density criteria, the following aspects should also be considered:

- Current and expected situation of water supply in the area,
- Current and expected on-site sanitation management system development,
- Socio-economic condition and affordability of the users,
- Legal planning status of the area,
- Quality of the receiving water with respect to the likely effect of treated or raw sewage on it, and
- Areas with special interest like, airports, tourist spots, industrial areas, etc.

Sewer System Area: In high population density areas with more than 40 person/ha, the sewer system should be developed so that sewage from each household can be collected and treated off-site. However, this system might not work if the affordability is low. Also, house connection or yard connection type of water supply service is a requirement for water-borne sewer system.

On-site Sanitation System Area: Medium population density areas (11-39 persons/ha) are better served by on-site treatment systems like septic tanks followed by soak pits. Both human excreta and gray water must be captured by the septic tank system.

Sanitary Latrine Area: The low population density area (10 persons/ha) can be served with an improved sanitary latrine system (like twin pit latrine, ventilated improved pit latrine, compost latrine, water seal pour flush latrine, etc.), so that each household can sanitarily manage human waste. This is to ensure the prevention of pollution to the surrounding environment. The gray water in this case will be discharged into the drainage system.

8.1.3 Sanitation Service Planning Area and Type

As explained in Chapter 5, five types of residential land use patterns are proposed. The ideal sanitation service type for each land use pattern based on population density and excreta disposal guideline (Table 8.1.1) are given in Table 8.1.2 below.

Table 8.1.2 Ideal Sanitation Service Type by Area

Area Type	Density*	Ideal Sanitation Service	Remarks
Low density	30 p/ha	Septic tank	Must collect gray water; should be reviewed after 2030
Medium density	50 p/ha	Piped sewer	
High rise flat	70 p/ha	Piped sewer	
High density	80 – 90 p/ha	Piped sewer	Includes current THA which lacks proper water supply; thus, it needs evaluation
Quasi-residential	90 – 100 p/ha	Piped sewer	Lacks proper water supply so it needs evaluation
Mixed use		Piped sewer	Area specific evaluation is needed

* = Adopted from land use plan given in Chapter 5
Source: JICA Study Team

Low density area:

It is proposed not to cover the low density areas with piped sewer system. The reasons are as follows:

- To maintain their self-cleaning velocity, sewers need steep slopes and should be deeply installed which will require lifting pump installation;
- Construction and operation are difficult due to deeply installed sewers and lifting pumps;
- Both construction and operation costs are high;
- No additional health benefit from user's perspective; and
- No additional environmental benefit (if on-site systems operate correctly and collect gray water).

The current LCC practices for sewer installation also follow this guideline. The current sewer coverage areas and their land uses are shown in Table 8.1.3 below. It can be seen from the table that no low density area, except Area 9, is currently served with sewer system. However, it should be noted that the sewers in Area 9 are under construction by a private company.

Table 8.1.3 Current Sewerage Coverage Area

Area	Current Land use	Main Future Land use	Remarks
1	High Density	High Density	
2	Medium Density	Medium Density	
4	Industry	Commercial	
6	Medium Density	Medium Density	
11	Medium Density	Low Density	
13	Commercial	High rise Commercial	
16	Commercial	High rise Commercial	
18	High Density	High Density	
19	Commercial	High rise Commercial	
20	Government	Government	
30	Institutional	Government	
32	Institutional	Commercial	
33	Institutional	Commercial/High rise flat	
35	Institutional	Military	
52	Airport	Airport	
53	Medium Density	High Density	
9	*Low Density*	*Low density*	*Currently under construction, funded by a private company*

Source: JICA Study Team

High density area:

The future proposed high density area includes current high density permanent and current high density traditional housing areas (THA). In addition, some new area will be developed as high density area. The current service levels of two existing area types are quite different. As explained in Chapter 5, the process of transformation is time consuming. After total integration, a piped sewer system is recommended. Until then, sanitary latrines are proposed for THAs. While this may not be the best solution from an environmental aspect as gray water cannot be captured in this option, it will certainly improve the health situation as unsanitary pit latrines are currently used in most cases. Further, water supply for most of these areas is currently served by kiosks. With such water supply service level, it is not possible to establish water-borne sewerage system. On-site system is not recommendable to reduce the misuse of investment since a sewer system is proposed in the medium term. However, current high density permanent areas and newly developed high density areas should be served by piped sewer systems.

Quasi-residential area:

Same argument is also applied to quasi-residential areas. Until fully integrated into the planned system, sanitary latrine should be applied. After that time, piped sewer system should be introduced. However, such introduction of piped sewer is expected to take place beyond the planning horizon of this Study, i.e., 2030.

Mixed use area:

In the proposed land use plan, mixed use has been promoted. For commercial and government (institutional) areas, a sewer system is proposed as day time occupants in these areas are expected to be significant.

Since the waste generated from industrial areas might contain hazardous materials, it is proposed that localized small scale sewerage treatment plants should be developed for industrial areas. This is also in line with the present practice, i.e., there are currently two treatment plants designated for industrial areas. Only few residents will be located within the industrial areas. Thus, it is not feasible to provide piped sewer service to isolated residential plots within the industrial areas. As a result, on-site sanitation is recommended for these dwellings.

Recommended service types:

Based on the above discussion, the proposed sewerage system by area is presented in Table 8.1.4. This will ensure that the entire population will have access to safe sanitation.

Table 8.1.4 Proposed Sanitation Service Type by Area

Area Type	Current	Up to 2015	Up to 2020	Up to 2030	Beyond 2030
Low density	Septic tank	Continue	Continue	Continue	Review
Medium density	Septic tank/ Sewer	Sewer	Continue	Continue	Continue
High rise flat	N/A	Sewer	Continue	Continue	Continue
High density -Current permanent	Septic tank/ Sewer	Sewer	Continue	Continue	Continue
-New development	N/A	Sewer	Continue	Continue	Continue
-Current THA	Unsafe Latrine/ Sanitary Latrine	Sanitary latrine	Continue	Sewer	Continue
Quasi-residential	Unsafe Latrine	Sanitary latrine	Continue	Continue	Sewer
Mixed use (exp industrial area)	N/A	Sewer	Continue	Continue	Continue
Mixed use (industrial area)	N/A	Septic tank	Continue	Continue	Continue

Source: JICA Study Team

8.1.4 Wastewater Collection System

There are various systems used for wastewater collection. These alternatives are discussed below.

1) Combined Sewer System

In this alternative, sewage and storm water would be collected in the same sewer. Septic tanks can be used, but are not needed. Dry weather sewage flows are intercepted at selected points in the system and transported to a wastewater treatment plant. Storm water is diverted as overflow and discharged to surface water bodies.

2) Simplified Separate Sewer System

In this alternative, sewage and storm water are collected in different sewers. Septic tanks are used. Wastewater is collected from septic tanks by a small-bore pipe system and transported to a wastewater treatment plant. Primary treatment of the collected wastewater is generally not needed. Treatment is also simplified.

3) Separate Sewer System

In this alternative, sewage and storm water are collected in different sewers. Septic tanks are not required. Wastewater is collected directly from the source and transported to a wastewater treatment plant. Primary treatment of the collected wastewater is needed.

Since the current sewerage system is a separate sewer type, the same system is proposed for all new developments. A separate system might be expensive to install, but it needs less skill and cost to operate. For new development, a separate system is almost always adopted.

8.1.5 Planning Conditions

Sewerage system should be planned and proposed considering the following:

- Future population, land use and water demand projection determined in this Study are applied;
- Separate sewer type is adopted as explained above (Section 8.1.4).
- Pressure flow by lift pump for wastewater collection should be avoided as much as possible in order to achieve easy operation and maintenance.
- The existing sewerage systems shall be utilized and necessary rehabilitation plan shall be proposed for the maximum utilization of current assets.
- The effluent water quality from Sewage Treatment Plant (STP) must meet the country's requirements.
- In addition to the environmental requirement above, the wastewater treatment process shall be carefully selected considering the land use of the surrounding area, characteristics of the discharging water body, cost efficiency and easy maintenance.

- In the absence of a Malawi standard for influent quality, the design influent quality used for the Kauma STP is adopted (BOD value is 300 mg/L; details in Table 3.3.15).
- The Malawian effluent standard is rather relaxed as shown in Table 3.3.18. Anticipating that this standard will become strict in the future, the design effluent value used for the Kauma STP is adopted (BOD value is 20 mg/L; details in Table 3.3.15).

On-site system should be planned and proposed considering the following:

- The design and size must conform to the National Construction Industry Institute guidelines.
- All septic tanks must be followed by appropriately designed soaking pits.
- All gray water (sullage) generated within the premises must be captured by the on-site system.
- LCC must monitor the construction of on-site system.
- LCC should also monitor appropriate cleaning (removal and safe disposal of septage)

Latrine system should be planned and proposed considering the following:

- Latrines must be ‘safe’ from the health aspect as recommended by WHO, which include VIP latrine and water seal latrine, among others.
- Public awareness in the form of ‘sanitation marketing’ should be a continuous program.
- Some form of financial assistance should be provided like revolving fund, low interest micro credit, or subsidy.

8.2 Demand Projection

8.2.1 Unit Sewerage Generation

(1) Design Coverage Area

For the planning horizon up to 2030, sewer service is proposed for medium density, high rise flat, and high density areas under the residential category. In addition, commercial and public sector areas should also be covered. In the proposed land use plan, mixed use is promoted and accordingly, there would be residents within commercial and office areas. These plots should have access to the sewer system.

Until 2020, however, current THAs (that would become high density areas by 2030) will not be served by piped sewer service as explained in Section 8.1.3 and summarized in Table 8.1.4. Thus, these areas will not contribute to sewerage generation until 2020.

(2) Wastewater Generation Factor

In general, the contribution of drinking water to wastewater is around 75% to 85% in residential and commercial areas. Most of the Study Area is mainly residential and commercial areas, and there are few industries within the residential areas. Therefore, the contribution of 80%, which is a median value of wastewater generation for typical residential and commercial areas, is selected.

(3) Daily Maximum Peak Factor

The peak factor of water supply, which is 1.25 as described in Section 7.1.5, is applied to determine the daily maximum wastewater generation.

(4) Inflow and Infiltration Contribution

Inflow and infiltration contribution is the ratio of groundwater and storm water that enter into sewer pipe to the daily maximum wastewater flow. Although it depends on the total pipe length of the sewer network, values between 10% and 20% are generally applied. Since no special condition prevails in the Study Area, 15% is applied as the inflow and infiltration contribution.

8.2.2 Demand Estimation

Sewer area:

As explained in Table 8.1.4, sewer service would be provided for medium density, high rise flat, and high density areas by 2030. Residents within commercial and office areas would also be served by the sewer system. The domestic water use in the planned sewer area is about 97,000 m^3/day in 2030. The calculation details are shown in Table 8.2.1.

Table 8.2.1 Domestic Water Use in Sewer Area in 2030

Area Type	Land Area (ha)*	2030 Coverage Population*	Target density (persons /ha)*	2030 unit consumption (Lpcd)	2030 total consumption (m^3/day)
Medium Density	1,987	99,335	50	150	14,900
High Rise Flat	1,155	80,876	70	150	12,131
High Density	6,795	591,230	80 - 90	100	59,123
Mixed Use (except industrial area)	3,666	73,282	10 - 30	150	10,992
Total domestic use	**13,604**	**844,723**			**97,147**

* = Adopted from land use plan given in Chapter 5
Source: JICA Study Team

The non-domestic water use, except industrial area, in the target sewer area in 2030 is about 8,000 m^3/day (Table 7.2.5). Therefore, the total water use in the target sewer area in 2030 is about 105,000 m^3/day. Factoring the wastewater conversion ratio, daily peak demand and infiltration ratio into this, the wastewater generation in 2030 is around 121,000 m^3/day. The calculation details are shown in Table 8.2.2.

Table 8.2.2 Estimated Wastewater Generation in 2030

Demand type	Reference	2030 Wastewater Generation (m^3/day)
Domestic Use	Table 8.2.1	97,147
Public Sector (office) demand	Table 7.2.5	1,800
Institutional Demand	Table 7.2.5	4,363
Commercial Demand	Table 7.2.5	2,060
Total non-domestic use except industrial area		8,224
Total water use (W)		*105,371*
Generated Wastewater (WW)	80% of W	84,296
Daily Maximum generated wastewater (WWM)	1.25 of WW	105,371
Total Sewage with inflow	**1.15 of WWM**	**121,176**

Source: JICA Study Team

For the estimation of sewerage generation in 2015 and 2020, a similar method is applied except that the THA area has not been considered for the sewer system until 2020, as explained in Section 8.1.3. The total sewage volume in 2015 and 2020 are 35,000 and 59,000 m^3/day, respectively.

On-site Sanitation Area:

In 2030, people living in low density and industrial areas are expected to use septic tank. The total population is 95,220 (Chapter 5). Considering an average family size of 4.0 in 2030 (as explained in Section 7.2.2) and one septic tank per family, the required number of tanks is 23,805. Similarly, 8,787 and 14,195 septic tanks are respectively estimated in 2015 and 2020.

Sanitary Latrine:

As proposed in Table 8.1.4, only quasi-residential area will be served by sanitary latrines in 2030, where population is estimated at 600,047 (Chapter 5). Thus, the requirement will be 150,012 sanitary latrines. However, THAs will be served by sanitary latrines up to 2020. Accordingly, 146,516 and 160,781 sanitary latrines will be required in 2015 and 2020, respectively. In 2020, 44,500 sanitary latrines will be in THA.

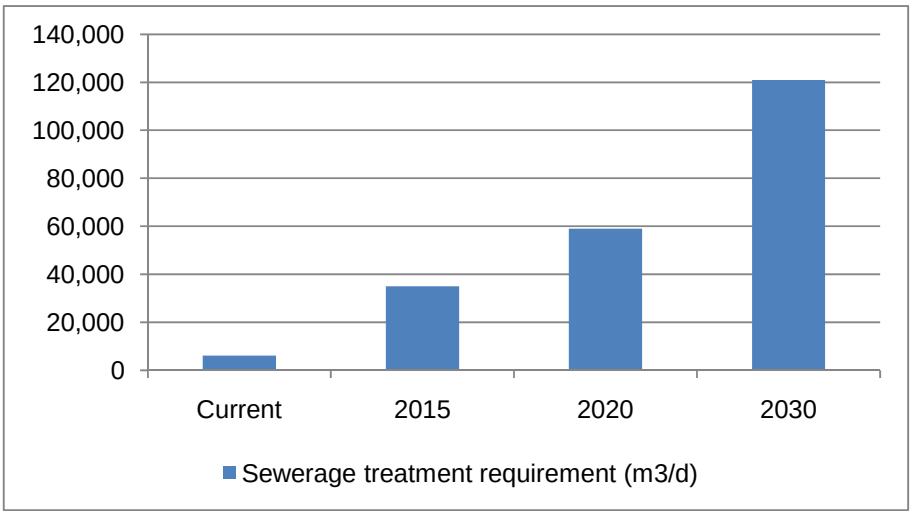
Summary:

In 2030, the piped sewerage coverage ratio in terms of population will be 54% from the current 9%. In addition, about 44% will depend on on-site technologies like septic tanks (6%) and sanitary latrines (38%). Thus, 98% of the population in 2030 will have access to safe sanitation compared to the current 29%. The summary of demand projection is given in Table 8.2.3 below.

Table 8.2.3 Summary of Demand Projection

	Current	2015	2020	2030
Sewerage treatment requirement (m^3/d)	6,100	35,000	59,000	121,000
Sewerage coverage (%)	9	28	34	54
Septic tank number	N/A	8,800	14,200	23,800
Septic tank coverage (%)	20	4	5	6
Number of sanitary latrine	N/A	147,000	161,000	150,000
Sanitary latrine coverage (%)	0.01	65	58	38
Safe sanitation coverage (%)	**29**	**97**	**97**	**98**

Source: JICA Study Team



8.3 Development Concept of Sewerage/Sanitation System

8.3.1 Development Strategy

As described in Section 3.3.5 (2), the on-going "Development of Strategic Sanitation Plan" project aims to prepare the overall sanitation planning for Lilongwe. This project is carried out under the WB-funded NWDP II and implemented by MIWD. Therefore, the JICA Study does not duplicate this task and rather provides a general outline plan which emphasizes short term requirements by identifying priority projects.

The most important development strategy is to provide safe sanitation for the entire population of Lilongwe by 2030. Due priority should be given to the population who are using unsafe sanitation practices.

As explained in Section 3.3.3, the lack of institutional capacity is the most significant constraint for further sanitation/sewerage development. Organizational development and capacity building must be started immediately. Another major issue is extreme shortage of manpower. Implementation of any development activity will be severely hindered without urgently filling the vacancies in the sewerage services at LCC.

To improve the service level, financial sustainability, mainly the billing strategy, must be reconsidered. Currently discontinued sewage tariff collection should be re-introduced.

The National Sanitation Policy of 2008 recommends that the sewerage service should be transferred to the Water Boards. The Water Works Act 1995 also designates LWB as the responsible organization for both water supply and sewerage systems in Lilongwe. However, it is understood that LWB is reluctant to take over the sewerage operation. Major reasons include LCC's sewerage services' poor capacity, lack of management, inefficient operation and limited financial return. Thus, it is proposed that LCC's sewerage service must be strengthened in the short and medium term before evaluating the possible transfer to LWB in the longer term.

Rehabilitation works will be prioritized to improve the capacities of the treatment plants. Expansion projects, which usually cost more, should be done at a later stage. In line with the improvement of the plants, sewer lines must also be restored to their normal condition.

8.3.2 Planning, Institutional and Financial Capacity Building

(1) Requirement

As explained in Section 3.3.3, LCC's lack of institutional Capacity is the most significant constraint for sanitation/sewerage development in Lilongwe. This is also outlined in the proposed development strategy (Section 8.3.1).

(2) System Development

Unlike the water supply sector, there is no comprehensive sector plan for sewerage and sanitation at present. Without such exercise, the holistic picture cannot be framed and future activities cannot be streamlined.

A study named "Development of Strategic Sanitation Plan" is included in NWDP II.

Conceivable project: Preparation of sewerage and sanitation master plan.

As explained in Section 3.3.3, LCC's current operation suffers from a number of capacity issues, namely: (1) poor legal authority, (2) low administrative hierarchy, (3) weak human resources, (4) many vacancies including entire management level, and (5) inappropriate monitoring and reporting. Addressing these challenges is a prerequisite of any future system development.

As explained in Section 3.3.3, the sewerage service of Lilongwe should be transferred to LWB according to National Sanitation Policy of 2008 and Water Works Act of 1995. However, it is assessed that LWB is reluctant since the service is barely operational. Until now, there is no specific plan or time frame of service hand over. Thus, JST proposes that until such transfer takes place, LCC's sewerage service should be strengthened for proper operation. In this regard, the capacity building project should ensure the following;

- Discuss with MIWD, NWDP, WB, EU & other donors, LWB, LCC and other stakeholders to formulate a handover process and time frame;
- Ensure that until that period, LCC can properly operate the service;
- Help LCC to recruit engineers and other staffs and ensure the staff can move to LWB when the migration takes place;
- Arrange on-the-job, in house and external staff training focusing operation;
- Help increase administrative hierarchy of the service within LCC; and
- Introduce reporting and monitoring system.

Conceivable project: Capacity building of LCC's sewerage service.

For any sustainable development, financial strength is very important. LCC used to collect sewerage tariff until 2007. Due to the lack of manpower and competency, this is now discontinued.

Conceivable project: Tariff study and implementation.

Sanitation project cannot be successful without wide public participation, especially for on-site sanitation system. Education, ownership development, and stakeholders' consultation are essential for public awareness building.

A program called "Sanitation and Hygiene Promotion through Sanitation Marketing" is included in NWDP II.

Conceivable project: Sanitation promotion campaign.

8.3.3 On-Site Sanitation

(1) Requirement

The currently used dug-hole type pit latrines are among the most unsafe sanitation practices. It is highly recommended to discontinue the present use of these types of

latrines. The most important development activity in the sanitation sector is to convert unsafe latrines into safe latrines. The current septic tanks lack regular cleaning of septage thus limiting their effectiveness. The management of on-site sanitation should be institutionalized from design, construction, and operation to cleaning, maintenance and closure.

In 2030, a total of 23,800 septic tanks and 150,000 sanitary latrines will be required. The required units during the interim years are given in Table 8.2.3.

(2) System Development

A continuous program is required to convert unsafe latrines to safe latrines. As the total requirement is rather huge, a well coordinated approach is a must.

The current MPUWSP project includes the provision of 29,640 latrines in 5 years.

Conceivable project: Provision of safe latrine.

Currently, there is no coordinated approach for septic tank management. The National Construction Industry Institute prepares the septic tank design; the LCC's development control section approves the design; and the LCC's building inspectorate supervises the construction. However, there is no designated authority for monitoring septage removal and soak pit cleaning. The lone septage treatment pond is managed by LCC's sewerage service but there is no monitoring of private septage collecting firms. Because of such disorganized situation, a septage management plan should be prepared first.

Conceivable project: Study on on-site sanitation management.

Based on the outcome of the study, on-site sanitation management should be implemented. It is expected that the following components will be included:

- Septage treatment plants; and
- Septage collection vehicles.

Conceivable project: Implementation of on-site sanitation management.

8.3.4 Sewage Treatment Plant

(1) Requirement

LCC currently operates four STPs, two of which are for industrial purposes (at Kanengo and cold storage) and two for domestic purposes (at Lumbadzi and Kauma). However, the Lumbadzi STP (capacity: 1,200 m^3/day) is no longer operational now due to the breakage of the main collector pipe. The Kauma STP with a capacity of 6,100 m^3/day has been constructed through a Japanese grant aid in 1997. Its full development capacity is 15,600 m^3/day.

Against the current operational capacity, the additional required treatment volume in 2030 is 115,000 m^3/day. The required volume in 2015 is 29,000 m^3/day.

It should be noted that sewerage treatment requirement is realized with the extension of sewer network. As explained in Section 3.3.3, current generation is estimated at 5,280

m^3/d, while the current target demand is around 20,000m^3/d. Given the low capacity of LCC's sewerage services and uncertainty of legal status, it is anticipated that actual demand will be less than target demand.

(2) System Development

The required treatment capacity in 2030 is substantially high when compared to the current capacity. Detailed analysis and planning is needed to achieve such ambitious target. The on-going sector master plan named "Development of Strategic Sanitation Plan" under NWDP II is expected to address such issues.

In this Study, a more realistic approach is adopted in planning the system development. It would be rather difficult to address the target demand, thus the development plan proposed to satisfy a realistic demand considering the challenges of sewer line extension.

Sewage treatment development is costly and time consuming. Therefore, the rehabilitation, extension and upgrading of existing plants is initially considered. Hence, the Lumbadzi STP should be rehabilitated first.

The rehabilitation of the Lumbadzi STP is expected to be implemented by 2010 with LCC's own budget. The location of the STP is shown in Figure 3.3.5.

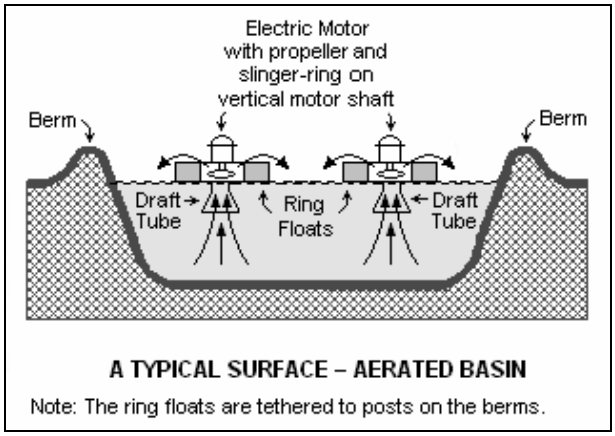
Conceivable project: Rehabilitation of Lumbadzi STP.

The capacity extension of Kauma STP should be the next step. Its Phase II capacity is 9,500 m^3/day. This will involve the construction of two anaerobic ponds, four facultative ponds and six maturation ponds. At that point, the total available treatment capacity in Lilongwe will be 16,800 m^3/day (Kauma with full capacity and Lumbadzi). The location of the STP is shown in Figure 3.3.5.

Conceivable project: Extension of Kauma STP.

To achieve the proposed target of 121,000 m^3/day treatment capacity, additional capacity of more than 100,000 m^3/day peed to be added until 2030. For this massive requirement, many new STPs have to be constructed along with the upgrading of existing STPs. It is expected that the detailed plan will be available through the ongoing Strategic Sanitation Plan.

Depending on the outcome of the ongoing Strategic Sanitation Plan, future development can have various options. By installing surface aerators, the current waste stabilization pond (WSP) system can be upgraded into an aerated lagoon (AL) system. Ponds or basins using floating surface aerators (as shown in Figure 8.3.1) achieve 80% to 90% removal of BOD with retention times of 1 to 10 days as opposed to Kauma STP's current retention time of 16.7 days (facultative ponds). Also, AL can be as deep as 5 m as opposed to Kauma plant's current 2 m depth (facultative ponds). This can increase the capacity of current STPs by 50% to 100%. If this option is adopted, the capacity will be increased to around 30,000 m^3/day. The operation and management requirements for AL are also less than those required for activated sludge and similar technologies.



Source: Website. Activated Sludge: Surface Aerated Basins, (http://www.absoluteastronomy.com/topics/Activated_sludge)

Figure 8.3.1 Concept of Aerated Lagoon

Conceivable project: Upgrading of Existing STPs.

Afterwards, the construction of new additional STPs is the next course of development. It is too early to propose the treatment system at this stage, but it is expected to be a combination of WSP, AL and Activated Sludge (AS) processes. The ongoing sector master plan is expected to provide such direction.

Potential sites for wastewater treatment plants are generally identified from the following criteria:

- Treatment plants should be located at sites where wastewater can be collected and transported mostly by gravity flow with a minimum amount of pumping stations;
- Sites will have enough space for construction of the treatment plant facilities with minimal effects on existing buildings and structures;
- Treatment plants will be located at sites where operation of the plants will have minimal environmental impacts;
- Sites should be adjacent to the receiving water of the treatment plant;
- Sites should be selected from less extensive land use areas both at present and in the future; and
- Treatment plants should be located where reuse of the treated wastewater is possible.

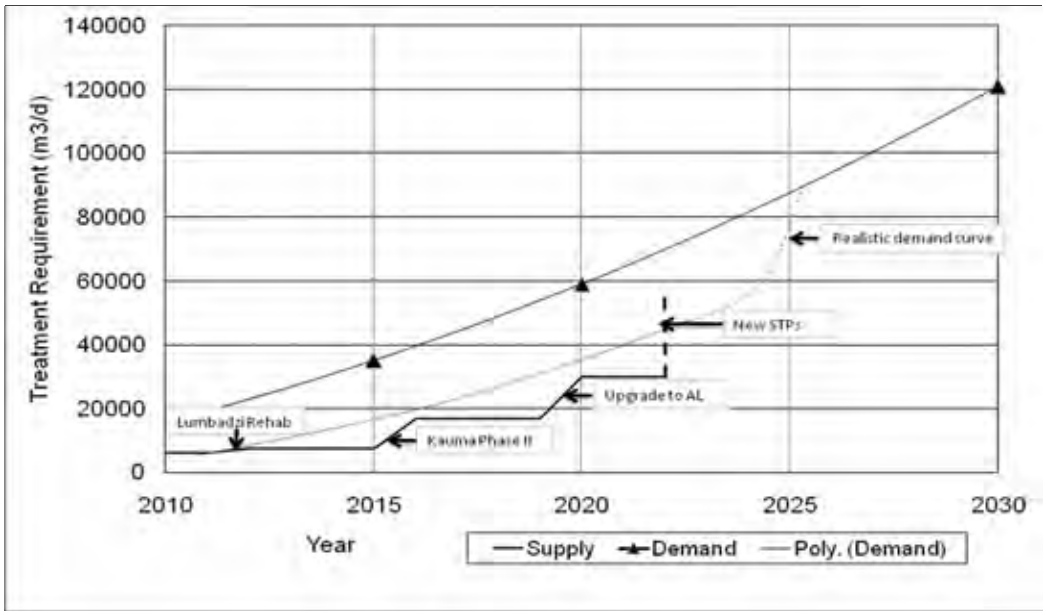
Localized STPs are cost-effective as they can reduce lift pump costs. Since land availability is not a major concern in Lilongwe, localized STPs are proposed.

At that stage, the community disposal alternative for wastewater should be investigated. In this alternative, wastewater is collected and treated at each community zone such as housing, industrial estates, and business centres. This will lead to faster system development.

Conceivable project: Construction of additional STPs.

Demand /supply of sewerage treatment capacity is shown in Figure 8.3.2. In the figure,

a more realistic demand curve is plotted parallel to the target demand curve starting with the current actual demand. The implementation schedule of the treatment capacity increase projects proposed above are planned considering current institutional weakness and it's strengthening activities.



Source: JICA Study Team

Figure 8.3.2 Demand/Supply of Sewerage Treatment

8.3.5 Collection System

(1) Requirement

To achieve the target set in this Study, new sewer, lift pump stations and collector mains have to be constructed. The exact requirement depends on the final STPs' site location, elevation, and expansion scheme.

(2) System Development

Collection system development is much more complex than water supply system development. It depends not only on the demand centre locations but also on hydraulic catchment, total generation, gradient and location of lift pump, if any. Thus, coordinated planning of the total system is needed. After completion of the ongoing Strategic Sanitation Plan, such details should be worked out considering the total system.

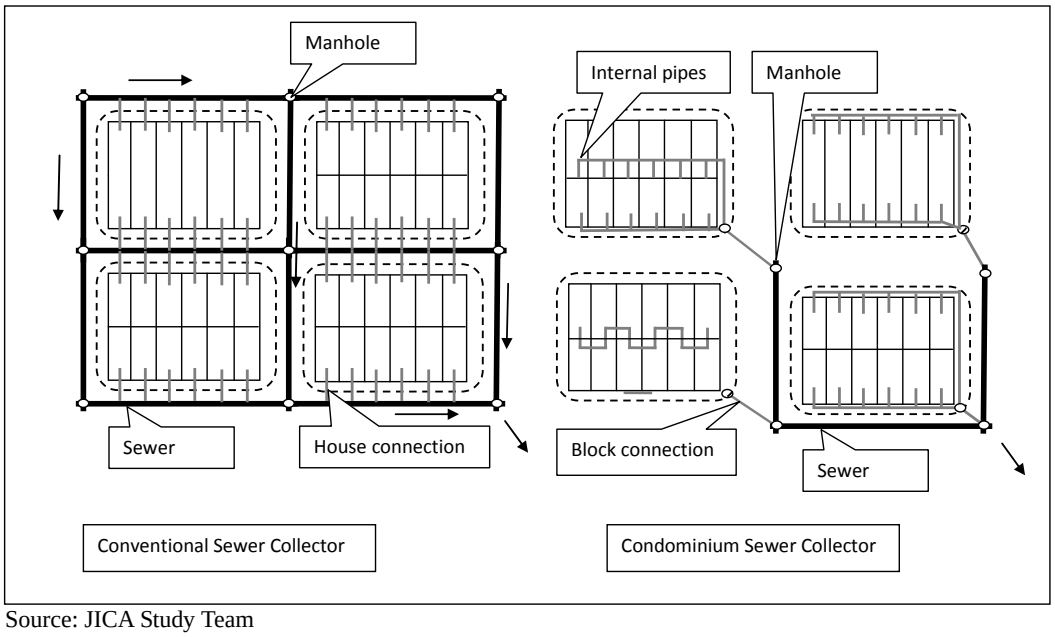
Sewerage development is defined according to the following technical factors, with particular emphasis on the quantities of sewage, pollution loads, and geographic conditions:

- drainage basins
- land use (present and future)
- population density (present and future)
- wastewater and pollution load generation

- configuration of wastewater disposal systems
- existing wastewater collection systems
- city development plans

For the piped sewer system to be introduced in the future in the current high density traditional areas, condominium sewer system should be considered as an alternative secondary collection system to significantly reduce the construction and O&M costs and facilitate the quick development of the sewerage system.

