Volume-I – Chapter-8

ACTION PLAN 2020

FINAL REPORT

8. LUTMP ACTION PLAN 2020

8.1 Development of Action Plan

8.1.1 Action Plan Development Approach

To understand and tackle the current transport/ traffic problems urgently, an Action Plan has been formulated for the year 2020. The primary components of the Action Plan include the following:

1) Project Integration and Coordination

While some major projects are underway in transport sector, the coordination among the projects is insufficient in terms of facility and service at many locations. For instance, intersection improvement should be implemented with due consideration, if the planned urban railway (RMTS) and/ or BRT is to be realised without excessive additional cost, particularly at road intersections. The Action Plan focuses on integrating new and the existing facilities, and serves to maximize the potential benefits of investment.

2) New Strategy

The future transport/ traffic situation will never improve if Lahore relies on conventional countermeasures, like ad-hoc solutions for localised problems. Rapid growth of population and urbanization has been a continued pressure on transport development. Rapidly growing vehicle ownership (car and motorcycle) and usage are the most serious threat to the living environment of Lahore. Hence the Action Plan intends to introduce possible new strategies to promote more effective use of existing infrastructure and attempts to moderately control the transport demand. The Carrot and Stick strategy will be adopted. This is with improvement of public transport and road traffic vs. stricter traffic management and control.

3) Reality

Public investment during the action plan period is severely constrained due to the lack of funding sources, and existing commitment to several mega projects. Institutional and organizational capacity also needs improvement. In the light of the budget envelope, realistic projects are proposed in the Action Plan 2020.

8.1.2 Available Funds for Action Plan

As estimated in Chapter 5 of this report, the budget envelop until 2020 for Action Plan in the Study Area is as follows:

2012 – 2015 Total: PKR 77 ~ 232 billion, (USD 1,000 ~ 2,900 million)

2016 – 2020 Total: PKR 105 ~ 316 billion, (USD 1,300 ~ 4,000 million)

2012 – 2020 Total: PKR 182 ~ 548 billion, (USD 2,300 ~ 6,900 million)

Realistically, the total fund available for the next 9 years (2012-2020) should be considered - at best this would amount to PKR 250 billion (USD 3,100 million). It should be noted, that most of this fund would need to be allocated to already on-going and committed projects.

8.1.3 Broad Priorities for Action Plan

Under these severe financial constraints, investment priorities have been broadly determined as follows:

- Preparatory but urgent works for establishing convenient and robust trunk public transport system in Lahore. This includes RMTS Green Line and all seven (7) BRT lines.
- Management of network for improved efficiency and low-cost traffic management measures such as, upgrade and development of secondary road network, minor road improvement, intersection improvement and upgrading of public transport. This is crucial to alleviate the current disorderly traffic situation in central Lahore.
- Primary and secondary arterial roads. Particularly missing links in east-west direction in central Lahore, access roads to Lahore Ring Road and roads necessary to guide sound urbanization in the south-west quadrant should be given priority.

8.1.4 LUTMP 2020 Action Plan – Core Programs 1 and 2

A number of transport projects have been proposed in the Master Plan (previous) chapter of this report. Among those projects, there are many projects that need immediate government action due to urgent needs of the citizen. These projects are categorized as follows:

1. Trunk public transport system - RMTS and BRT; (***Core Program-1***).
2. Traffic management in central Lahore; particularly around the Walled City, by a combination of minor road improvement, junction re-design, parking management, pedestrian/ bicycle paths development and other cost effective traffic management measures (***Core Program-2***).

These projects may be considered as the core program of the LUTMP Action Plan 2020. Other cost effective projects to supplement the projects mentioned above may be included in the core program.

8.2 Trunk Public Transport System – Core Program-1

8.2.1 Proposed Trunk Public Transport System

In the Action Plan period (2012-2020), one RMTS line (Green) and seven BRT lines are proposed. Later by 2030, two BRT lines (Orange and Blue) will be upgraded to RMTS. Table 8.2.1 illustrates the RMTS and BRT performance in 2020. It can be seen that Orange Line would be virtually operating at capacity by 2020.

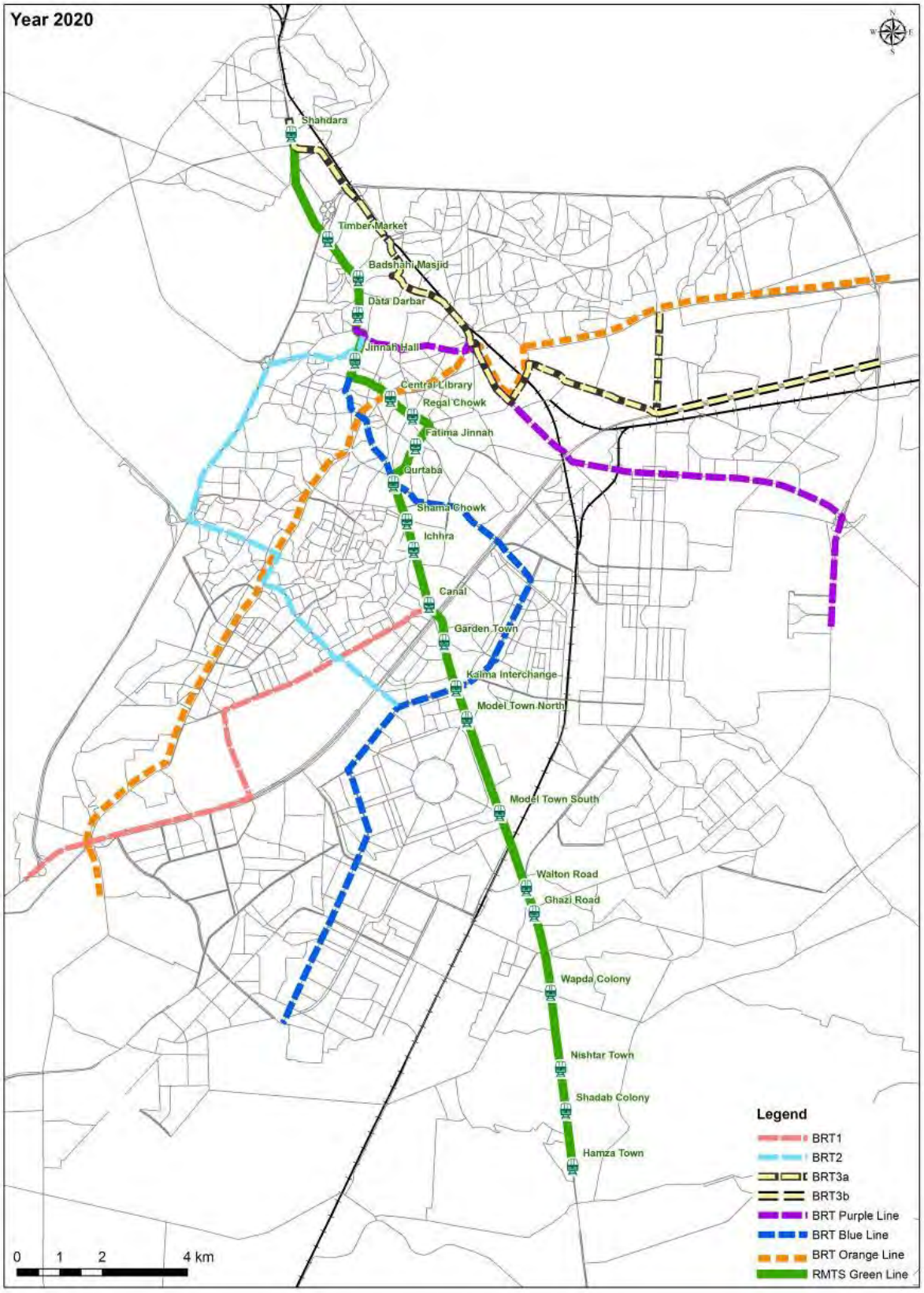
Table 8.2.1 RMTS and BRT Proposed Core Program-1 Systems Performance

System 2020		Route/ Line	2020 System Performance	
			Daily Boarding	Max. Line Load (PPHPD)
PT06	RMTS	Green Line	759,000	17,200
PT07	BRT	Orange Line	510,000	9,500
PT08	BRT	Blue Line	270,000	5,600
PT09	BRT	Purple Line	129,000	1,800
PT10	BRT	Line – 1	88,000	2,100
PT11	BRT	Line – 2	109,000	1,500
PT12	BRT	Line – 3a	161,000	3,200
PT13	BRT	Line – 3b	167,000	2,700

Source: JICA Study Team

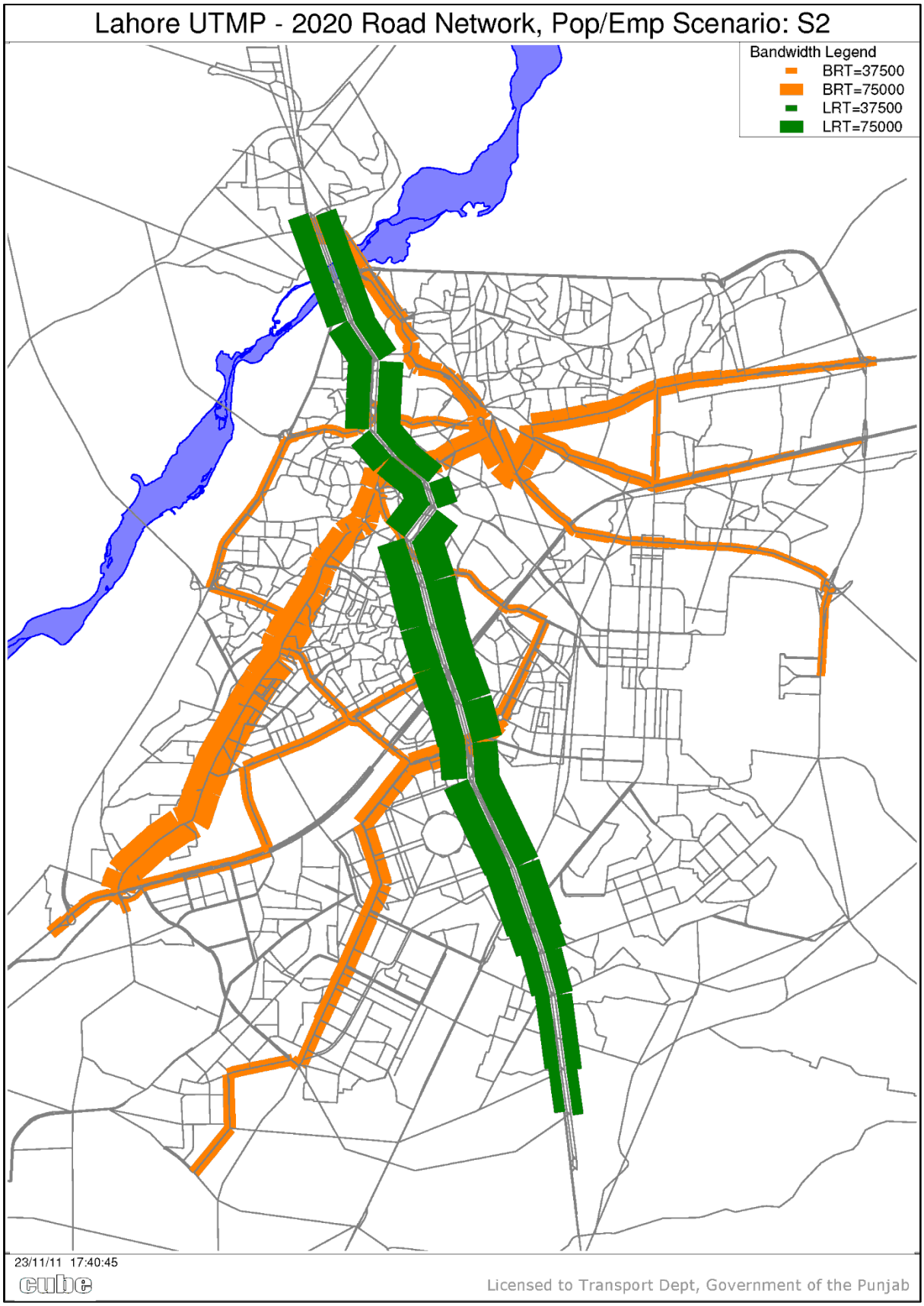
Figure 8.2.1 broadly defines the corridor location of these projects, and the forecast 2020 travel demand on RMTS/ BRT lines is shown as volume along the alignment in Figure 8.2.2.

Figure 8.2.1 Route Alignment of RMTS/ BRT Lines for 2020



Source: JICA Study Team

Figure 8.2.2 Estimated RMTS/ BRT Travel Demand for 2020



Source: JICA Study Team

8.2.2 Required Actions for Truck Public Transport System

To launch a transport development project, a series of actions are needed. These are, in general, as follows:

1. **PC-1 or PC-2:** This process is required for government agencies to launch a project (PC-1 for construction and PC-2 for studies, equipment and so on). For each action described below, PC-1 or PC-2 should be prepared and PDWP approval obtained in a timely manner.
2. **Feasibility Study (FS):** For Green Line, FS was completed in 2006. Other lines need FS. Note that FS was also completed for Orange Line in 2007. However, this was done as an RMTS line, not as a BRT. Therefore Feasibility Studies of Orange, Blue, Purple lines, and other four BRT Lines (1, 2, 3a and 3b) are required.
3. **Environmental Impact Assessment (EIA):** EIA is necessary for all proposed projects. Both GoPb and international funding organizations require EIA of their own standards.
4. **Detailed Design (DD):** Green Line reference design was completed in 2008, DD is still required. All other projects need DD as well.
5. **Land Acquisition and Resettlement Plan (LARP):** Land should be acquired before construction starts. But some international funding organizations require earlier land acquisition as one of their requirement to provide finance. Relocation of affected people should be duly conducted according to the rules.
6. **Relocation of Utilities:** In the case of Green Line, it was estimated that utility removal/ relocation would take 18 months, at cost of over PKR 5 billion. This process must be completed before the land is handed over to contractors for construction.
7. **Procurement of General Consultant (Transaction Adviser, etc.):** The General Consultant plays an important role in assisting GoPb to prepare tenders as well as detailed design project. The GC should be selected right after financing perspective becomes clear.
8. **Tendering:** In large-scale projects such as RMTS Green Line, international tender is required. The process from call for tender to selection of the winner requires 9 months at least. Moreover, prior to the tender, well elaborated tender documents should be prepared as a joint effort of General Consultant and GoPb. This process will take 6-12 months in general.

9. **Construction:** In the case of Green Line, the construction period is estimated at 5 years. Procurement of tunnel boring machine takes 12 months. Thus the construction of Green Line should be commenced before 2016 if it can open for service in 2020. In the case of BRTs, construction period is about 2-3 years, and since project cost is less than RMTS (roughly 1/ 10 per km) the works stated above can be simplified or shortened.
10. **Operation:** Green Line RMTS will start operation in 2020. Among BRTs, Orange Line BRT is proposed to start operation by 2016 while others by 2020 or earlier.

In Pakistan, there have been cases that project plan and finance should have to be largely changed from the original plan due to the delay in the actions mentioned above. Table 8.2.2 summarizes the actions needed by 2020.

Table 8.2.2 Necessary Actions to Construct Trunk Public Transport System

Route/ Line		System	Actions Needed
PT06	RMTS Green Line	RMTS	EIA, detailed design, land acquisition, utility relocation and procurement of transaction adviser are needed immediately. Tender and financial arrangement by 2015. Completion by 2019/20.
PT07	RMTS Orange Line	BRT	Reference Design is needed urgently to firm up costs for budgeting, land acquisition etc. Other actions (EIA etc.) by 2015.
PT08	RMTS Blue Line	BRT	FS is needed by 2015. Other actions by 2019.
PT09	BRT Purple Line	BRT	All actions by 2019.
PT10	BRT Line – 1	BRT	All actions by 2019.
PT11	BRT Line – 2	BRT	All actions by 2019.
PT12	BRT Line – 3a	BRT	All actions by 2019.
PT13	BRT Line – 3b	BRT	All actions by 2019.

Source: JICA Study Team

8.2.3 Financing Arrangements for Core Program-1

1) RMTS Green Line

The study for RMTS was first completed in 2006. The study proposed a rail based mass transit prioritised network of four lines of about 97 km, with 82 stations. The study also completed the feasibility study of the 1st priority (Green) line in 2007. Again Ferozepur road corridor was proposed for the priority line envisioned to be completed by 2015/16.

GoPb taking on-board the recommendations started work in earnest on the implementation of the system, by seeking funding from the Asian Development Bank (ADB). In parallel the GoPb also commissioned consultants to proceed with the reference design of the Green Line, and also the feasibility of the 2nd priority (Orange) line. These studies were completed in 2008 and 2007 respectively. The feasibility studies concluded that the mass transit lines are economically viable, and should be implemented as planned in approximately one line after every five years.

ADB conducted independent assessment of the feasibility studies, agreed to fund the RMTS project in phases, and approved to provide a multi-tranche loan of USD one billion towards the capital cost of the Green Line. However, since 2008 negotiation with the ADB has been suspended. The GoPb from its ADP cannot afford to fund the project capital cost. As a result the project remains suspended until some form of capital cost funding could be secured.

GoPb, recently negotiated the project with Chinese company "NORNICO" who showed willingness to obtain the buyers' credit from Chinese financing institutions including China Exim Bank to provide 85% of the contract amount; whereas GoPb would be responsible for effecting 15% advance payment. NORINCO had to do detail design and build Green Line; whereas LTC to engage an operator for the subsequent operation of the system. No further details are available to the JICA Study Team for further progress in this regard. The GoPb should do its maximum effort, assisted by the federal government, to ensure the finance for the project

2) Bus Rapid Transit (BRT) Lines

Unlike RMTS, financial condition for BRT projects is generally favourable. This is due to the lower cost (roughly 1/ 10 of RMTS per km), and profit from BRT business can be expected. Owing to the "profitability", the private sector can be involved, or PPP scheme could be applied for less profitable lines. Therefore, the role of GoPb is primarily to seek for reliable service suppliers. After feasibility study is conducted for each line, the projects should be announced to the public based on the proposed financing scheme (e.g. purely private or PPP), and tender shall be called on competitive basis.

8.2.4 Intermodal Integration with Public Transport Trunk System

1) Development of Feeder Services

RMTS Green Line will have a significant impact on people's travel behaviour. As the new system offer faster and more reliable services than existing wagon, bus, rickshaw and Qingqi, considerable number of passengers will shift from these conventional/ paratransit modes to RMTS and BRTs. In other words, the operators of conventional public transport will be affected by RMTS and BRTs. The impact of RMTS Green Line was estimated in its feasibility study that Buses would lose 30-50 % passengers by 2021 along Ferozepur Road corridor, and in the north across Ravi.

In order to alleviate this negative impact on bus/ wagon, and to ensure quick smooth transfers between modes, well-coordinated feeder services should be provided. Buses and wagons could be used as feeder services for the trunk public transport system; RMTS and BRTs. This is modal integration of conventional public transport and RMTS/ BRTs. For

buses/ wagons feeder service is an expansion of their market, and for RMTS/ BRTs it offers an opportunity to increase their patronage. Various actions are needed to promote this integration. Rerouting plans of bus/ wagon should be formulated prior to the operation of RMTS/ BRTs.

In addition, common (electronic/ smart card type) ticketing system needs investigation for future application under the initiative of Transport Department and LTC.

2) Multi-modal Terminals

At present, relocation of the congested bus terminal at Badami Bagh is planned. The relocation sites are three; Shahdara, Thokar Niaz-baig and Ferozepur Road near Hudiara Drain. These bus terminals serve as interchange facilities of intercity and intra-city buses. These bus terminals will function as multi-modal terminals if transfer facility is provided between bus terminal and RMTS/ BRT station.

Among these three terminals - Shahdara is to be located north of Ravi Bridge (adjacent to GL Terminal, as planned in the GL design studies), will play the most important role as the interface between intercity and intra-city bus/ wagon and RMTS/ BRTs of Lahore. By this project, all the available public transport modes will be integrated at one location to offer integrated services to passengers. Similarly an integrated bus terminal is planned at the Green Line South Depot/ Station (Shadab Colony), about 4km north of Hudiara Drain. A similar location should be considered as a priority option, when conducting Feasibility Studies for the southern multi-modal bus terminal along Multan Road. For other terminals, similar concepts should be applied.

8.2.5 Preparatory Actions for RMTS System

1) Staff Training for Opening the RMTS Green Line

The railway differs entirely from other transport modes such as road, aviation and shipping. In case of road, after completion, some bus companies operate buses and some transport companies operate trucks and private cars use the road. Purchase of vehicles and training of drivers are in the transport companies, and private cars are used by individuals under their own responsibility.

However, Railway Company should do all the necessary works themselves, including construction of infrastructure, purchase of rolling stock, training of drivers, conductors maintenance staff, daily operation works, and safety treatment of level crossing and so on. Therefore, to establish a good railway company is not an easy task. Of particularly importance is the training of railway staff that will be responsible for all the work necessary for railway operation. This is a point often overlooked in railway development and planning.

Long period of time will be required for training drivers to operate urban trains safely. For the operation of the RMTS Green Line, about 350 staffs will be needed as per Japanese railway standard. Since operation of the RMTS Green Line is proposed to start in 2020, preparatory works should start as soon as possible, and not later than 2016.

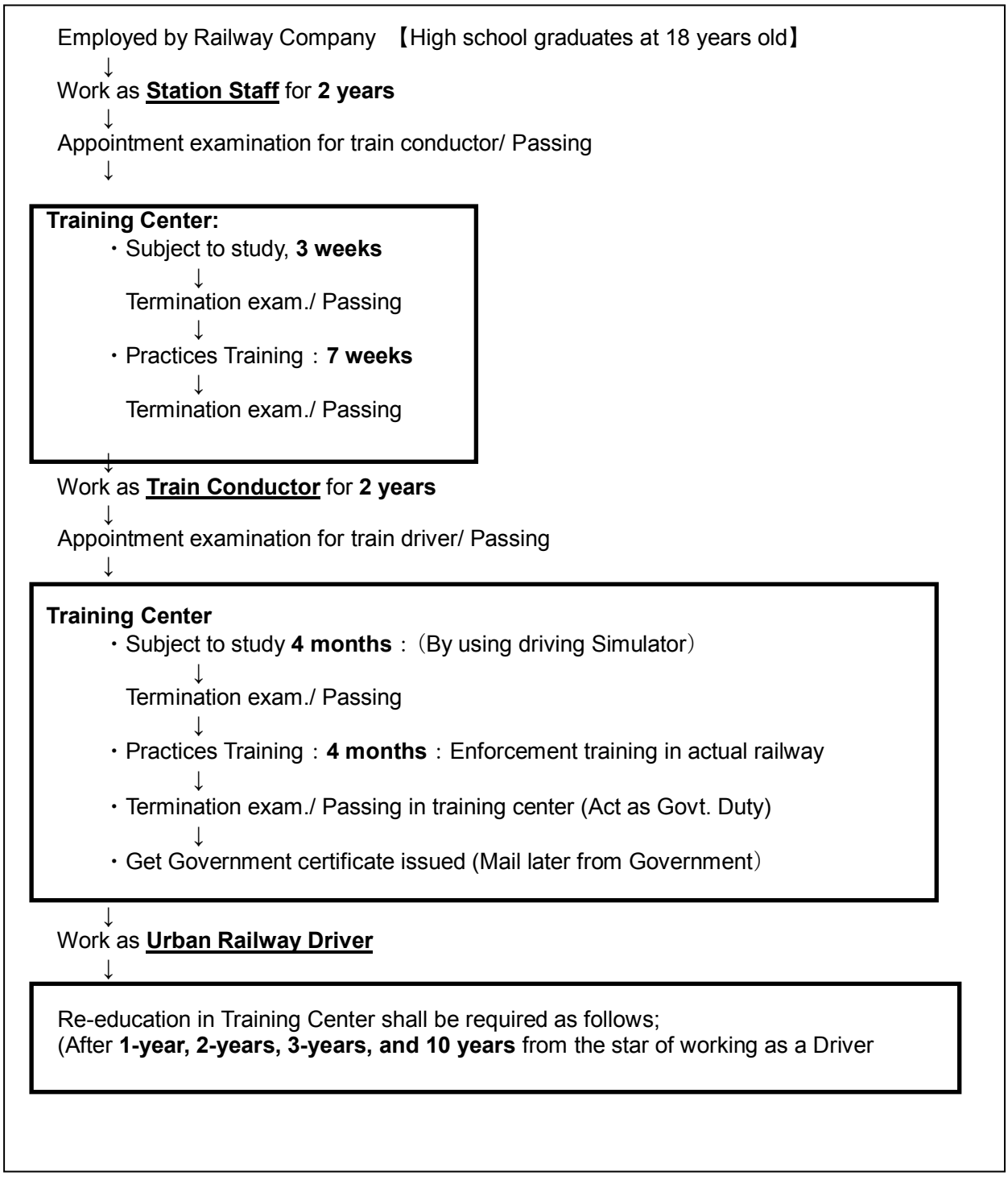
Table 8.2.3 Estimated Number of Staff for RMTS Green Line Operation

Staff Position / Task	Number
Conductor / Driver	50
Conductor Administration/Station Staff	180
Electrical / Signal Staff	40
Track Works	40
Rolling Stock Maintenance Staff	40
Total	**350**

Source JICA Study Team

In Japan, seven to eight years are usually required for the training of train drivers and other auxiliary staff as illustrated in Figure 8.2.3.