The main concept of condominium sewerage system is to redefine the user connection point where the service is provided. While the conventional systems primarily provide services to each dwelling/house unit, the condominium system provides service to each block or group of houses that could be called a neighbourhood unit or "condominium". It is similar to the concept of providing a single connection to an apartment building, although here the “condominium” is physically horizontal and institutionally informal. As a result of this new concept, the public network will no longer need to connect to each piece of land/house or exist in every street. It simply needs to have a connection point at every single urban block. Therefore, the length of the network is considerably shorter than that of a conventional system. A conceptual drawing of the condominium sewer system is given in Figure 8.3.3 below.



Source: JICA Study Team

Figure 8.3.3 Conceptual Diagram of a Condominium Sewer System

Conceivable project: Sewerage service extension.

8.3.6 Sewerage/Sanitation System Development Plan

To achieve the development targets and goals, a huge number of programs and projects need to be implemented. The necessary programs and projects related to the sewerage/ sanitation sector plan that have been considered and selected are summarized in Table 8.3.1 below. However, the projects included in the list cannot be implemented at once

due to financial and technical issues.

Table 8.3.1 Sewerage/Sanitation System Development Program

ID No	Project	Project Outline	Remarks
SS1	Preparation of Sewerage and Sanitation Master Plan	Sector master plan for sanitation and sewerage	Ongoing project "Development of Strategic Sanitation Plan" included in NWDP II
SS2	Capacity Building of LCC's Sewerage Service	Organizational improvement and institutional development program including staff recruitment and training. Also includes equipment and know-how for proper operation	Prerequisite of any future system development
SS3	Tariff Study and Implementation	Sewerage tariff setting, formulation of collection process and reintroduction of sewerage tariff	Financial strength is important for any sustainable development
SS4	Sanitation Promotion Campaign	Sanitation awareness and hygiene promotion To be continued for long term	Ongoing project, "Sanitation and Hygiene Promotion through Sanitation Marketing Approach", included in NWDP II.
SS5	Provision of Safe Latrine	Construction of VIP latrines. Total number required = 150,000	Ongoing project, total 29,640 in five years, included in MPUWSP.
SS6	Study on On-Site Sanitation (OSS) Management	A study to formulate on-site sanitation management strategy, FS for collection and treatment, Support for OSS management unit	Required before implementing any OSS management
SS7	Implementation of OSS Management	Implementation based on the study	
SS8	Rehabilitation of Lumbadzi STP	Replacement of main collector and restarting the operations of the STP, capacity 1,200 m^3/day	Included in LCC's current budget
SS9	Extension of Kauma STP	Phase 2, Additional capacity: 9,500 m^3/day ultimate capacity: 15,600 m^3/day	
SS10	Upgrading of Existing STPs	Process conversion from WSP to AL for existing STPs	
SS11	Construction of Additional STPs	New STPs construction based on master plan, Total requirement = 70,000 m^3/day	
SS12	Sewerage Service Extension	Sewer network, service connection, lift pump if required	

Source: JICA Study Team.

8.4 Preliminary Cost Estimate and Implementation Outline

8.4.1 Preliminary Cost Estimate

US$0.3 million is allocated for the consultancy of "Development of Strategic Sanitation Plan" in the NWDP II. However, it is estimated that it might require around US$1.0 million.

It is proposed that LCC would hire an individual consultant for 1 year for the capacity building of its sewerage service. This project is included in the LCC's overall capacity development project and cost is given in Chapter 10.

For the tariff study and implementation, it is also proposed that LCC would hire an individual consultant for 6 months. This project is also included in the LCC's overall capacity development project and cost is given in Chapter 10.

The estimated cost for "Sanitation Marketing" is about US$5.0 million for the first 3 years (based on 2007 Strategy Document). However, it is important to continue this program for a long period. After the initial 3 years, it is proposed to allocate US$0.5 million every year so the total cost during the entire planning horizon is estimated at US$10-15 million.

Based on CCODE's recent construction information, one VIP latrine costs about MWK 30,000 or just over US$200 (using February 2010 exchange rate of 1 US$ = 143 MWK). Over 160,000 latrines are required over the planning horizon with a total cost requirement of around US$32 million. The ongoing MPUWSP has a provision of 29,640 latrines over five years. The estimated cost is around US$ 6million.

The study on on-site sanitation (OSS) management is expected to be carried out by hiring a consultant firm. The cost for septic tank inventory preparation, estimated at around US$250,000, should be included in this study. Accordingly, the total cost of this study is estimated at US$0.75 million.

The implementation of OSS management has many components. The cost for septic tank monitoring unit is estimated at US$0.5 million. While it is not possible to estimate the number of collector vehicles at this stage, it is anticipated to cost at least US$2.5 million. Also, it is not possible to estimate the cost of septage treatment until the proposed OSS Management Study comes up with the appropriate treatment option and capacity. However, it can be anticipated to be more than US$5.0 million. Hence, the cost for this component could be more than US$8.0 million.

The rehabilitation work of Lumbadzi STP is included in the LCC's current budget. The estimated allocation is MWK 35 million, which is around US$0.25 million.

The extension of Kauma STP will add 9,500 m^3/day to its total capacity and is expected to cost around US$4.5 million.

The estimated upgrading cost from waste stabilization pond (WSP) to aerated lagoon (AL) is expected to be between 150 and 250 US$/$m^3$. Thus, the total upgrading cost for 2 STPs (Kauma and Lumbadzi) would be around US$4-4.5 million.

It is reported that the unit costs of treatment in developing country are US$350-450/$m^3$ for WSP, US$500-600/ m^3 for AL, and US$600-800/$m^3$ for AS process. Since the future STPs would be a mixture of different processes, a median value of US$600/$m^3$ is assumed. After upgrading, the remaining treatment capacity requirement is around 70,000 m^3/day. This gives an estimated cost of US$45-50 million.

The unit cost of sewer pipe installation is between US$500 and US$1,000. Assuming 1,000 m/ha of net built up area, the sewer development cost is around US$0.5 million/ha. Out of the estimated future sewer area of 13,600 ha, the net built up area is estimated at 6,800 ha, assuming a 0.5 net ratio of built up area. The current sewer network covers an area of 3,300 ha. Hence, new sewer extension will be required for 3,500 ha. Thus, the total investment cost requirement for the new collection system is about US$1,500-2,000 million.

8.4.2 Implementation Outline

The indicative implementation schedule for the development plan along with the preliminary cost estimates are proposed in the following Table 8.4.1.

Table 8.4.1 Indicative Implementation Plan and Preliminary Cost Estimate of Sewerage/Sanitation System Development Program

ID No.	Project	Implementation Schedule			Cost (million US$)
		Short	Medium	Long	
SS1	Preparation of Sewerage and Sanitation Master Plan				1.0
SS2	Capacity Building of LCC's Sewerage Service				#
SS3	Tariff Study and Implementation				#
SS4	Sanitation Promotion Campaign				13.5
SS5	Provision of Safe Latrine				32.0
SS6	Study on On-Site Sanitation (OSS) Management				0.75
SS7	Implementation of OSS Management				8.0
SS8	Rehabilitation of Lumbadzi STP				0.25
SS9	Extension of Kauma STP				4.0
SS10	Upgrading of Existing STPs				4.0
SS11	Construction of Additional STPs			2nd Phase	45.0
SS12	Sewerage Service Extension			2nd Phase	1,500.0

Cost included in LCC's overall capacity development program, refer to Chapter 10
Source: JICA Study Team

8.5 Selection of Priority Projects

From the projects listed in Table 8.3.1, priority projects are selected based on the following criteria.

1) Urgency: This is the most important criteria. The development of new STP is a must when the current STP cannot meet the demand. Similarly, conversion of unsafe latrine to VIP latrine is very urgent from the health perspective. If a project is currently ongoing, this also indicates its urgency. It is given the highest weight in the priority project selection process.

2) Technical viability: Some of the projects are easy to implement while others may pose challenges. For example, the operation of the AL process needs proper orientation and training.

3) Cost efficiency: It is equivalent to investment return. For example, the conversion of unsafe latrine to VIP latrine provides the best return in the investment.

4) Consistency and contribution to urban land use and other related plans: No project should be implemented if it is not consistent with the proposed plans. Sewerage/ sanitation development plan fully integrated with the future land use plan.

5) Socio-environmental considerations: Projects with more positive and less negative socio-environmental impacts should be considered. Major impacts considered include natural environmental parameters like topography and geography, soil erosion, hydrologic condition, bio-diversity, air, water and soil pollution, noise, odour, waste, etc; and socio environment parameters like land acquisition, resettlement, employment, cultural heritage, women empowerment, etc.

The projects identified in the Sewerage/ Sanitation System Development Plan (Table 8.3.1) is evaluated using the above selection criteria to select the priority projects as shown in the following Table 8.5.1. It is also proposed that large scale projects should be implemented in phases considering the incremental needs and implementation requirements.

Table 8.5.1 Sewerage/Sanitation System Priority Projects

ID No	Projects	Urgency	Technical viability	Cost efficiency	Consistency with plans	Socio-environmental		Priority Project
						Positive	Negative*	
SS1	Preparation of Sewerage and Sanitation Master Plan	A	A	A	A	A	A	YES
SS2	Capacity Building of LCC's Sewerage Service	A	A	A	A	A	A	YES
SS3	Tariff Study and Implementation	A	A	A	A	A	A	YES
SS4	Sanitation Promotion Campaign	A	A	A	A	A	A	YES
SS5	Provision of Safe Latrine	A	A	A	A	A	A	YES
SS6	Study on On-Site Sanitation (OSS) Management	A	A	A	A	A	A	YES
SS7	Implementation of OSS Management	B	C	C	C	C	B (n, s)	No

ID No	Projects	Urgency	Technical viability	Cost efficiency	Consistency with plans	Socio-environmental		Priority Project
SS8	Rehabilitation of Lumbadzi STP	A	A	A	A	A	B (n)	YES
SS9	Extension of Kauma STP	B	C	C	C	C	B (n, s)	No
SS10	Upgrading of Existing STPs	C	C	B	C	C	B (n)	No
SS11	Construction of Additional STPs	C	B	C	B	C	B (n, s)	No
SS12	Sewerage Service Extension	B	C	B	C	C	B (n, s)	No

Note: Suitability/Acceptability index: A = High sustainability/acceptability.
B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa
Source: JICA Study Team

8.6 Priority Projects

8.6.1 Preparation of Sewerage and Sanitation Master Plan

Due to the confusion regarding responsibilities, there has been little development in the water-borne sanitation sub-sector during the past 10 years. As a result, there were no investments in sanitation infrastructures under the National Water Development Program. Lilongwe now faces significant challenges related to sewerage and excreta disposal especially in the low income/peri urban communities. A master plan is a prerequisite for streamlining all future developments in this sector.

The preparation of sewerage and sanitation sector master plan entitled "Development of Strategic Sanitation Plan" is included under component D of the WB-funded NWDP II. This component would support MIWD to carry out a strategic sanitation planning for the two major cities plus several large towns in preparation for the implementation of the National Sanitation Policy. The required time for this component is about 12 months.

The scope of this study should include the following:

- Review the National Sanitation Policy and prepare an implementation plan for service handover (from LCC to LWB).
- Define LCC's role in the interim period.
- Confirm vision, mission, target and objective of the sector.
- Compile basic information on topographic and foundation conditions.
- Compile information on existing inventory and customer base.
- Analysis of ambient and wastewater.
- Detail the system development plan.
- Determine the conditions for extension of the sewer network.
- Define applicable design criteria for network size and treatment plants.
- Identify short, medium and long term projects/programs.
- Estimate investment and operation costs and prepare implementation plan.
- Evaluate from technical, environmental, social, economic, financial, legal and institutional aspects.

8.6.2 Capacity Building of LCC's Sewerage Service

As explained in Section 3.3.3, LCC's current sewerage operation suffers from a number of capacity issues, namely:

- poor legal authority: scope of sewerage service is not clear
- low administrative hierarchy: sewerage service is at the fourth tier in hierarchy
- weak human resources: no engineer
- many vacancies: entire management level is vacant

- inappropriate monitoring and reporting: almost non-existent

Thus, capacity building is a prerequisite for any future system development. It is proposed to mobilize an expert on a daily basis for at least 1 year for the capacity building activities. The scope should include:

- Formulate most suitable legal and institutional set up.
- Prepare job description of staff members.
- Identify required trainings for staff competency development.
- Provide on the job training on a daily basis.
- Identify resources required for optimum operation.

8.6.3 Tariff Study and Implementation

Without reasonable financial strength, no utility can operate properly. LCC must reintroduce the sewerage tariff; this will not only provide financial means to the Council but also give a sense of ownership to the users. However, the rate must be reviewed before reintroduction since the tariff was discontinued in 2007. It is proposed to mobilize an expert for at least 6 months for the tariff study to set the tariff from an affordability viewpoint and to assist LCC in the tariff reintroduction. The scope should include:

- Prepare GIS and MIS databases for the management of billing and invoicing and management of sewerage client system.
- Investigate operation cost and ways to reduce it.
- Conduct affordability analysis through three different methods: willingness to pay, disposal income and utility change.
- Compute the most reasonable sewerage tariff.
- Suggest collection method and provide a detailed procedure.
- Provide training and other necessary capacity for tariff collection.
- Assist LCC to reintroduce the tariff.

8.6.4 Sanitation Promotion Campaign

Sanitation and hygiene problems affect mainly those living in low income areas. The under-five mortality rate is high and the main causes of child deaths in Malawi are malaria, diarrhea and acute respiratory infection. Cholera, as a sanitation and hygiene problem, is endemic and typically attacks 2.5 per 1,000 persons every year.[1] Two other studies[2] conducted has illustrated that the percentage of proper hand washing ranges from 35% to 50% after using a latrine and only less than 10% before feeding or cooking.

Without proper hygienic practices, the benefits of safe sanitation cannot be fully

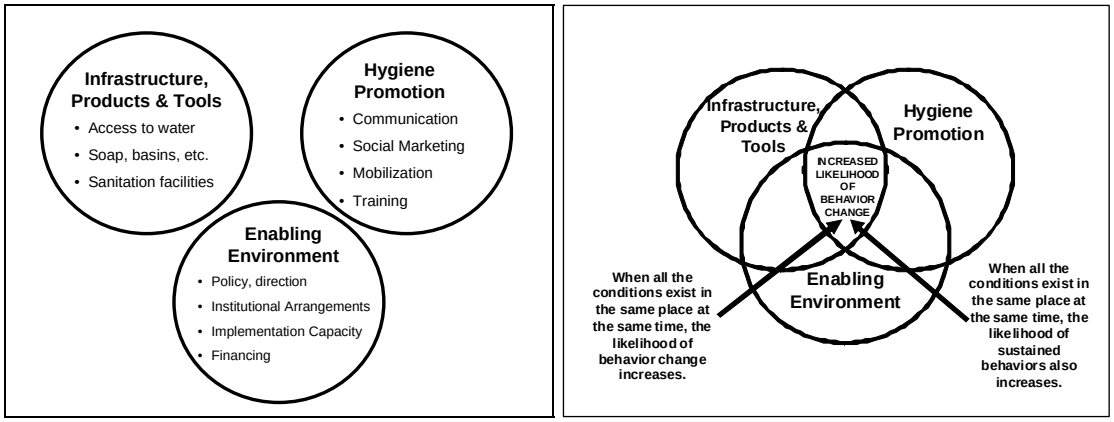
[1] During the 2001/02 rainy season, Malawi experienced a severe cholera outbreak of 33,150 cases with 981 fatalities. During the 2005/06 rainy season, the figures were lower at 4,433 and 55, respectively, but cholera was still reported in 26 of the 28 districts, including the city of Blantrye and Lilongwe.
[2] CIMCI project evaluation, 2005 and PSI, 2006.

realized. WHO reported that the full benefits from a water supply system also partially depend on safe sanitation and its proper use.

Currently, the government focuses on three key hygiene practices that have been proven extremely effective in reducing diarrhea (typically resulting in a 30%-40% reduction in diarrhea prevalence), namely: (1) safe storage and treatment of water at the household level; (2) access to and effective use of a sanitation facility such as a latrine; and (3) hand washing with soap.

The WB-funded NWDP II includes a sanitation promotion campaign called "Sanitation Marketing Program", which is a sub component of Component A (Urban Water Supply and Sanitation). MIWD is the executing agency with the LWB and BWB as the respective implementing agencies. As part of the process, a three-person consultant team has been contracted to carry out market research and to assist stakeholders in developing a sanitation marketing and hygiene promotion strategy. In November 2007, the output has been published as the "Strategy Document", which is the basis of the current "Sanitation Marketing Program".

Sanitation marketing creates a demand for a sanitation product, service, or practice. It promotes an improved sanitation practice. Provision of hardware is not enough. Sanitation marketing ensures that the hardware, the appropriate media mix, and the required enabling environment are all in place (as shown in the following Figure 8.6.1). It identifies where people are on the sanitation ladder and moves them up by providing multiple options.



Source: Sanitation Marketing and Hygiene Promotion Project Strategy Document, MIWD, 2007

Figure 8.6.1 Strategy Intervention

Sanitation marketing entails a six-step process:

- Gain consensus on policy;
- Learn about the consumer, market and product availability;
- Overcome barriers and promote demand;
- Develop the right products;
- Develop a thriving industry; and
- Regulate waste transportation and final disposal.

Hygiene promotion seeks to encourage specific behavioural practices in each domain:

- Hand washing with soap.
- Safe disposal of feces.
- Safe storage and use of drinking water.

The structure of sanitation promotion is proposed as in the following Table 8.6.1:

Table 8.6.1 Structure of Sanitation Promotion

Item	Description
Primary audience	• Plot/house landlord • Tenant/user parents • School children • Community leaders • Teachers • Religious leaders
Secondary audience	• Ministry • LWB, LCC • Other concerned agencies • Media • NGOs • Latrine builders • Pit emptying providers
Target component	• Install/get access to a safe latrine • Use the safe latrine • Maintain the latrine
Product to promote	• VIP latrine • Latrine door • Pit emptying
Product availability	• LWB, LCC • Local market • NGOs • Sanitation promotion centre
Promotion tools	• Media (radio, TV, newspaper) • Cultural show, drama, song contest • Posters, leaflets, newsletter, T-shirts • Visit by campaign staff, NGO • Teaching in school • Deliberation by religious leaders • Arranging field visit
Promotion stage	• Drawing attention • Provide knowledge • Encouragement • Take action • Evaluation

Source: JICA Study Team

8.6.5 Provision of Safe Latrine

The current pit latrines used in Lilongwe are mostly non-sanitary type and it is strongly recommended to replace these with some form of sanitary latrine, like VIP latrine, pour flush water seal latrine, twin pit latrine or compost latrine.

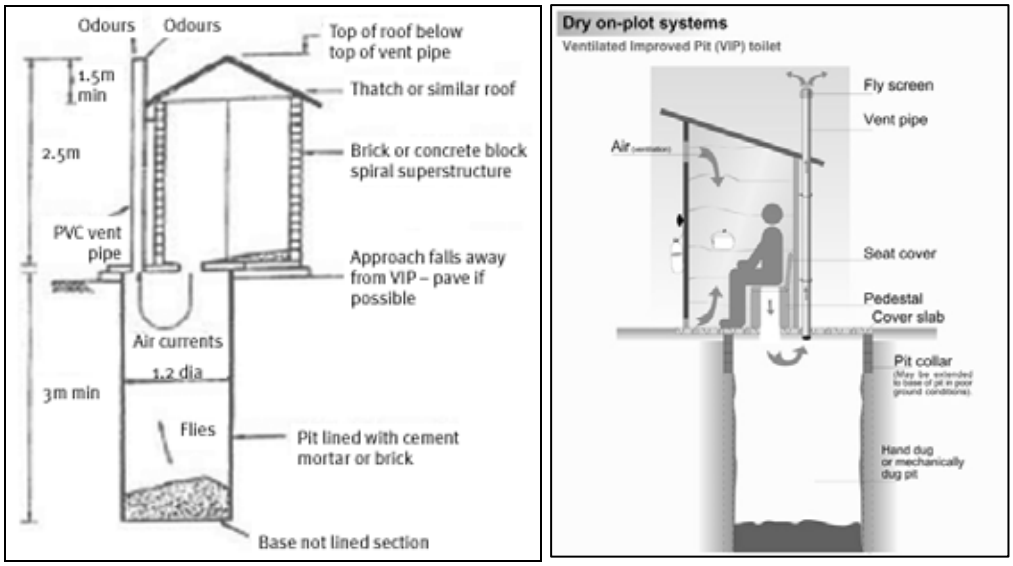
The VIP and compost latrines are appropriate where people do not use water for cleaning themselves after defecating, and instead use solid materials such as paper, corncobs or leaves. Since Malawians culturally prefer the dry method to clean

themselves after defecating, VIP and Compost latrines are suitable. It is rather easy to convert the currently used latrines into VIP latrines. Therefore, VIP latrine is proposed as the preferred option for sanitary latrine.

The VIP latrine is a pit toilet with a black pipe (vent pipe) fitted to the pit and a screen (fly-screen) at the top outlet of the pipe. VIP latrines are improvements to overcome the disadvantages of simple pit latrines, i.e., fly and mosquito nuisance and unpleasant odour. The smell is carried upwards by the chimney effect and flies are prevented from leaving the pit and spreading diseases.

A VIP latrine has a vent pipe from the pit to above the roof of the building as shown in Figure 8.5.2. When air flows across the top of the vent pipe, air is drawn up the pipe from the pit and fresh air is drawn into the pit from the toilet. Offensive odour from the pit thus passes through the vent pipe and do not enter the toilet. The location of VIP latrines is important, i.e., unless a clear flow of air is maintained across the top of the vent, the ventilation system may not be effective. VIP latrines should therefore be located away from trees or high buildings that may limit airflow. A dark vent pipe also helps the air to rise by quickly absorbing heat from sunlight. To ensure the flow of air through the latrine, there must be adequate ventilation in the superstructure. This is usually achieved by leaving openings above and below the door, or by constructing a spiral wall without a door.

Flies, searching for an egg-laying site, are attracted by faecal odour coming from the vent pipe, but they are prevented from entering through the fly-screen at the outlet of the vent pipe. Some flies may enter into the pit via the squat hole and lay their eggs there. When new adult flies emerge, they instinctively fly towards light. However, if the latrine is dark inside, the only light they can see is at the top of the vent pipe. Since the vent pipe is provided with a fly screen at the top, flies will not be able to escape and eventually they will die and fall back into the pit. Thus, maintaining dark condition inside the latrine is also important. Doors must be kept closed most of the time.



Source: Websites
Left: The VIP Latrines (www.wateraid.org)
Right: VIP Thrones (www.kevin-vervuurt.com)

Figure 8.6.2 Examples of VIP Latrine

If faecal matter is left to decompose in dry conditions for at least two years, the contents can be safely emptied manually and the pit can be reused. Indeed, some pit latrines are designed to allow faecal matter to be composted and reused in agriculture. Other designs use two alternating pits, reducing the need for new pits. When one pit is full, the other can be emptied and reused. Yet in another option, there is a space to use a vacuum pump to empty the pit so that the same pit can be used.

The main design criteria for VIP latrines are as follows:

- Minimum lifetime of pit latrine or VIP latrine: 5 years
- Sludge accumulation rate: 60 L/year/capita

As explained above, the key difference between a VIP latrine and the currently used unsafe latrine is the vent pipe. Thus, VIP latrines can be constructed with very little extra investment. Also, it is rather easy to upgrade the current latrines into VIP latrines.

To materialize the upgrade of existing latrines and new construction, a multi-pronged approach is needed. The package must include social education, awareness-building, providing access to construction materials and skills, and provision of financing in the form of either grant or no-interest revolving fund.

Currently, there is an ongoing project, the EU/EIB-funded MPUWSP, that has a component to install 29,640 VIP latrines over five years.

8.6.6 Study on On-Site Sanitation Management

A septic tank is a form of on-site sanitation that provides the convenience of a sewerage system. It is usually linked to flush toilets and can receive domestic wastewater (or sullage/gray water). Since flush toilets tend to use large amounts of water, septic tanks are usually appropriate only for households with water piped into the home (at least house connection).

The National Construction Industry Institute under Ministry of Transportation and Public Infrastructure (MoTPI) currently regulates the standard values of the tank size. The supernatant water from the septic tank seeps underground from a soak pit filled with gravel. The current LCC design requirement stipulates that not only human waste but also wastewater from kitchen, laundry and bathroom should go to the septic tanks at private homes.

A management system for septic tanks should be established for efficient operation, namely to:

- Ensure all gray water entering into the septic tank system comply with the current regulation of the National Construction Industry Institute,
- Ensure periodic septage removal,
- Institutionalize a septage management system, and
- Review the system for possible upgrading (preferably after 2025).

The principal design criteria for septic tanks and soak-aways are as follows:

- Sufficient retention volume based on the maximum occupation of the dwelling

unit.

- The effluent's retention time should not be lower than two days.
- The septic tank should have two compartments (2/3 of volume for the first, 1/3 for the second) with a perforated partition wall.
- The second compartment requires ventilation.
- The liquid intake point should be below the water level in the septic tank, and the effluent outlet point should have a shape of tube 30 to 40 cm under the water level to prevent discharge of scum.
- Soak-aways should be sized according to the permeability of the ground.

Since the septic tank should be emptied when it is approximately one-third full of sludge, the desludging interval (DSI) in years can be approximately found from the following equation:

$$DSI = \frac{0.33\,Vt}{Vs\,P}$$

where,
Vt is the septic tank volume (m^3)
Vs is the sludge accumulation rate (normally, 0.03 – 0.04 m^3/capita/year), and
P is the population using the septic tank.

A dedicated on-site sanitation management unit should be established within LCC. Its operation should cover the following:

- Work with LCC's Development Control section for approving septic tank and sanitary latrine design.
- Monitor the construction of on-site systems.
- Manage the sludge removal operation (through service receipt provided by septage/night soil collection companies and possible GIS database).
- Issue licenses to private operators for septage/night soil collection.
- Manage septage treatment.

The principal methods most commonly used for the treatment and disposal of septage are as follows:

- Land application (drying bed)
- Co-disposal with solid wastes
- Co-treatment with wastewater
- Processing at separate facilities

Currently, septage is treated together with the wastewater. The proposed study should evaluate the best option.

The proposed study should look into the details of the above issues, among others. The scope of the study should include:

- Estimate the current septic tanks and prepare inventory (size, chambers, access point).
- Estimate the current and future septage generation.
- Determine the cleaning frequency.
- Estimate daily septage collection over the years.
- Review various collection methods and recommend the most optimum.
- Calculate the required number of collection vehicles.
- Prepare the monitoring regime for septic tank cleaning, including the possibility of GIS database.
- Fix tariff and its collection method.
- Study the possibility of communal septic tank.
- Conduct public awareness program.
- Review various treatment methods and recommend the most optimum.
- Complete initial assessment of the septage treatment facility.
- Prepare implementation plan and cost estimate.
- Evaluate the whole program from technical, financial, economic, environmental, social and institutional aspects.

8.6.7 Rehabilitation of Lumbadzi STP

Lumbadzi STP used to serve the airport housing area. It has a capacity of 1,200 m^3/day. However, the main collector steel pipe between the housing area and STP has been broken. As a result, the plant is no longer working and all sewerage is now going to the nearby river.

The scope of the rehabilitation work is as follows:

- Replacement of steel collector pipe.
- Cleaning of ponds.
- Installation of flow meter and water quality measuring equipment.
- Seeding and trial run.

8.6.8 Summary of Priority Projects

The following Table 8.6.2 shows the summary of the priority projects together with the suggested implementing agencies.

Table 8.6.2 Summary of Sewerage/Sanitation System Development Priority Projects

ID No	Priority Projects	Project Outline	Implementing Agency
SS1	Preparation of Sewerage and Sanitation Master Plan	Ongoing under NWDP II. Development of long term sewerage/sanitation strategy.	MIWD
SS2	Capacity building of LCC's Sewerage Service	Improvement of capacity in terms human resources, management, and reporting. Also includes equipment and know-how for proper operation.	LCC
SS3	Tariff Study and Implementation	Establish sewerage tariff, formulate collection process and reintroduce tariff collection.	LCC
SS4	Sanitation Promotion Campaign	Ongoing under NWDP II. Increase public awareness through the sanitation marketing approach.	MIWD
SS5	Provision of Safe Latrine	Ongoing under MPUWSP. Provision of VIP latrines, total = 150,000. Ongoing project has provision for 29,640.	MIWD/ LWB/ LCC
SS6	Study on On-Site Sanitation (OSS) Management	Preparation of sector strategy for monitoring, cleaning, collecting and treating of septage. Support for OSS management unit.	LCC
SS8	Rehabilitation of Lumbadzi STP	Ongoing under LCC budget. Installation of collector pipe, cleaning of ponds and seeding. Capacity = 1,200 m^3/day.	LCC

ID No	Priority Projects	Cost (million US$)			
		Short	Medium	Long	Total
SS1	Preparation of Sewerage and Sanitation Master Plan	1.0	-	-	1.0
SS2	Capacity building of LCC's Sewerage Service	-#	-	-	--
SS3	Tariff Study and Implementation	-#	-	-	--
SS4	Sanitation Promotion Campaign	5.0	3.5	5.0	13.5
SS5	Provision of Safe Latrine	6.0	10.0	16.0	32.0
SS6	Study on On-Site Sanitation (OSS) Management	0.75	-	-	0.75
SS8	Rehabilitation of Lumbadzi STP	0.25	-	-	0.25

Note: Shaded cell denotes funds are already secured.
Cost included in LCC's overall capacity development program, refer to Chapter 10
Source: JICA Study Team

CHAPTER 9

SOLID WASTE MANAGEMENT SYSTEM DEVELOPMENT

CHAPTER 9 SOLID WASTE MANAGEMENT SYSTEM DEVELOPMENT

9.1 Demand Projection

9.1.1 Planning Strategy

Solid waste management system development should be carried out in a way that there is little or no environmental and social impact from generation to final disposal. In this sense, it is targeted that waste collection services should be provided for the whole urban population by the target year. It should be achieved by providing the services to governmental, institutional, commercial as well as domestic areas. As for waste disposal, it should be achieved through sanitary means.

Currently, the LCC collects wastes from each household in low and medium density areas. On the other hand, people from high density areas place their wastes in a bin which is later hauled by the LCC. Nevertheless, the waste collection service area is still very limited. Accordingly, the service area should be expanded while still adopting the current approach in the meantime. However, alternative waste collection system and the possibility of out-sourcing communal collection should be investigated.

Waste reduction as well as waste separation at the source should be promoted in accordance with the governmental regulation. It should be noted that establishing a smooth waste stream is recognized as the least requirement of Solid Waste Management (SWM). It is proposed to introduce recent concepts such as Sound Material Cycle Society at a later stage in the implementation of the plan.

9.1.2 Basic Conditions

(1) Target Solid Waste Type

The Local Government Act of 1998 provides that solid wastes refer to all domestic refuse and non-hazardous wastes such as commercial, industrial and institutional wastes, street sweeping wastes, garden refuse and construction debris (rubble), which is non-liquid in nature. Accordingly, the target solid waste type in the plan includes municipal wastes that do not include hazardous and infectious wastes.

Since rubbles such as soil, waste bricks and stones should be taken cared of by their generators, they are not covered in regular solid waste collection. These wastes are only occasionally generated during construction and demolition works. Therefore, these wastes are considered differently from domestic and other municipal wastes.