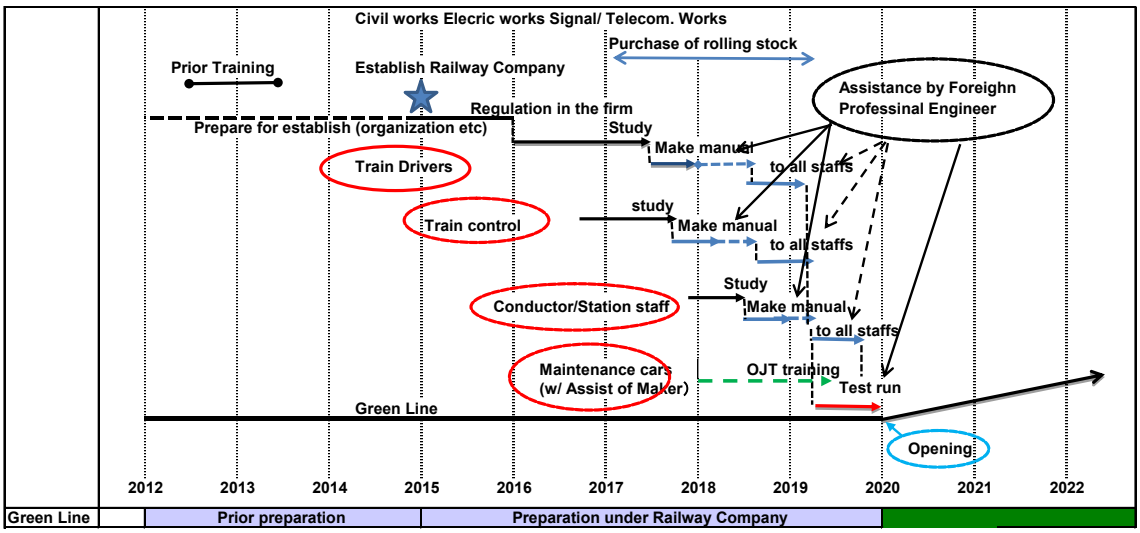
Figure 8.2.3 Typical Training of Train Drivers in Japan



Source JICA Study Team

All the trained staff should be ready to work before the opening day. As a reference, Line-1 in Hanoi, Vietnam, while the opening year is set at 2018, first driver trainees have already been sent to Japan, and training has already started. As the income for Railway Company is zero before railway service is commenced, special financial assistance from the government is required.

Figure 8.2.4 Proposed Staff Training Program to Open RMTS Green Line



Source JICA Study Team

To learn the basics of railway engineering, it is desired that training will be executed by Pakistani natives. Therefore, after establishment of a training center, the core staffs i.e. teachers in each field should be appointed at first, and they prepare textbooks and manuals, then excellent railway engineer and staffs shall be trained by On-the-Job Participation (OJP).

2) Compensation for Relocation and Resettlement

The Green Line project involves relocation of shop, commercial buildings and residential buildings along the alignment. The number of affected families and people is approximately 400 and 2,800, respectively. The railway is planned almost on the central part of existing roads, i.e. Government land, but stations and depots need private land of approximately 33,500m^2. This land acquisition is crucial for early completion of Green Line. This compensation for the land including of the following items:

a) Compensation for Loss of Land

b) Compensation for Loss of Trees

c) Compensation for Relocation and Resettlement

For the BRT projects, this compensation is not expected though feasibility studies are needed to establish land requirement and integration of access arrangements to the adjacent amenities.

8.3 Core Program-2 – Traffic Management (TM) Projects

8.3.1 Selection of Areas for Priority Traffic Management Projects

The selection of project areas for the LUTMP 2020 Action Plan, Core Program-2 is based on detailed analysis, evaluation, and prioritisation of projects as described in Sections 7.4 and 7.5 of this report. In addition, it is also influenced by the in depth knowledge of the area gained from traffic and transport condition surveys by the Study Team, about the special/ specific needs of the citizens of certain areas.

The core of the city urgently needs proper planning, and network connectivity, operation of its road network in hierarchical fashion and state-of-the-art junction design equipped with modern centrally controlled signal system. The transport network should accommodate all types of users according to the local condition. Non-motorized traffic (pedestrians and bicycles) is to be given priority, where possible, as the most vulnerable and neglected group in the existing transport system. LUTMP HIS survey results showed that there are about 45% of all travel either by walk or cycle in the Study Area.

Provision of planned parking facilities both on-street and off-street are one of the most important component of transport system of the city, but it is poorly managed and uncontrolled. Proper parking arrangement can help in removing illegal parking, temporary encroachments and improve traffic circulation and the environment. Travel behaviour issues are also needed to be seriously addressed, which is the major factor in the worsening of traffic situation and traffic safety. The main reasons are lack of traffic education, poor signage, and very week enforcement of traffic rules and regulations.

Developed countries in the world are preserving their environment and heritage by limiting the traffic access in central areas through various traffic demand management measures. This factor is also given a high priority, in addition to those mentioned above, in the selection of action plan areas. However, certain areas have been identified to need immediate attention and action, because of the dire state of the traffic and environment in these areas. These areas have been given high priority in the Action Plan, irrespective of the small differences in the MCA evaluation results of these projects in these areas.

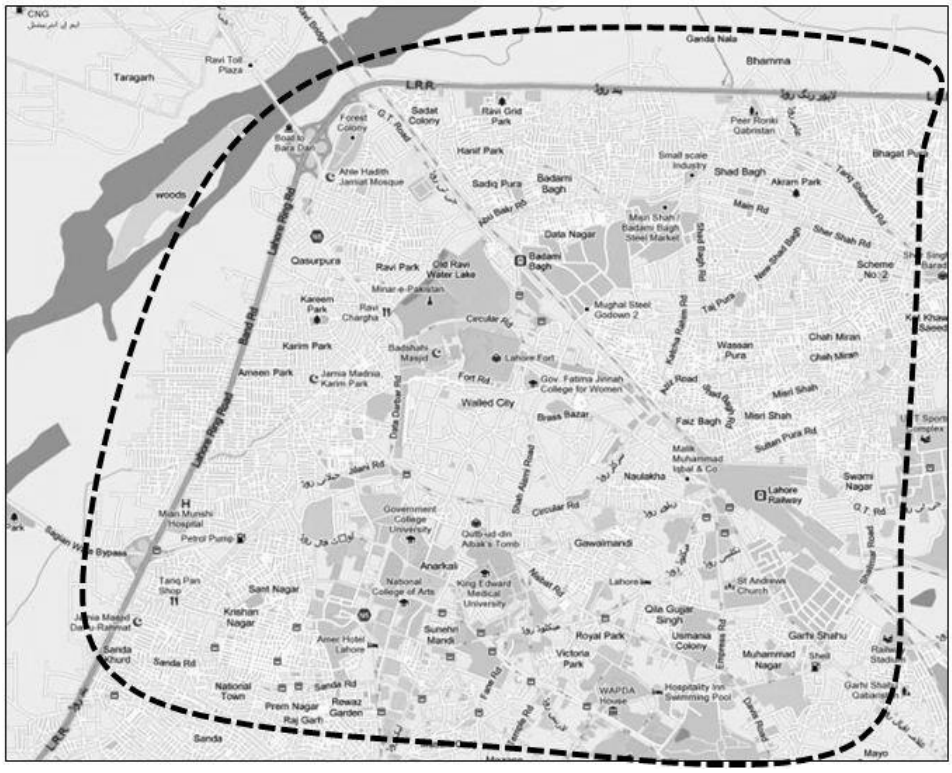
1) Lahore CBD Area for Priority TM Projects

The Walled city and surrounding area is considered to be the city centre of Lahore, because of its location and outward expansion in a radial pattern. Areas surrounding the walled city have been poorly developed *without:* road network planning, traffic management, and land use control. Areas of concern include: Ravi, Data Gunj Baksh, and Samanabad towns, and also parts of Iqbal and Gulberg towns. This area is considered as the Central Business District (CBD) of the Lahore. It is the major

commercial '***hub'*** not only of the Lahore city/ district, but also of the whole of the Punjab province. It includes markets, different types of service sector businesses, small cottage industries, all major provincial and local government offices, recreational areas, and most of the historical/ heritage places. In the Study this area is considered to be the CBD area of Lahore, and it is broadly shown in Figure 8.3.1. The chaotic traffic situation and poor living environment in this area is evident from the picture depicted as Figure 8.3.2.

This CBD area totally lacks facilities for pedestrians and cyclists, limited public transport which is mostly Para-transit based, and it infiltrated by illegal Qingqis. Other major issues: include encroachment of already scarce public spaces; roads and footpaths by legal and illegal parking, lack of parking provision, uncontrolled commercialization, and poor traffic circulation arrangements. These result in traffic chaos and bottlenecks, noise and air pollution and poor environment. Legal and illegal intercity and intra-city public transport stops/ terminals are operating in this area without any check and control, causing traffic mayhem and unsafe passenger/ pedestrian environment. Specifically, acidic rain from air pollutants of the Badami Bagh bus terminal is causing an irreparable damage to the marble exterior of the of the Badshahi mosque – a world heritage site.

Figure 8.3.1 Lahore CBD Area for Action Plan Projects



Source: JICA Study Team

Figure 8.3.2 Traffic on Fleming Road in Lahore CBD Area

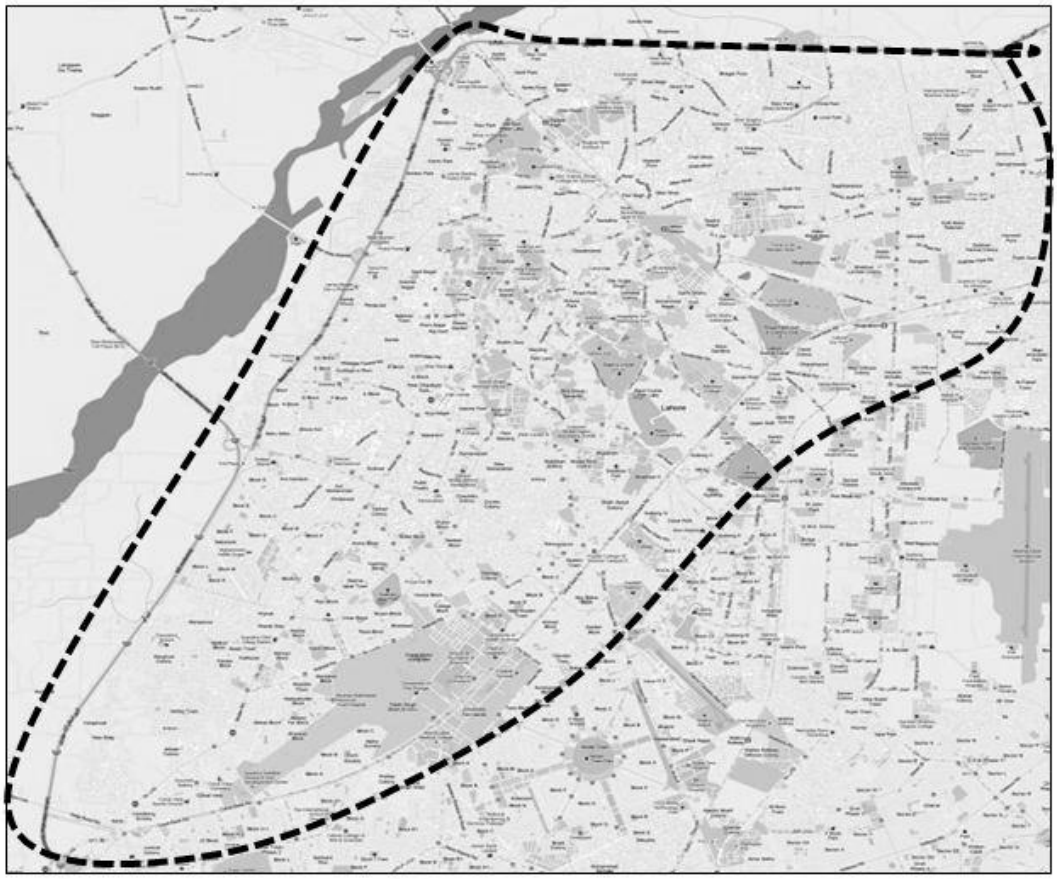
Source: JICA Study Team

2) Lahore City Area – North of Canal to Ravi

This area of Lahore city is locally called as 'old Lahore'. It includes CBD area, and an illustrative map is given below Figure 8.3.3. The area is more compact compared to the south and south-western areas of Lahore District. The general situation in this area is worsening rapidly due to uncontrolled traffic situation and lack of planning and land use or development density control. This lack of urban development planning and control has resulted in uncontrolled commercialization; which is mostly approved without any traffic or development impact assessment. No traffic planning has been applied to manage the generated traffic/ travel demand from these commercial centres and mix developments. This has converted the area traffic in to uncontrolled mix of motorized and non-motorized traffic. Traffic situation is further aggravated by the lack of public transport; and illegal Qingqi and wagon operations. Legal and illegal intercity bus operation and trucking on the Bund Road East are the major factors in worsening the traffic situation in the area and along Multan Road.

Area to the east of the Walled city has the biggest steel market of Lahore, but it is without any direct access or egress to any trunk road like G.T. Road or Lahore Ring Road. Trucks and heavy tractor-trailers (commonly and illegally) are used for movement of heavy goods and containers. Situation is worsened by the limited capacity local roads, unplanned and illegal truck stands, and unplanned fruit market in the area. These are the major impediments to the smooth traffic flow and also for the poor local living environment.

Figure 8.3.3 Lahore City Action Plan Area – North of Canal to South of Ravi



Source: JICA Study Team

8.3.2 Selection of TM Priority Projects – Core Program-2

In total thirty one (31) Traffic Management projects (TM01-TM31) have been proposed and assessed in the LUTMP 2030. Eleven (TM01-TM11) of these Traffic Management projects are the committed Government projects, and some of these are on-going or at various stages of implementation. Therefore these projects are not included or further discussed here under the LUTMP 2020 Action Plan, Core Program-2.

An outline description and scope of each of the remaining twenty (TM12-TM31) projects have been given in Section 7.3.3. A comprehensive Multi Criteria Assessment (MCA) and prioritisation of these projects has been presented in Sections 7.4 and Table 7.4.17. The implementation schedule in the context of budget envelope, and agencies responsible for the project implementation have been discussed in Section 7.5 and presented in Tables 7.5.1 and 7.5.2 of this Report.

The implementation schedule as proposed in Table 7.5.1 suggests that most of these traffic management projects need to be implemented either in the Short or Medium term time frame. In order to further prioritise these projects for their implementation, it was estimated that the six of the short term projects (TM14, TM21, TM22, TM27-TM29) are

mostly low cost (USD 1~6 million) 'soft' – limited scale feasibility/ initial studies and could be implemented in the earlier years of the Action Plan 2020 timeframe, without burdening/ disrupting the budget envelope. Therefore, for the implementation of these studies, ToR should be prepared based on the outline project description and scope of work as given in Section 7.3.3. It is recommended that TD should proceed with these projects as soon as possible, along with the committed projects.

In addition, Government should also start the process for the medium term projects like [TM15] 'Public Transport in Rural Areas', as soon as the condition of the public transport in the city is improved. Whereas, medium term project like [TM13] 'Existing Junction Design and Network Improvement' would have wait for the completion of short study [TM12] prior to its implementation.

The remaining eight Short (5) and Medium (3) term traffic management projects are included in the LUTMP 2020 Action Plan 2020 Core Program-2. Further detailed description and scope of work of these projects is illustrated in the following two Sections 8.4 and 8.5 respectively, as summarised in the following Table 8.3.1.

The table also includes three (R44, R45 and R57) of the road sub-sector projects included in the Action Plan 2020. These projects under MCA evaluation did not score so high to be recognised as Short Term projects. However, the local traffic and environment situation in these areas is dire. It demands that high priority should be given to the improvement of roads/ junctions, general traffic situation, and pedestrian environment in the areas of projects R44 and R45.

The road sub-sector project R57 is listed here as, it is part of the LDA/ TEPA on-going projects. It involves new housing developments in the south-west of Lahore. LDA/ TEPA are responsible for the development or road network to sustain the developments either by upgrading the existing roads or by building new roads in conjunction with the private sector/ developers, as part of old Lahore Master Plan 2021.

Table 8.3.1 LUTMP 2002 Action Plan Projects – Core Program-2

Project No.	Project Description	Report Section	Implementation
TM12	A.1 Junction Design and Traffic Signal Improvement – CBD	**8.4.1**	Short Term
TM18	B.4 Linking Communities - Smart Roads	**8.4.2**	Short Term
TM23	C.3 Pedestrian and Bicycle Path Network	**8.4.3**	Short Term
TM24	D.1 Comprehensive Parking System Development	**8.4.4**	Short Term
TM31	H.1 Local Standards and Guide Lines Development	**8.4.5**	Short Term
TM16	B.2 Traffic Circulation System Design and Implementation	**8.5.1**	Medium-term
TM17	B.3 Public and Freight Transport Terminals	**8.5.2**	Medium-term
TM19	B.5 Feasibility Study for Traffic Demand Management Measures	**8.5.3**	Medium-term
R44 and R45	Shadbagh Area (Roads - R44) and Samanabad Area (Roads R45) – Secondary Road Network Development	**8.6.1**	Urgent Action
R57	Construction and Remodeling of Secondary roads - south of LRR in the south-western quadrant between Ferozepur Road and Multan Road	**8.6.2**	On-Going Developments

Source: JICA Study Team

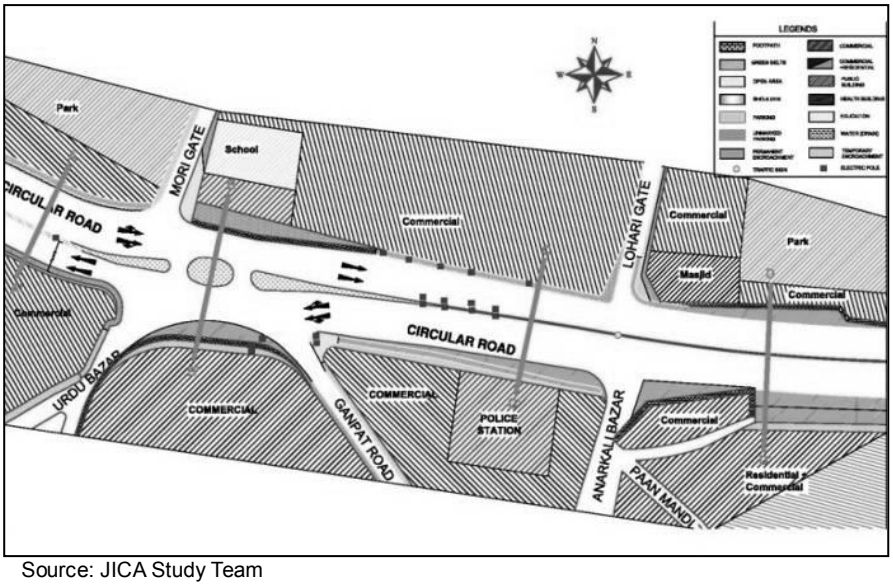
8.4 Core Program-2 – Short Term Traffic Management Projects

8.4.1 [TM12] Junction Design and Traffic Signal Improvement – CBD Area

1) Introduction

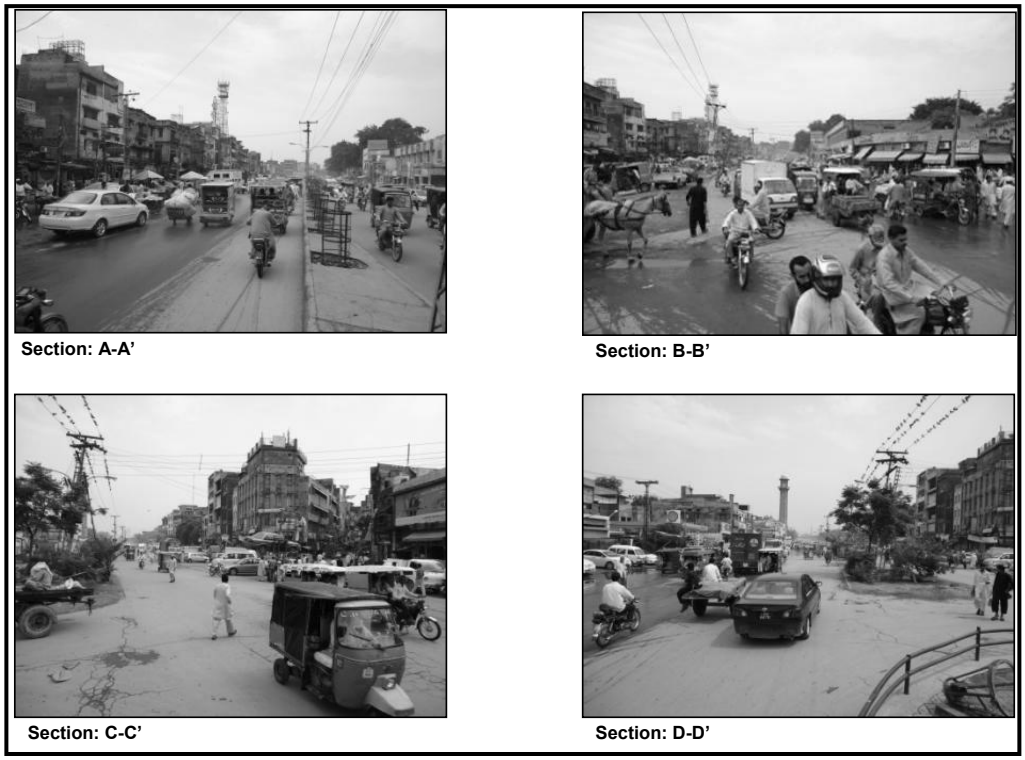
Lahore CBD area road junctions are poorly designed, if at all. It is clear that their layout is not based on any traffic data, traffic engineering design principles, safety considerations and they lack even the basic concept of time and space segregation of vehicles of conflicting movements. This result in unnecessary and avoidable delays, poor and unsafe environment for all the road users and local area communities. A typical example, Lohari Gate junction layout is given below in Figure 8.4.1 and it is further illustrated by pictures of various cross-sections of roads in Figure 8.4.2. At the junction five streets have access/ egress. It is not at all clear which movement has priority over the other. It is 'free-for-all' situation. There is no provision for pedestrians to even cross the main Circular Road. Five streets are directly entering the main traffic stream without any merging, diverging lanes. This results in congestion, which often locks the junction during peak periods.

Figure 8.4.1 Existing Situation Lohari Gate Junction – Poor Junction Design



Source: JICA Study Team

Figure 8.4.2 Lohari Gate Junction – Pictures at Marked Sections



Source: JICA Study Team

This situation is common throughout the CBD area. It is further exacerbated by mix land use and uncontrolled development, without due consideration to the impact of development on the traffic. Lack of parking spaces, legal and illegal parking on the footpaths (thereby making the pedestrians to walk in the road) limits the already scarce road space. Strewn street furniture like garbage containers, not to mention the ever present hawkers interrupt the traffic flow endlessly. The solution is comprehensive traffic management study of the area, scope of which should include, but not be limited to the following components.

2) Project Area and Components

The proposed project area has already been defined as the CBD area of Lahore, which is described above in Section 8.3.1 and the map is shown Figure 8.3.1. The major project components are as follows:

- Urban planning and street design in the context of the land use in area;
- Road network and junction operational assessment, design and improvements;
- Traffic signal system design according to the junction and network requirements;
- Planning and design of a pilot central traffic control system;
- Traffic circulation system design and pilot implementation;
- Parking facilities planning and design;

- Pedestrian paths and road crossing facilities design;
- Bicycle paths and network planning and design;
- Pedestrianization of certain areas, and associated traffic circulation plan; and
- Capacity building and training of local traffic engineers through OJP.

3) Implementation Strategy and Schedule

It is suggested that international consultant with considerable experience of such projects should be commissioned. They should be supported by local consultants and TPU staff to gain necessary experience. The project should involve network simulation techniques to achieve the best design for the CBD area as whole. This project should be executed by TEPA with the involvement of TPU as the overseeing authority.

This project is of high priority as established by the MCA evaluation process, and the implementation of a number of projects depends upon the successful completion of the project as soon as possible. This project is proposed to start immediately, and should be implemented by year 2014. Tentative implementation schedule of various project components is given in Table 8.4.1. The estimated project cost is USD 4.0 million, including the implementation of the pilot scheme.

Table 8.4.1 Tentative Implementation Schedule of TM12

Project Activities	2012	2013	2014
Conduct of traffic surveys, and identify major issues (Comprehensive problem statement)			
Planning and design based on the identified problems and issues			
Proposed designs/ improvements implementation under the supervision of consultant or contractor			

Source: JICA Study Team

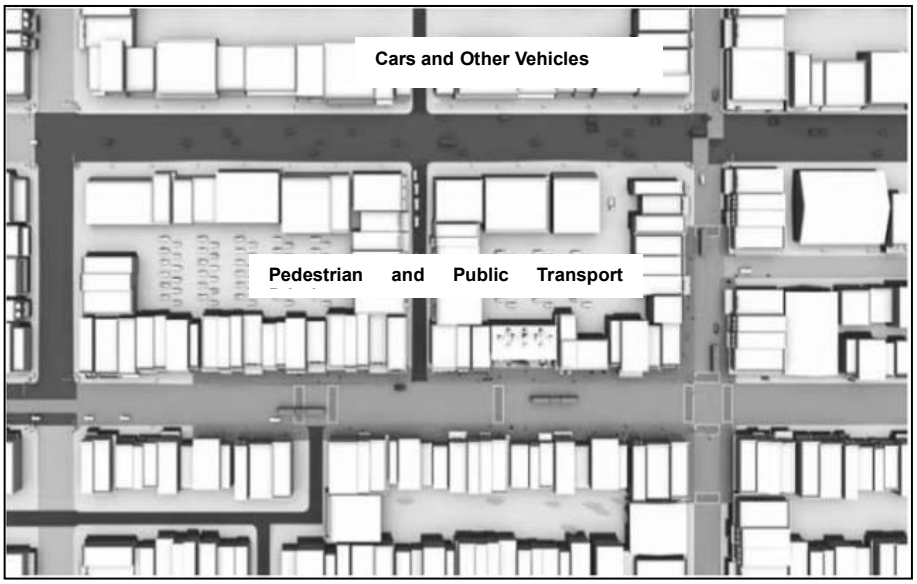
8.4.2 [TM18] Linking Communities – Smart Roads

1) Introduction

Under this approach it is ensured that most effective use is made of the scarce road space for the most suitable and sustainable transport mode(s). It should recognize the importance of activities in areas these take place, such as places to live, work and enjoy. Under this plan, certain routes will be managed to perform better for cars, and other will be best suited for public transport or pedestrians as shown in Figure 8.4.3.

Public would be encouraged to walk and cycle by making places more environment friendly by ensuring that the cyclists have improved access to activity centers and other public transport services. This project is important to shift the emphasis from building new expensive transport infrastructure to effectively and efficiently manage the operation of existing road network.