Table 9.1.1 Target Solid Wastes Types in the Plan

Category	Waste Type	Target Waste
Solid waste (Municipal waste)	Domestic waste	Yes
	Other municipal wastes (OMW): (Commercial, industrial (non-hazardous), institutional waste, street wastes, garden refuse)	Yes
	Construction debris *	
Hazardous waste	Industrial (hazardous)	
	Infectious and medical *	

Note: * Management process is proposed for 2030. Amount of wastes is not projected.
Source: JICA Study Team

(2) Conditions of the Target Waste in the Initial Year

FY 2007 is set as the initial year for planning since statistical data of collected solid waste by the LCC is available for this year. It is regarded that waste generation conditions such as waste generation rate and economic conditions have changed since 2007 while waste management conditions such as waste collection coverage and operation at the existing landfill site have remained as before.

The collected amount of solid waste in FY2007 is shown in the following Table 9.1.2. The percentages of domestic and other municipal waste have been estimated at 53% and 47%, respectively. These amounts have been transported to the existing landfill site by compactor vehicles, skip carriers and occasionally hired vehicles. The assumed present collection coverage of solid waste is as shown in Table 9.1.3.

Table 9.1.2 Collected Solid Waste Amount by Type in 2007

Category	Amount (ton/year)	Ratio
Domestic waste	16,713	0.53
Other municipal wastes (OMW)	14,719	0.47
Total	31,432	1.00

Source: Estimated by JICA Study Team based on LCC data of 2007/2008

Table 9.1.3 Present Coverage of Solid Waste Collection

Category	Area Type	2007
Domestic waste	Low/medium density	50%
	High density	20%
Other municipal waste (OMW)		40%

Source: Estimated by JICA Study Team based on LCC data of 2007/2008

(3) Basis of Demand Estimation

The estimation basis for solid waste generation is shown in Table 9.1.4:

Table 9.1.4 Estimation Basis for Solid Waste Generation

No.	Category	Waste Type	Estimation Basis for Demand Projection
1	Domestic waste	Domestic waste	Population basis
2	Other municipal wastes (OMW)	Commercial, industrial (non-hazardous), institutional waste, street waste, garden waste	Proportionally increase with economic growth

Source: JICA Study Team

(4) Future Population and Economic Growth

The population and economic growth scenario described in Chapter 4 has been applied to the planning of SWM. The projected population figures have been used for estimating the solid waste generation amount as well as the required capacity for final disposal.

Similar to the principle used for water supply development planning described in Chapter 7, people living inside special governmental area and indigenous village population within the forestry area have been excluded from the planning service area.

(5) Collection Coverage of Solid Waste

Different waste collection coverage ratios are proposed for different socioeconomic

areas. The future proposed high density area is classified into three types, namely: (1) area presently recognized as Traditional Housing Area, hereinafter called "high density (current THA)"; (2) present high density area, hereinafter called "high density (current permanent)"; and (3) areas to be newly allocated for development, hereinafter called "high density (new development)". The collection coverage ratios for these three types are set considering housing pattern and accessibility.

As shown in Table 9.1.5, three scenarios have been set for expanding the coverage ratio of waste collection by area type in different years. Scenario 1 expects that wastes generated in low/medium density residential area, high density (current permanent and new development) residential area, and high rise flat area would be completely collected by 2020 while the coverage ratio in high density (current THA) and quasi-residential areas would be 100% by 2030. In this scenario, 100% collection of other municipal wastes is proposed by 2020. As for scenario 2, the target year to attain 100% coverage has been delayed. In scenario 3 the target year for 100% collection from low/medium density residential area, high density (current permanent and new development) residential area, high rise flat is further delayed to 2030. In this scenario, 100% coverage for other municipal wastes would be achieved by 2030 while that for high density area (current THA) and quasi-residential area would be achieved later than 2030.

Table 9.1.5 Scenarios to Improve Collection Coverage of Solid Waste

Category	Area type	Scenario[*1]		
		1	2	3
Domestic waste	Low/medium density, high density (current permanent, new development), high rise flat	2020	2025	2030
	High density (current THA), quasi-residential	2025	2030	after 2030[*2]
OMW		2020	2025	2030

Note: *1. Year to achieve 100% collection coverage *2. Coverage in 2030 is set at 70%.
Source: JICA Study Team

9.1.3 Projection of Domestic Waste

(1) Projection Model

The future amount of domestic waste has been projected based on the following assumptions:

- The total amount of domestic waste generation can be calculated by multiplying the waste generation rate and the population in the year *i*.
- The collection coverage will be expanded in the urbanized areas.

Based on the assumptions, the amount of waste to be collected in the year *i* (*DWi*) is expressed by the following formula:

$$DWi = \sum_{j} (WGRij * POPij * COVij)$$

Where *WGRij* is the waste generation rate (kg/capita/day) in the year *i* at area type *j*.
POPij is the population of the urban areas in the year *i* at area type *j*.

COVij is the collection coverage (%) in urban areas in the year *i* at area type *j*.

(2) Waste Generation Rate

Waste generation rates have been set as shown in the following Table 9.1.6 based on the following assumptions:

- The waste generation rate differs across area types, which represents the lifestyles of the residents.
- The waste generation rate increases according to economic growth.
- The waste generation rate of high density area will reach the same level as that of medium density area in 2030. The adopted waste generation growth rate for this type of area would be higher than the economic growth rate.
- The waste generation rate of medium density area is applied to high rise flat area which is a newly planned area.

Table 9.1.6 Waste Generation Rate of Domestic Waste

Area Type	Current	2015	2020	2030
Low density	0.800	0.824	0.844	0.884
Medium density	0.700	0.724	0.744	0.774
High density	0.400	0.530	0.612	0.774
Quasi-residential	(0.400)	0.408	0.418	0.438
High rise flat	(0.700)	0.724	0.744	0.774

Note: Unit is kg/capita/day
Source: Estimated by JICA Study Team referring the following data:
JICA study for SWM of Dar Es Salaam in Tanzania (1997): 0.7 kg/capita/day
This value was adopted as the generation rate of medium density area in 2007
Survey by University of Malawi (2004):
Low density: 1.6 kg/capita/day, Medium density: 1.4 kg/capita/day High density: 0.8 kg/capita/day
Ratio of the above values: Low density (1.15), Medium density (1.00), High density (0.57)

As assumed above, *WGRi* for high density area has been projected to increase linearly up to the same value of medium density area (0.774 kg/capita/day) in 2030.

WGRi, other than that of high density residential area, can be expressed as:

$$WGRij = WGR_{(i-1)\,j} * (1 + R_i^{\,2}) = WGR0_{\,j} * \prod_{k=1}^{i} (1 + R_k^{\,2})$$

Where WGR0 is the waste generation rate in the initial year.
R_i is the growth rate in the year *i*.

The waste generation rate values for medium, high density and high rise flat areas in 2030 shown in the table above can be considered reasonable for a city with a middle income economy in 2030 when compared with the values given by the World Bank (1999), i.e., low income countries: 0.64 kg/capita/day, middle income countries: 0.73 kg/capita/day, high income countries: 1.64 kg/capita/day.

9.1.4 Projection of Other Municipal Waste

(1) Projection Model

The future amount of other municipal waste has been projected based on the following assumptions:

- Waste generation increases according to economic growth.
- Collection coverage will be expanded in the urbanized areas as planned.

Based on the above assumptions, the amount of other municipal waste to be collected in the year *i* (*OMWi*) is expressed by the following formula:

$$OMWi = OMW_{(i-1)} * (1 + R_i) * COVi = OMW0 * \prod_{k=1}^{i} (1 + R_k) * COVi$$

Where *OMW0* is the amount of waste collected in the initial year.
R_i is the growth rate in the year of *i*.
COVi is the collection coverage (%) in urban areas in the year of *i*.

(2) OMW0 Estimation

OMW0 is calculated by the following formula. The value has been estimated to be 36,798 ton/year.

$$OMW0 = OMW_{2007} / COV_{2007}$$

Where OMW_{2007} is the collected amount of other municipal waste in FY2007.
OMW_{2007} is the collection coverage (%) in urban areas in FY2007.

9.1.5 Future Amount of Solid Waste

The future amount of solid waste to be collected has been projected as shown in the following Table 9.1.7:

Table 9.1.7 Future Amount of Solid Waste to be Collected

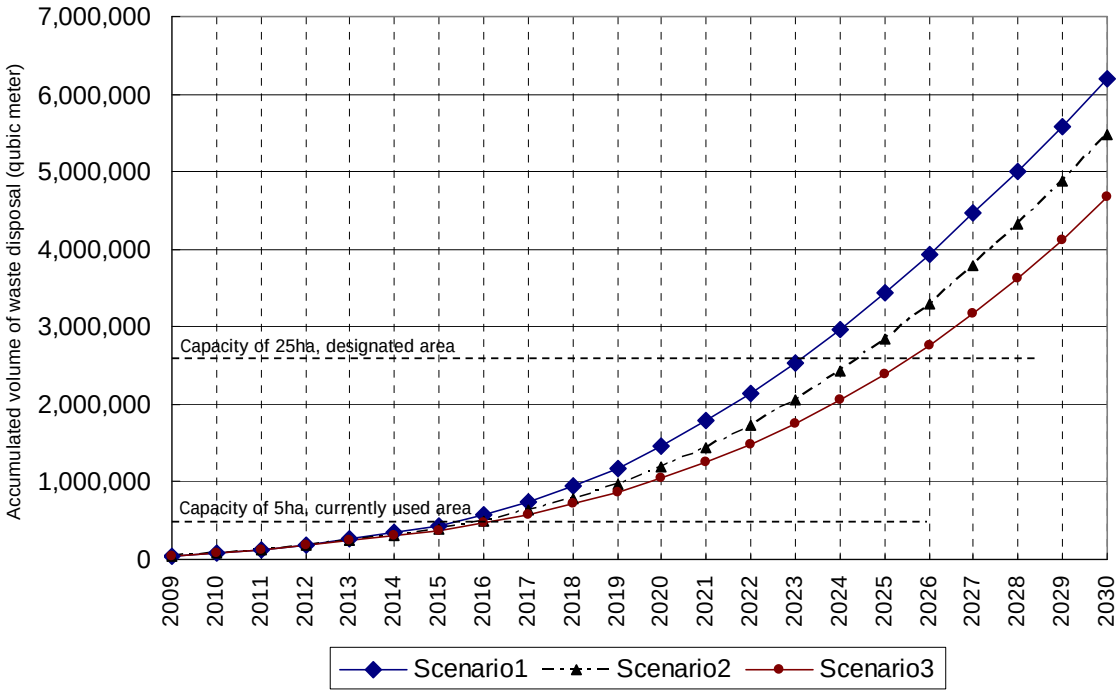
Scenario	Category	Current	2015	2020	2030
1	Domestic waste	16,713	39,272	153,481	339,712
	OMW	14,719	41,056	82,261	154,415
	Total	31,432	80,328	235,742	494,127
2	Domestic waste	16,713	32,687	111,385	339,712
	OMW	14,719	35,190	65,809	154,415
	Total	31,432	67,877	177,194	494,127
3	Domestic waste	16,713	29,212	89,070	294,263
	OMW	14,719	32,258	57,582	154,415
	Total	31,432	61,470	146,652	448,678

Note: Unit is ton/year
Source: JICA Study Team

9.1.6 Capacity Demand for the Final Disposal Site

The accumulated amount of final disposal of waste up to 2030 has been estimated as shown in the following Figure 9.1.1. It is estimated that a capacity of 4.7 to 6.2 million cubic meters will be necessary for final disposal according to the scenarios.

Based on the rough estimate of the existing designated disposal area's capacity (25 ha) including the present operation area (5 ha), a new site will be necessary before 2025 in case of scenario 2.



Source: JICA Study Team

Figure 9.1.1 Necessary Capacity of Final Disposal Site by 2030

9.1.7 Proposed Scenario to be Adopted for the Development

It is proposed to adopt scenario 2 considering the following:

- Provision of waste collection services for the whole urban population by the target year can be achieved through scenarios 1 and 2. Scenario 3 cannot satisfy this strategy.
- Substantial capacity development is required for the LCC to implement the development plan not only in terms of facility and equipment but also in terms of institution and finance. In this sense, scenario 1 has been regarded as too ambitious.

9.2 Development Concept of Solid Waste Management System

9.2.1 Overall Concept

There are many challenges that the LCC needs to tackle in the field of SWM. It is necessary at first to improve the regular waste collection service within its jurisdiction in order to prevent the spread of pests and diseases arising from the improper management of solid waste.

Further to ensuring sanitary condition, it is also proposed to introduce other modern concepts like Sound Material Cycle Society (SMCS) and Expanded Producer Responsibility (EPR). Lilongwe City can learn and utilize experiences and lessons in other countries in these fields. The following Table 9.2.1 gives the development concept of SWM system across the different development time frames.

Table 9.2.1 Development Concept of SWM System

Term	Period	Concept
Overall	-	■ Improvement of sanitary condition of Lilongwe city ■ Less impact from final disposal
Short	Present – 2015	■ Better living environment for the existing planned land use areas ■ Introduction of management at landfill site
Medium	2016-2020	■ Better living environment for newly legalized and newly released planned land use areas ■ Control of environmental impact from landfill site
Long	2021-2030	■ Complete transportation of solid waste from urban area ■ Development of efficient SWM system ■ Application of PPP[2] (Polluter Pay Principle, Public Private Partnership) ■ Introduction of Sound Material Cycle Society (SMCS) and Expanded Producer Responsibility (EPR)

Source: JICA Study Team

9.2.2 Organization and Institution

(1) Enhancement of Organization

While the restructuring of the existing organization is necessary to improve the management situation of sewerage and sanitation services including SWM, the entrustment of the financial and manpower management for SWM to the concerned directorate is also indispensable for the efficient implementation of any project and works. Presently, the directorate cannot manage the budget for fuel and driver of the waste collection vehicles and this leads to inefficient and insufficient waste collection activities.

The capacity of personnel for waste collection and transportation and final waste disposal shall be enhanced. Management at the final disposal site has been conducted every four months but the work is only limited to the pushing of unloaded wastes.

Conceivable project: Capacity development of institutional organization

(2) Plan and Legislation

It is proposed to prepare LCC's policy and regulation for the privatization of SWM services based on the Environmental Management (Waste Management and Sanitation)

Regulation issued by the Department of Environmental Affairs, Ministry of Forestry, Fisheries and Environmental Affairs in 2008. The privatization of waste collection/transportation as well as landfill management may reduce the cost of these operations. It is also necessary to amend the Local Government Act to accommodate newly proposed SWM systems.

Since the improvement of the sanitary condition of Lilongwe City is this planning's first purpose, most of the proposed measures are related to waste collection and final disposal. Actually, waste reduction at sources may also offer potential benefits to the LCC. Thus, it should be studied as part of the comprehensive planning for SWM, which should include waste characteristic survey (waste amount and compositions), waste collection survey (time and motion survey), study on potentials of waste reduction and recycling, as well as study on the funding options.

Conceivable project: Comprehensive Master Plan for SWM

9.2.3 Collection and Transportation

(1) Improvement of Waste Collection Service

The removal of solid waste is a minimum requirement to keep the sanitary condition in city environment. There are two aspects of improvement of waste collection service, namely:

- Expansion of waste collection service coverage in terms of area and population
- Improvement of waste collection service quality

For the first aspect, waste collection equipment and human and financial resources for operation shall be increased according to the area expansion plan.

While the first aspect is prioritized in the planning, the second aspect should also be considered. House-to-house collection in low and medium density residential areas should be continued. As for the collection service in high density residential area, the current skip collection should be gradually replaced with other methods. The surrounding areas of skips are generally dirty though LCC tries to clean them as well. The demerits of skip collection are considered as follows:

- Anyone can put out waste any time. Accordingly, no one is responsible for the generated solid wastes and maintenance of the skip place;
- Wastes are kept in skips for about half or one week until replaced by another empty skip; this practice is very unsanitary;
- Skips are bulky and eyesores.

Instead of skip collection, communal collection using different types of waste bins or containers is recommended in the future. Communal waste collection points should provide services to 20-60 households. Communities and households have to maintain the sanitary conditions of the communal waste collection points. Waste collection can be done by compactor trucks similar to the house-to-house collection practice in low and medium density residential areas. For the modification of the collection system, the LCC has to conduct intensive explanation and public relations to the people.

The following Table 9.2.2 shows the direction of improvement of collection services for

each development time frame. Through the expansion of waste collection work in the short and medium terms, the LCC's waste collection capacity is expected to improve. Then, it is expected that LCC will focus on the improvement of service quality which will result in the termination of skip collection practices.

Table 9.2.2 Waste Collection Service by Development Term

Improvement aspect		Short (2015)	Medium (2020)	Long (2030)
Collection coverage		To be expanded	To be expanded	To achieve 100%
Service quality (collection method)	Low/medium density	House to house	House to house	House to house
	High density	Skip	Skip	Communal
	Quasi-residential	-	Skip	Communal
	High rise flat	Skip	Skip	Communal
	Commerce, industry, institution	Containers*/ Skip	Containers*/ Skip	Containers*

Note: * Containers prepared by waste generators
Source: JICA Study Team

The following Table 9.2.3 shows the required number of collection equipment for each development time frame. In procuring waste collection vehicles, standardization of vehicles should be considered. Compactor trucks presently used by the LCC consist of various types since some vehicles have been provided by different donors. This situation makes maintenance work difficult and is not appropriate for the stocking of spare parts. These problems can be solved by standardizing the equipment for waste collection.

Table 9.2.3 Necessary Number of Collection Equipment

Equipment	Spec	Short (2015)	Medium (2020)	Long (2030)
Compactor truck	9.7 ton	12	23	113
Skip carrier	10 ton	6	32	-*
Skip	6 m^3	80	150	-*
Tipper truck	-	1	2	4

Note: * Skip collection should be replaced gradually and terminated before 2030
Source: JICA Study Team

In accordance with the increasing number of waste collection equipment, facilities and maintenance capacity should be improved. It is proposed to use the LCC's existing workshop for vehicles until 2020. Thereafter, another facility will be needed for this purpose.

Conceivable project: Procurement of equipment for waste collection and transportation; new maintenance workshop for SWM equipment

(2) Outsourcing of Waste Collection

To reduce the work and financial load of LCC for SWM, privatization should be considered. Some of LCC's roles will be changed from operation to monitoring and inspection of private contractors. However, Lilongwe City has not done it yet even if allowed by national governmental regulation. LCC's administrative procedure should be studied under the capacity development project.

Conceivable project: Privatization of waste collection service

9.2.4 Final Disposal

(1) Introduction of Landfill Site Management

There is no daily management at the existing landfill site. As a first step towards controlled and sanitary final disposal, it is proposed to introduce the management activities below. For these operations, heavy equipment such as bulldozer, excavator and front end loader (wheel loader) are necessary. This operation is recognized as level 1 of landfill management shown in Table 9.2.4.

- Regular soil cover on the disposed waste
- Control of access to the landfill site
- Pushing and compacting of solid waste
- Separation of rainwater from the leachate

Table 9.2.4 Level of Landfill Management

Items	Level 1	Level 2	Level 3	Level 4
Final Disposal Method	Controlled tipping with introduction of soil cover	Sanitary landfill with a dike and sufficient daily soil cover	Level 2 + primary leachate circulation system	Level 3 + leachate treatment system

Source: Technical Guideline on Sanitary Landfill; Design and Operation (Draft), Matsufuji Y, Ministry and Housing and Local Government, Malaysia

As part of landfill management, the utilization of construction debris should be considered since substantial amount of soil will be required to cover the disposed solid wastes. Although, in principle, construction debris should be managed by contractors or construction owners, the LCC currently assists in the disposal of these wastes to prevent them from remaining in the city area. Since normally these wastes are not harmful and non-degradable except wood, it is recommended to allocate an area for these materials so that they could be used as cover materials.

Table 9.2.5 below shows the necessary number of equipment for landfill operation in each phase.

Table 9.2.5 Necessary Number of Landfill Equipment

Equipment	Spec	Short (2015)	Medium (2020)	Long (2030)
Wheel loader	2 m^3	1	1	1
Bulldozer	20 ton	1	2	4
Excavator	0.8 m^3	1	1	1
Supervisory vehicle	2,500 cc	1	1	1

Source: JICA Study Team

Conceivable project: Procurement of equipment for landfill management

(2) Development and Operation of Engineered Landfill Site

The existing operation area (5 ha of landfill) has not been equipped with landfill facilities such as embankment, leachate collection facility, truck scale, etc. It is recommended that the remaining 20 out of the 25 ha area should be developed as an engineered landfill site to prevent environmental and social impacts to the surrounding areas. The structure and operation of landfill management level 3 is recommended since the LCC is expected to have learned landfill operation by the time of this development.

Conceivable project: Construction of the engineered landfill site at the designated land

(3) Development of New Landfill Site

A new landfill site shall be used after the existing final disposal area has been filled up. In the absence of any discussion, the location of the new site is not yet clear. It is proposed to allocate an area in the northern part of the city before the closure of the existing area. By decreasing transportation distance, this will make waste transportation works more efficient. The structure and operation method for the landfill should then be upgraded to level 4 of landfill management.

Conceivable project: Construction of the engineered landfill at a new site

9.2.5 Waste Reduction

(1) Composting at Community

Organic wastes such as kitchen and garden wastes occupy a large portion of the generated wastes in terms of weight. Utilization of such wastes at the source may contribute to the reduction of solid wastes to be collected by public services.

UNDP is implementing a project for the promotion of this activity at a community through coordination with NGOs, college and a private company. This project will be evaluated. Thereafter, it may be extended to other communities after verification of its viability.

Conceivable project: Pilot project for composting at a community, Promotion of composting at community level

(2) Public Enhancement Projects

The following two projects are proposed for public enhancement of SWM:

- Promotion of community activity for cleaning
- Promotion of 3R (reduction, reuse and recycling of waste)

In the short term, cleaning of the surrounding area and raising of community awareness through the first project should be considered. The LCC has to improve public services by expanding waste collection coverage. At the same time, the LCC should encourage participation and cooperation from the people. It is recommended that the LCC would offer incentives to communities who participate in cleaning activities to encourage their contribution to SWM.

Activities to reduce waste and reuse materials might follow in the medium and long terms. It is proposed to upgrade the project for community activity for cleaning into the promotion of 3R (reduction, reuse and recycling) so that public enhancement project could be continuously implemented without suspension. The following activities could done under this:

- Environmental education on 3R at community, school, etc.

- Public campaign for waste reduction by using media, materials, and events
- Workshop for livelihoods utilizing waste material

As for the recycling promotion project, the market condition of recyclable materials and recycling industries shall be considered. These conditions can be enhanced by making relevant policy and regulations.

Conceivable project: Project for community activity for cleaning, Awareness raising activity for waste reduction

(3) Legislation for Waste Reduction and Efficient Use of Resources

Because the market for recyclables as well as recycling industries have not been developed in Lilongwe, material collection and recovery activities have not been active so far. The legislation for the promotion of recycling at the industry level might be required during the medium or long-term implementation of the plan. It means that the city could prepare well at the time of the development of such industry.

Other developed and developing countries are facing the problem of increasing solid waste amount and they are struggling for their treatment and disposal. It is recommended for Lilongwe City to introduce recent concepts such as the sound material society and the expanded producer responsibility which have been discussed and applied in other countries to improve the SWM system. The following ideas are examples that should be discussed in preparing the legislation for SWM:

- Incentives for industrial processes for recycling and zero emission
- Entrusting responsibilities to industries and businesses to promote wise use of natural resources
- Encouraging the existing low impact system such as reuse of glass bottles for beverages
- Charging system on import or disposal of bulk products such as vehicles and electric appliances
- Fare charging system for waste collection and disposal fee to all solid waste generators

Conceivable project: Legalization for waste reduction and wise use of natural resources

9.2.6 Infectious and Hazardous Solid Waste Management

While the management of infectious waste is controlled by the Ministry of Health and big hospitals take care of their infectious wastes by themselves, the LCC intends to support clinics for the appropriate treatment of this type of solid waste in the future.

It is considered in the long term to procure and install small scale incinerator, encapsulation equipment and container for the collection of infectious wastes.

Hazardous waste from industries and businesses shall be treated by the waste generator following the PPP (Polluter Pay Principle) as well as the National Governmental Regulation of SWM. Depending on its nature, hazardous waste from households can be treated and disposed of with the same kind of equipment used for infectious waste disposal.

Conceivable project: Facility such as small-scale incinerator and container for infectious and hazardous wastes

9.2.7 Proposed Projects for Solid Waste Management System

Based on the concepts described above regarding the components of SWM, the projects shown in the following Table 9.2.6 are proposed.

Table 9.2.6 Solid Waste Management System Development Plan

ID No.	Project	Project Outline	Remarks
	Organization &Institution		
SW1	Capacity development of institutional organization	Restructuring and entrustment of required organizational responsibilities. Basic knowledge of SWM to be improved and operation and maintenance practice should be reviewed. Amendment of the Local Government Act to be discussed.	
SW2	Comprehensive master plan for solid waste management	Study includes field survey and measures for waste reduction as well as waste collection and final disposal	
	Collection &Transportation		
SW3	Procurement of equipment for waste collection and transportation	Procurement of equipment to expand waste collection coverage. Collection vehicle, skip carrier, skips and other necessary equipment are procured in accordance with the increase of waste amount to be collected and managed by the LCC.	
SW4	New maintenance workshop for SWM equipment	Construction of new workshop/area including necessary equipment for maintenance of SWM equipment	
SW5	Privatization of waste collection service for low/medium/high density area, high rise flat, other municipal waste	Privatization of collection service in areas where house-to-house collection is used	
SW6	Privatization of waste collection service for high density (current THA), quasi-residential area	Privatization of collection service in areas where waste is collected at a communal collection point	
	Final Disposal		
SW7	Procurement of equipment for landfill management	Procurement of equipment and operation of landfill management. Bulldozer, excavator, front end loader	
SW8	Construction of the engineered landfill at the designated site	Embankment, leachate collection, leachate retention pond. Two-phase development is proposed.	
SW9	Construction of the engineered landfill at the new site	After reaching full capacity of landfill at the existing site, new landfill is required. Estimated area is about 30 ha.	
	Waste Reduction		
SW10	Pilot project for composting at a community	Waste reduction at community level Being conducted by UNDP	On-going project, conducted from 2008 to 2011
SW11	Promotion of composting at community level	Implementation and expansion of the above pilot project	
SW12	Project of community activity for cleaning	Enhance community activity for cleaning	
SW13	Public enhancement for 3R (reduction, reuse and recycling)	Awareness raising activity for waste reduction	

ID No.	Project	Project Outline	Remarks
SW14	Local Government Act to promote Sound Material Cycle Society	Legalization for waste reduction, and wise use of natural resources	
	Infectious and Hazardous Waste Management		
SW15	Procurement and installation of treatment facility for infectious waste	Facility such as small scale incinerator and container for infectious and hazardous wastes	

Source: JICA Study Team

9.3 Preliminary Cost Estimate and Implementation Outline

9.3.1 Preliminary Cost Estimate

It is proposed that LCC would hire an individual consultant for the capacity development of institutional organizations of SWM. The estimated cost is described in Chapter 10 as a part of the capacity development project.

It is recommended to hire a consulting firm to conduct the comprehensive master plan for SWM. It may take two years to complete this study. The estimated cost is about US$2.1 million.

Based on the unit prices of equipment and cost for transportation, etc., the costs for the procurement of equipment for waste collection and transportation are estimated at US$2.8 million (1st phase), US$12.9 million (2nd phase) and US$18.6 million (3rd phase). In addition, it is proposed to change the collection system in the 3rd phase. The cost of the individual consultant (US$0.2 million for 6 months) and other expenses (US$0.3 million every year) are summed up to US$1.5 million. The total project cost for the 3 phases amounts to US$34.3 million.

The total cost for the new maintenance workshop for the SWM equipment is estimated at US$1.1 million assuming a cost for the procurement of maintenance equipment of US$0.5million and workshop construction cost of US$0.6 million.

At first, the LCC needs to prepare the policy and regulation for the privatization of waste collection services. It may be one of the tasks of the consultant hired for the capacity development of the institutional organizations of SWM. Then, it is expected that LCC would independently enforce the privatization activities. Accordingly, additional cost will not be needed.

Based on the unit prices of equipment and cost for transportation, etc., the cost for the procurement of equipment for landfill management is estimated at US$0.9 million.

The estimated capacity of the engineered landfill at the designated site is about 2.1 million m^3 and that of the landfill at the new site is about 2.9 million m^3. It is reported that the unit cost of waste disposal for sanitary landfill in a developing country is around US$6-12/$m^3$. Assuming US$7/m^3 for a level 3 landfill and US$10/$m^3$ for level 4 landfill, costs for the construction of the engineered landfill at the designated site and the construction of the new landfill at site are estimated at US$14.7 million and US$29.0 million, respectively.

The UNDP project estimates the cost for the pilot project for composting at a community at US$0.2 million (Source: project document, UNDP). This project is expected to be expanded to other areas as well. It is proposed that the LCC will allocate US$0.2 million over five years for enhancing the sustainability of this project.

To commence the project of community activity for cleaning in 2011, it is expected that the LCC would hire an individual consultant for six months. The consultant shall coordinate stakeholders and facilitate the project. The estimated cost in the first year is about US$0.4 million. Then, the LCC should continue to allocate US$0.2 million every year. Assuming the project continues for five years, the total cost is estimated at US$1.4

million.

It is proposed to start the public enhancement for 3R (reduction, reuse and recycling) in 2017. Then, this project will continue up to 2030. It is recommended to hire individual consultant twice, once at the commencement of the project in 2017 and again during the intermediate evaluation and feedback period in 2020. The cost for 14 years is estimated at about US$4.2 million.

For preparing the Local Government Act to promote Sound Material Cycle Society, it is proposed that LCC hire an individual consultant for eight months. The consultant will be required to initiate the study and discussions among concerned stakeholders and to develop the act. The estimated cost is about US$0.3 million including the cost for various meetings among stakeholders.

For the procurement and installation of the treatment facility for infectious wastes, one small scale incinerator and the construction of encapsulation cell for incinerated infectious waste and hazardous waste, such as cylinder and dry cells, are considered. The cost is estimated at about US$0.3 million.

9.3.2 Implementation Schedule

The indicative implementation schedule for the development plan along with the preliminary cost estimates are proposed in the following Table 9.3.1 below.

Table 9.3.1 Indicative Implementation Plan and Preliminary Cost Estimate of SWM System Development

ID No.	Project	Implementation Schedule			Cost (million US$)
		Short	Medium	Long	
SW1	Capacity development of institutional organization				-*
SW2	Comprehensive master plan for solid waste management				2.1
SW3	Procurement of equipment for waste collection and transportation	1st Phase	2nd Phase	3rd Phase	34.3
SW4	New maintenance workshop for SWM equipment				1.0
SW5	Privatization of waste collection service for low/medium/high density area, high rise flat, other municipal waste				-
SW6	Privatization of waste collection service for high density (current THA), quasi-residential area				-
SW7	Procurement of equipment for landfill management				0.9
SW8	Construction of the engineered landfill at the designated site				14.7
SW9	Construction of the engineered landfill at the new site				29.0
SW10	Pilot project for composting at a community				0.2
SW11	Promotion of composting at community level				1.0
SW12	Project of community activity for cleaning				1.4
SW13	Public enhancement for 3R (reduction, reuse and recycling)				4.2

ID No.	Project	Implementation Schedule			Cost (million US$)
		Short	Medium	Long	
SW14	Local Government Act to promote Sound Material Cycle Society				0.3
SW15	Procurement and installation of treatment facility for infectious waste				0.3

Note: * the necessary cost is estimated in Chapter 10.
Source: JICA Study Team.

9.4 Selection of Priority Projects

From the projects listed in Table 9.3.1, priority projects have been selected based on same criteria used in the other sectors such as water supply and sewerage.

Criteria are: 1) Urgency, 2) Technical viability, 3) Cost efficiency, 4) Consistency with land use plan and other related development plans, and 5) Socio-environmental consideration.

Table 9.4.1 Selection of Priority Projects

No.	Project	Urgency	Technical viability	Cost efficiency	Consistency with plans	Socio-environmental		Priority Project
						Positive	Negative*	
	Organization and Institution							
SW1	Capacity development of institutional organization	A	B	A	A	A (s)	A	Yes
SW2	Comprehensive master plan for solid waste management	B	B	B	B	C (s)	B (s, n)	
	Collection and Transportation							
SW3	Procurement of equipment for waste collection and transportation	A	B	A	A	A (s)	A	Yes
SW4	New maintenance workshop for SWM equipment	B	B	B	C	C (s)	B (s, n)	
SW5	Privatization of waste collection service for low/medium/high density area, high rise flat, other municipal waste	B	A	C	B	C (s)	C	
SW6	Privatization of waste collection service for high density (current THA), quasi-residential area	A	A	C	B	C (s)	C	
	Final Disposal							
SW7	Procurement of equipment for landfill management	A	B	A	A	A (n)	A	Yes
SW8	Construction of the engineered landfill at the designated site	B	B	B	C	C (s, n)	B (s, n)	
SW9	Construction of the engineered landfill at the new site	A	A	B	C	C (s, n)	A (s, n)	
	Waste Reduction							
SW10	Pilot project for composting at a community	A	B	A	B	A (s, n)	A	Yes
SW11	Promotion of composting at community level	C	A	C	B	C (s, n)	C	
SW12	Project of community activity for cleaning	A	B	A	B	A (s, n)	A	Yes
SW13	Public enhancement for 3R (reduction, reuse and recycling)	B	A	B	B	C (s, n)	C	
SW14	Local Government Act to promote Sound Material Cycle Society	B	A	B	B	C (s, n)	C	
	Infectious and Hazardous Waste Management							
SW15	Procurement and installation of treatment facility for infectious waste	C	C	B	B	C (n)	B (n)	

Note: Suitability/Acceptability index: A = High sustainability/acceptability. B = Medium sustainability/acceptability, C = Low sustainability/acceptability
(s) = social environmental impact, (n) = natural environmental impact
* = For high negative socio-environmental impacts, acceptability is low and vice versa

Source: JICA Study Team

9.5 Priority Projects

9.5.1 Capacity Development of Institutional Organization

It is impossible to accomplish any appropriate management as well as improvement unless the present institutional organization is enhanced. The current resources for SWM are insufficient in the LCC. The capacity of individuals and organizations should be improved in this project.

The priority projects should focus on the following aspects:

- To restructure the organization so as to entrust the division with financial and manpower management for SWM
- To recruit staff including officers and workers in accordance with need
- To assign the necessary staff for landfill management which has not been regularly implemented
- To assign the necessary staff for public education on SWM considering the need based on the progress and result of the pilot project
- To develop the training program for SWM staff in terms of waste collection, final disposal, waste reduction, facility/equipment operation and maintenance, and public enhancement
- To draft the policy and regulation for the privatization of SWM services

9.5.2 Procurement of Equipment for Waste Collection and Transportation

Enhancement of waste collection capacity should be conducted periodically to satisfy the waste collection demand as projected in Section 9.1. The first phase of the project is intended to be implemented in the short-term. The equipment to be procured should be of the same type as those which the LCC have experience to use. It is practical to keep the same system of waste collection in the short-term.

The following Table 9.5.1 shows the necessary equipment during the first phase of the project, which include waste collection vehicles (compactor truck), skip carriers, skips and tipper truck. In order to make use of the equipment, the LCC has to prepare human and financial resources for waste collection and transportation.

Table 9.5.1 Equipment Procurement for Waste Collection and Transportation

Equipment	Spec	Short (2015)	Medium (2020)	Long (2030)
Compactor truck	9.7 ton	9	14	113
Skip carrier	10 ton	3	29	-
Skip	6 m^3	30	120	-
Tipper truck	-	1	1	4

Source: JICA Study Team

Preparations should be made for the second and third phases of the project because more equipment for waste collection will be necessary as the collection area and population increase.

9.5.3 Procurement of Equipment for Landfill Management

Currently, the LCC brings a bulldozer to the existing open dumpsite only once every three months. This operation is insufficient or can be considered as almost no management at the dumpsite. Since not many settlements can be observed around the dump site at present, serious impacts to human life have not been obvious. It is estimated that the existing allocated site for waste disposal, which covers 25 ha, will be used for final disposal for around 15 years. The LCC should commence regular operation and management at the dumpsite as soon as possible to prevent the negative environmental impacts from the disposed wastes. The heavy equipment required for the landfill operation is shown in the following Table 9.5.2.

Table 9.5.2 Equipment Procurement for Landfill Management

Equipment	Spec	Number (unit)
Wheel loader	2 m^3	1
Bulldozer	112 PS, 20 ton	1
Excavator	0.8 m^3	1
Supervisory vehicle	2,500 cc	1

Source: JICA Study Team

9.5.4 Pilot Project for Composting at a Community

UNDP and the stakeholders including the LCC, NGOs, and a private company have been conducting the project named "Waste for Wealth, Promoting Zero Waste Environment" since 2008. Composting through community participation is one of the major aspects of this UNDP project.

The project is conducted at a small scale. It is expected that the applied system would be expanded to other areas and communities will make use of the outcome from the project.

9.5.5 Project of Community Activity for Cleaning

Sanitation promotion is a very basic requirement to ensure the improvement of human living environment. This aspect as well as awareness creation is also considered in the ongoing UNDP project. In addition to sanitation promotion, the responsibility of waste generators should also be remembered. To encourage people's responsibility in SWM, it is expected that this project will lead people to realize that they could contribute to SWM. The project includes the following:

- To develop incentive system to subsidize the participating community
- To identify several participating communities
- To monitor community activities and performance
- To provide participating communities with the equipment for waste transportation
- To inform the public about the community's contribution and effect of their activities
- To share good practices among participating communities
- To award the best performing community
- To expand the number of participating communities

Since the market for recyclables such as aluminum, steel, paper and plastic does not exist in the city at the present, collection of recyclables has not been so attractive for the

general people including the poor. It is proposed that the LCC would initiate steps to make recyclable materials attractive and valuable through coordination with private companies.

9.5.6 Summary of Priority Projects

Table 9.5.3 shows the summary of priority projects together with the suggested implementing agencies.

Table 9.5.3 Summary of SWM System Development Priority Projects

ID No.	Priority Project	Project Outline	Imple. Agency
SW1	Capacity development of institutional organization	Improvement of capacity of LCC. - Entrustment of financial and manpower management to the division responsible for SWM - Basic knowledge on SWM, and operation management - Policy and guidelines to be discussed	LCC
SW3	Procurement of equipment for waste collection and transportation	Expansion of the capacity of waste collection and transportation. Waste collection vehicle, waste container (skip) etc. are procured in accordance with the increase of waste amount to be collected.	LCC
SW7	Procurement of equipment for landfill management	Equipment required for regular operation of landfill. Bulldozer, wheel loader, excavator etc. are procured.	LCC
SW10	Pilot project for composting at a community	On-going UNDP project. Promotion of composting through participation of community.	UNDP, LCC, NGOs
SW12	Project of community activity for cleaning	Involvement of community in the management of their wastes. It is intended to remind their responsibilities in SWM.	LCC

ID No.	Priority Project	Cost (million US$)			
		Short	Medium	Long	Total
SW1	Capacity development of institutional organization	-*	-	-	-
SW3	Procurement of equipment for waste collection and transportation	2.8	12.9	19.6	34.3
SW7	Procurement of equipment for landfill management	0.9	-	-	0.9
SW10	Pilot project for composting at a community	0.2	-	-	0.2
SW12	Project of community activity for cleaning	1.2	0.2	-	1.4

Note: 1. Shade denotes that funds are already secured.
2. * the necessary cost is estimated in Chapter 10.

Source: JICA Study Team

CHAPTER 10

CAPACITY DEVELOPMENT PLAN

CHAPTER 10 CAPACITY DEVELOPMENT PLAN

10.1 Introduction

10.1.1 Goals of Good Governance

Governance of urban development in Lilongwe shall be increasingly highlighted since the capital city will have its responsibility as the face of Malawi. The successful implementation of the urban development plan embodied in this Master Plan could depend on how thorough good governance of urban development can be achieved. Good governance for the development of Lilongwe City could be achieved in the areas shown in Table 10.1.1.

Table 10.1.1 Goals of Good Governance

Areas	Sub-areas	Goals or Status to be Achieved
Urban Plan and Development Management	a) Legalization of land use plan	Legal status of land use plan proposed in the Master Plan.
	b) Planning permission	Planning Standards and Guidelines are improved.
	c) Land use and building control	By-laws or regulation for development control and its transparency is needed.
	d) Review of Master Plan	Review of the Master Plan should be made in 2015 and 2020 in line with the timeframe of the Master Plan.
Land Management	Land Registration	Land management for the new zoning proposed under the Master Plan should be institutionalized.
	Urban Agriculture	Institutional arrangements for commercial farm-based urban agriculture development should be established.
Improvement of Living Environment	Fund Creation	Fund to assist in sustainable urban renewal in unplanned settlement and THA should be established.
	Community-based Public and Social Services	Community-based public and social services shall be practiced for residents in unplanned settlements.
Effective Implementation System	Development control	Implementation system of development control shall be strengthened.
	Priority projects	Implementation system of priority projects proposed in the Master Plan.
Public Administration	New Administration	New administration and management of the LCC should be formulated through the establishment of Local Assemblies in accordance with the Constitution of Malawi.
	Human resource development	Professional skills of middle management could be strengthened through staff retention strategies.

Source: JICA Study Team

The above table shows five areas for good governance of urban development in Lilongwe City. These consist of i) urban plan and development management, ii) land management, iii) improvement of living environment, iv) effective implementation system, and v) public administration. Urban plan and development management aims to strengthen enforcement system of land use/building control based on the new zoning scheme. Land management is intended to update/renew land registration system of the new zoning proposed in the master plan. Improvement of living environment specifically focuses on upgrading of unplanned settlements (quasi-residential area) by means of fund creation through land adjustment. Effective implementation mechanism proposes the practical implementation method of development control and priority projects. Public administration focuses on the LCC that must be empowered in connection with the other four areas.

Each area is comprised of sub-areas in which goal or status to be achieved is spelled out. Governance of urban development encompasses a wide array of issues such as i) policy,

ii) institutions relating to urban plan and land management, iii) organization of the LCC as implementer of urban development plan and projects, and iv) human resource development.

10.1.2 Capacity Assessment

Capacities are defined as institutional arrangements, organizational or functional capabilities and individual capacities for the attainment of good governance. Institutions correspond to the relevant government policies, laws, by-laws, standards and regulations. Organizational and functional capabilities focus on those of the LCC and its attached services/standing committees.

The LCC seems to be currently trapped in a vicious circle:

Lack of incentives (lower salary standard compared to that of central government officers)

→ Difficulty in recruiting experienced staff members

→ Many vacant posts in middle management

→ Degradation of professional skills in the junior management class

Improvement of this situation would be ascribed to the effective management of new public administration (LCC). The LCC might need an administration (management) policy that encourages staff members to revitalize their work ethics. Administration (management) is also a significant aspect of capacity.

A capacity gap is alternatively interpreted as “to what extent capacity development is needed for the attainment of good governance”. A “gap assessment” is firstly made on the particular issues (sub-areas in Table 10.1.1). A “needs assessment” is then made on the capacity development required for each issue.

10.1.3 Plan of Capacity Development

Since good governance is interpreted as the outcome of capacity development, priority shall be given to outcome-based capacity development. The outcome-based capacity development plan firstly needs an interdisciplinary body that handles a wide array of governance issues. Such body, consisting of the GoM, LCC and semi-governmental organizations, ideally plans and implements capacity development programs towards the attainment of good governance.

A donor shall be interested in assisting relevant stakeholders in planning and implementing capacity development programs. Such technical assistance extended to capacity development for good governance of urban development could be a model for other cities’ development.

Lilongwe CDS has finalized its paper that presents strategies and activities in the areas of i) governance, ii) shelter and land, iii) infrastructure and environment, iv) community development, and v) economic development. CDS covers a wide array of activities so that LCC must prioritize them in accordance with its strategy.

It is high time that the LCC should mobilize its staff members to discuss capacity development activities and plans that are recommended in the Master Plan and Lilongwe CDS. Needless to say, the capacity development plan proposed in this chapter could be a prerequisite for the empowerment of the LCC which is definitely needed since it shall be the stakeholder handling urban development management in the 21st century.

10.2 Gap and Needs Assessment

Based on the goals of good governance shown in Table 10.1.1, status quo observation and gap/needs assessment of capacity development for respective governance areas/issues are presented in the following.

10.2.1 Institutional Arrangements

(1) Urban Plan and Development Management

The Study (master plan) shall need to be reviewed and renewed according to the changes of urban development policy. Urban plan and development management should guide urban development based on policy/strategy, proper planning process (coordination and permission), and development (land use) control (management).

1) Legalization of Land Use Plan

Gap Assessment

The 1986 OZS was the statutory land use plan for Lilongwe City. It was prepared by the Town and Country Planning Department (currently the Physical Planning Department, Ministry of Lands, Housing and Urban Development). It was approved then by the Planning Committee and finally approved by the Minister responsible for town and country planning. A similar legalization process can be applied to the land use plan proposed in the Master Plan. It is expected that the long-term land use plan could be named as the '2010 Outline Zoning Scheme' that shall be valid until 2030.

The Planning and Development Department of LCC is requested to conduct preparatory works for the urgent legalization of the 2010 Outline Zoning Scheme since the existing zoning scheme was valid only until 2000. No current staff member of the Planning and Development Department has experience on the legalization of the existing zoning scheme.

Needs Assessment

Shortly after the completion of this Study, the LCC should appoint staff members to prepare a document to be called the "Lilongwe Outline Zoning Scheme" with the following contents: i) legal status, ii) explanation of new zoning scheme, iii) infrastructural development, iv) timeframe of new zoning, et. Such document has been prepared when the existing zoning scheme was made. The LCC is also requested to coordinate with the Planning Committee for the approval of the new zoning scheme.

2) Planning Coordination and Process

Gap Assessment

The land use plan needs multi-stakeholder planning coordination and process in the areas of economic and social sectors, infrastructure development and inter-district coordination. Multi-sector and infrastructure development cooperation have been legalized in the TCPA (1988). According to the procedure stipulated in TCPA, the planning process and coordination involves many stakeholders such as the i) Plot Allocation Committee (LCC) for THA administration, ii) Plot Allocation Committee (the Department of Lands) for land administered under the Department of Lands iii) Infrastructure Committee, iv) City Assembly with Planning Committee, and v) Town Planning Board under the Physical Planning Department of MoLHUD. However, the coordination and process for planning and urban development is almost inactive due primarily to poor cooperation among multi-stakeholders.

Needs Assessment

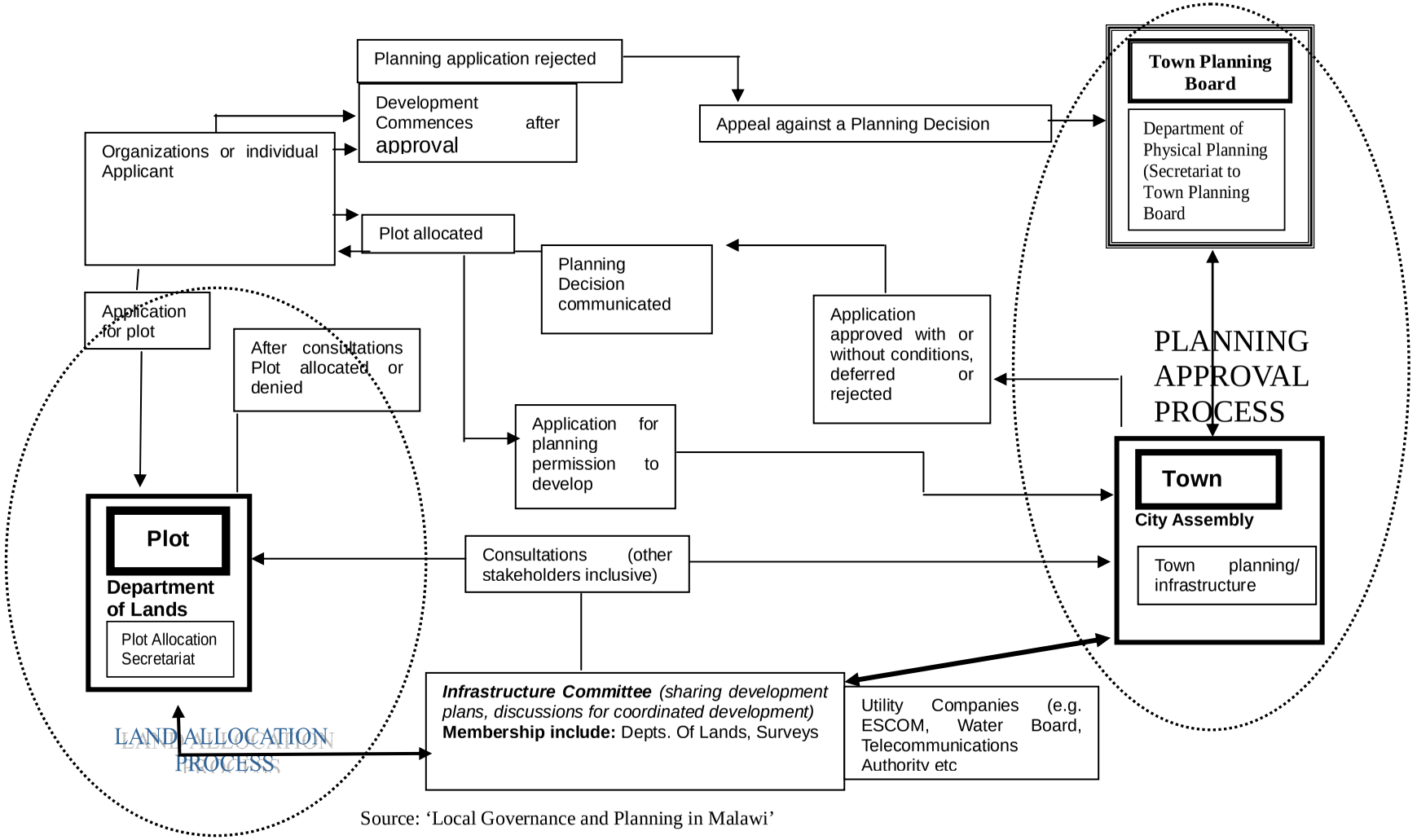
a) Planning Implementation Process

The planning implementation process indicated in the TCPA is shown in Figure 10.2.1. This figure exemplifies the coordination procedure among the Plot Allocation Committee attached to the Department of Lands, the Infrastructure Committee, the Planning Committee attached to the LCC and the Town Planning Board attached to the Department of Physical Planning. Inactivity in the planning process and coordination is primarily ascribed to the weak coordination between the Plot Allocation Committee and the Planning Committee, the absence of the Infrastructure Committee and the weak capacity of the LCC in evaluation of plot application. Coordination among the multi-stakeholders is practically difficult so that there would need a core function that chairs the process and coordination. The Physical Planning Department of the MoLHUD mandated by the TCPA is headed by the Commissioner for Physical Planning and four Deputy Commissioners for Physical Planning responsible for Mzuzu, Lilongwe, Blantyre and Zomba. It is recommended that the Physical Planning Department should continue to work more closely with the LCC to ensure coordination of the planning functions.

b) Inter-local government's coordination

Greater Lilongwe could be the expected expansion of administrative boundaries as a result of urban population increase. The land use plan of the Master Plan encompasses parts of Lilongwe and Dowa districts. Physical development plans included in the TCPA consist of the following: i) national plan, ii) district plan and iii) local or urban development plan. In the future, the boundary of the city could change based on the further expansion of city areas. Lilongwe could be the first model of a greater city in Malawi. Thus, inter-district coordination is an important aspect of planning until such time that the changes in the city boundary are recognized.

Figure 10.2.1 Situation Analysis of Town Planning and Urban Development for the Past Decade – Plan Implementation Process Simplified (According to Procedure)



Source: 'Local Governance and Planning in Malawi'

3) Planning Permission

Gap Assessment

The Outline Zoning Scheme (1986) was complimented by the Planning Standards and Guidelines (1986). The old zoning standards and guidelines are difficult to adapt to the land use plan proposed in the Master Plan so that planning standards and regulations should be improved to incorporate population increase, urban sprawl and patterns of economic development prescribed in the Master Plan. A new planning standard and guideline shall be formulated to incorporate the proposed land use plan.

Irrespective of major or minor applications for the amendment of the current Planning Standards and Guidelines, planning permission applications need basic requirements for the final approval of the Planning Committee. Basic requirements include land survey, property records, and other information in order for the authority to finally approve the building plans.

Needs Assessment

a) Amendment of Planning Standards and Guidelines

The long-term land use plan prepared under the Master Plan presents new zoning concepts like the following: i) mixed use of residential and commercial buildings in central area, ii) high rise commercial area, iii) high rise flat area, and iv) high density residential area.

High rise flat area and high rise commercial area might have condominiums and high rise buildings whose height regulation and design criteria for common and individual spaces are entirely new to Malawi. High density residential area may also have low cost housing. The current Planning Standards and Guidelines, including the planning standards documents from 1 to 8, shall be reviewed and amended in the following areas:
i) Subdivision regulations for low cost housing in high density residential area, residential development in areas where residential and commercial buildings are mixed with commercial development, and condominium projects;
ii) Subdivision standards for public facility requirements, road standards, minimum lot size, lot frontage requirement, block length, water supply system, sewerage disposal, and drainage system;
iii) New zoning sub-categories such as light industry and quasi-residential areas;
iv) A matrix table to control types of buildings by land use category (see Table 5.7.1);
v) Maximum Building Coverage Ratio and Floor Area Ratio for density control (see Table 5.7.2); and
vi) Regulation for building line and minimum car parking space (see Table 5.7.3).

The Planning and Development Department is primarily responsible for the preparation of the draft Planning Standards and Guidelines. The draft shall be finalized by the Physical Development Department of MoLHUD.

b) Basic Requirements for Planning Permission

The Planning and Development Department (of the LCC) shall be strengthened to equip it with basic requirements such as research and information system. However, this requires capital outlay from the LCC. The minimum requirements related to the land use plan provided under the Master Plan shall be studied and built into the scope of works of the Planning and Development Department. These are contemplated to be:

i) Property records (Cadastral mapping, title registration)

ii) THA, transparent plot allocation (design and development of THA land),

iii) Improvement of unplanned settlement (land record holding system), and

iv) Land survey (topographic map, information management for land management).

v) The LCC is requested to provide the budget for the Planning and Development Department in order to carry out the basic requirements for planning permission.

4) Land Use and Building Control

Gap Assessment

a) **Legal status of existing development/building permission**: Land use control and building permission have been legally regulated by the TCPA (1988) and the Building By-Law (1961), respectively. The Building By-Law incorporates provisions of the Public Health Act. The existing Building By-Law is so obsolete that there has been a proposal to introduce the National Building Regulations in 1990. Nevertheless, the effort has not been realized so that enactment of such regulations is currently needed.

b) **Legal status of the Town Planning Committee**: According to the TCPA, planning committee members in charge of development permission are appointed through the order of the minister (Section 9) or election of city/district assemblies (Section 10). The current Town Planning Committee (of the LCC) has been established by way of the minister's order. Nevertheless, its status seems to be legally provisional and should be established through the election of the city council in accordance with the Local Government Act (1998).

c) **Relationship between planning permission and development control**: Land use control is subject to planning permission in accordance with the zoning application and urban development permitted under the Planning Standards and Guideline (1986). The authority (MoLHUD) is requested to focus on the linkage between land use control and planning permission for effective control and enforcement.

d) **Planning coordination about subdivision or plot allocation plan**: Land use control also includes the sub-division of land which creates parcels of land for development. Any sub-division is subject to the approval of the Planning Committee and further subject to the approval of the Director of Environmental Affairs and Natural Resources (of the LCC) in accordance with the Environmental Management Act (1996). Nevertheless, the City has a number of land use changes, particularly the conversion of open spaces into commercial and residential use, in recent years. The MoLHUD has issued the Ministry's decree stopping further land use changes subject to the review of the urban structural plan. It implies that LCC has to review the land use control process regulated by the Development Control Procedures for Lilongwe City (1993).

Needs Assessment

a) The existing Building By-Law (1961) is outdated in terms of building standards and construction technology while the existing Public Health Act, which spells out the minimum residence size and ventilation method, is inadequate to guide all the necessary regulations of buildings. Under such circumstance, the National Building Regulations (not a by-law but a national law) once drafted in 1990 should be reviewed and amended in accordance with new building requirements (building height). The National Building Regulations should also include building regulations for low cost housing. Or as practiced in Blantyre City, the LCC should update the existing Building By-Law in cooperation with the relevant stakeholders. The latter would be the more practical approach to establishing a new building control process.

b) A building inspector (Planning and Development Department of the LCC) charges scrutiny (inspection) fees to developers based on floor area and unit cost per square meter of building application (residential, industries, offices). However, the 2001 unit cost remains unchanged; hence, the formula for inspection fees should be revised.

c) Land use control is one of the important governance issues which should be consistent with the Constitution of Malawi. It implicates that the Planning Committee should be reorganized once the Lilongwe City Assembly councillors (currently inactive) have been elected.

d) Needs assessment in planning permission (discussed in the preceding section) should be concurrently realized with needs assessment in land use control.

e) The Development Control Procedures for Lilongwe City regulates the land use control procedure as follows: 1st: Site Inspection, 2nd: Approval Process, and 3rd: Compliance (Monitoring). The Inspection Section (Planning and Development Department of the LCC) currently receives 80 applications every month. The new zoning scheme based on the land use plan proposed under the Master Plan could further increase the number of applications. It implies that the LCC would need a more effective implementation system of land use control. The current problems in each step are summarized in Table 10.2.1.

Table 10.2.1 Current Problems Observed in Land Use Control

Site Inspection	a) lack of supervision vehicles b) inadequate number of inspectors c) inadequate skills of inspectors in the areas of assessment
Approval Process	a) need for timely approval (the Planning Committee) b) need for outsourcing judgment for approval by use of specialized expertise
Compliance	a) management of monitoring records b) timely enforcement of decisions c) certification process in accordance with by-laws/regulations

Source: JICA Study Team

f) Two alternative structures of the implementation system can be considered for effective land use control. One is a decentralized system based on 12 zones (the Study area is divided into 12 zones according to spatial urban development) so that site inspection and compliance could be intensified through the daily operation of the branch offices. Another is a centralized system where the LCC headquarter manages the land use control using an information management system. This would put a financial burden on the LCC in terms of vehicles for site inspection, computer system and institutional cost. In Blantyre, land use control is currently practiced by five branch offices. More details are discussed in the succeeding section (effective implementation system in 10.2.4).

g) Other permissions such as water rights and technical specifications are further needed from relevant authorities for development projects, and a concession agreement between a project implementer and related authority in case of conservation/protection areas.

5) Review of the Master Plan

Gap Assessment

Since its creation in 1986, there has been no occasion to renew or update the old Outline Zoning Scheme so far. The LCC has been virtually operating urban development activities almost on a yearly basis instead of a mid and long-term planning frame. Under such circumstance, the LCC has little resources on plan and policy making in terms of data, human resources and information network.

Needs Assessment

The country's development is planned and implemented under a mid-term frame as reflected in the MGDS. Urban plan and development management should also be conducted under a mid-term frame. This means that the LCC should review the Master Plan periodically. The Master Plan comprises of the following time frames: short (up to 2015), middle (2016-2020), and long (2021-2030). Accordingly, the Master Plan shall be reviewed first in 2015 and then again in 2020.

The following are the institutional arrangements necessary for the review of the Master Plan:
a) The LCC should appropriate budget for the review of the Master Plan.
b) The LCC should coordinate with the MoLGRD about a short-term exchange system of staff members between the LCC and the GoM in order to upgrade the skills of the LCC staff members in the areas of economic sector policy/planning and urban planning.
c) The LCC should coordinate with the NSO to conduct an economic survey of the study area and its surrounding districts for the purpose of building up economic data.

The above institutional arrangements are necessary to sustain the city's development in the mid- and long-term periods. The LCC should establish a research unit in order to update planning information.

(2) Land Management

Institutional arrangements for land management shall be in conjunction with the observed issues and the long-term land use plan proposed under the Master Plan. The current land management is summarized as follows:

The Land Act (2000) empowers the state to control and own all types of land in Malawi. The GoM (Department of Lands in MoLHUD) owns and manages most of the institutional, commercial and residential lands in the city. The LCC, Malawi Housing Corporation, Airport Development Limited and private developers are entrusted to manage the land/area they administer. For instance, the LCC, which is responsible for THA, has been granted a semi-permanent leasehold (199 years) called public freehold. Private developers, which are managing large chunks of public land, have also been granted long-term leases.

The GoM transfers or leases its government land to public and private entities through freehold or leasehold titles that are registered at the Department of Lands, in accordance with the land registration system prevailing under the Land Act. Freehold title relates to private ownership while leasehold title refers to a land holding agreement for a specified period (usually leasehold of 99 years), which is recorded in the title.

The LCC manages market areas and subdivides plots for individual allocation through leasehold titles of 99, 66 and 33 years or monthly tenancy agreements under certificates of title. Individual allocation of THA plot in Areas 7, 8, 21, 22, 23, 24, 25, 36, 49 and 53 is based on a monthly tenancy agreement. Leasehold titles are registered at the Department of Lands while certificates of title are kept at the LCC registry.

No stakeholder is legally responsible for unplanned settlements whose area cover 3,700 ha or 9.4% of the city area (39,345 ha). Unplanned settlements are therefore illegal and their residents are not land title holders. These areas are included in the Master Plan as quasi-residential areas.

Urban agricultural land of about 2,300 ha allocated in the old OZS (1986) has not been actively used. Big firms like poultry farming companies (commercial companies) are

only observed. Their lands are based on leasehold titles (99 years) registered at the Department of Lands. As shown in Table 3.1.1, the current agriculture land use is 21,646 ha, dominated by seasonal agriculture, which involves cultivation in small parcels of residential, commercial and industrial. The present land use of agriculture is much larger than agricultural land (2,300 ha) planned under the 1986 zoning scheme. Most of land used for seasonal agriculture is thus illegal. .

The LCC is not responsible for the administration of Traditional Authority in the areas outside the City. Massive encroachment on public land by traditional chiefs through customary tenure is restricted by the Land Act and Malawi National Land Policy (2002). Some parts of peripheral lands that have recently been integrated into the City such as Area 58 are now under the adjudicated land act where residents are given certificates of title registered at the Department of Lands.

1) Land Registration

Gap Assessment

Land tenure currently consists of public freehold, customary tenure, freehold, leasehold, certificates of title for THA, and those administered under the adjudicated land act. The following are current land tenure practices which are not in compliance with good governance:

a) **Absence of legal status of unplanned settlement**: Residents in unplanned settlements are illegal settlers. They are not legally given land holding titles. The more serious concern is the absence of an authority which legally manages unplanned settlements.

b) **A certificate of title as land tenure**: A certificate of title is just a tenancy agreement without a cadastral map. This implies that a certificate of title is not interpreted as a formal legal title of the land holder.

c) **Absence of GoM's policy for urban agriculture**: The GoM's agricultural development programs are planned and implemented in the Lilongwe District outside the Study area. The GoM's policy for urban agriculture has not been officially clarified. Thus, leasehold titles of small holders (farmers) in the city are not legally supported by the GoM's policy.

Needs Assessment

The long-term land use plan (2030) proposes new zoning including the following: i) quasi-residential area where the existing unplanned settlements would be improved, ii) high density residential area where THA would be incorporated, iii) high rise commercial area and high rise flat area, and iv) agricultural area.

Table 10.2.2 shows the land management system in line with the long-term land use plan.