Figure 8.4.3 Smart Road Concept – Activity Centers Network in Operation



Source: JICA Study Team

Figure 8.4.4 Pedestrians, Public Transport and Private Traffic

Source: JICA Study Team

2) Project Components and Area Description

This project relies upon road network operational efficiency improvement through traffic management and planning techniques. However, local transport related agency has to work with broad range of relevant stakeholders in developing and implementing this concept in the city effectively. This needs extensive consultation within government departments and agencies, and also with relevant stakeholders in the private sector.

The project components may be broadly defined as follows:

- Road Use Hierarchy by Time Period
- Network Operation Plans by Time Period
- Evaluation of Network Operation
- Using Smart Roads Effectively

This proposed project area where it would be most suited to is shown above, with possible road usage hierarchy as a pilot, and then it could be extended to the other areas of Lahore District. However, on the other hand the concept implementation may be less restrictive/ easy in the south of Lahore (South of Canal). Implementation in the Old Lahore area would be tedious due to high density and limited options of alternative routes for different modes of transport.

3) Implementation Strategy and Schedule

It is suggested that an international consultant would be commissioned with extensive traffic modelling/ simulation, local area modelling, pedestrian planning and design experience. Consultant should help design the above mentioned system as a pilot project of considerable size area where benefits of the scheme could be quantified and realised by public at large. TEPA should prepare the project ToR for specific area following the above guidelines.

As the project would be implemented from the concept stage to its implementation TEPA should use this as capacity building exercise, and commit their staff as counterpart to work with international consultants as an OJP training exercise, so that similar schemes could be implemented in other parts of the Study Area. TEPA staff should also be able to monitor the project performance as 'before' and 'after' study comparison. A tentative implementation schedule is given below in Table 8.5.3. The project is to be implemented by TEPA, and estimated cost is USD 4.0million.

Table 8.4.2 [TM18] Tentative Implementation Schedule

Project Activity	2015	2016	2017	2018
Project Preparation and Consultant Engagement				
Adopt LUTMP Model for Local Area				
Define Road Use Hierarchy				
Network Operation Plans				
Evaluation of Alternative Network Operations				
Using Smart Roads – In Operation and Monitoring				

Source: JICA Study Team

8.4.3 [TM23] Pedestrian and Bicycle Path Network

1) Introduction

Developed and developing countries are moving toward the development of sustainable urban transport system, to revitalize the central urban areas, by incorporating pedestrian and cycling facilities in the design as high priority, and even replacing the existing dependence on motor vehicle. Pedestrian and cycling facilities are incorporated as an integral component of the modern urban fabric. Some examples of sidewalks with bicycle path are depicted in Figure 8.4.5.

Figure 8.4.5 Side-walk Photos in Fukuoka Japan

Source: JICA Study Team

Currently there is no transport policy or strategy to move the city towards such sustainable transport system for the city. The Study HIS survey showed that; about 41 % of the trips in the Study Area are by walk and 5 % by bicycle and rest of the 54 % are by all other modes. This is an asset of the city that shows the importance of walk and cycling, and should not be squandered in favour of motorisation.

Pedestrian Facilities

Figure 8.4.6 Pedestrian Endeavor to Cross Gulberg Main Boulevard

Source: JICA Study Team

In the recently developed areas of Johar Town, DHA and also in older areas like Gulberg, and Model Town; walk culture is limited and it is discouraged, as there are absolutely no footpaths in these areas. Walking is only possible in the main carriageway, even in cases where there are service roads, walking is hazardous among parked vehicles and other street furniture. This causes most nuisances in the commercial areas without walking facilities, as result shoppers tend to park their vehicle nearest to the shop of their choice. Road crossing is serious hazard, as can be seen above in Figure 8.4.6. Road crossing

facilities are either not provided at all, or if available, are ignored by motorists. This also hampers the access to public transport (bus stops etc.). In some parts of Lahore attempts have been made to create better pedestrian environment, but designs are poor, and compliance is limited.

It has been observed that Old Lahore area severely lacks proper provisions for pedestrians, footpaths and road crossing facilities. Examples of poor facilities in several residential, commercial and other mix areas are shown in Figure 8.4.7 and are outlined below which need urgent attention:

- Shadbagh area - small scale industries and biggest steel market of Lahore;
- Walled city area congested by commercial activities and truck stands,
- Badami Bagh bus terminal without any waiting areas, walkways, access to local transport stands, and parking facilities, and
- Niazi bus terminal along Bund Road East and Babu Sabu area bus stands lack pedestrian facilities and is most dangerous for passengers to cross the busy roads.

Figure 8.4.7 Badami Bagh Bus Terminal – No Pedestrians/ Passengers Facilities

Source: JICA Study Team

Cycling In Lahore!

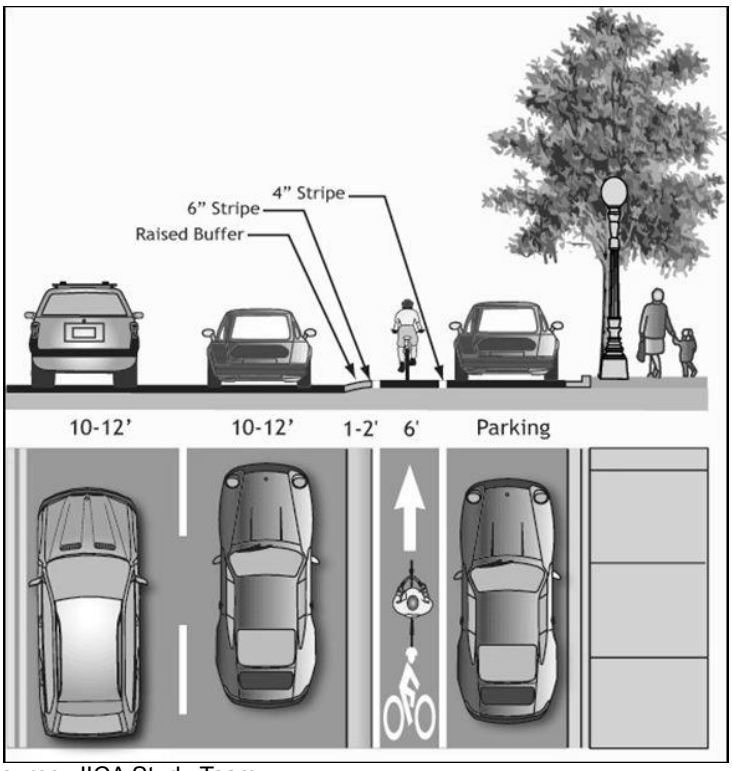
There is no provision at all for cyclists on the entire road network of Lahore. The level of cycling is common and it is (from LUTMP Travel Demand Model) illustrated in Figure 8.4.8. This shows that how much cycling is common in the entire Lahore City area, and on some roads daily cycle volume is in thousands (2010 volumes). Some of these roads are primary, while others are secondary and local streets. Cycling on most major roads is hazardous and dangerous, accidents/ fatalities are common, and the root cause is lack of clearly planned, designed and marked provision of cycling facilities. There is also no regard for cyclists by the motorists – a common driving misbehaviour problem, as cycling rights are not spelled out officially. Therefore, it is essential that due consideration be given to cycling as a mode of transport, and this can be best achieved through planning, design and implementation of cycling facilities in the Lahore City area.

Design concepts of integrated walkways and cycling facilities are illustrated in the following Figures 8.4.9 to 8.4.13 along with the maps of Lahore areas depicting where such concepts should be applied to provide safe and better environment.

Figure 8.4.8 Daily Bicycle Demand in 2010

Source: JICA Study Team (LUTMP Model)

Figure 8.4.9 Integrated Design Concept for Walkways, Bicycle Lane and Parking



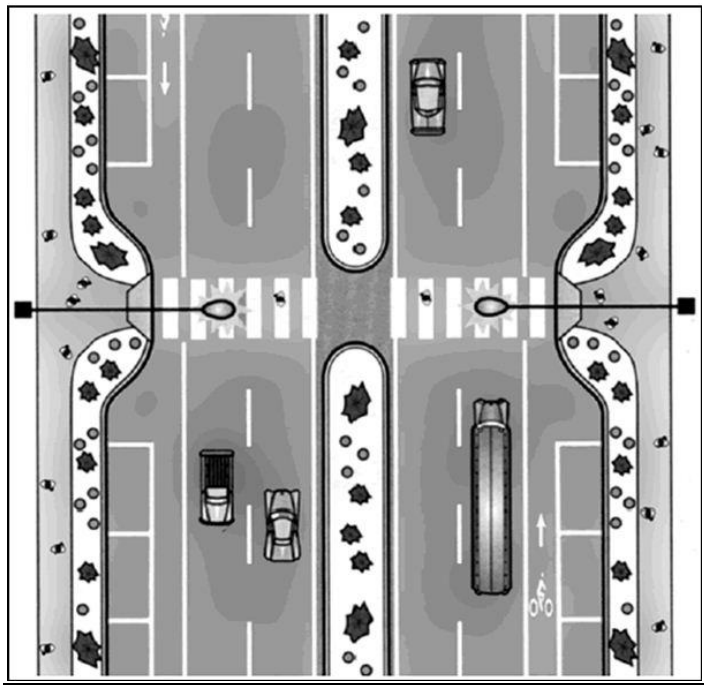
Source: JICA Study Team

Figure 8.4.10 Application of Integrated Pedestrian and Cycling Design in Central Lahore

Green – Historical Monuments – Wider walkways, Bicycle Lanes, restrict heavy vehicles
Red – Pedestrianize the area
Blue – Wide Footpaths along both sides of roads
Black – Pedestrianize the Area

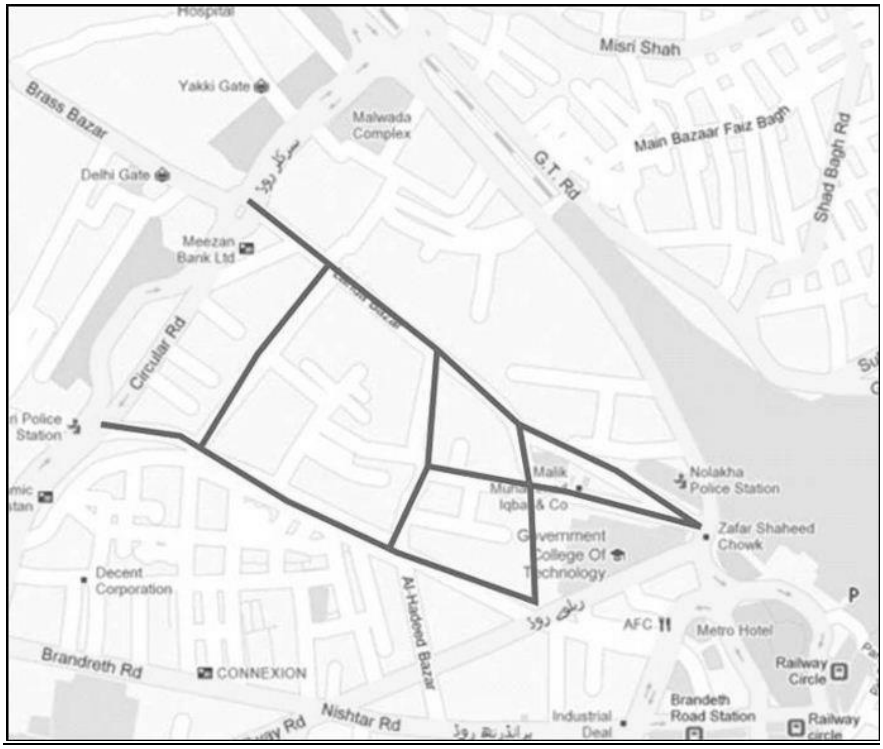
Source: JICA Study Team

Figure 8.4.11 Concept Design of Mid-block Safe Pedestrian Road Crossing



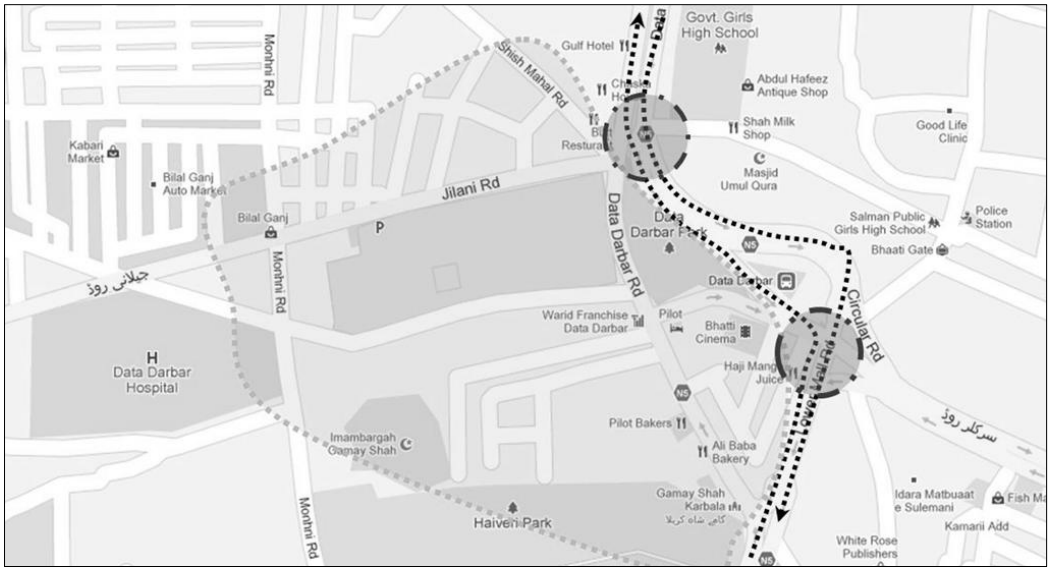
Source: JICA Study Team

Figure 8.4.12 Some Street of Central Lahore Identified for Pedestrianization



Note: Al-Hadeed and Lanada Bazar Areas
Source: JICA Study Team

Figure 8.4.13 Data Darbar Area for Pedestrianization



Note: Highlighted Junctions Needs Special Junction Design
Source: JICA Study Team

2) Project Components and Priority Areas

This project includes comprehensive pedestrian and cycle path planning and design study for the Old Lahore area. The study scope should include detail design of pedestrian and bicycle path network based on demand, and also local area traffic management plans where Pedestrianization is proposed.