Table 10.2.2 Future Land Management System

Authority	Planned Settlement Area		Quasi-Settlement Area	
	Land Management System	Tax System	Improvement Area	Area outside Improvement Area
Ministry of Land, Housing, and Urban Development	Leasehold of 99 years title deed, Commercial farms	Property rate		
Lilongwe City Assembly	Leasehold of 99, 66, 33 years title deed High density including	LCC property rate	Occupancy License (charging rent per	Land Record Card (charging lower rent per month)

	former THA		Month)	
Traditional Authority	To be incorporated into public land			

Source: JICA Study Team

a) A quasi-settlement is not a statutory housing area but it needs to be administered under the LCC. This settlement is further divided into two, namely, i) improvement area and ii) area outside improvement. Residents in the improvement areas, which have developed community infrastructures, are given Occupancy Licenses and pay monthly tenancy fees. Residents in areas outside improvement are given Land Record Cards and also pay lower monthly rents. Land management of a quasi-residential system should be adopted by the LCC as seen in the case of the Lusaka City Council in Zambia.

b) A high density residential area where THA is incorporated shall be a statutory housing area where land tenure is basically through leasehold titles. However, they have high registration costs so that some residents are allowed to hold certificates of title with less registration costs.

c) The draft Housing (Traditional Housing Areas and Improvement Areas) Bill of 1998 has mandated the LCC to take over existing THA and informal settlements. Actually, the LCC only took over THAs. In the future, the same Bill shall be amended and approved in Parliament so that the LCC shall be the legal body administering high density residential and quasi-settlement areas.

d) Once the long-term land use plan is approved by the minister of MoLHUD, part of Area 58 where customary tenure prevails shall be converted into public land. Land tenure system shall be either through leasehold title or certificate of title. The GoM is responsible for the financial compensation for people who will be moved to the outside area.

e) A condominium bill shall be needed to regulate the following: i) ownership of common and individual spaces inside a building, ii) building tenure, and iii) repair and maintenance of common spaces for high-rise building area.

f) Agricultural land in the City shall be used for commercial farming. Agricultural land tenure shall be through leasehold titles.

2) Urban Agriculture

Gap Assessment

The MGDS-based Agricultural Development Program focuses on the increase of traditional crops, i.e., maize, in districts areas. No budget has been programmed and appropriated for urban agriculture in city areas. Therefore, the GoM has no strategy for urban agricultural development. The absence of the GoM's policy for urban agriculture has given rise to illegal seasonal farming in residential areas in the city.

Needs Assessment

a) Agricultural land in the City shall be primarily used for commercial farms. In the absence of a government policy for urban agriculture, the LCC together with the Department of Lands, which owns and manages agricultural land in the city, should be responsible for the regulation of agricultural land with respect to land size and leasehold period of business applications. Delineation of land size and leasehold period could be based on criteria such as foreign exchange earnings, employment creation and linkage to small holders outside the city. For instance, a business application that meets the three criteria shall be given leasehold of 99 years.

b) Commercial farms producing high value-added products such as fresh vegetables and fruits, cut flowers and poultry meat are recommendable since they contribute to foreign exchange earnings through export or import substitution. Urban agricultural enterprises shall be promoted in order for them to put agricultural investment in the agricultural areas of the city. The LCC may need to cooperate with the Malawi Investment Promotion Agency for the promotion of agricultural investment.

(3) Improvement of Living Environment

The population in unplanned settlements in 2008 is 280,000, which is about 40% of the city's population, and is expected to increase to 610,000 or about 39% of the city's population in 2030. They are illegal residents who have poor living environment. The improvement of living environment in unplanned settlements aims to achieve a step-wise housing development from illegal status to quasi-statutory housing area. The current THA is interpreted as planned settlement but quasi-housing area. The land management system applied to quasi-settlements is discussed in the preceding section. This section focuses on how improved living environment in quasi-settlements can be achieved.

1) Fund Creation

Gap Assessment

The World Bank has been releasing the so-called Malawi Social Action Fund (MASAF) to improve the living environment of local communities. MASAF is currently released through the Local Development Fund wherein city/district assemblies coordinate with NGOs in order to improve infrastructural conditions of local communities. The LCC uses MASAF to cover a wide area of local communities including unplanned settlements in Kauma (Area 43) and Chatata (Area 39) and to provide water kiosks and classroom blocks.

MASAF is a typical social fund providing minor community infrastructure based on community-driven proposals. This bottom-up-based community improvement, however, lacks a comprehensive improvement plan for target communities. In particular, unplanned settlements need a comprehensive plan to identify which of their parts can be targeted for improvement. Accordingly, top-down-based community improvement could lead to the comprehensive and efficient use of MASAF.

Mchenga Fund used for housing, sanitary facilities and home improvement is also a kind of social fund providing a micro credit revolving fund for members of the Malawi Homeless People's Federation. The CCODE is responsible for the implementation of this project's operation.

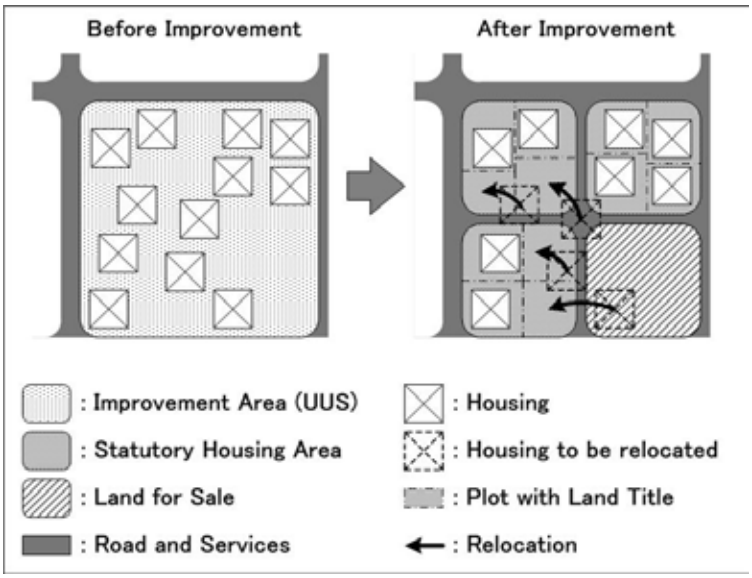
Social funds including MASAF and Mchenga are subject to the aid policies of donors and international financial institutions. Improvement of unplanned settlements would need sustainable financial resources. The Constituency Development Fund (CDF) is another financial resource given to city/district assemblies as a national government grant through the members of parliament. Nevertheless, the amount of CDF released to one constituency is just two million MK per year. A sizeable amount of government grant would be difficult to appropriate for a single purpose such as the improvement of unplanned settlements considering the budget condition of the national government.

Needs Assessment

First of all, the LCC, which is the assumed authority responsible for unplanned settlements, is requested to make an implementation plan for the improvement of unplanned settlements. Such plan could contain the short-term (priority blocks of

unplanned settlements for improvement), mid-term and long-term improvement plans.

Next, the LCC should make a subdivision plan of priority blocks, subdividing them into candidate plots with land titles (occupancy licenses) and plots for sale. A proposed land adjustment measure for urban renewal in unplanned settlements is shown in Figure 10.2.2.



Source: The Study on Comprehensive Urban Development Plan for the City of Lusaka in Zambia (JICA)

Figure 10.2.2 Land Adjustment Measure in Informal Settlements

The above method not only enables target residents to hold land titles (occupancy licenses), but also to generate funds for new houses and community infrastructure improvement (road, drainage and water supply) through the sale of adjusted plots. The plots for sale should be sizeable enough for private developers to purchase for redevelopment. Such fund might be called “Improvement Fund for Unplanned Settlements” and could be administered by the LCC. The current black market price of land per square kilometer in unplanned settlements is reported to be within the range of MK 1,000 to MK 1,500. Thus, the selling price of one hectare is about MK 15 million. Market price could be set to depend more on the location of plots for sale and the kind of intended redevelopment.

CCODE might be the implementer of community development using the Improvement Fund. This fund would be the first case for the construction of improvement area in unplanned settlements. CCODE would be entrusted to make the more detailed plan of priority blocks in terms of housing, community road, and water supply. Once the detailed plan for the improvement area has been approved by the Planning Committee, the LCC together with CCODE would implement community development. Some of the residents holding “occupancy licenses” in the improvement area might sell their licenses for speculative investment. The LCC must ban such speculative actions.

2) Community Based Organization (CBO)

Gap Assessment

Many residents in unplanned settlements are underemployed or informally employed so that their living standards are extremely low. Improvement of living environment also aims to increase their income. Community-based organizations (CBOs) could be utilized

to enhance the income of local people through community business. The question is how to sustain income-generating business at the community level. One approach would be for CBOs to undertake public services. Lots of CBOs registered at the LCC have been fairly active in various fields of social and community development. Nevertheless, none of them have been engaged as public services providers that undertake fee collection and construction works.

Needs Assessment

The annual budget for public expenditure on public services is the sustainable income source of CBOs, which could undertake part of such services in place of public service providers. The LCC, as the management body of unplanned settlements, needs to firstly introduce the following: i) scope of works for services to be undertaken; ii) a contract system comprising of contract period, payment and employment conditions; and iii) organization of people for public services. Staff members of the LCC responsible for the above tasks shall be the community development officers under the Planning and Development Department. They may coordinate with the different service providers such as the Lilongwe Water Board, Electricity Supply Corporation of Malawi (ESCOM) and others.

The undertaking of public services is alternatively interpreted as one method of privatization or subcontracting services to private organizations.

10.2.2 Public Administration

The LCC is currently experiencing a political constraint, i.e., members of the assembly (councillors) have not been elected for almost five years. This gives rise to the suspension of its decision-making authority because all legislations relating to its activities have not been enacted. Institutional arrangements discussed in Section 10.2.1 shall be reviewed and enacted after the local election of councillors has been carried out (local election is scheduled to be conducted in December 2010).

As a whole, an administrative body of the LCC called the Council Secretariat is being developed and needs further efforts to improve its business management relating to the urban development presented in the Master Plan. The administrative body, however, has not been restructured based on the departmental structural plan despite its approval in 2005. The LCC may wait for recommendations about the institutional/organizational studies made in the on-going CDS. However, the current LCC seems to lack the will to empower the Assembly Secretariat. A good administration usually has the following attributes: i) competent staff members, ii) efficient organizational structure for implementation of public services, iii) decision-making process or coordination inside the Secretariat, and v) incentives given to employees (i.e., salary of employees). The above factors may cause the lack of will to empower the Secretariat. This section focuses on the new administration while analyzing the structural problems of the Secretariat's management.

(1) New Administration

Gap Assessment

a) **Redundancy of supporting staff members**: As of 2009, the Secretariat has about 2,300 staff members comprising of officers and supporting staff members (e.g., copy typists, drivers, messengers, and gardeners). The proportion of supporting staff members ranges from 80% to 90% in the Departments of Administration, Commerce, Public Works (Engineering), and Health and Social Welfare. The Secretariat should appropriately revise the number of these supporting staff members.

b) **Missing mid-professions**: The Departments of Public Works and Health and Social Welfare face a constant problem called "missing middle", i.e., a chief class of officers (M3 or M4) are vacant. This results to the improper management of the planning and implementation of public services.

c) **Inefficient budget utilization**: Budget appropriation for capital outlay has not been properly expended (actual expenditure). This may be caused by the following: i) poor budget plan made by each department, ii) lack of coordination between Department of Finance and other departments, and iii) poor implementation capacity of each department in case actual capital outlay turns out be less than the budget.

d) **Necessity of economic development policy**: The Secretariat lacks adequate guiding strategy for the city's economic development policy encompassing agriculture, commerce and industry, and infrastructural development. Its function should definitely be necessary for the annual planning of programs and infrastructural development and review of the Master Plan in the future.

e) **Importance of annual goals**: As observed in most government bodies, there seems to be lack of competitive strategies inside the LCC for effective urban management. The Secretariat should set out annual goals such as i) target population per clinic or school, ii) target amount of revenue collection, iii) employment number of the middle management class, and iv) target housing stocks for THA. Such goals could motivate competitive minds of relevant staff members if personal rating is assessed based on the level of his/her performance in satisfying the goals. Coordination among staff members and departments shall also be improved.

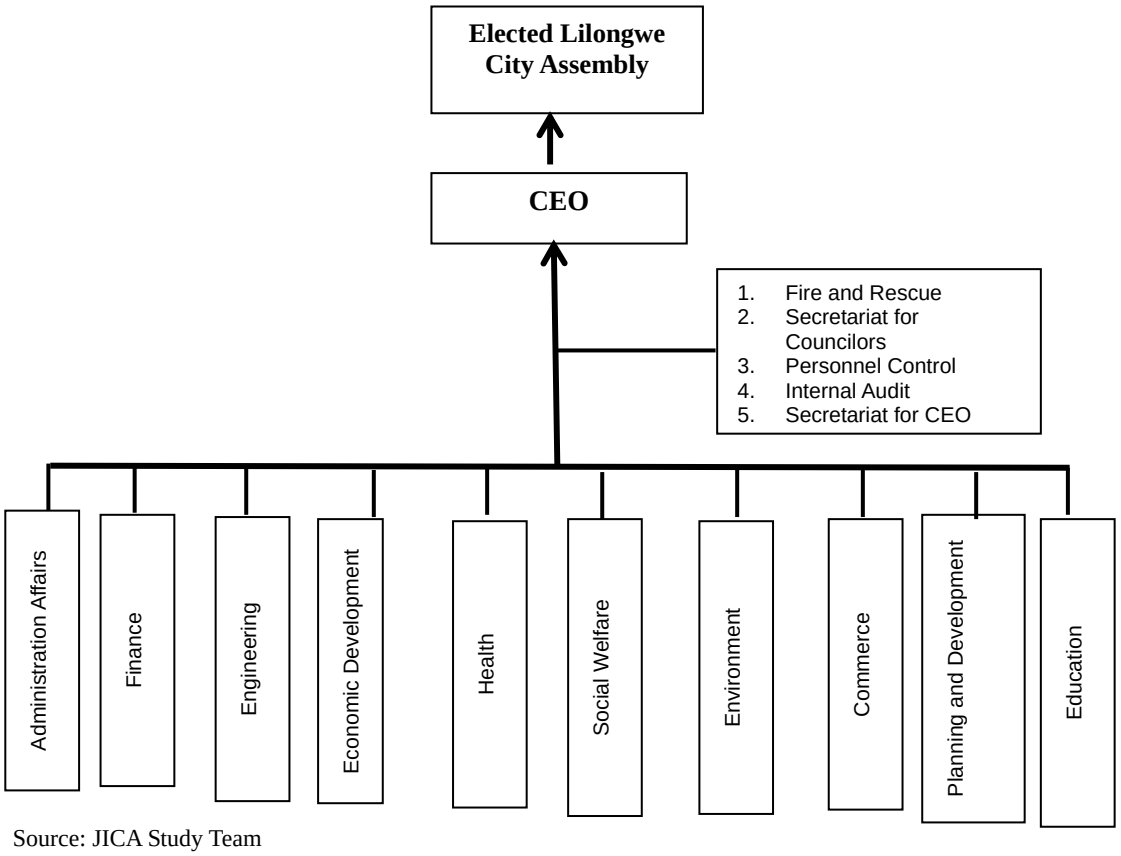
f) **Improvement of skills of mid-professions**: In connection with b), skills and know how of staff members in the middle management class need to be improved.

Needs Assessment

It is high time that the LCC has to shape a new administration complying with the five factors for the fulfilment of a good administration.

a) Organizational Structure

Whether public services are functionally provided or not depends on the organizational structure. A department (directorate in the LCC) is functionally a primal division of services. A departmental structure sometimes is different depending on what functions the CEO emphasizes and could change in the process of the city's development. For instance, finance can be split into budget management and accounting for issues of compliance and transparency. Environment could be one of important primal division of services. A division under a department should be a practical unit providing services. A division head (equivalent to M3 or M4 according to the rank of the LCC) is a key staff member for the planning and implementation of services. Nevertheless, such practical units are placed (equivalent to M5) under divisions in some departments (i.e., Public Works and Heath & Social Welfare). Giving incentive to raise the rank from M5 to M3 would be one approach to solve the missing middle. The new administration is proposed to be structured as shown in Figure 10.2.3.



Source: JICA Study Team

Figure 10.2.3 Proposed Structure of the LCC Secretariat

The more detailed divisions-based structure is shown in Table 10.2.3.

Table 10.2.3 Structure of Divisions by Department

Departments	Divisions
1) Administration Affairs	a) Legal, b) HRD, c) Information/documents management, d) Personnel records
2) Finance	a) Budget management, b) Revenue management, c) Contract, d) Tax management
3) Engineering	a) Road, b) Building, c) Sewerage, d) Electrical/mechanical
4) Economic Development	a) Industry promotion, b) Employment promotion, c) Tourism/commerce
5) Health	a) Preventive health, b) Curative health (clinic, nursing)
6) Social Welfare	a) Community services, b) CBO for unplanned settlement & destitute/relief services/child development
7) Environment	a) Solid waste collection and final disposal, b) Facility management, c) Industrial waste d) Environmental management (EIA, legal issues)
8) Commerce	a) Business licensing, b) Market, c) Vendors management
9) Planning and Development	a) Development control, b) Architect/design, c) High density residential, d) Information & monitoring, e) Greenery and landscape and parks, f) Quasi-residential
10) Education	a) Primary education, b) Youth development, c) Adult literacy
11) Fire and Rescue	Fire and rescue works
12) Secretariat for councilors	Scheduling and preparatory works for election
13) Personnel Control	Personnel management

14) Internal Audit	Auditing
15) Secretariat for CEO	Annual plan, documentation for internal meetings

Source: JICA Study Team

i) Ten departments are proposed. An Economic Development Department shall be necessary for the City's economic plan/investment promotion. The functions of health and social (community) welfare are split because the nature of services is different. An Environment Department is created for solid waste collection and industrial waste controls. Sewerage should be under the Engineering Department because sewerage treatments are part of civil engineering works. The Planning and Development Department would be functional covering i) information management, ii) management of new zoning such as high density residential area and unplanned settlements.

ii) There are 35 divisions proposed. It means that 35 division heads are placed directly under their respective directors. The present position of deputy directors shall be abolished. Instead, a division head shall be equivalent to grade M3 that is now given to a deputy director.

iii) The five areas consisting of fire/rescue, secretariat for councillors, personnel management of the administration, secretariat for CEO and auditing shall be independent and managed by the administration.

b) Streamlining the LCC staff members

The LCC is requested to review a proportion of staff members with grades against those without grades. Since a proportion of them without grades (supporting staff members) appear to be more than the actual need, they should be estimated based on the actual demand for these works. Division heads are responsible for the appropriate number of these positions. Secondly, a staff retention problem of junior staff members (S6) after graduation is often reported. The LCC may launch a retention measure by increasing the salary standard of S class so that a pyramid of staff members by grade shall be streamlined.

c) Strengthening of output-based performance monitoring

The LCC currently carries out a weekly internal meeting where the CEO chairs discussions of inter-departmental issues. Meanwhile, the CEO should chair monthly progress report meetings and receive work programs from departments. Each department should have bi-weekly meetings to review the department work plans and programs as well as assess capital requirements and monitor performance. The CEO Secretariat assists the CEO in evaluating the progress of planned or programmed activities.

(2) Approach to Human Resource Development

Gap Assessment

There seems to be no clear-cut strategy for human resource development for staff members of the LCC. The Department of Administration is functionally responsible for human resource development but its capacity to plan human resource development is limited.

Needs Assessment

The LCC may need a consultant for the preparation of human resources development plan. Otherwise, the Department of Administration should prepare the urgent plan for human resource development in which specific positions with required skills are spelled

out. If possible, an exchange system between the LCC and the GoM/other stakeholders shall be established for skills development of these positions or the LCC may employ experts on a contractual basis to train staff members on-the-job on a daily basis.

10.2.3 Effective Implementation System

The Master Plan proposes the following: i) long-term land use plan of the city, ii) priority projects of the transportation sector, iii) priority projects of water supply and sewerage, and iv) priority projects of solid waste management. This section focuses on the implementation system for development control and infrastructural projects proposed under the master plan.

(1) Development Control

Gap Assessment

There are only two officers in the Development Control Division and one inspector in the Building Inspectorate under the Planning and Development Department. The gap between the present capacity (three officers) and actual demand for development permission (i.e., 60-80 inspection applications per month) seriously constrains the development control operation.

Needs Assessment

The Department of Planning and Development needs a plan for the development permission system, which should contain the following scope of works:

i) THA plot allocation: Design and development of THA land, and information management of THA properties

ii) Property records of planned settlements and land registration

iii) Cadastral mapping and aerial photos of the City by area

iv) Digitization of the current and future layout plan

v) Documentation of development control and building inspections

vi) Monitoring and enforcement management system

Based on the scope of works for development control, the Department of Planning and Development is also requested to estimate the number of staff members for its operation and the vehicles for the required survey. There are two alternatives for the implementation system, namely, the decentralized system where implementation is carried out in 12 zones and the centralized system wherein the implementation is controlled by the LCC headquarters. Under the decentralized system, 12 branch offices with at least two officers (a development control officer and a building inspector) could be established. The said two officers in each branch office shall control all stages of operation from planning to enforcement. Under the centralized system, development control could be divided into scope of works, e.g., THA/unplanned settlement, property records/cadastral mapping.

Strengthening of the implementation system for development control is an urgent matter so that the LCC is requested to study this issue together with the effective structure of the Planning and Development Department.

(2) Urban Transportation Projects

The urban transportation projects consist of the following: i) major roads consisting of

M1 road widening into 4 lanes, inner and outer roads, radial roads, ii) urban roads development, iii) public transportation projects such as new bus terminal, minibus depot, bus rapid transit and establishment of new bus company, and iv) maintenance and rehabilitation projects. Projects of i) shall be primarily under the management of the Roads Authority (RA) while project ii) to iv) shall be under the LCC and MOAM (Minibus Association of Malawi).

The urban transportation projects proposed shall bring about the heavy responsibility to LCC. First of all, the primary concern is how LCC will empower its implementation capacity in project cycle of road development projects. Second, the shift from small minibus operators to a mass transit modal system like bus rapid transit will require public sector's involvement in public transportation. The so-called PPP would be highlighted in terms of project implementation system.

Gap Assessment

a) Road Development: Due to the decentralization policy, urban road construction works have been transferred from the RA to the city assemblies. Blantyre City currently controls urban road construction works. Lilongwe City, however, has little experience on main and secondary roads construction works except for the Mzimba Road Extension Project. Two positions, namely, chief road engineer (M4) and superintendent of road engineer (M5), have been vacant constraining the plan and implementation of road construction/improvement works.

Road maintenance and rehabilitation is the routine work for the Civil Engineering Department of the LCC. Nevertheless its performance in this field has been poorly made due to i) the absence of road inventory database, ii) budget constraint for road maintenance and rehabilitation, and iii) poor planning associated with the absence of database.

b) Public Transportation: None of city assemblies including LCC has experiences of public transportation projects in planning, design and construction, and management. LCC might be able to construct minibus depot in association with MOAM, but bus rapid transit could need either the third sector's company or private one, which needs further study.

Needs Assessment

a) Road Development

Both RA and LCC are requested to discuss the coordination system for the implementation of priority road construction projects.

LCC's Civil Engineering Department may be capable of planning and design under the leadership of the RA. However, the LCC is not eligible as an implementing agency of construction works because the local government is not a signatory in loan agreements for major road construction works financed by donors. Nevertheless, LCC's Civil Engineering Department may still be entitled to do the operation and maintenance works of secondary roads.

Table 10.2.4 Demarcation of Responsibility of RA and LCC by Project Cycle and Road Category

	Planning	Design	Construction	Operation & Maintenance
Main roads	RA	RA	RA	RA
Secondary roads	LCC/RA	RA	RA	LCC/RA
Urban roads	LCC	LCC	LCC	LCC
Community	LCC	LCC	LCC	LCC

roads				

Source: Interview with Blantyre City Assembly

The above table shows a matrix of responsibilities of RA and LCC by project cycle and road category based on an interview with the Blantyre City Council (BCC). RA is entirely responsible for all project cycle for main roads. As regards secondary roads, LCC is responsible for planning and O&M while RA implements design and construction through the Roads Fund Administration. The BCC currently strengthens the capacity of its staff members in the area of project management for the evaluation of bidding documents, construction and financial management, and documentation reporting for RA or donors. The BCC is now able to manage the design and construction of secondary roads. LCC has been advised to follow what BCC did, i.e., strengthen its staff members in the area of project management. The best method for the capacity development of LCC's staff members would be for them to join in the planning, design and construction management carried out by the RA. For this purpose, both the LCC and RA are requested to coordinate for the implementation of the short-term road development plan. The capacity development for LCC's road related services (RD53, one of the priority projects) will be carried out through exchange system of staff members between RA and LCC. Then the Civil Engineering Department could implement priority projects of road development in accordance with demarcation of responsibility shown in Table 10.2.4.

The priority projects of RD 55 (Development of road inventory database) and RD 54(road routine maintenance/rehabilitation) will be jointly implemented primarily because RA managing RD55 transfers planning of road maintenance/rehabilitation to staff members of the Civil Engineering Department while civil engineers in the LCC are trained to make an annual/monthly plan/schedule of road maintenance and rehabilitation subject to the budget for maintenance. This will be the first step to empower staff members of the Civil Engineering Department.

b) Public Transportation

There could definitely need either a third sector company or a private bus company operating a bus rapid transit. The former usually takes the form of a joint venture (JV) where a public investor is responsible for management of JV while a private investor for operation of public transportation. The latter is entirely managed by a private transportation company while public contribution might be in the form of subsidy to transportation fare. There appears to be none of public institution that can be appropriate for management of a joint venture company. Accordingly a public-private partnership of the second case would be the practical implementation method for a mass transit transportation project.

(3) Solid Waste Management

The solid waste management priority projects consist of the following: i) institutional strengthening of the Department of Health and Social Welfare with respect to solid waste management, ii) procurement of equipment for solid waste collection and transportation (compactor trucks and skip carriers), iii) procurement of equipment for landfill management, iv) pilot projects for composting at community, and v) pilot projects for community activity on cleaning.

Gap Assessment

Considering that the current collection of solid waste is assumed to be less than 30% of daily generation, the priority project of supplying compactors and skip carriers could definitely improve the collection of solid waste. Nevertheless, improvement of solid

waste collection could still depend on other factors, namely: i) collection system, ii) proper operation and maintenance of supplied equipment, and iii) proper allocation of staff members in line with the collection system. Organizational strengthening and promoting efficiency of the collection system could definitely improve the current solid waste management of the Cleaning Service Division.

Needs Assessment

Efficiency of solid waste collection could result from a more efficient solid waste management structure which might be the proposed Environment Department shown in Table 10.2.3. The new Department shall be empowered to exclusively handle solid waste collection and final disposal. Each division head (M3) is responsible for the following: i) solid waste collection and final disposal, ii) facility management, and iii) industrial waste and so on. In case the LCC needs time to reshuffle the existing structure, the current cleansing service division should be reorganized according to the functions shown in Table 10.2.3. The LCC is advised to urgently undertake organizational restructuring and employment of M3 class staff members.

Priority project i) could be the pre-condition for the implementation of priority projects ii) to v). The LCC is advised to mobilize in-house consultants to make an institutional strengthening plan for the Department of Health and Social Welfare. Priority projects ii) to v) could take the form of "a technical cooperation project" in which a project sets out a goal of solid waste collection and also plans the effective collection system. A project would be divided into two parts, namely, a) procurement of equipment for collection and pilot project for community activity on cleaning, and b) procurement of equipment for landfill and pilot project for composting at community. Part a) should be implemented first since the LCC urgently needs the improvement of solid waste collection. A pilot project of solid waste collection would be entrusted to the new Department of Social Welfare (as shown in Table 10.2.3) handling community activities. A pilot project at a community matches with the concept of CBOs which are empowered to improve the living environment of local residents at THA and unplanned settlements.

(4) Water Supply and Sewerage System

The priority projects (i.e., construction of Diamphwe Dam and a water treatment plant) of water supply shall be under the jurisdiction of the Lilongwe Water Board. The priority projects for the sewerage system meanwhile, will be under the management of the LCC and consist of the following: i) sewerage master plan, ii) capacity development of the LCC, iii) tariff study, iv) sanitation promotion campaign, v) provision of safe latrine, vi) study on on-site sanitation management (pit latrine and septic tank), and vii) rehabilitation of Lumbudzi Sewerage Treatment Plant.

Gap Assessment

The Civil Engineering Department is currently constrained by the absence of the middle management class including a chief sewerage engineer (M4) and a superintendent sewerage engineer (M5). This division also lacks staff members in the area of planning.

Needs Assessment

Most of the priority projects for sewerage system are studies on sewerage master plan, tariff study and on-site sanitation management. The Civil Engineering Department is requested to employ in-house consultants as advisors in order to implement the proposed studies. As recommended in Table 10.2.3, creation of a sewerage division under the Department of Civil Engineering shall be a prerequisite for the improvement of sewerage services rendered by the LCC. A division head (M3) should be recruited as soon as

possible. The LCC should look for donors to finance the employment of in-house consultants who would focus on the institutional strengthening of public sewers in order to shift the authority from LCC to the Lilongwe Water Board (LWB). The key issue shall be the necessary condition for the transfer of LCC authority to the LWB.

10.3 Capacity Development Plan

10.3.1 Capacity Development Plan

Chapter 10.2 discusses capacity development in the following areas: i) institutional arrangements for urban planning and development management, ii) land management, iii) improvement of living environment, iv) public administration of the LCC, and v) effective implementation system of development control and priority projects proposed under the Master Plan. The capacity development plan based on the needs assessment discussed in Chapter 10.2 is summarized in Table 10.3.1.

Table 10.3.1 Capacity Development Plan

Sub-Programs	ID No	Projects	Implementation Schedule		
			-2015	-2020	-2030
Institutionalization of urban development MP	CD 1	a) Legalization of the 2030 land use plan			
	CD 2	b) Review of the master plan			
Capacity development for effective urban management	CD 3	a) Urban plan and development management,			
	CD 4	b) Improvement of land registration,			
	CD 5	c) Enhancement of LCC administration			
	CD 6	d) Institutional strengthening of priority projects			
Improvement of living environment in THA and unplanned settlement	CD 7	a) Strengthening of land registration system; property records, land survey,			
	CD 8	b) Fund creation for community development			
	CD 9	c) Improvement of public services by strengthening CBO			

Source: JICA Study Team

The capacity development plan is comprised of the i) institutionalization of urban development master plan sub-program, ii) capacity development for effective urban management sub-program, and iii) improvement of living environment in THA and unplanned settlement. The capacity development plan consists of the nine projects mentioned above.

(1) Institutionalization of urban development MP

The LCC should give its urgent priority to the legalization of the 2030 land use plan (CD 1) since this institutional arrangement could be the pre-condition for other projects. Review of the master plan needs to be institutionalized in 2015 and 2021 for the adjustment of a new zoning scheme or infrastructural development plan caused by the change in planning conditions.

(2) Capacity development for effective urban management

Urban plan and development management (CD 3) consists of i) institutional arrangement for planning coordination and implementation, ii) improvement of the exiting planning standards and guidelines, and iii) improvement of the enhancement system for development and building control. This project would suit the technical cooperation project where relevant stakeholders are to be given training. It would take almost ten years to implement both CD 4 and CD 5 projects. Particularly, improvement of public administration (CD 5) could be the fundamental project for CD 3, 4 and 6 projects.

(3) Improvement of living environment in THA and unplanned settlement

The primal concern will be how to upgrade THA into a statutory housing area and improve unplanned settlement into a quasi-statutory housing area. Initiation of three projects (CD 7, 8

and 9) is necessary to achieve the above purpose.

10.3.2 Implementation Schedule

Since the capacity development plans encompass a wide array of actions that are scheduled to be implemented in a short timeframe (present-2015), the Steering Committee, headed by the CEO, should preferably continue to work diligently in order to ensure good governance of the LCC. The following Table 10.3.2 shows an indicative implementation schedule of the capacity development plan in the short term.

Table 10.3.2 Implementation Schedule of Capacity Development Program (Short Term)

Projects	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Legal/Institutional arrangement					
CD 1 Legalization of land use	———				
CD 3 Planning system		———			
CD 3 Planning standards		———			
CD 3 Land use control			———		
CD 4 Land registration system					
a) Housing Bill		———			
b) Unplanned settlement			———		
c) High density residential				———	———
d) Customary tenure			———		
e) Condominium Bill				———	———
Implementation					
CD 7 Land record, mapping, etc.			- - -	- - -	- - -
CD 8 Fund creation			———	———	
CD 9 CBO			———	———	
CD 5 Public administration					
a) New administration	———	———			
b) Streamlining of LCC		———	———		
c) HRD			- - -	- - -	- - -
CD 6 Implementation of projects					
a) Land use control			- - -	- - -	- - -
b) Road development	———				
c) Solid waste management and sewerage		———			

Remarks: Dotted lines denote the conceivable implementation period. Full lines indicate continuous implementation of the relevant projects.
Source: JICA Study Team

The capacity development plan is largely divided into i) legal/institutional arrangement and ii) implementation. The former is comprised of CD 1, 3 and 4 while the latter consists of CD 5, 6, 7, 8 and 9. Its implementation schedule in the short-term is explained below:

(August/2010-March/2011)

Three activities shall be highlighted as urgent actions for the first fiscal year (2010-2011). These are the i) legalization of the 2030 land use plan, ii) establishment of a new administration, and iii) institutional strengthening of the LCC (Engineering Department) in the area of road development. Capacity development (i.e., training of staff members under the road section of the Engineering Department in planning, design and project management) shall be the urgent activity for the short-term road development plan.

(April/2011-March/2013)

The successive two fiscal years should be focused on the following: i) planning implementation system, amendment of the existing Planning Standards and Guidelines and Building By-Law, and establishment of enforcement system for land use/building control, ii) enactment of the Housing Bill in order for the LCC to take charge in unplanned settlements, and establishment of land registration for unplanned settlement and customary tenure; iii) fund creation and activation of community-based organizations, iv) streamlining and training of the LCC's staff members, and v) institutional strengthening of the solid waste management and sewerage sectors. These are contemplated as the fundamental capacity development plans to empower the LCC towards the attainment of good governance.

(April/2014-March/2015)

The LCC may consider the practice of more professional administration in the following areas: i) land registration for high residential area including THA, ii) practice of efficient system for land use/building control, and iii) human resource development that would support the upgrading of its staff members' skills, and iv) land recording and mapping, and its corresponding information management system in THA and unplanned settlement. In particular, human resource development shall be emphasized to sustain the new administration. The basic planning and project management skills for road maintenance and rehabilitation will be instituted during April/2014-March/2015.

10.3.3 Implementation Method

The following Table 10.3.3 shows the implementation method and indicative budget for the capacity development plans.

Table 10.3.3 Implementation Method for Capacity Development Program

Projects	Implementation Method	Indicative Budget for TA and In-house Consultant
Urban plan and development management		
a) Legalization of land use	Implementation by LCC	US$ 0.03 million
b) Planning system	*Technical assistance(TA)*	US$ 2.8 million for technical assistance based on 70 man-months of experts' services from 2012 to 2014
c) Planning permission	*Technical assistance*	
d) Land use/building control	*Technical assistance*	
Land Registration		US$ 0.06 million
a) Housing bill	Implementation by LCC	
b) Unplanned settlement	Implementation by LCC	
c) High density residential	Implementation by LCC	
d) Customary tenure	Implementation by LCC	
e) Condominium bill	Implementation by LCC	
Land use regulation for agriculture	Implementation by LCC	
Improvement of living environment		
a) Creation of improvement fund	Implementation by LCC	US$ 0.05 million
b) CBO	Implementation by LCC	US$ 0.05 million
Effective Implementation system		
a) Development control	*Technical assistance*	
b) Institutional strengthening of the LCC for road development	Implementation by RA	
c) Institutional strengthening of the LCC for SWM and sewerage	In-house consultant	US$ 0.1 million for in-house consultant
Public administration		US$ 0.06 million

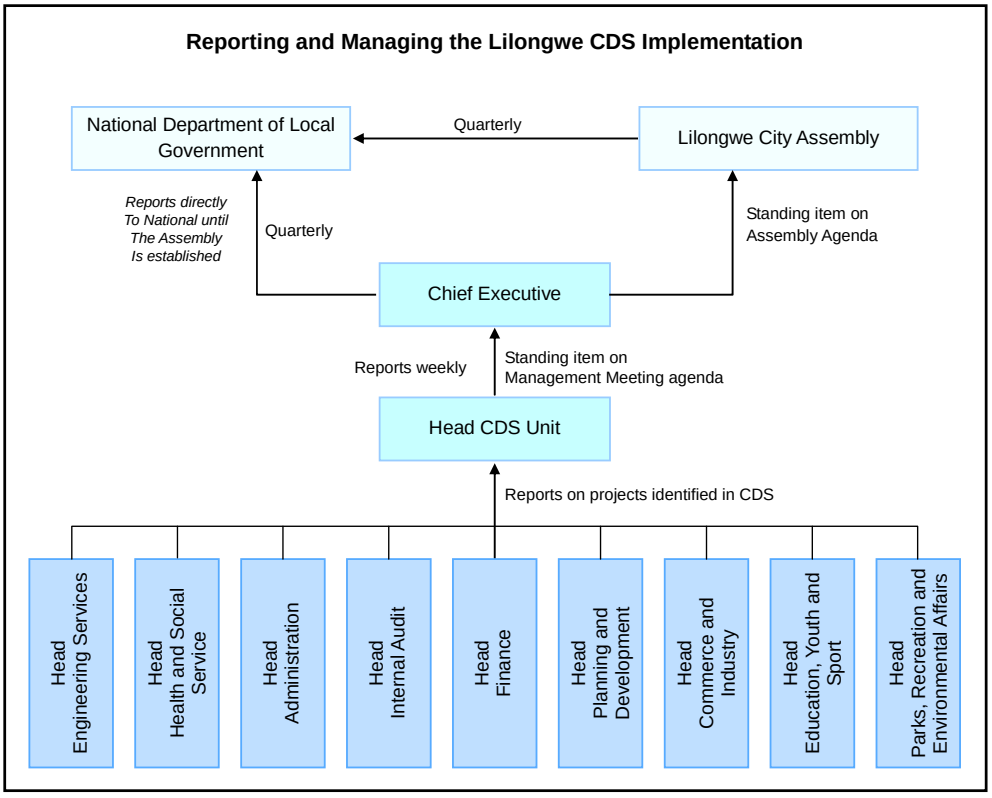
a) New administration b) Streamlining of the LCC's staff members c) Human resource development	Implementation by LCC Implementation by LCC *Technical assistance*	

Source: JICA Study Team

10.3.4 Coordination with CDS

CDS proposes a wide array of activities in the areas of i) governance (study on new administration and standing committee structure, study on accounting system and tax revenue and its implementation), ii) shelter development and land management (development control, information system with GIS, management of unplanned settlement, institutional strengthening of housing development), iii) infrastructure and environmental management (water supply, solid waste management, road, electricity, sanitation, bio-diversity and pollution control), iv) economic development (formulation of policy and plan for economic development) and v) community development (improvement of the current social services to the communities).

CDS does not provide comprehensive policies and plans for governance, urban structural development, land management, and community/infrastructure development. CDS plans its proposed activities. Technical assistance presumes a bilateral donor-assisted project that in the form of technical cooperation in the areas of urban planning and development management including implementation of development control and associated training (HRD). Based on the final report of the CDS, as of March, 2010, Gates Foundation, with its head office located in Seattle, USA, has decided to appropriate USD 2.5 million for the improvement of the living environment in unplanned settlements. The detailed scope of works will be informed to JICA later.



Source: JICA Study Team

Figure 10.3.1 Proposed CDS Unit

Figure 10.3.1 shows a proposed CDS unit between departments and the chief executive officer. If LCC establishes such a unit, its staff members should review the master plan and CDS, and propose LCC's capacity development plan with budgeting. The immediate action for the creation of the unit could facilitate LCC's activities for its capacity development.

CHAPTER 11

ENVIRONMENTAL CONSIDERATIONS

CHAPTER 11 ENVIRONMENTAL CONSIDERATIONS

11.1 Environmental Consideration for Urban Development

An environmental working group was established for the study. During the group's meeting, the following were the confirmed discussion results, which were then reflected into the master plan (MP).:

- Current reserved areas shall be reserved continuously in the future in compliance with the laws.
- Afforestation areas shall be designated and categorized in the forestry land use so that aforestation will be carried out. Said areas will be reserved and will not be subject to any development.
- Parks shall be designated in the land use plan and will be developed in accordance with the MP.

Conservation of greenery is important for recreation and relaxation in the city. It will also contribute to carbon dioxide reduction and help combat global warming.

The conservation areas, resulting from the above strategies, are shown in the Figure 11.1.1.

11.1.1 Current Reserved Area

There are currently two reserved areas, namely, the Lilongwe Nature Sanctuary and National Herbarium and Botanic Gardens. Moreover, existing rivers and streams are classified as protected areas.

(1) Lilongwe Nature Sanctuary

Creation of the Nature Sanctuary is covered under Act 15 (2004) of the Parliament on Parks and Wildlife, which was amended from the Act of the year 1992. This is an area where animals, plants and natural environment are preserved for conservation and recreation.

Lilongwe City has one such place where different species of animals, plants, trees and other biodiversity are found for preservation. Lilongwe Nature Sanctuary lies between the City centre and the Old Town, covering an area of over 137 hectares. It was reserved in 1972 as an environmental education centre. The area was part of the Namilombwa Forest Reserve since 1928 to 1972. When the Department of Forestry handed the area over to the Department of National Parks and Wildlife (DNPW) under Ministry of Tourism in 1972, DNPW established an Environmental Education Centre.

The sanctuary is therefore managed under DNPW. The place is open to the general public where families go to spend their leisure time viewing nature. Students and pupils visit said place as well for leisure and learning nature. Entrance is free for environmental education visitors. Meanwhile, an entrance fee of 20 MWK is required for recreational visitors, which is the source of revenue of the government. More than 6,000 school children and 2,000 adults visit the area yearly to learn on wildlife conservation and enjoy nature. Besides being an educational centre, Lilongwe Nature

Sanctuary also attracts more than 10,000 recreational visitors, including international tourists.

Therefore the place is very important for the citizens as an open and greenery space for, recreation, relaxation and educational centre, as well as a reserved area for diversified fauna and flora.

In Malawi, most of the fauna and flora is protected, with a few exceptions. Only some of the animals could be hunted for game with permission. Malawi's red data list of protected species can be found in Appendices I and II of the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora. Unfortunately, there is no complete list of fauna and flora available in the Lilongwe Nature Sanctuary. The following table shows a partial list of major fauna in the Lilongwe Nature Sanctuary.

Table 11.1.1 List of Fauna in the Lilongwe Nature Sanctuary

Common name	Scientific name	Class	Conservation Status	CITES Listing	Remarks
Common duiker	Silvicapra grimmia	Mammal	Very common (game species)	Appendix III	
Bush buck	Tragelaphus scriptus	Mammal	Very common (game species)	Appendix III	
Porcupine	Hystrix africaeaustralis	Mammal	Common	Appendix III	
Velvet monkey	Circopithecus aethiops	Mammal	Very common - Vermin	Appendix III	
Bush pig	Potamocoerus porcus	Mammal	Very common - vermin	Appendix III	
Pangolin	Manis temminckii	Mammal	Very rare; endangered	Appendix I	
Hedge hog	Atelerix frontalis	Mammal	Common	Appendix III	
Bats	Various spp.*	Mammal	Common	Appendix III	Requires study
Rodents	Various spp.*	Mammal	Common	Appendix III	Requires study
Nile Crocodile	Crocodylus niloticus	Reptile	Common	Appendix II (for Malawi)	
African Python	Python sabae	Reptile	Common	Appendix II	
Tortoises and terrapins	Various spp.*	Reptiles	Some common; some rare	Appendices II & III	Requires study
Monitor lizard	Veranus albigularis	Reptile	Common	Appendix II	
Birds	Various spp.*	Birds	Some common, some rare	Appendices II & III	Requires study

*spp.:species
Remarks: Data is provided by a senior officer of DNPW
Source: JICA Study Team based on the information from DNPW

Mammals that are seen include common duiker, porcupine, bush pigs, spotted hyena, civet cats, velvet monkeys, and bushbucks. Regarding birds, it is said that more than 200 species exist in the area. According to the book "*A Guide to the Birds of the Lilongwe Nature Sanctuary, Barbara A. Ryder*" produced by DNPW, 25 species of birds are identified in Appendix II of CITES. It also identified 68 other species. The publication year of the book is unknown. Regarding reptiles, there are crocodiles,

African python, puff-adders, twig snakes, green mambas, and cobras. Furthermore, more than 100 different types of trees can be found in the sanctuary.

(2) Lilongwe National Herbarium and Botanic Garden

The City has the Lilongwe National Herbarium and Botanic Gardens where indigenous tree species are propagated, planted, researched and preserved. Medicinal plants in the gardens are also being studied and preserved. The National Herbarium and Botanic Gardens Act No. 7 was enacted by the Parliament in 1987. Since Malawi has been the signatory to several international conventions on environment, it was necessary to respond to those conventions. The garden also serves as a recreational area for citizens. Therefore it is also very important area as it consists of both nature and greenery area, and recreation and relaxation area in the city.

(3) Rivers and Streams

Buffer zones of rivers and streams are areas protected by Water Resources Act (1969) and Water Works Act because of their fragile nature. This ensures preservation of biodiversity and protection of water resource that are used for different purposes. However, buffer distance from the river is not stipulated by the Acts. Therefore, Ministry of Irrigation and Water Development drafted a new Act and is now under approval process in the parliament. The draft Act stipulates the buffer zone as follows;

- 100 meters from water bodies such as dams and lakes,
- 100 meters from rivers leading to dams and lakes,
- 50 meters from large river, and
- 20 meters from all small stable rivers and streams.

In accordance with the draft, 50 meters from rivers and 20 meters from streams as shown in Figure 11.1.1 are designated as conservation area's buffer zones.

However the current situation along the rivers and streams is not satisfactory as these have been encroached for cultivation or building structures, consequently causing environmental degradation. The situation must be redressed and reserved in the future.

11.1.2 Afforestation

An important afforestation area has been designated as the forestry land use in Area 54 in the Lilongwe OZS. Another important afforestation area has also been designated as forestry land use in Area 45 of Lilongwe OZS. There is an intake facility for the Lilongwe Water Board in the downstream of the area. Therefore the area is part of the catchment of the water source for the city.

The Department of Parks, Recreation, and Environment (DPRE) of LCC has plans of river line rehabilitation. The total cost of all afforestation projects is US$730,000.

11.1.3 Park

The following parks have been planned by the Department of Parks, Recreation, and Environment (DPRE) of LCC since long before. However, these have not been developed yet due to lack of budget though areas are secured except for Area 49 Open

Space. Two parks are planed to be developed by public and private partnership (PPP). Cost of other parks is estimated by DPRE as shown in the table below. The total cost of the development of parks is approximately US$40,000.

Therefore these parks shall be reserved and designated as park and recreation land use and should be developed for the use of the citizens as an open space for greenery, recreation and relaxation.

Table 11.1.2 List of Parks

No.	Name of Park	Location	Area (ha)	Park Classification	Remarks
1	Area 10 Open Space	Area 10	5.0	Neighborhood Park	PPP*
2	Area 18 Open Space	Area 18	2.0	Neighborhood park	10,903 US$
3	Area 28 Open Space	Area 28	3.0	Neighborhood park	10,903 US$
4	Area 49 Open Space	Area 49	1.0	Neighborhood park	Location is not determined.
5	Paul Kagame Rd Park (1)	Area 4	3.0	Neighborhood park	4,790 US$
6	Paul Kagame Rd Park(2)	Area 4	0.2	Children's playground	PPP*
7	Tsoka Park	Area 4	10.0	Area park	6,332 US$
8	Biwi (Area 8) Open Space	Area 8	2.0	Neighborhood park	6,698 US$

Note: Proper names have not yet been given to the parks because these are not yet developed.
PPP*: developed by public and private partnership
Source: JICA Study Team based on the information from DPRE

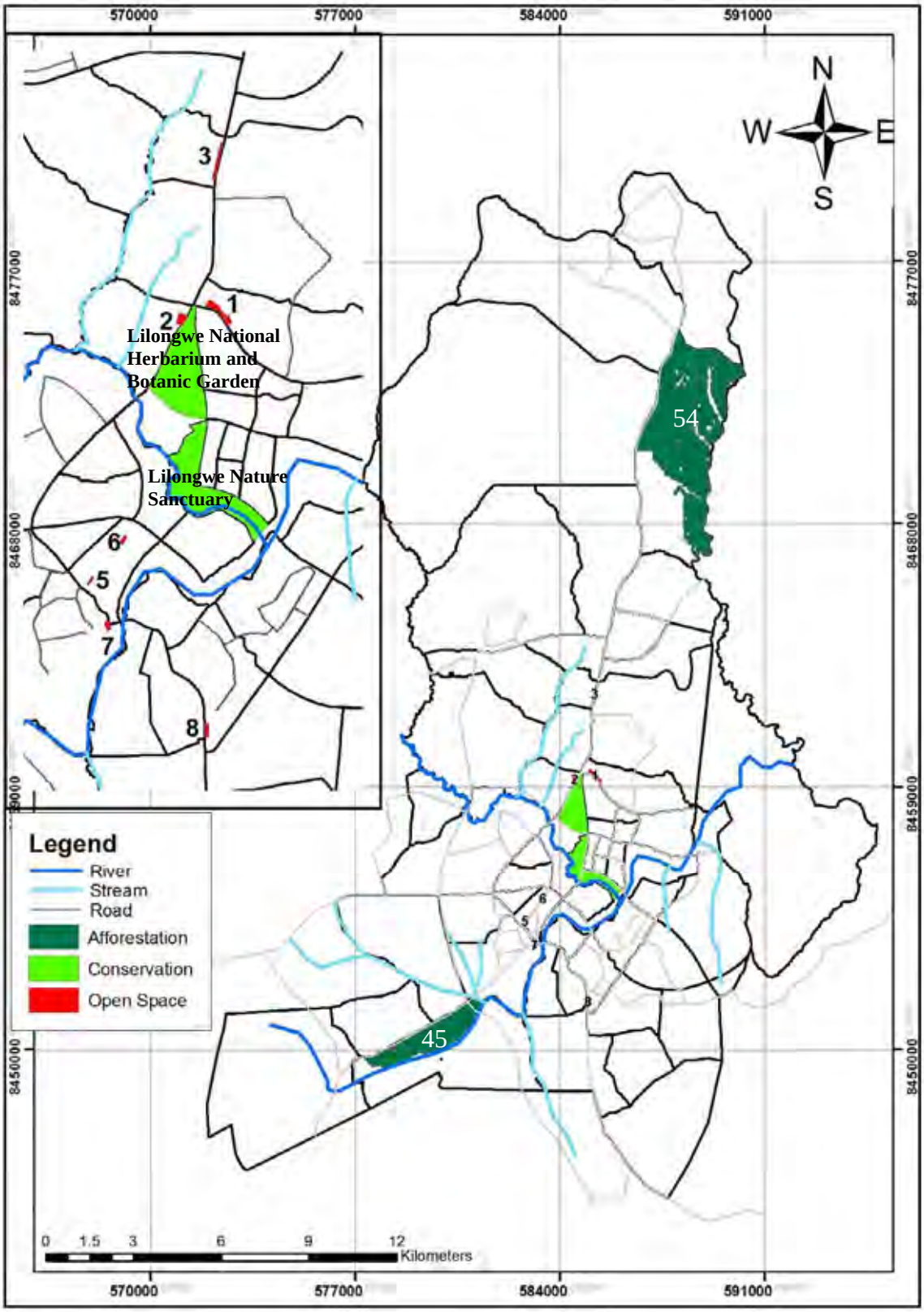
11.1.4 Environmental Preservation Program

The environmental preservation program based on the preceding sections is summarized in Table 11.1.3.

Table 11.1.3 Environment Preservation Program

Sub-Programs	ID No	Projects	Implementation Schedule		
			-2015	-2020	-2030
Park and Green Development	EP 1	Park Construction (1 Area Park, 6 Neighborhood Park, 1 Children Park)			
Natural Greenery Preservation	EP 2	Afforestation of 1,520 ha Barren Land in Area 45 and 54 (Lumbazi)			
	EP 3	River Side Trees Rehabilitation			

Source: JICA Study Team



Source: JICA Study Team

Figure 11.1.1 Conservation Areas

11.2 Strategic Environmental Assessment (SEA) for the Urban Development MP

SEA has been applied in the process of formulating the urban development MP to assess the environmental and social impacts of the entire urban development MP, instead of individual development projects. For applying SEA, the following approaches have been taken:

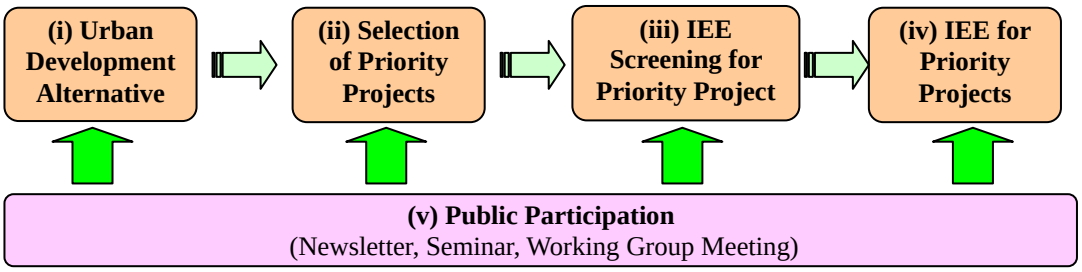
(i) Consideration for urban development alternatives,

(ii) Selection of priority projects,

(iii) IEE screening for priority projects

(iv) IEE for priority projects, and

(v) Public participation



Source: JICA Study Team

Figure 11.2.1 Structure of SEA

(1) Consideration for urban development alternatives

Various urban development alternatives have been discussed in the Steering Committee Meetings, Working Group Meetings and seminars. In considering development strategy, four alternatives of the future urban structure pattern including zero option have been discussed and considered. The result of the alternative consideration is described in Section 4.3. Finally, "Alternative 3 - Cluster Shape Development" was selected as the most suitable pattern for the future urban structure in the MP.

(2) Selection of priority projects

In each sector development plan, necessary projects were identified. Among these, priority projects in each sector have been selected considering the following criteria:

- Urgency
- Technical viability
- Cost efficiency

- Consistency with plans
- Social and environmental impacts (both positive and negative)

The result of the selection processes are described in relevant chapters.

(3) IEE Screening for priority projects

Some of the selected priority projects, including the capacity development project, are not infrastructure projects and will not have any adverse impacts on social and natural environment. IEE for priority projects were screened through the following steps:

- Screening by list of prescribed projects
- Classification and grouping into same type of projects
- Checking the status of projects (e.g. ongoing project)

The priority projects were screened for IEE based on "List of Prescribed Projects" which is stipulated in the Guidelines for Environmental Impact Assessment (EAD, Ministry of Forestry, Fisheries and Environmental Affairs, Dec., 1997, Ministry of Natural Resources, Energy and Environment at present). The list shows projects where Environmental Impact Assessment (EIA) is mandatory (List A) and projects where EIA may be required (List B).

After the projects were screened based on the lists of prescribed projects, these were classified in terms of project nature.

After such grouping, projects that do not require IEE will be determined, specifically those which only involve preparation of studies.

(4) IEE for priority projects

After IEE screening for priority projects, IEE were conducted for four types of projects based on scoping matrix.

(5) Public participation

To encourage public participation in the study, the following approaches have been taken;

(i) Issuance of Newsletter

Newsletters were issued two times, i.e., in July and October, 2009, to disseminate information and progress of the study.

(ii) Seminar

Seminars were already held three times, the first in October 2009, the second in January 2010, and the third in March 2010 as described in the table below. The participants consisted of representatives from government agencies, donors, and NGOs. Leaders of community development committees, members of the Parliament

and traditional chiefs also participated in the seminar. Both English and the local language (Chichewa language) were used especially for local representatives. Presentations were made by counterparts and Japanese experts using PowerPoint and with handout materials.

During discussions, some opinions/comments were raised by the participants. One of the main opinions was that the undeveloped area in the north should be developed. Based on this, the required land area for future development was considered and calculated. It was then found that it is not necessary to develop the area in the north. Another main opinion was that the land use classification of agriculture will encourage development of large-scale farms. In response to such comment, the land use classification of agriculture has been modified to forestry. Apart from these questions, there were no other critical objections raised.

The seminars were reported through mass media, such as TV, radio and newspaper as shown below.

Newspaper: The Nation on 4th October 2009 (see below article)

Radio:

- Zodiak Radio on 2nd, 3rd, 5th, October 2009 in English and Chichewa Language

- Malawi Broadcasting Corporation Radio on 4th, 5th, October 2009 in English and Chichewa Language

TV: Malawi Television on 5th, 6th in English and Chichewa Language

Lilongwe to wear new face

PHOTOGRAPH: NATION LIBRARY

Kabambe: We want a well-planned city

DAVIE MALIKHWA
STAFF REPORTER

Lilongwe will soon wear a new face following plans which government, with funding and technical support from the Japanese International Cooperation Agency (Jica) is implementing.

Principal Secretary for the Ministry of Local Government Patrick Kabambe said this on Friday in Lilongwe during a first study workshop on Urban Master Plan for the city.

He said Lilongwe is the fastest growing city in the country and there is need to revisit its plans which he described as out of touch in today's needs of the population.

"Lilongwe, as the capital city of this country, is the main entry point for foreign investors and tourists. We want an orderly and much organised city to give a good impression on our visitors.

"We know Lilongwe is the fastest growing city than any other town in Malawi. We want to revisit issues of water and sanitation, roads, land ownership and residential areas, among others," said Kabambe.

The Urban Master Plan workshop, the first of its kind, attracted architects, engineers, administrators and a Japanese expatriate team to map the way forward.

Kabambe cited traffic jams in Lilongwe as one of the issues which will be considered in the new plans.

Lilongwe City Assembly chief executive officer Kelvin Mmangisa said buildings which were built in prohibited areas will be demolished to pave way for the new plans.

Mmangisa also said the city assembly will introduce big buses to ferry people to and from their work places like in some countries.

Both Kabambe and Mmangisa could not mention the money to be invested in the project, saying it is too early to talk about the cost of rebranding the city. ■

Article on the 1st Seminar

Source: The Nation on 4th October 2009

Table 11.2.1 Outline of the Seminar

No.	Date	Main Topic	Venue	No. of Participants
1st Seminar	2nd October, 2009 9:00 – 12:00	- Current situation and issues - Development framework - Development strategy	Pacific Hotel	60
2nd seminar	26th January, 2010 9:00 – 13:00	- Draft land use plan 2030 - Sector development plan	Crossroad Hotel	70
3rd seminar	10th March, 2010 9:00 – 13:00	- Priority projects - Land use plan 2030	Pacific Hotel	105

Source: JICA Study Team

1st Seminar

Group Discussion in the 3rd Seminar

Source: JICA Study Team

(iii) Working Group Meeting

Working groups were established into four sectors, namely i) land use planning and management sector, ii) urban transportation, iii) urban environmental utilities and iv) environment, where wide range of governmental stakeholders were invited to participate. Working group meetings have been held several times in each sector and discussed the related issues deeply.

Table 11.2.2 Number of Working Group Meetings

No.	Date	Agenda/Theme	Major Participants
Land use planning and management Working Group			
1	22 Jun. 2009	Land use issues, preparation of land use map	DPD, MLHUD, LDA
2	30 Jun. 2009	Zoning regulation and building control	DPD, MHC
3	8 Jul. 2009	City concept	CPC, MLHUD, MHC
4	14 Jul. 2009	Land use category	MLHUD, MHC, DPD, LDA
5	21 Jul. 2009	Urban statistics and GIS data	MLHUD, DPD
6	28 Jul. 2009	Area boundary	DPD, LDA, MLHUD, NSO
7	4 Aug. 2009	Urban profile of the city	MLHUD, DPD
8	11 Aug. 2009	Land issues and urban poor	MLHUD, DPD

No.	Date	Agenda/Theme	Major Participants
9	18 Aug. 2009	Building and development control	MLHUD, DPD, MHC,
10	8 Sep. 2009	Agriculture land use	MLHUD, DPD, Survey company
11	15 Sep. 2009	Capacity gap development	MHC, DPD, MoTPI
12	24 Nov. 2009	Future urban structure	DPD, MLHUD
13	1 Dec. 2009	Informal settlements	MLHUD, DPD
14	3 Dec. 2009	Land use plan 2030	DPD, MLHUD,
15	8 Mar. 2010	Revision on Land use plan and implementation of MP	DPD, MHC, MLHUD
Urban transportation Working Group			
1	22 Jun. 2009	Presentation of objective & activities for transport sector	MoTPI, DES, MOAM, MHC
2	1 Jul. 2009	Questionnaire, Traffic survey to be conducted by JICA Study team	MoTPI, DES, MOAM, MHC
3	8 & 10 Jul. 2009	Data Collection, progress of traffic survey	MoTPI, DES, MOAM, MHC
4	19 Aug. 2009	Development issues	MoTPI, DES
5	15 Sep. 2009	Understanding current condition Identifying development issues	MoTPI, DES, RA, NRSC
6	17 Dec. 2009	Development plan for transport sector (road and public transport)	MoTPI, RA, DES
Urban environmental utilities Working Group			
1	22 Jun. 2009	Formulation, scope, functions and targets of WG	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
2	08 Jul. 2009	Legal basis, institutional arrangement,	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
3	22 Jul. 2009	Capacity gap assessment, Assessment of existing condition	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
4	15 Sep. 2009	Capacity gap assessment, Future development strategy	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
5	9 Oct. 2009	Needs assessment, Urgent projects	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
6	25 Nov. 2009	Basic planning conditions for system development	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
7	7 Dec. 2009	Demand estimation, System development plan	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
Spe.	16 Dec. 2009	Special working group for SWM plan	Cleansing service Div. LCC
Spe.	17 Dec. 2009	Special working group Water Supply Plan	LWB
Spe.	17 Dec. 2009	Special working group Sewerage/ Sanitation Plan	Engineering Dept. LCC
8	11 Feb. 2010	Adjustment and interim demand estimation, Priority project selection	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
9	2 Mar. 2010	Priority project, cost estimation, implementation plan	LWB, Engineering Dept. LCC, Cleansing service Div. LCC
Environment Working Group			
1	9 Nov. 2009	Conservation Area	DPRE, NHBG, EAD
2	5 Mar. 2010	IEE for Priority Project	DPRE, EAD, RA

DPD: Department of Planning and Development
MoLHUD: Ministry of Lands, Housing, and Urban Development
LDA: Lilongwe District Assembly
MHC: Malawi Housing Corporation
NSO: National Statistics Office
MoTPI: Ministry of Transport and Public Infrastructure
DES: Department of Engineering Services, LCC
MOAM: Minibus Owners Association of Malawi
MHC: Malawi Housing Corporation

NRSC: National Road safety Council
LWB: Lilongwe Water Board
DPRE: Department of Parks, Recreation and Environment, LCC
NHBG: National Herbarium & Botanic Gardens of Malawi
EAD: Environmental Affairs Department
RA: National Road Authority
Spe.: Special working group meeting
Source: JICA Study Team

11.3 Method for Environmental Considerations for Priority Projects

11.3.1 Environmental Assessment Procedures of Malawi

(1) Legislations Related to Environmental and Natural Resources Provisions

The environment-related legislations are shown in Table 11.3.1. According to the Environment Management Act (EMA), an EIA is applied to, 'a development activity or proposal which has or is likely to have an impact on the environment'. .