Areas south of the Canal should be also studied, but are not a high priority as Old Lahore area, where pedestrian and cycle volumes are relatively much higher. Traffic calming measures for secondary and local roads should be an integral part of the network. In addition special commercial areas should be given high priority for Pedestrianized areas similar to Liberty Market, but with better segregation of traffic and pedestrians, and also with full traffic circulation plan around the area. Areas to be given priority could be: Sadar Bazar, Model Town Link Road Market, Moon Market Iqbal Town. Major components of the projects are as follows:

- Non-Motorized traffic demand and interview surveys;
- Topographic surveys of the road sections for design of walkways and bicycle path network;
- Removal of permanent as well as temporary encroachments;
- Bicycle and pedestrian path network plan, design and construction;
- Traffic circulation plans for the pedestrianized zones;
- Pedestrian planning of major commercial areas with their traffic circulation plans and parking facilities;
- Traffic calming measures for Secondary roads associated with Pedestrianization

and Cycle path network;

- Improved and mandatory pedestrian crossing facilities in all commercial areas.

3) Implementation Strategy and Schedule

This project is proposed to start from year 2014 after completion of Junction design project [TM12]. TEPA should be the executing agency. It is proposed that TEPA should carry out the projects with its local resources, with limited help from international consultants.

LUTMP database could be used to calculate pedestrian and bicycle demand by area and road network. However, supplementary localized pedestrian and bicycles demand and interview survey would need to be required and should be conducted in a manner that data could be incorporated in the LUTMP model for network-wide analysis and forecast purposes. The project is proposed to last three years from 2014 to 2016. Some of the key project activities with timescale are given in Table 8.4.3. The project cost is estimated at USD 5 million, but depend upon the size of area.

Table 8.4.3 [TM23] Pedestrian and Cycling - Tentative Implementation Schedule

Project Activity	2014	2015	2016
Planning, design and construction of Pedestrian path network			
Planning, design and construction of Bicycle path network			

8.4.4 [TM24] Comprehensive Parking System Development

1) Introduction

CDGL has provided small scale parking stands along 32 major roads in Lahore for motorcycles and cars; which are neither planned nor designed for such activity. The roads already lack capacity, and parking is a major encroachment of the road space. There is no signage for Parking or No Parking, legal and illegal parking is common, and enforcement of legal parking is non-existent. CDGL is only authority who is providing on-street parking facilities; however they do not have technical capability to plan, design and manage parking at any level. They simply contract out a section of road (often including footpath) to be used as *'legal parking'*, and the contract amount is the revenue for CDGL without any specific expenditure against this income.

Parking facilities: on or off-street, planning, design, implementation and enforcement should the responsibility of a single competent agency. It is already under TEPA, but due to various historical reasons and lack of local planning laws it is also in the domain of CDGL. This makes the situation unnecessarily complex, and has left this area of traffic management completely without direction and control. As a result there is no concept of parking demand and required/ necessary supply quantification, strategies to provide parking or restrain it? Recent trend is to build multi-storey parking plaza objective is that it

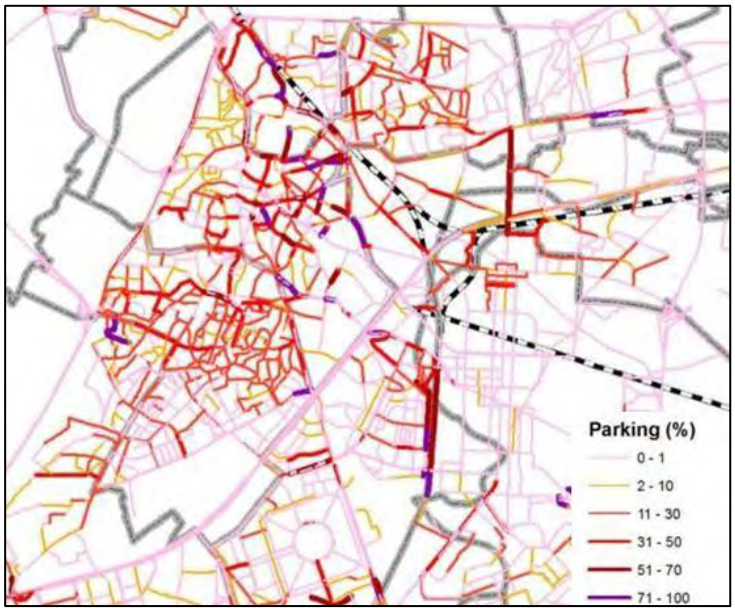
would reduce congestion, whereas basic transport planning suggests that it would increase traffic demand to the area, and worsen congestion. The result of total ineffective control and lack of planning is evident from the picture in Figure 8.4.14.

Figure 8.4.14 Discriminate Parking at Panorama Shopping Centre – The Mall

Source: JICA Study Team

There are only three car parking plazas in the whole of Lahore, parking integral to large development often ends up as commercial space (like Panorama Shopping Centre basement) due to lack of building control. Encroachment of local road network was observed during the LUTMP surveys and is illustrated in Figure 8.4.15 with the aid of LUTMP model. The Figure also gives the level of demand as percentage of the street section is occupied by legal/ illegal parking.

Figure 8.4.15 On-street Legal/ Illegal Parking in Lahore – LUTMP Surveys



Source: JICA Study Team

2) Project Components and Study Area

There is no local institution with capacity to plan, design and manage the parking in the city. Development of an institution responsible for such a task is essential. Setup of a company for the Development of Parking Management is a step in the right direction. However, the main components of the project are briefly described as:

- Institutional planning study leading to development of Parking Management Company prior to the starting of the parking system study.
- Capacity building of parking management company would be the major part of the institutional development exercise.
- Comprehensive parking demand surveys needs to be conducted; this need to be supported with details of the associated land use of the area to estimate parking demand by volume and time period.
- Commercial activity centres would be identified and studied in detail for their parking demand and provisions.
- On-street parking facilities would be planned and designed based on demand, and supply, possibly with parking restraint as a policy. The strategies should be proposed based on the environmental impact of parking provision in the area.
- Off-street parking facilities feasibility study should be conducted according to demand and impact on the local road network and the associated environmental impacts.
- Pilot off-street parking facility detail design as a capacity building exercise for the parking management company and TEPA.
- Comprehensive parking policy and strategy would be formulated based on the existing parking demand analysis and parking behaviour in the city.
- This study should lead to the development of Parking Design Guidelines for both on-street and off-street facilities.

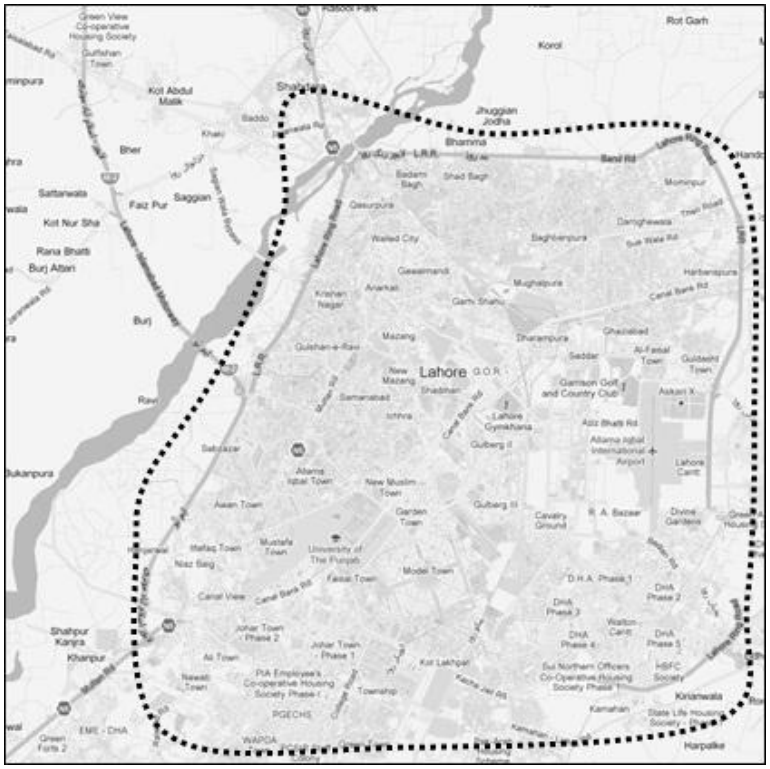
This proposed project area includes the Old Lahore (as described above in Section 8.3.1 and shown in Figure 8.3.3), and the areas south of Canal including Model Town, Iqbal Town, Gulberg, and DHA as mapped out below in Figure 8.4.15.

3) Implementation Strategy and Schedule

It is suggested that a local and/ or international consultant could be engaged; who have extensive experience of institutional development and conduct of such studies in the developing countries. This exercise can effectively be utilized by TEPA and Parking Management Company as capacity building exercise. Parking Management Company could also be made responsible for planning, designing, development, and management

of all parking facilities in Lahore. Tentative implementation schedule of the project is given below in Table 8.4.4, and project cost is estimated at USD 2.5 million.

Figure 8.4.15 [TM24] Parking Study – Proposed Project Area



Source: JICA Study Team

Table 8.4.4 [TM24] Parking Study Tentative Implementation Schedule

Project Components/ Activity	2012	2013	2014
Institutional Study			
Parking Management Company Development			
Parking Planning Study			
Parking Design Study			
Capacity Building of TEPA			
Project Implementation			

Source: JICA Study Team

8.4.5 [TM31] Local Standards and Guide Lines Development

1) Introduction

Currently no standards or guidelines exist for transport planning and traffic engineering in Pakistan. Previous attempts by NTRC (National Transport Research Center) and other provincial institutions failed to produce documents of international standards, which could be adopted as Standards/ Guidelines. Even the documents which exist do not fully reflect the local conditions.

The Urban Unit recently prepared a 'Punjab Traffic and Transport Manual' which includes traffic signs in English language only and does not include the signs recently used (on

LRR). Hence, it completely lacks the local context, in terms of ability of local *totally illiterate* drivers to understand these signs in English or its use for signage in Punjab, at least new roads. However, this manual could be used as starting point for this study. It would need to be completely revised in the local area context. Its legal status needs to be ascertained and reasons for lack of its implementation needs to be determined. This is a serious concern, as enforcement would be the key issue for the implementation and conformity to such a document. This project is considered as a core project for all traffic management and traffic engineering design work; and can bring conformity to the design of transport facilities.

2) Project Components and Area of Implementation

Different transport facilities design standards and guidelines would be developed under this project. The proposed standards and guidelines documents needed to be produced are briefly outlined below:

1. Road Geometric Design Standards
2. Parking Facilities Design Manual
3. Traffic Control Devices Manual
4. Traffic Signal System Design Manual
5. Development or Traffic Impact Assessment Guidelines

These guidelines would be designed in the local context, and should be applicable in the whole of Pakistan. These standards and guidelines should be applicable to all major cities and towns. However, if the situation demands (to be ascertained by the study), these standards and guidelines may be relaxed for rural or outlying areas. This relaxation should be clearly documented, and where possible supplementary guidelines would need to be prepared for such areas.

3) Implementation Strategy and Schedule

TEPA or other transport sector institutions should have full technical involvement with the project, and must have technical capacity to formulate such comprehensive document of standards or guidelines. Project should be executed by commissioning international consultants with full involvement of all stakeholders. The standards and guidelines thus developed are mandatory on all transport sector concerned agencies.

Table 8.4.5 [TM31] Development of Guidelines and Standards Tentative Schedule

Standards and Guidelines	2012	2013	2014	2015	2016
1. Road Geometric Design Standards			Project Review/ Implementation Period Involving Other On-Going Traffic Management Project.		
2. Parking Facilities Design Manual					
3. Traffic Control Devices Manual					
4. Traffic Signal System Design Manual					
5. Development or Traffic Impact Assessment Guidelines					

Source: JICA Study Team

8.5 Core Program-2 – Medium Term Traffic Management Projects

There are in total five (5) medium traffic projects in the LUTMP 2030, and two of these have been included in Core Program-2. These projects are deemed to be essential as the start of implementation is vital for the city's traffic management system, as explained below under each project description.

8.5.1 [TM16] Traffic Circulation System Design and Implementation

1) Introduction

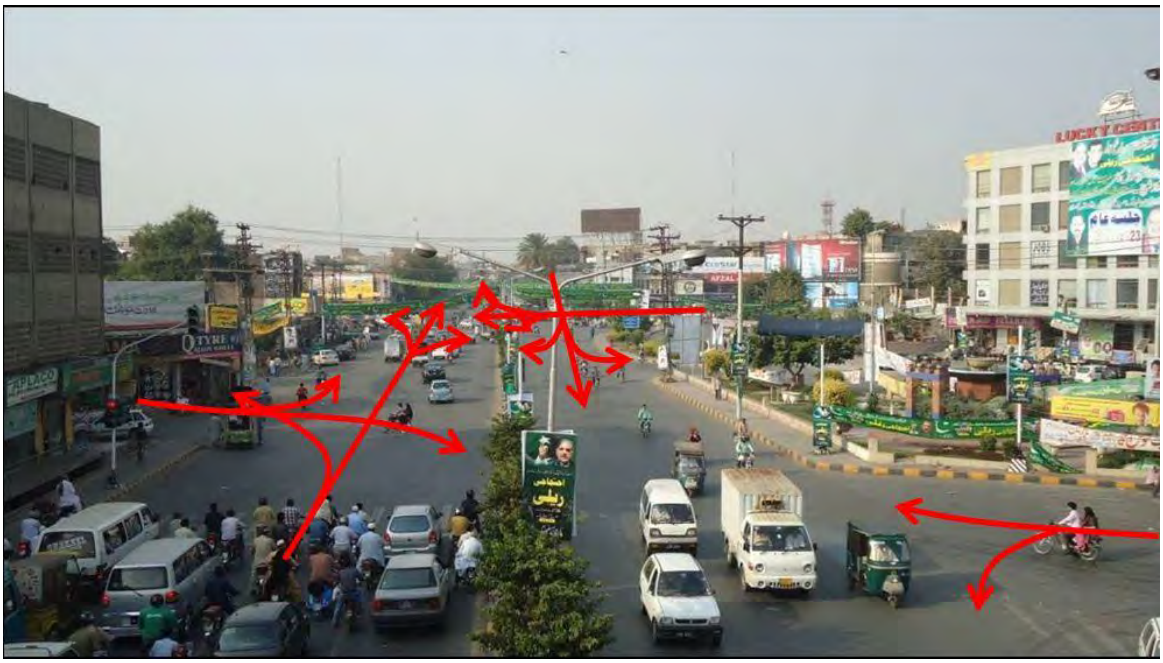
In a large metropolis an effective traffic circulation system is essential to get the best operational efficiency from its road network. The traffic circulation design concept is commonly used in the developed countries to improve the functional and operational efficiency of road network as whole. Under this concept a carriageway is made one-way (sometimes for peak periods only) to reduce conflicts along its length to improve its capacity. It should be understood that a 1-way carriageway has 30 % more capacity than a 2-way undivided carriageway of the same width. Conversely, if a 1-way carriageway is turned into 2-way operation, there would be a loss of up to 30~50 % of its total capacity. Similarly, junction capacity in a 1-way system is also enhanced, and this further improves the network operational efficiency. On the other hand 1-way system does increase the trip length over a limited area, hence its implementation needs to be carefully planned, and evaluated before implementation.

Lahore has many dual carriageways, very wide roads and often with service roads along most of their length, which often extend right into the city centre. Sadly this available road capacity is simple wasted away due to total lack of directional control of traffic. Most service roads operate 2-way, without any provision of such contra-flow movements at junctions. This causes total chaos at junction, when vehicle end up travelling in the contra-flow direction. Such 2-way operation of service roads is not only inefficient, but dangerous and is major cause of junction blockage, accidents, sometime serious and fatal. Major advantage of this concept is to effectively minimize the severity and minimize the number of conflicting movements at the junctions. The chaos caused by conflicting movements by not having clearly defined efficient traffic flow system is shown in the following Figures 8.5.1 to 8.5.4.

Currently, LUTMP road network traffic circulation is very inefficient from the reasons outlined above; specifically where it could be implemented without much investment – an example is to enforce 1-way use of service roads, or at least at the junctions. This simple measure would improve junction efficiency and link capacity, not only of the service roads

but also of the main carriageways, due to reduction of conflicts at the carriageway junctions.

Figure 8.5.1 Poor Traffic Circulation at Qurtaba Chowk – Note Conflicting Movements



Source: JICA Study Team

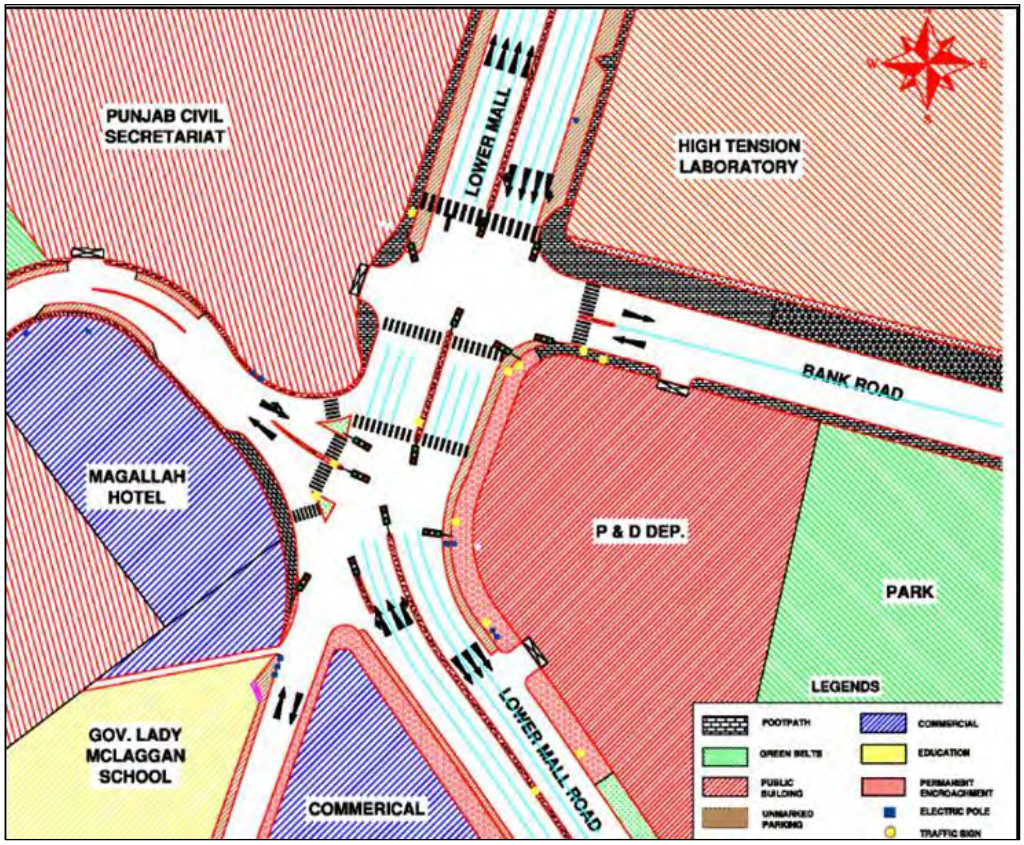
Figure 8.5.2 Dual Carriageway Ferozepur Road – Note Traffic in Contra-flow Direction

Source: JICA Study Team

Figure 8.5.3 Poor Gyratory System Design without Traffic Channelization

Source: JICA Study Team

Figure 8.5.4 Secretariat Junction – 2-way Junctions are Too Close



Source: JICA Study Team

2) Project Components

For this project network simulation model would be required, which could initially be setup using a 'window approach' to the LUTMP strategic model, for local area data extraction. Traffic circulation system need to be designed on an area-wide network basis and not for streets / roads in isolation to get the best performance from the road network. The project would include the following major components, but not limited to:

- New simulation model would need to be developed, whereas the LUTMP strategic model would provide the area-wide traffic cordon flows.
- The simulation model need to be based on state-of-the-art software, and would require calibration for the area of application.
- Topographic survey, and other related transport and traffic surveys of the local area road network as input data to the simulation model;
- Pilot traffic circulation system design could be broadly evaluated using a smaller/ local area version of the LUTMP transport model.
- All new schemes of road and traffic management should be assessed and evaluated, initially in the LUTMP model then through the simulation model prior to implementation.
- Junctions should then be designed as modelled, including traffic signals, and control devices as per plan and design of the scheme.
- Capacity building of traffic police is needed to effectively enforce such traffic circulation system, and not interfere with the system, unless in case of an emergency.

3) Area Description

This project should be initially planned, designed and implemented as pilot project at location/ for an area where enforcement is not a major challenge. It should then be implemented in stages, to cover the CBD area, and other stand-alone independent areas like Gulberg Market areas and the adjacent network.

4) Implementation Strategy and Schedule

TPU/ TEPA do not have technical capacity to fully comprehend and modify the LUTMP model, and develop traffic simulation model for this project. Therefore, it is suggested that international consultant should be commissioned with experience in such detailed traffic modelling, both at strategic and simulation levels. TPU/ TEPA should prepare the project ToR with the above components as a 'must be', and with proposals for a pilot area. The project should be used as capacity building exercise for both TPU/ TEPA staff.

This project is designed to efficiently manage existing road network operation, and would enhance the network capacity without major investment in road building and grade separation. Table 8.5.1 provides a tentative implementation schedule for the whole project within the LUTMP Core Program-2. Project should be executed by TPU, in conjunction with TEPA and should take account of other on-going short term projects. Estimated project cost is USD 20million, less than a single grade separation cost, but would yield far more benefits

Table 8.5.1 [TM16] Traffic Circulation Project Tentative Implementation Schedule

Project Activity	2013	2014	2015	2016	2017
Project Preparation and Consultant Appointment					
Development of Simulation Model					
Pilot Project Implementation					
Old Lahore Area Traffic					
South of Canal Areas Circulation System Design					
The Study Area wide Application of Concept					
Traffic Control Devices Installation and Implementation					
Traffic Police Capacity Development					

Source: JICA Study Team

8.5.2 [TM17] Public and Freight Transport Terminals

1) Introduction

District Regional Transport Authority (DRTA) is responsible for planning, issuing permits, and overall operation of inter-city bus terminals in Lahore. DRTA has approved eleven 'D' class bus stands which are operational. In addition there are main bus terminals like Badami Bagh, Daewoo, Multan Road (near M-2), and Niazi Bus Terminals. Locations of these terminals are shown in Figure 8.5.5.

Bus Terminals

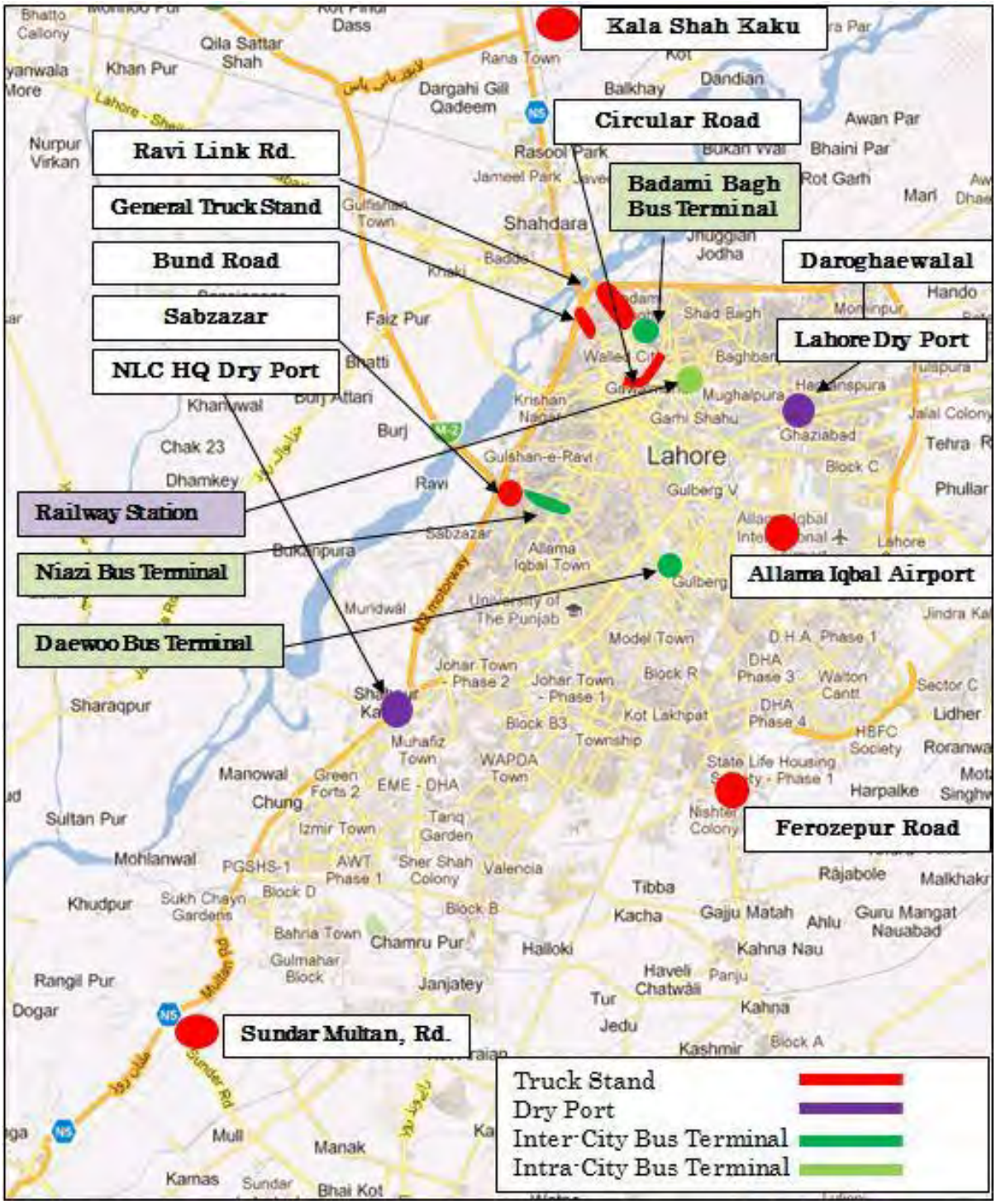
Badami Bagh bus terminal is the largest and oldest of all. It was planned to be an inert-city bus terminal and was built to shift the inter-city bus operation from the Lahore Railway Station area in late 1960's. It was a well-planned, designed terminal, with integrated intra-city travel facilities at that time. However, now it's nothing more than a slum area and a collection of bus stands without any order or planning of amenities for passengers. Its location is ideal for passengers, as it is located in the city centre, but it is a serious environmental hazard for the heritage sites. The bus terminal has been unlawfully expanded to areas adjacent to the Lahore Fort, which is a serious environmental issue. Location of the heritage sites and the bus terminal traffic circulation is shown in Figure 8.5.6. The CDGL bus terminal on Bund Road East is better planned, and functions well

compared to the other bus stands in that area, which are mostly located and operated at the convenience of the bus operators.