Table 11.3.1 List of Relevant Laws, Policies and Guidelines on Environmental Considerations

Legal Instrument	Description
Land Resources Legislation	
Land Act – Cap 57.01	Customary, public and private land, use of land, trespass and encroachment
Registered Land Act – Cap 58.01	Registration of land title and dwellings on registered land
Customary Land (Development) Act – Cap 59.01	Rights and interests in customary land including land allocation; aim to promote better land development
Lilongwe Agricultural Development Area Border	Customary land borders in Lilongwe
Local Land Boards Act – Cap 59.02	Establishment and power of local land boards – control of land transactions
Land Survey Act – Cap 59.03	Land surveys, licensing and control of land matters
Planning Subdivision Control Act – Cap 59.04	Subdivision of land outside town planning areas
Water Resources Legislation	
Water Resources Act – Cap 72.03	Control and use of water resources: water rights, pollution of public water: can designate controlled areas to protect water supplies
Water Resources (Water Pollution Control) Regulations	Control of water pollution discharge of effluent into public water: analysis of water and effluent
Water Works Act – Cap 72.01	Establishment of water boards and water areas; injury pollution of water and earth
Inland Waters Shipping Act – Cap 72.01	Survey, registration, licensing and safety of vessel agreements with other countries
Inland Waters Shipping (Harbour) Regulations	Carriage of materials
Blantyre Water Works Act – Cap. 72.02	Administration of Blantyre water area and water board
Lilongwe Water Board Act – Cap 72.04	Administration of Lilongwe water area and water board
Plants Animals Legislation	
Fisheries Act – Cap 66.05	Regulation and control of fishing, prohibits use of explosive and poison
Crocodiles Act – Cap 66.06	Control and protection of crocodiles
Forestry Act – Cap 66.06	Control and regulation of forest products, declaration of forest reserves: protection, control and management of forest products, tree planting and enterprises
Forest Rules	Regulations in forest areas, afforestation, felling of trees, etc.
Plant Protection Act – Cap 64.01	Eradication of pests and diseases, export and importation of plants
Noxious Weeds Act – Cap 64.02	Eradication of noxious weeds

Legal Instrument	Description
Special Crops Act – Cap 65.01	Controls development and marketing of crops, flue-cured tobacco, cashew nuts, cotton, groundnuts, tea
Tobacco Act – Cap 65.02	Production, manufacture and marketing of tobacco
Cotton Act – Cap 65.04	Production, marketing and processing of cotton
Council for National Herbarium and Botanic Gardens of Malawi Act – Cap 41.SC	Development and management of herbarium and botanical gardens
National Parks and Wildlife Act – Cap 66.07	Establishment of national parks, preservation of animals vegetation and objects of special interest in parks
Game Act – Cap 66.03	Preservation and control of game in controlled areas and game reserves
Control of Diseases of Animals Act – Cap 66.02	Control of animals/diseases
Minerals, Chemicals and Pollution Legislation	
Mines and Minerals Act – Cap 61.01	Regulates the exploration and mining of minerals for protection of the environment and natural resources
Petroleum (Applications) Regulations – Cap 61.02	Regulates the search and production of petroleum, provides for protection of the environment, exploration, licensing
Explosives Act – Cap 14.01	Regulation control, etc.
Fertilizers, Farm Feeds and Remedies Act – Cap 67.04	Registration of fertilizers, farm seeds, etc.
Industrial Infrastructure and Urban Development	Regulates infrastructural an d urban development from the viewpoint of mineral/chemical industries.
Industrial Development Act – Cap 51.01	Controls the orderly development and promotion of industries
Factories Act – Cap 55.07	Regulation of employment conditions, health, welfare and safety in the work place
Electricity Act – Cap 73.01	Establishment of the Electricity Supply Commission of Malawi (ESCOM) – gives power with respect to generation, supply and use of electricity relevant for cleaning of land and transmission lines
Other Act	
Treaties and Convention Publications Act – Cap 16.02	Provision for international treaties
Monuments Act – Cap 29.01	Protection of places of distinctive natural beauty and of sites, buildings, etc.
Public Roads Act – Cap 69.02	Provides for matters relating to public roads, construction and maintenance, including compensation for acquired land under roads construction
Road Traffic Act – Cap 69.01	Road traffic and vehicles
Local Government (Urban Areas) Act – Cap 22.01	Powers to acquire land and by-laws on agriculture, forestry, health, sanitation and water supply in urban areas
Blantyre Sanitation Planning Act – Cap 23.01	Town and country planning; development control, acquisition of land, compensation and development of land
Public Health Act – Cap 34.01	Preservation of public health: prevention of infectious diseases, sanitation and housing, sewerage and drainage
Malawi Housing Corporation Act – Cap 32.02	Establishes the Malawi Housing Corporation
Railways Act – Cap 69.03	Regulates the construction, control, management and operation of railways

Source: Guidelines for Environmental Impact Assessment (EAD, 1997)

(2) EIA Process

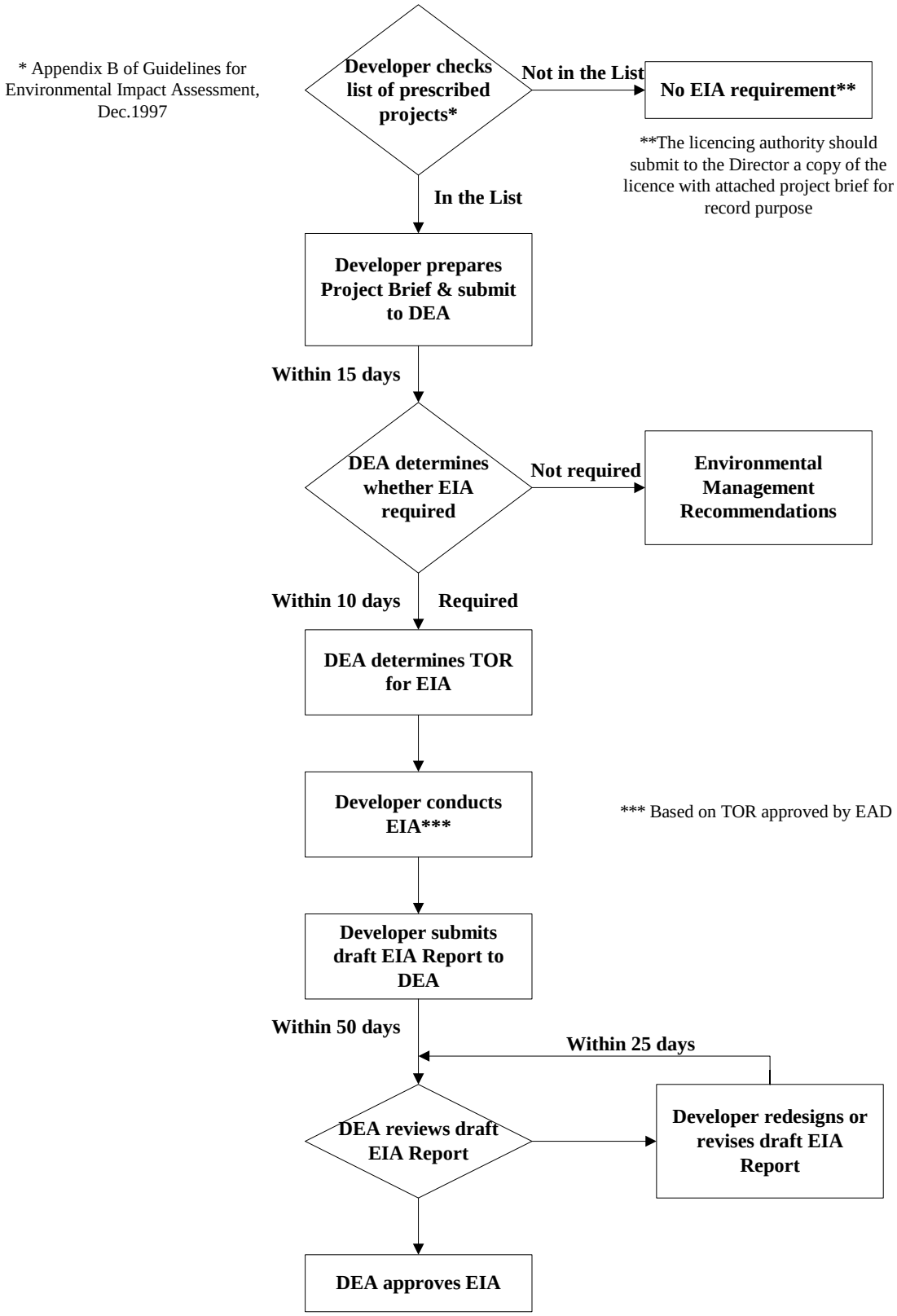
Section 5 of the EMA stipulates that a concerned project is not to be implemented unless the Director of the Environmental Affairs Department (EAD) approves the result of an EIA survey.

The three stages of the EIA process are as follows.

Table 11.3.2 EIA Process

Stage	Description
Screening	A process of determining what projects should be subject to EIA requirements
Scoping	Establishes the principle issues to be addressed in an EIA. This is performed by a project preparation team comprising of the developer and a multi-disciplinary team of experts. The team should ensure that there is public participation in the EIA process.
EIA Study 1. Identification 2. Prediction 3. Evaluation and Interpretation 4. Mitigation 5. Monitoring and Management 6. Report	 What will happen as a result of the project? What will be the extent of the changes brought about by the project? Do the changes matter? What can be done about the changes? What are the monitoring and management plans? How can decision-makers be informed of what needs to be done, given the various alternatives?

Source: Guidelines for Environmental Impact Assessment (EAD, 1997)



Source: Modified by JICA Study Team based on Guidelines for Environmental Impact Assessment (EAD, 1997)

Figure11.3.1 EIA Approval Process

The EIA process starts from the submission of a project brief or project submission documents for a public sector project. In this document, the location, size, number of employees, assumed impacts on environment, etc. must be stated. This suggests that the EIA is applied to projects that have detailed plans. It, however, has no stipulation for plan level activities.

(3) Land Acquisition and Resettlement

Policy and legal framework on land acquisition and resettlement for public infrastructure is drawn from various government policies and pieces of legislation. Basically, land and/or properties such as buildings and trees have to be compensated by the government at market value. The following highlights some related sections in the policy and legal framework:

(i) The Constitution of Republic of Malawi

Section 44(4) highlights that "Expropriation of property shall be permissible only when done for public utility and only when there has been adequate notification and appropriate compensation provided that there shall always be a right to appeal a court of law". The implication of this provision to proposed infrastructure projects is that the government will have to pay fair and adequately compensate for the land/property of the owners, in the event of the need to acquire private land for construction of infrastructures.

(ii) The Malawi National Land Policy

Section 4.16.1 of the Malawi National Land Policy advocates fair compensation at market value to property owners for all classifications of land (whether held under customary land tenure or leasehold) in case such land is acquired for public infrastructure.

(iii) Land Act

Sections 27 and 28 of the Land Act, guarantee landholders with appropriate compensation in the event of disturbance or loss, or damage of assets and interests, on the land. The act also provides procedures of acquisition of one classification of land to another. The process begins with appropriate notification of the existing lessee of the land.

(iv) Land Acquisition Act

The Land Acquisition Act covers comprehensive procedures relating to the acquisition of land by either the government or individuals from any form of land tenure systems in Malawi. The act contains provisions for preliminary investigation, preliminary survey of the area and the procedure to be followed where land should be acquired.

The procedure for land acquisition starts with the issuance of a formal notice to persons who have existing interests on the land. Such notices are issued under Section 6 of this act. Sections 9 and 10 of the act cover the steps for assessment of properties and subsequent procedures for payments of the compensations to the displaced people. Sections 11 to 14 outline the necessary steps for land surveying and

land transfer. The sections also require posting of notices in the government gazette. The responsibility of identifying alternative land for those affected people rests with the government.

(v) Town and Country Planning Act

Sections 63 - 65 recognize the need of appropriate compensations for properties, such as land and building, to owners in case of compulsory acquisition of land for public interest.

(vi) Public Roads Act

Land acquisition is outlined in part II of the Public Road Act. Section 44 provides assessment of compensations which can be paid under this act. The compensations also cover temporary acquisition for construction. Section 45 provides for compensation for conversion of land into public use.

(vii) Forestry Act

The Forestry Act number 11 of 1997 stipulates compensation for trees so that those who are involved in forestry are compensated reasonably for their trees. The government has rules and regulations which stipulates the government rates for compensation of all types of trees. The rates are made under Section 86 of the Forestry Act. These rates are gazetted and the current rates were gazetted in 2006. . Normally, the valuation of private trees are done based on species of trees, measured diameter of breast height and market price in kwacha per cubic meter.

In addition to these policy and legal framework, the National Road Authority has established a guideline and a manual for the road sector, as follows;

- Environmental and Social Management Guidelines in the Road Sector, and
- Health and Safety Manual for the Malawi Road Sector

The organization responsible for land and property valuation for compensation is the National Property Valuation Services under the Department of Lands and Valuation in the Ministry of Land, Housing and Urban Development. A private registered land economy surveyor can do the job once approved by the Commissioner for Lands and Valuation.

The organization responsible for compensation is the GoM through the Commissioner for Lands and Valuation in the Ministry of Land, Housing and Urban Development. Normally the compensation is paid from the project fund. In practice, the District Commissioner pays out compensation to affected property owners.

The compensation must be paid within six months from the date of valuation. After six months, the values of property should be reassessed.

Apart from the provisions stipulated in the policy and legislations above, it is suggested that the illegal vendors along the roadside (within the right of way) are consulted

although there are no legal restrictions on this matter. Through consultation, appropriate place for their business could be determined by the government.

LCC's road department has no experience on resettlement. Meanwhile National Road Authority has resettlement experiences from more than 15 projects without any serious problems.

11.3.2 Environmental and Social Considerations for Priority Projects

(1) Screening of Priority Projects using EAD Guideline

Identified priority projects in each sector are summarized in the table below. (References: Transportation in Chapter 5, Water Supply System in Chapter 7, Sewerage System in Chapter 8, and Solid Waste Management System in Chapter 9)

Table 11.3.3 List of Priority Projects

Sector	Name of Project	Description
Transportation (Road Development)	Widening of M1, M18 Roundabouts	Widening from 2-lane to 4-lane road
	Widening of M1 Mchinji Roundabout	Widening from 2-lane to 4-lane road, Area 18 Roundabout - Paul Kagame Road
	Widening & Improvement of M1 Old Town Area	Widening from 2-lane to 4-lane road including bridge construction
	Improvement of S263	Upgrading to standard road with widening and pavement as 2-lane road
	Widening of Mzimba Street	Widening from 2-lane to 4-lane
	Improvement of Mzimba Street West Extension	Pavement work
	Construction of Old Town Road	New construction with 4-lane, including bridge
	Widening of Kenyatta Road	Widening from 2-lane to 4-lane road
	Construction of Connection Road with Area 25 Market	New construction, Outer Ring Road - Inner urban road in Area 25
	Upgrading to Urban Road in Area 49	Upgrading, Kaunda Road - S260 (2-lane road upgrading)
	Construction of Urban Road in Area 50 & 28 (missing link)	New construction, M1 - Kaunda Road (2-lane road)
	Extension of Urban Road in Area 44 (to Kauma market)	New construction, Chyamba Road extension to Area 44 (2-lane road) Widening to 4-lane
	Improvement of Preliminary Community Road in Area 56 & 62	Pavement, Kauma Road - Mchinji Road
	Upgrading to Urban Road in Area 7 & 8	Upgrading, Kawale Road - Chidzamja Road
	Upgrading to Urban Road in Area 36 & 37	Upgrading, Malangalanga Road – Area 36 Market - M1
	Upgrading to Urban Road in Area 22 & 24	Pavement, Chidzanja Road - Area 24 Market (2-lane road)
	Upgrading to Urban Road in Area 57	Pavement, Circulation road in Area 57 (2-lane road)
	Construction of Primary Community Road to Presidential Drive in Area 47	New construction, connection with Presidential Drive in Area 47 (2-lane paved road)
(Institution)	Capacity Development of Lilongwe City	Capacity development & purchasing of operational equipment
	Development of Road Inventory Database	Establishment of road inventory data for planning
(Public Transport Development)	Rerouting of Minibus Routes	Efficient route formation in terms of cost and users' convenience
(Traffic Management)	Improvement of Intersections	Provision of signal lights for un-signalized intersections, and installation of exclusive right turn

Sector	Name of Project	Description
		lanes
(Traffic Safety)	Development of Safety Traffic Environment	Dissemination of traffic safety education to drivers and local people
(Airport Development)	Modernization of Navigation System	Standardization of navigation system
	Improvement/Modernization of Terminal Facilities for Kamuzu International Airport	Feasibility study for terminal facilities improvement, including strengthening hand luggage handling capacity for passengers
Water Supply System	Development of Diamphwe Dam as New Source	H=22 m, Y=125,000 m3/d A raw water canal from dam site to WTP, Capacity = 1,500 l/s, L = 16 km
	Development of New Water Treatment Plant	WTP capacity = 120,000 m3/d, Develop in 2 phases, each with 60,000 m3/day Most civil structures in Phase 1 will be for final capacity A transmission line of 20.7 km of dia 800 Transmission reservoir Transmission lift pump
	Service Extension and Development	New service connections = 201,000 New kiosks = 2,550 Water meters
	NRW Reduction Program	Both administrative and physical loss detection and reduction program
Sewerage System	Preparation of Sewerage and Sanitation Master Plan	Sector master plan for sanitation and sewerage
	Capacity Building of LCC's Sewerage Service	Organizational improvement and institutional development program, including staff requirement and training
	Tariff Study and Implementation	Sewerage tariff-setting and reintroduction of sewerage tariff
	Sanitation Promotion Campaign	Sanitation awareness and hygiene promotion To be continued for the long term
	Provision of Safe Latrine	Construction of VIP latrines. Total number = 150,000
	Study on On-site Sanitation Management	A study to formulate on-site sanitation management strategy, FS for collection and treatment
	Rehabilitation of Limbudzi STP	Replacement of main collector and re-starting of the STP
Solid Waste Management	Capacity development of institutional organization	Enhancement of organizational capacity to enable LCC to improve the present situation and manage other priority projects
	Procurement of equipment for waste collection and transportation	Collection vehicles such as compactor truck and skip carriers which are urgently required for waste collection will be procured.
	Procurement of equipment for landfill management	Equipment to start landfill management will be procured.
	Pilot project for composting at a community	On-going UNDP project. Promotion of composting through participation of community.
	Program for community activity for cleaning	Involvement of community in managing their waste. It is intended to remind their responsibility in SWM.

Source: JICA Study Team

Some projects listed in the above table, such as the capacity development project, will not require EIA. The Director of EAD determines whether EIA is necessary or not by evaluating the project brief which is prepared and submitted by the concerned project owner/implementing agency.

Necessity of project brief is screened through the prescribed lists in Appendix B of the Guidelines for Environmental Impact Assessment (EAD, 1997). The projects for which EIA is mandatory are listed in List A and those for which it may be required are listed in List B. The following table shows the necessity of project briefs for priority projects.

Table 11.3.4 Necessity of Project Brief

Sector	Name of Project	Implementing Agency	Prescribed List (A)*	Prescribed List (B)**	Necessity of Project Brief
Transportation (Road Development)	Widening of M1, M18 Roundabout	RA	A.4.5		✓
	Widening of M1 Mchinji Roundabout	RA	A.4.5		✓
	Widening & Improvement of M1 Old Town Area	RA	A.4.5		✓
	Improvement of S263	RA & LCC		B.5.2	✓
	Widening of Mzimba Street	RA & LCC	A.4.5		✓
	Improvement of Mzimba Street West Extension	RA & LCC		B.5.2	✓
	Construction of Old Town Road	RA	A.4.5		✓
	Widening of Kenyatta Road	RA	A.4.5		✓
	Construction of Connection Road with Area 25 Market	LCC	A.4.5		✓
	Upgrading to Urban Road in Area 49	LCC		B.5.2	✓
	Construction of Urban Road in Area 50 & 28 (missing link)	LCC	A.4.5		✓
	Extension of Urban Road in Area 44 (to Kauma market)	RA	A.4.5		✓
	Improvement of Preliminary Community Road in Area 56 & 62	RA/MoLHUD		B.5.2	✓
	Upgrading to Urban Road in Area 7 & 8	LCC		B.5.2	✓
	Upgrading to Urban Road in Area 36 & 37	LCC		B.5.2	✓
	Upgrading to Urban Road in Area 22 & 24	LCC		B.5.2	✓
	Upgrading to Urban Road in Area 57	MoLHUD		B.5.2	✓
	Construction of Primary Community Road to Presidential Drive in Area47	MoLHUD	A.4.5		✓
(Institution)	Capacity Development of Lilongwe City	RA			
	Development of Road Inventory Database	RA			
(Public Transport Development)	Rerouting of Minibus Routes	MOAM, LCC			
(Traffic Management)	Improvement of Intersections	National Road Safety Council, LCC		B.5.2	✓
(Traffic Safety)	Development of Safety Traffic Environment	National Road Safety Council, LCC			
(Airport Development)	Modernization of Navigation System	MoTPI			
	Improvement/Modernization of Terminal Facilities for Kamuzu	MoTPI		B.5.5	✓

Sector	Name of Project	Implementing Agency	Prescribed List (A)*	Prescribed List (B)**	Necessity of Project Brief
	International Airport				
Water Supply System	Development of Diamphwe Dam as New Source	LWB	A.3.5 A.3.6		✓
	Development of New Water Treatment Plant	LWB	A.3.2 A.3.3 A.3.4		✓
	Service Extension and Development	LWB			
	NRW Reduction Program	LWB			
Sewerage System	Preparation of Sewerage and Sanitation Master Plan	MIWD			
	Capacity Building of LCC's Sewerage Service	LCC			
	Tariff Study and Implementation	LCC			
	Sanitation Promotion Campaign	MIWD			
	Provision of Safe Latrine	MIWD/LCC			
	Study on On-site Sanitation Management	LCC			
	Rehabilitation of Limbudzi STP	LCC	A.4.3		✓
Solid Waste Management	Capacity development of institutional organization	LCC			
	Procurement of equipment for waste collection and transportation	LCC			
	Procurement of equipment for landfill management	LCC			
	Pilot project for composting at a community	UNDP, LCC, NGOs			
	Program for community activity for cleaning	LCC			

*: Prescribed List (A) is a list of projects for which EIA is mandatory in the LIST A of the Appendix B of Guidelines for Environmental Impact Assessment.

**: Prescribed List (B) is a list of projects for which EIA may be required in the LIST B of Appendix B of Guidelines for Environmental Impact Assessment.

* Note: RA: Roads Authority
MOAM: Minibus Owners Association of Malawi
MoTPI: Ministry of Transport and Public Infrastructure
LCC: Lilongwe City Council
MoLHUD: Ministry of Land, Housing and Urban Development
MIWD: Ministry of Irrigation and Water Development
A.3.2 Construction of new water pipelines or canals longer than 1 km, where the cross-sectional area is greater than 20 square metres and the volume of water to be carried will be greater than 50 cubic metres per second.
A.3.3 Water pumping stations adjacent to lakes, rivers, and reservoirs which withdraw more than 2 cubic metres per second
A.3.4 Drinking water supply scheme to serve a population of greater than 10,000 people, or expansions of existing schemes to serve such a population, or water reticulation networks with more than 10 kilometres of pipeline
A.3.5 Area of greater than 100 ha, or expansion of existing reservoirs by greater than 500,000 liters or greater than 100 ha
A.3.6 Construction or expansion of dams with a height of 4.5 m or higher
A.4.5 Construction of new highways and feeder roads or expansion of existing highways and feeder roads
B.5.2 Major roads and highways
B.5.5 Airports and airport facilities

Source: JICA Study Team

(2) Scoping of Screened Priority Projects

There are 23 priority projects, for which project briefs will be required. If a full-scale EIA is required after submission of the Project Brief, an EIA-level study has to be conducted by the project owner/implementing agency after completion of this MP Study. The period for conducting EIA is indicated in Section 2.2.2 of the Guidelines for EIA, December, 1997 (page 8): "EIA should be undertaken during pre-feasibility or early feasibility studies of a project. For public sector projects, this will be during Stage 3 or 4 of NEC's project appraisal process."

The 23 priority projects were classified and grouped together in terms of project nature, as scoping outcome would be similar. Then, the project groups were reviewed to determine whether IEE is required or not. In this Study, IEE was conducted using scoping matrix. These scoping results will facilitate development of a full-scale EIA when conducted.

In transportation, 20 related screened projects were grouped into four types, namely new road construction, road widening including upgrading, road pavement including rehabilitation, and feasibility study. The feasibility study group was not selected for scoping because it is just a study and not a construction project. Therefore only the three types were selected for scoping.

In water supply system, two screened priority projects were grouped into ongoing project. The feasibility study including EIA study is now ongoing under the National Water Development Project II (NWDP II) funded by World Bank. Therefore, these were not selected for scoping in this MP Study.

In sewerage system, there is only one screened priority project. This project is ongoing under LCC financing. However, no information is available regarding its EIA study so far. Therefore, this was selected for scoping.

As a result, three types of transportation projects and one type of sewerage project are subject to scoping as IEE-level study. This is in compliance with the Guidelines for EIA and JICA guidelines for environmental and social considerations, as well as other related laws, policies and guidelines on environmental considerations listed in Table 11.1.1.

Table 11.3.5 Grouping of Screened Priority Projects for Scoping

Sector	Name of Project	Description	Type of Project	Scoping
Transportation	Construction of Old Town Road	New construction with 4-lane including bridge	New road construction	✓
	Construction of Connection Road with Area 25 Market	New construction, Outer Ring Road - Inner urban road in Area 25		
	Construction of Urban Road in Area 50 & 28 (missing link)	New construction, M1 - Kaunda Road (2-lane road)		
	Extension of Urban Road in Area 44 (to Kauma market)	New construction, Chyamba Road extension to Area 44 (2-lane road) Widening to 4-lane		
	Construction of Primary Community Road to	New construction, connection with Presidential Drive in Area47 (2 lane		

Sector	Name of Project	Description	Type of Project	Scoping
	Presidential Drive in Area47	paved road)		
	Construction of Primary Community Road to Presidential Drive in Area47	New construction, connection with Presidential Drive in Area47 (2 lane paved road)		
	Widening of M1, M18 Roundabout	Widening from 2-lane to 4-lane road	Road widening including upgrading	✓
	Widening of M1 Mchinji Roundabout	Widening from 2-lane to 4-lane road, Area 18 Roundabout - Paul Kagame Road		
	Widening & Improvement of M1 Old Town Area	Widening from 2-lane to 4-lane road including bridge construction		
	Widening of Mzimba Street	Widening from 2-lane to 4-lane		
	Improvement of S263	Upgrading to standard road with widening and pavement as 2-lane road		
	Widening of Kenyatta Road	Widening from 2-lane to 4-lane road		
	Upgrading to Urban Road in Area 7 & 8	Upgrading, Kawale Road - Chidzamja Road		
	Upgrading to Urban Road in Area 36 & 37	Upgrading, Malangalanga Road - Area36 Market - M1		
	Improvement of Intersections	Provision of signal lights for un-signalized intersection, and installation of exclusive right turn lanes		
	Improvement of Mzimba Street West Extension	Pavement work	Road pavement including rehabilitation	✓
	Improvement of Preliminary Community Road in Area 56 & 62	Pavement, Kauma Road - Mchinji Road		
	Upgrading to Urban Road in Area 22 & 24	Pavement, Chidzanja Road - Area 24 Market (2-lane road)		
	Upgrading to Urban Road in Area 57	Pavement, Circulation road in Area 57 (2-lane road)		
	Improvement/Modernization of Terminal Facilities for Kamuzu International Airport	Feasibility study for terminal facilities improvement including strengthening hand luggage handling capacity for passengers	Feasibility study	
Water Supply System	Development of Diamphwe Dam as New Source	H=22 m, Y=125,000 m3/d Develop in 2 phases, each with 62,500 m3/d. Most civil structures in phase 1 will be for final capacity A raw water canal from dam site to WTP, Capacity = 1,500 l/s, L = 16 km	Ongoing project	
	Development of New Water Treatment Plant	WTP capacity = 120,000 m3/d, Develop in 2 phases, each with 60,000 m3/d. Most civil structures in phase 1 will be for final capacity A transmission line of 20.7 km of dia 800 Transmission reservoir Transmission lift pump		
Sewerage System	Rehabilitation of Limbudzi STP	Replacement of main collector and re start of the STP	Rehabilitation of STP (Ongoing project)	✓

Source: JICA Study Team

(3) Environmental and Social Considerations at IEE Level (Scoping)

Based on the above discussion, environmental and social considerations at IEE level was carried out using scoping matrix. The results are shown in the tables below.

Table 11.3.6 Matrix for Scoping (New Road Construction)

	No.	Likely Impacts	Overall Rating	Planning Phase		Construction Phase						Operation Phase		
				Land acquisition	Change of Land use plan, Control of various activities by regulations for the construction	Reclamation of Wetland, etc.	Deforestation	Alteration to ground by cut land, filling, drilling, tunnel, etc.	Operation of Construction Equipment and Vehicles	Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities	Traffic Restriction in construction area	Increase of Through Traffic	Appearance/ Occupancy of Roads and related building structures	Increasing influx of settlers
Social Environment: *Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.	1	Involuntary Resettlement	B	B										
	2	Local economy such as employment and livelihood, etc.	B	B	B					B	B	B	B	B
	3	Land use and utilization of local resources	B	B	B									B
	4	Social institutions such as social infrastructure and local decision-making institutions												
	5	Existing social infrastructures and services	B							B				
	6	The poor, indigenous and ethnic people												
	7	Misdistribution of benefit and damage												
	8	Cultural heritage												
	9	Local conflict of interests												
	10	Water Usage or Water Rights and Rights of Common												
	11	Sanitation	B					B	B	B				C
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS	B					B	B	B	B			
Natural Environment	13	Topography and Geographical features												
	14	Soil Erosion												
	15	Groundwater												
	16	Hydrological Situation												
	17	Coastal Zone												
	18	Flora, Fauna and Biodiversity												
	19	Meteorology												
	20	Landscape	B					B						
	21	Global Warming												
Pollution	22	Air Pollution	B						B	B		B		
	23	Water Pollution	B				B	B		B				B
	24	Soil Contamination												
	25	Waste	B				B	B		B				B
	26	Noise and Vibration	B					B	B	B		B		
	27	Ground Subsidence												
	28	Offensive Odor	B							B				
	29	Bottom sediment												
	30	Accidents	B					B	B			B		B

Rating:
A: Serious impact is expected.
B: Some impact is expected.
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
No Mark: No impact is expected. IEE/EIA is not necessary.

Reference:
1) Japan International Cooperation Agency (1992) "III Roads: Environmental Guidelines for Infrastructure Projects", Tokyo, Japan.
2) Norman Lee and Clive George (2002) "Environmental Assessment in Developing and Transitional Countries", JOHN WILEY & SONS, LTD., London, England.

Source: JICA Study Team

Table 11.3.7 Matrix for Scoping (Widening Road)

	No.	Likely Impacts	Overall Rating	Planning Phase		Construction Phase						Operation Phase		
				Land acquisition	Change of Land use plan, Control of various activities by regulations for the construction	Reclamation of Wetland, etc.	Deforestation	Alteration to ground by cut land, filling, drilling, tunnel, etc.	Operation of Construction Equipment and Vehicles	Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities	Traffic Restriction in construction area	Increase of Through Traffic	Appearance/ Occupancy of Roads and related building structures	Increasing influx of settlers
Social Environment: *Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.	1	Involuntary Resettlement	B	B										
	2	Local economy such as employment and livelihood, etc.	B	B	B					B	B	B	B	B
	3	Land use and utilization of local resources	B	B	B									B
	4	Social institutions such as social infrastructure and local decision-making institutions												
	5	Existing social infrastructures and services	B							B				
	6	The poor, indigenous and ethnic people												
	7	Misdistribution of benefit and damage												
	8	Cultural heritage	C							C				
	9	Local conflict of interests												
	10	Water Usage or Water Rights and Rights of Common												
	11	Sanitation	B					B	B	B				C
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS	B					B	B	B	B			
Natural Environment	13	Topography and Geographical features												
	14	Soil Erosion												
	15	Groundwater												
	16	Hydrological Situation	C							C				
	17	Coastal Zone												
	18	Flora, Fauna and Biodiversity												
	19	Meteorology												
	20	Landscape	B				B							
	21	Global Warming												
Pollution	22	Air Pollution	B						B	B		A		
	23	Water Pollution	B				B	B		B				B
	24	Soil Contamination												
	25	Waste	B				B	B		B				B
	26	Noise and Vibration	B				B	B	B	B		B		
	27	Ground Subsidence												
	28	Offensive Odor	B						B					
	29	Bottom sediment												
	30	Accidents	B					B	B			B		B

Rating:
A: Serious impact is expected.
B: Some impact is expected.
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
No Mark: No impact is expected. IEE/EIA is not necessary.

Reference:
1) Japan International Cooperation Agency (1992) "III Roads: Environmental Guidelines for Infrastructure Projects", Tokyo, Japan.
2) Norman Lee and Clive George (2002) "Environmental Assessment in Developing and Transitional Countries", JOHN WILEY & SONS, LTD., London, England.

Source: JICA Study Team

Table 11.3.8 Matrix for Scoping (Pavement)

	No.	Likely Impacts	Overall Rating	Planning Phase		Construction Phase						Operation Phase		
				Land acquisition	Change of Land use plan, Control of various activities by regulations for the construction	Reclamation of Wetland, etc.	Deforestation	Alteration to ground by cut land, filling, drilling, tunnel, etc.	Operation of Construction Equipment and Vehicles	Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities	Traffic Restriction in construction area	Increase of Through Traffic	Appearance/ Occupancy of Roads and related building structures	Increasing influx of settlers
Social Environment: *Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.	1	Involuntary Resettlement												
	2	Local economy such as employment and livelihood, etc.												
	3	Land use and utilization of local resources	B											B
	4	Social institutions such as social infrastructure and local decision-making institutions												
	5	Existing social infrastructures and services	B							B				
	6	The poor, indigenous and ethnic people												
	7	Misdistribution of benefit and damage												
	8	Cultural heritage												
	9	Local conflict of interests												
	10	Water Usage or Water Rights and Rights of Common												
	11	Sanitation	B					B	B	B				C
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS	B					B	B	B	B			
Natural Environment	13	Topography and Geographical features												
	14	Soil Erosion												
	15	Groundwater												
	16	Hydrological Situation												
	17	Coastal Zone												
	18	Flora, Fauna and Biodiversity												
	19	Meteorology												
	20	Landscape												
	21	Global Warming												
Pollution	22	Air Pollution	B									B		
	23	Water Pollution	B				B	B		B				B
	24	Soil Contamination												
	25	Waste	B							B				B
	26	Noise and Vibration	B						B	B		B		
	27	Ground Subsidence												
	28	Offensive Odor												
	29	Bottom sediment												
	30	Accidents	B					B	B			B		B

Rating:
A: Serious impact is expected.
B: Some impact is expected.
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
No Mark: No impact is expected. IEE/EIA is not necessary.

Reference:
1) Japan International Cooperation Agency (1992) "III Roads: Environmental Guidelines for Infrastructure Projects", Tokyo, Japan.
2) Norman Lee and Clive George (2002) "Environmental Assessment in Developing and Transitional Countries", JOHN WILEY & SONS, LTD., London, England.

Source: JICA Study Team

Table 11.3.9 Matrix for Scoping (Sewerage Treatment Plant)

	No.	Likely Impacts	Overall Rating	Planning Phase		Construction Phase			Operation Phase		
				Land acquisition	Change of Land use plan, Restriction of Various Activities by constructing new facilities	Reclamation from Ground, etc.	Construction of Sewer pipes, Pumping stations, Sewage/ Sludge treatment plants, etc.	Operation of Construction Equipment and Vehicles	Conveyance of Sewage into facilities	Drainage	Treatment of Sewage such as Aeration, Concentration, Drying, Incineration, etc.
Social Environment: *Regarding the impacts on "Gender" and "Children's Right", might be related to all criterion of Social Environment.	1	Involuntary Resettlement									
	2	Local economy such as employment and livelihood, etc.									
	3	Land use and utilization of local resources									
	4	Social institutions such as social infrastructure and local decision-making institutions									
	5	Existing social infrastructures and services	B						B		B
	6	The poor, indigenous and ethnic people									
	7	Misdistribution of benefit and damage	B				B	B	B	B	B
	8	Cultural heritage									
	9	Local conflict of interests									
	10	Water Usage or Water Rights and Rights of Common									
	11	Sanitation	B				B	B			
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS	B				B	B			
Natural Environment	13	Topography and Geographical features									
	14	Groundwater	B				B	B			
	15	Soil Erosion									
	16	Hydrological Situation	B								B
	17	Coastal Zone									
	18	Flora, Fauna and Biodiversity									
	19	Meteorology									
	20	Landscape									
	21	Global Warming									
Pollution	22	Air Pollution	B				B	B			B
	23	Water Pollution	B				B	B			B
	24	Soil Contamination	B				B	B			B
	25	Waste	B				B	B			B
	26	Noise and Vibration	B				B	B			
	27	Ground Subsidence									
	28	Offensive Odor	B								B
	29	Bottom sediment	B								B
	30	Accidents	B					B			B

Rating:
A: Serious impact is expected.
B: Some impact is expected.
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
No Mark: No impact is expected. IEE/EIA is not necessary.

Reference:
1) Japan International Cooperation Agency (1992) "VII Sewerage: Environmental Guidelines for Infrastructure Projects", Tokyo, Japan.
2) Norman Lee and Clive George (2002) "Environmental Assessment in Developing and Transitional Countries", JOHN WILEY & SONS, LTD., London, England.

Source: JICA Study Team

(4) Recommendations for Mitigation Measures

Based on the four scoping activities as shown above, no serious impacts are expected from these projects. However, some of the major impacts are resettlement/land acquisition, local economy and cutting street trees. The following are detailed impacts and corresponding recommendations for mitigation measures.

(i) Resettlement/Land Acquisition

Some resettlements and/or land acquisitions are expected in new road projects and road widening projects. The scale of these are, however, not large. According to an interview with an environmental planner in Roads Authority, there were no serious problems in resettlement in the past projects. However, it is recommended to conduct public consultation with Project Affected Persons (PAPs) as well as with local residents so that they can understand the project benefits and their positive impacts.

(ii) Local Economy

Some impacts on the local economy are expected. The following cases are expected.

Illegal Vendors

There are illegal vendors in front of the Central Post Office along M1 road. They are selling souvenirs, handicrafts and so on. There are around 65 vendors and some have been working there for more than 20 years.

Consultation with the vendors and introduction of a new place for their businesses are recommended in spite of the fact that they are illegal.

Parking

Right of way is stipulated in the Road Act. Some road sections have service roads beside the main roads and within the right of way. In such case, service roads are being used as parking spaces. In compliance with laws and regulations in Malawi, there are no obstacles in utilizing these service roads for road widening projects. However, it is recommended to conduct public consultations with local residents and business owners with regards to parking. Besides, it is essential for them to understand the legal basis and necessity of the project.

(iii) Cutting Street Trees

Cutting street trees might have some impact on the natural environment and landscape. In the past experience of a road project in Blantyre under Japanese Grant Aid, there were some complaints from the local residents about cutting street trees. Therefore, it is recommended that during the design phase of the road, special consideration should be given in keeping the existing street trees as much as possible by adjusting the road alignment, etc. In unavoidable cases, re-planting of trees should be done.

CHAPTER 12

URBAN DEVELOPMENT PROGRAM

CHAPTER 12 URBAN DEVELOPMENT PROGRAM

12. 1 Development Program

12.1.1 Programs and Sub-Programs

This chapter presents the urban development programs of Lilongwe City, which are based on the development strategy discussed in Chapter 4, Section 4.1.3. The development program consists of four components as follows:

a) Public Administration Enhancement Program for Urban Management,

b) Urban Living Environment Improvement Program,

c) Economic Infrastructure Enhancement Program for Economic Growth, and

d) Urban Environment Enhancement Program for Creation of Attractive Capital City

The first program relates to good governance of urban development, which is primarily intended to strengthen the capacity of the relevant stakeholders including LCC, in the areas of urban planning and management. The second focuses on the basic requirements for better living environment conditions in THA and unplanned settlement, and on public services and infrastructures for planned residential areas. The third consists of the main transportation infrastructure and utility development projects that are needed for the economic development of the City. The last matches with the concept of abundant greenery that should be maintained to enhance attractiveness of the city.

Each program is comprised of two sub-programs, hence, a total of eight sub-programs. Figure 12.1.1 describes the relationship between the development strategy and program, and sub-programs constituting each program. The programs and their respective sub-programs are as follows:

a) Public Administration Enhancement Program

1-1 Institutionalization of the Urban Development Master Plan: This sub-program should be given the first priority since legal arrangement for the land use plan proposed in the master plan and review of the master plan should be prerequisites to the implementation of other programs/sub-programs.

1-2 Capacity Development for Effective Urban Management: This aims to ensure good governance of urban development by implementing institutional strengthening of LCC as the implementer of urban development and management activities.

b) Urban Living Environment Improvement Program

2-1 Living Environment Improvement in THA and Unplanned Settlement: This should be absolutely necessary for the upgrading of both areas into statutory housing areas. THA, which is categorized as high density residential area, should be reshaped with the provision of better community infrastructure. Meanwhile, an unplanned settlement needs gradual upgrading of its living environment to be classified as quasi-residential area.

2-2 Transportation and Urban Utility Services Upgrading: This aims to provide better access to the Old Town and City Centre, and improve utility services at the level of the community.

c) Economic Infrastructure Enhancement Program

3-1 Urban Transportation Capacity Strengthening: This sub-program encompasses main road development and traffic management, primarily for the economic development of the city.

3-2 Urban Utility Improvement: This sub-program caters for water resources development and sanitation improvement in order to cope with the growing urban population in Lilongwe.

d) Urban Environment Enhancement Program

4-1 Park and Green Development: This aims to initiate better management of recreational places for people in Lilongwe and good landscaping of the capital city.

4-2 Natural Greenery Preservation: This aims to increase greenery areas in order to comply with the concept of abundant greenery.

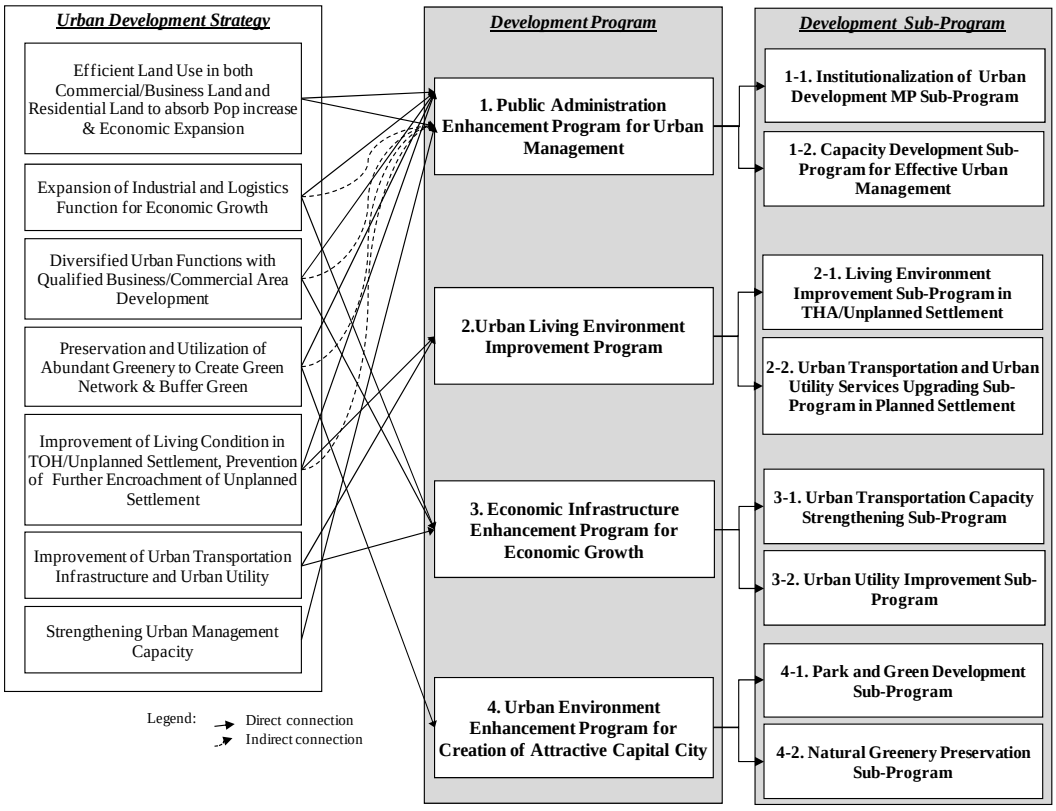


Figure 12.1.1 Plan for Necessary Development Program for Urban Development of Lilongwe

12.1.2 Sub-Programs and Projects

The schematic relationship between sub-programs and projects are illustrated in Figure 12.1.2. The two sub-programs (1-1 and 1-2) under the public administration enhancement program are comprised of projects necessary to ensure good governance of urban planning and development management. The two sub-programs (2-1 and 2-2) under urban living environment improvement program consist of basic requirements for upgrading the status of THA and unplanned settlement, and transportation/utility services at the community level. The projects under the sub-programs (3-1 and 3-2) are comprised of major infrastructure and utility works for economic development in the city. Finally, projects under the two sub-programs (4-1 and 4-2) are those that contribute to the concept of abundant greenery.

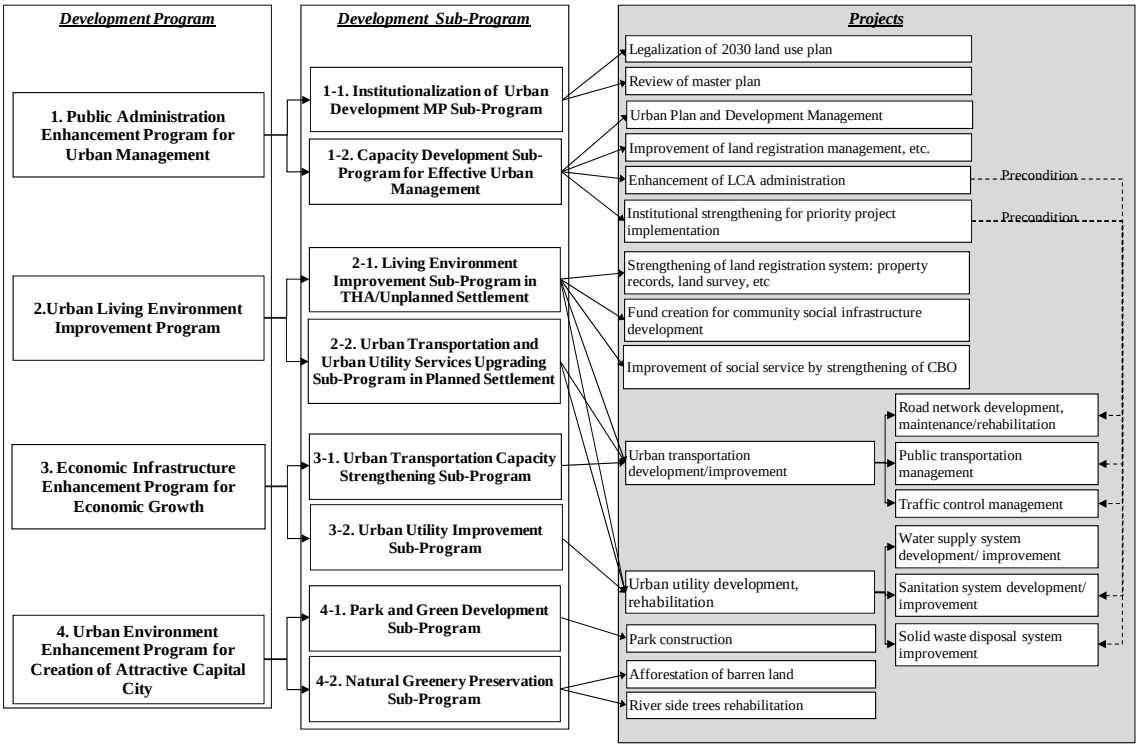


Figure 12.1.2 Necessary Projects for the Development Program Implementation

12. 2 Development Projects

12.2.1 Project Formation

The development projects by program are shown in Table 12.2.1 through 12.2.4. Brief descriptions of the projects are presented under the sub-programs below.

1-1 Institutionalization of the Urban Development Master Plan

1-1(1) Legalization of the 2030 land use plan: The purpose of this project is to legalize the 2030 land use plan proposed in the master plan. Top and urgent priority is given to this project. The new land use plan, which could be called “the 2010 Outline Zoning

Scheme", needs approval from the Planning Committee and the minister responsible for town and country planning.

1-1(2) Review of master plan: This aims to update the 2010 Outline Zoning Scheme and infrastructure plan, if necessary. Its review is expected to be implemented in 2016 and 2021.

1-2 Capacity Development for Effective Urban Management

1-2(1) Urban plan and management: The project consists of i) institutional arrangement for planning coordination and implementation, ii) improvement of the existing Planning Standards and Guidelines, and iii) improvement of enforcement system for development (land use) and building control.

1-2(2) Improvement of land registration management: The purpose of the project is to upgrade and legalize the status of THA and unplanned settlements to achieve the status as housing areas, in line with the 2010 Outline Zoning Scheme. The project consists of i) legal arrangement for a Housing Bill to determine an authority that will manage both areas, ii) establishment of a land registration system in THA and unplanned settlements, and iii) registration of customary tenure.

1-2(3) Enhancement of LCC administration: The purpose of this project is to strengthen the administrative structure of LCC, including streamlining of staff members and human resource development. This could be prerequisite to the implementation of other projects, and hence, its early implementation by LCC is a must.

1-2(4) Institutional strengthening for priority projects' implementation: This project primarily aims at empowerment of the Engineering Department for road development and sewerage treatment, and the Health and Community Services for solid waste collection in the areas of planning, construction and maintenance.

2-1 Living Environment Improvement in THA and Unplanned Settlement

2-1(1) Strengthening of land registration system: The purpose of this project is to equip LCC with basic tools for land registration in THA and unplanned settlement. Basic tools are i) topographic/cadastral mapping and GIS data, ii) land record holding system, iii) computerization of sub-division/plot allocation plans and iv) information management system for i) to iii).

2-1(2) Fund creation for community social infrastructure development: The fund is to be created through land adjustment for the upgrading of plots in THA and unplanned settlement. The purpose of the project is to create and manage the fund. The project needs legal arrangements for fund creation.

2-1(3) Improvement of social services by strengthening CBO: The purpose of this project is to implement social services through community-based organizations. This aims to achieve cost-effective implementation of public services by private organizations and creation of formal sector employment.

2-1(4) Urban transportation development/improvement; community road improvement in THA and unplanned settlement: This project aims at i) the improvement of urban roads, ii) upgrading of primary community roads, and iii) maintenance and

rehabilitation of i) and ii).

2-1(5) Urban utility development, rehabilitation and expansion; water kiosk development; provision of safe latrine; and community activity for clean facilities in THA and unplanned settlement: This project consists of a package for water supply, sanitation and solid waste management in THA and unplanned settlement.

2-2 Transportation and Urban Utility Services Upgrading

2-2(1) Urban road construction, maintenance/rehabilitation and inventory database: This project aims at urban and primary community road construction, O&M and preparation of database, which LCC administers. This could be subject to implementation of 1-2(4).

2-2(2) Public transportation improvement: This project consists of i) expansion of minibus depot in the Old Town and ii) review of minibus operations and routes in order to improve public bus transportation services.

2-2(3) Traffic control management establishment: This project targets all roads in the city in terms of i) traffic safety master plan, ii) safe pedestrian network, and iii) cycle road network.

2-2(4) Water supply system development and improvement: This project is comprised of i) water service extensions (house connection and water kiosk) and ii) reduction of non-revenue water.

2-2(5) Sanitation system improvement: The project is comprised of a comprehensive package for i) a sanitation master plan, ii) sanitation promotion campaign, and iii) study on on-site sanitation management outside public sewer service area.

2-2(6) Solid waste disposal system improvement: This project consists of i) procurement of equipment for solid waste collection including training of LCC staff members on waste collection, and ii) training on landfill site operation.

3-1 Urban Transportation Capacity Strengthening

3-1(1) Major road development: This project is comprised of road improvement construction of north-south axis (M1), ring road and radial road.

3-1(2) Traffic control management: The purpose of the project is to alleviate traffic congestion at major road intersections and commercial areas, through the improvement of intersections and provision of car parking system.

3-1(3) Other transportation improvement: The project contributes to the modernization of navigation system and improvement of baggage handling system at Kamuzu International Airport.

3-2 Urban Utility Improvement

3-2(1) Water supply system development and improvement: The project is comprised of the i) Diamphwe Dam development and ii) development of new water treatment plant.

3-2(2) Sanitation system improvement: The project consists of the i) rehabilitation of Lumbadzi Sewerage Treatment Plant and ii) sewerage tariff study.

4-1 Park and Green Development

4-1(1) Park construction: The project is comprised of construction of eight parks, which LCC currently plans. Since the project includes involvement of CBOs in parks' management, said project is closely related to 2-1(3).

4-2 Natural Greenery Preservation

4-2(1) Afforestation of 1,520 ha barren land in Area 45 and 54 (Lumbadzi): The project involves converting the barren land (1,520 ha) into a forestry area. The project is comprised of the implementation and O&M of forestation activities.

4-2(2) River side trees rehabilitation: The project is comprised of the implementation of tree planting and its operation along river sides.

Table 12.2.1 Priority Project for Public Administration Enhancement Program

Sub-Program	Project	Implementation Schedule			Resp. Organization		Dev. Cost	
		-2015	-2020	-2030	Implem-entation	Ope./ mainte.	MKW billion	US$ million
1-1. Institutionalization of Urban Development MP Sub-Program	1-1 (1) Legalization of 2030 land use plan	■			LCA/ MoLHUD	-	0.004	0.03
	1-1 (2) Review of master plan		review	review	LCA	-	0.029	0.20
1-2. Capacity Development Sub-Program for Effective Urban Management	1-2 (1) Urban Plan and Development Management	■			MoLGRD/ LCA	-	0.401	2.80
	1-2 (2) Improvement of land registration management	■	■		LCA/ MoLHUD	-	0.009	0.06
	1-2 (3) Enhancement of LCA administration (New public administration, streamlining of LCA staff and HRD)	■	■		LCA	-	0.009	0.06
	1-2 (4) Institutional strengthening for priority project implementation	■			LCA	-	0.014	0.10
						Total	0.47	3.3

Table 12.2.2 Priority Project for Urban Living Environment Improvement Program

Sub-Program	Project	Implementation Schedule			Resp. Organization		Dev. Cost	
		-2015	-2020	-2030	Implem-entation	Ope./ mainte.	MKW billion	US$ million
2-1. Living Environment Improvement Sub-Program in THA/Unplanned Settlement	2-1 (1) Strengthening of land registration system: property records, land survey, etc	■	■	■	LCA	-	0.014	0.10
	2-1 (2) Fund creation for community social infrastructure development	■			LCA	NGO	0.007	0.05
	2-1 (3) Improvement of social service by strengthening of CBO	■			LCA	CBO	0.007	0.05
	2-1 (4) Transportation development/improvement; Community road improvement in THA/unplanned settlement	■			MoLHUD/ LCA	MoLHUD/ LCA	3.468	24.20
	2-1 (5) Urban utility development, rehabilitation, expansion; water kiosk development, provision of safe latrine, composting & cleaning education in THA/unplanned settlement	■	■	■	MoIWD/ LWB/LCA	NGO	6.492	45.30
2-2. Urban Transportation and Urban Utility Services Upgrading Sub-Program in Planned Settlement	Urban transportation development/improvement							
	2-2 (1) Urban road development & maintenance and inventory database	■	■	■	LCA/RA	LCA/RA	12.210	85.20
	2-2 (2) Public transportation improvement (Expansion of Minibus Depot in Old Town, Review of Minibus Operation and Routes)	■			LCA	LCA/MOAM	0.115	0.80
	2-2 (3) Traffic control management establishment (Development of Safety Traffic Master Plan, Development of Safe Pedestrian Network, Development of Cycle Road Network)	■	■	■	LCA/ NRSCM	LCA	2.293	16.00
	Urban utility development, rehabilitation, expansion							
	2-2 (4) Water supply system development/ improvement (Service extension and development, NRW reduction program)	■	■	■	LWB/CBO	LWB/CBO	4.342	30.30
	2-2 (5) Sanitation system improvement (Preparation of sewerage and sanitation master plan, Sanitation promotion campaign, Study on on-site sanitation (OSS) management)	■	■	■	MoIWD/LCA	-	2.185	15.25
	2-2 (6) Solid waste disposal system improvement (Procurement of equipment for waste collection, transportation, dumping, pilot project for composting and community activity for cleaning)	■	■	■	LCA	LCA	5.059	35.30
						Total	36.19	252.6

Note: MoLHUD(Ministry of Land, Housing and Urban Development, MoIWD (Ministry of Irrigation and Water Development), NRSCM(National Road Safety Council of Malawi), CBO(Community based Organization),MOAM(Minibus Owners Association of Malawi)

Table 12.2.3 Priority Project for Economic Infrastructure Enhancement Program for Economic Growth

Sub-Program	Project	Implementation Schedule			Resp. Organization		Dev. Cost	
		-2015	-2020	-2030	Implem-entation	Ope./ mainte.	MKW billion	US$ million
3-1. Urban Transportation Capacity Strengthening Sub-Program	Urban transportation development/improvement							
	3-1 (1) Major road development & maintenance (M1, Ring, Radial)				RA	RA	18.258	127.40
	3-1 (2) Traffic control management establishment (Improvement of Intersections, Improvement of Car Parking System)				RA/LCA	RA/LCA	0.688	4.80
	3-1 (3) Other transportation improvement (Modernization of Airport Navigation System, Improvement of Airport Baggage Handling System)				MoTPI	ADL	1.003	7.00
3-2. Urban Utility Improvement Sub-Program	Urban utility development, rehabilitation, and expansion							
	3-2 (1) Water supply system development/ improvement (Development of Diamphwe Dam as new source, Development of new water treatment plant)				MoIWD/LWB	LWB	3.153	22.00
	3-2 (2) Sanitation system improvement(Rehabilitation of Lumbadzi STP)				LCA		0.036	0.25
						Total	23.14	161.5

Note: MoTPI (Ministry of Transportation, Public Infrastructure), MoIWD (Ministry of Irrigation and Water Development), ADL(The Airport Development Limited), NRSCM(National Road Safety Council of Malawi)

Table 12.2.4 Priority Project for Urban Environment Enhancement Program for Creation of Attractive Capital City

Sub-Program	Project	Implementation Schedule			Resp. Organization		Dev. Cost	
		-2015	-2020	-2030	Implem-entation	Ope./ mainte.	MKW billion	US$ million
4-1. Park and Green Development Sub-Program	4-1 (1) Park construction (1 area park, 6 neighborhood park, 1children park)				LCA	LCA	0.006	0.04
4-2. Natural Greenery Preservation Sub-Program	4-2 (1) Afforestation of 1,520ha barren land in area 45 and 54 (Lumbazi)				LCA	LCA	0.100	0.70
	4-2 (2) River side trees rehabilitation				LCA	LCA	0.004	0.03
						Total	0.11	0.77
						Grand Total	59.9	418

Source: JICA Study Team

The list of projects presented in the above four tables is based on the priority projects formulated in the respective sector plan in Chapters 6 to 11. The more detailed information about the priority projects shown in the four tables is described in the attached “Project Sheets”.

12.2.2 Project Implementation

The indicative project implementation schedule including the respective responsible stakeholders shown in Table 12.2.1 through 12.2.4, is summarized in Figure 12.2.1 below. As stated in Chapter 10, the existing Steering Committee is recommended to be sustained to discuss project implementation, including budgeting among relevant stakeholders even after the completion of the Lilongwe master plan study. If necessary, a local management consultant shall be employed under the Steering Committee in order to prepare a practical implementation schedule and monitor the progress of the project execution, for at least during the short-term development period. If LCC is ready for the establishment of a “CDS Unit”, said unit together with a management consultant would be the secretariat for project implementation.

Figure 12.2.1 Implementing Schedule and Organization of Development Program

Development Program	Development Sub-Program	Proposed Implementation Schedule (20XX) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	Major Implementing Organization
1. Public Administration Enhancement Program for Urban Management	Institutionalization of Urban Development MP Sub-Program	Review; Review; Review	MoLHUD/LCA
	Capacity Development Sub-Program for Effective Urban Management		MoLGRD/MoLHUD/LCA
2. Urban Living Environment Improvement Program	Living Environment Improvement Sub-Program in THA/Unplanned Settlement		MoLHUD/LCA/MoIWD/ LWB
	Urban Transportation and Urban Utility Services Upgrading Sub-Program in Planned Settlement		MoLHUD/LCA/MoIWD/R A/LWB
3. Economic Infrastructure Enhancement Program for Economic Growth	Urban Transportation Capacity Strengthening Sub-Program for Economic Growth		MoTPI/RA/LCA
	Urban Utility Improvement Sub-Program for Economic Growth		MoIWD/LWB/LCA
4. Urban Environment Enhancement Program for Creation of Attractive Capital City	Park and Green Development Sub-Program		LCA
	Natural Greenery Preservation Sub-Program		LCA

Source: JICA Study Team

The Public Administration Enhancement Program is given the urgent priority since the major stakeholders such as MoLGRD, MoLHUD and LCC take the initiative in institutional arrangement for project implementation. In particular, "legalization of the 2030 land use plan" is given utmost urgency. All projects under the capacity development sub-program must be initiated during the short-term development period. A more detailed implementation schedule of Capacity Development Sub-Program is shown in Table 10.3.2.

Other programs/sub-programs needs sustainable cooperation from the line agencies such as RA, LWB and MoIWD. The issue on urban development of Lilongwe should be highlighted on the next MGDS (2012-2016). Hence, the Steering Committee should promote other programs which are planned as part of the next MGDS, in cooperation with the central government.

At the time of the fourth Steering Committee meeting held on June 15, 2010, the projects planned in the short-term development period were regarded as those to be prioritized. Urgency of implementation should be given to the following projects:

a) 1-1(1): Legalization of the 2010-2030 land use plan (before December 2010)

b) 1-2(3): Enhancement of LCC administration (August/2010-March/2011)

c) 1-2(4): Institutional strengthening of Engineering Department, LCC for urgent road improvement project of M 1(August/2010-March/2011)

d) 1-2(1): Urban plan and development management (August/2011-July/2013)

e) 1-2(2) and 2-1(1): Land registration and its management system (August/2011-)

f) 2-1(4): Community road improvement in THA and unplanned settlement (August/2011-)

g) 2-1(5): Water kiosk, safe latrine, composting and cleaning education in THA and unplanned settlement

h) 3-1(1): Urgent road improvement project for M 1

The projects from a) to c) are compulsory for the implementation of d) to h). It is reported that Gates Foundation has decided to finance USD 2.5 million for the living environment improvement in THA and unplanned settlement proposed by LCC. The proposal covers the projects f) and g). In this connection, the projects d) and e) are simultaneously necessary for the development of management and land registration in THA and unplanned settlement. Project h) is also given urgency because traffic congestion in M1 around the Old Town should be improved immediately.

12.2.3 Project Cost

The project cost is estimated to be about MWK 60 billion or USD 419 million. In particular, the two programs on Urban Living Environment and Economic Infrastructure Enhancement share a substantial portion of the project costs. As stated in Section 12.2.2, the two programs shall be primarily under the responsibility of the central government, thus, the Economic Planning Agency is requested to include the projects under the two programs, in its long-term national development plan. The Ministry of Finance is responsible for the identification of donors' fund to finance these projects. Malawi would still need the government's support on urban development in the capital city during the entire timeframe of the master plan study.