Truck Terminals

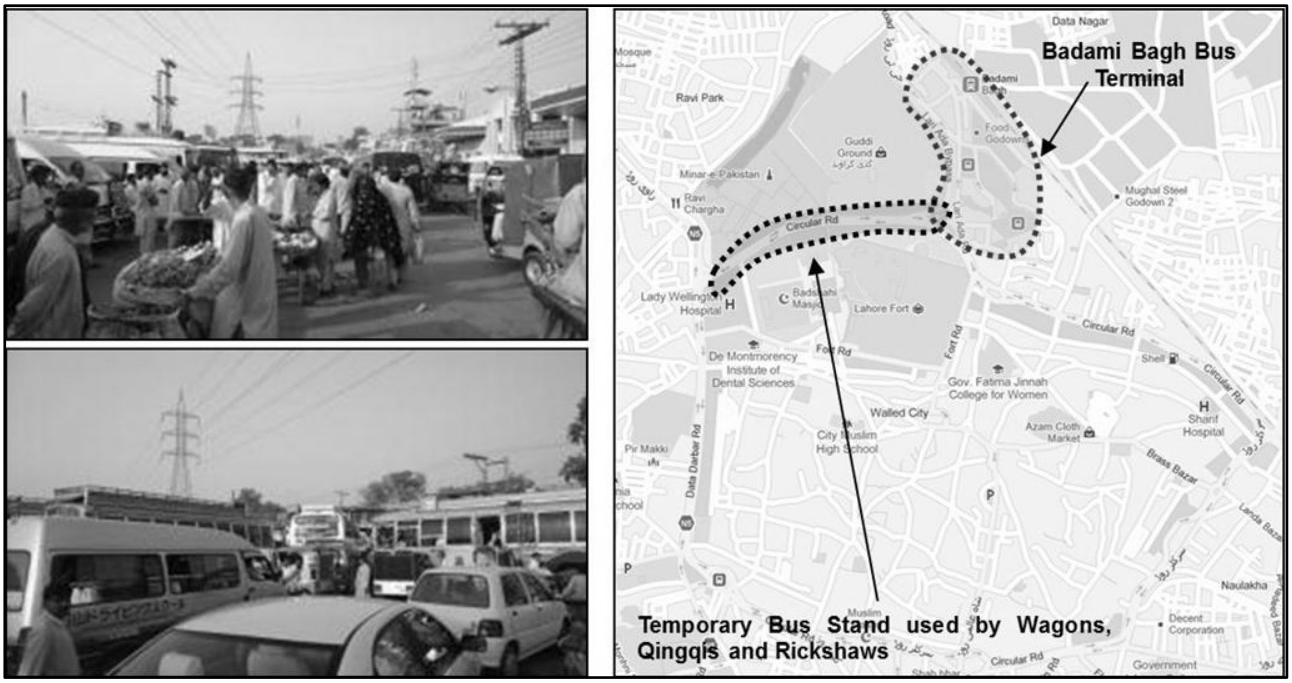
Existing truck terminals condition is worse than the bus terminals. Most of these are located in the dense urban areas and use road-side for loading and unloading. There is usually no off-road designated parking space or other facilities, for overnight parking and maintenance for the owner-operators. It should be noted that most of the trucking fleet is a single truck owner-operators. Therefore road space is often used for parking and maintenance. Condition and plight of some of the trucking areas so called the 'truck stands' is evident from the pictures in Figure 8.5.7.

Figure 8.5.5 Location of Public Transport and Truck Facilities in Lahore



Source: JICA Study Team

Figure 8.5.6 Bus Terminal Operation around Heritage Sites



Source: JICA Study Team

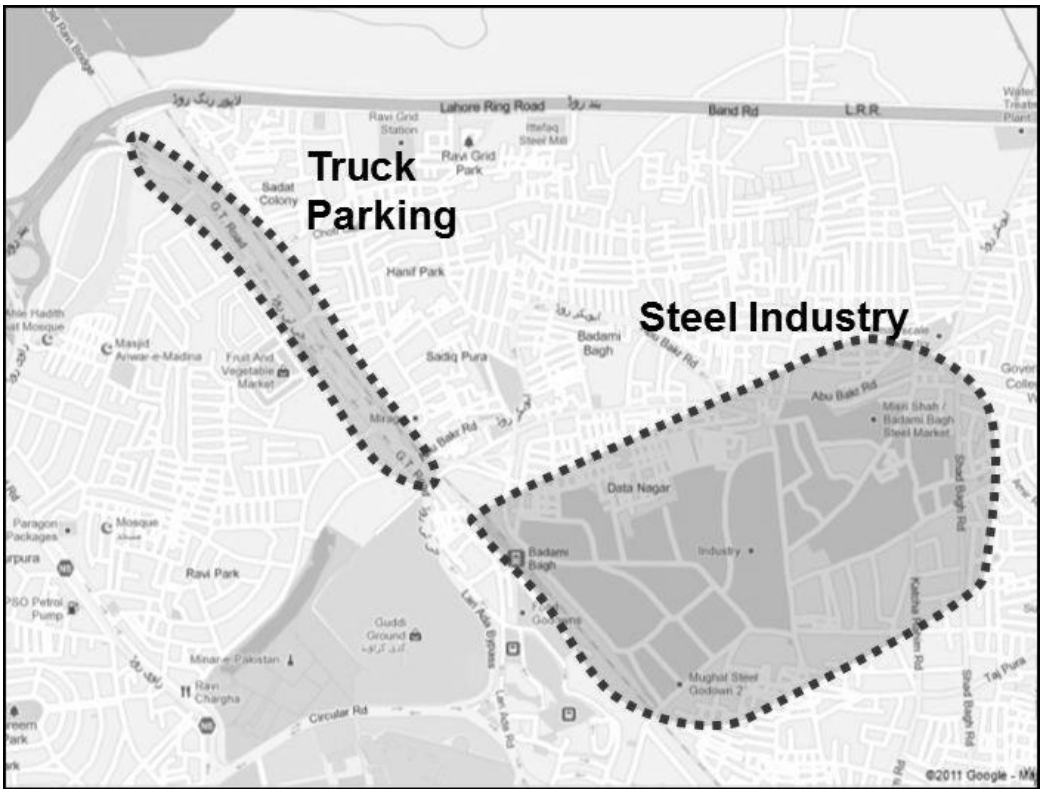
Figure 8.5.7 Condition of Existing Truck Stand/ Terminal at Sabzazar

Source: JICA Study Team

The area shown in Figure 8.5.8 is the Cottage Steel Industry, which is located in the centre of the CBD area, a totally inappropriate location for such commercial activity. This attracts trucking activity, but has no space and associated road network to function efficiently. As a result the 'steel market' activity is a traffic nuisance and the industrial/ commercial activity is a serious environmental and safety hazard for the local community.

The relocation of the whole of the 'steel market' industrial/ commercial activity is essential for the trucking activity to be limited in the area. This would be a major challenge to relocate the steel industry/ market to and industrial estate, and regenerate this inner CBD area of Lahore, just like the Dockland in London. It is a project, with many facets, and could not be done over-night, by ad-hoc decisions. It needs careful land use planning, and a phased implementation, and may take the rest of this decade to be fully implemented. This LUTMP proposal is being put forward with a 'vision' of Lahore as city of gardens.

Figure 8.5.8 Steel Industry/ Commercial Activity in CBD Area



Source: JICA Study Team

2) Project Components – Public Transport Terminals

For such a complex project, it is nearly impossible to list out all the project components, it requires a comprehensive understanding of the subject, which should be done in house by TPU/ LDA/ TEPA to ascertain how to handle this mega-project, and then proceed with caution. Following points give a brief list of components which are must, and cannot be ignored.

- A detailed feasibility study should be conducted to fully understand and realise the existing intercity and intra-city terminal operation, estimate future travel demand requirement for the additional terminals in medium to long term.
- The choice of terminal location should take account of the terminals proposed as part of the RMTS development program, and the planned/ designed bus terminals located

at the end of these BRT/ RMTS lines, and integrated with their respective depot sites.

- Based on the feasibility study recommendation; detail design study should be conducted for the proposed terminals;
- Construction and operation of bus terminals in the specified locations with all requirements necessary for a modern multi-modal transport interchange.
- For operation PPP options should be explored to reduce the financial burden on the public.
- Traffic management studies should be conducted as part of the feasibility study, to facilitate all traffic movement necessary for such terminal operation taking account of the trunk and secondary road network.

3) Project Components – Freight Terminals

It is recommended that the project should include the Following key/ vital components on board.

- Comprehensive freight planning study should be conducted for Lahore; which should accommodate current demand and supply, and future needs of the city.
- The study outcome/ recommendation should be the feasible locations of the truck terminals, conceptual designs, freight distributary network, local delivery system, and long term plan based on the industrial growth;
- Account should also be taken of Rail-freight terminals/ 'dry-ports' proposed or operated by Pakistan railways. This component is essential, as it is far more economical to transport bulk/ container freight over long distances by rail than road; e.g. goods movement between Lahore and Karachi.
- Design study should follow the feasibility study recommendations and design truck terminal facilities;
- Construction and operation of truck terminal facilities;
- For operation PPP options should be explored to reduce the financial burden on the public.
- Traffic management study should be conducted as part of the location feasibility study to take account of trunk and primary road network. Due attention should be given to day time truck ban in the inner city area. Therefore access to the secondary road network may need to be developed for the distribution of goods by smaller vehicles during the day.

4) Project Components – Steel Industry/ Market Relocation

Following are the main recommendations for the relocation project, but would need stakeholder involvement at the outset.

- Detailed assessment of exiting industrial and marketing activity to ascertain, what is really going on.
- Feasibility study to seek alternative location(s), their evaluation and stakeholder's views of these sites.
- Plan and design industrial area, this may be equivalent to the size of Sundar Industrial estate, or even larger.
- The relocation study, should be conducted taking account of the location of truck terminals, otherwise both relocation of trucking and steel Industry/ market would be a failure.
- The detailed lay out design of the industrial estate development at the proposed locations with access roads to secondary and trunk road system.
- Account should also be taken of labour/ workers in this regard; their housing and need for other amenities should be incorporated. This is because the current industry is a family business and has been going on for generations.
- An urban regeneration study of the existing area, its effective use should be conducted involving the current stake holders/ owners, so that they also benefit from the gains of relocation.

5) Implementation Strategy and Schedule

It is suggested that an international consultant in urban planning, transport planning and industrial development design should be commissioned for a strategic study for the whole project. They should then set up the three further studies for bus terminals/ freight centres, and relocation of steel industry/ market coupled with regeneration study of existing area. Only after the completion of these studies, individual projects should go out to tender.

The project has to be handled involving many provincial and local departments and agencies. It is proposed that the project initially should be started by LDA under P&D Department, and with close liaison with Transport department, TEPA, CDGL and LTC. Transport Department deals with inter-city public transport terminals, LDA/ CDGL with freight and local industries, LTC with intra-city operations and facilities, and TEPA for traffic engineering components. In addition, as the scope of the project is extensive, it would be appropriate to have an overall general consultant commission at the outset, and would be responsible for the project until its implementation and operation.

A tentative project implementation schedule is outlined in Table 8.5.2, with key project components and activities, essential for its success. Project cost is estimated at USD100 million.

Table 8.5.2 Bus and Freight Terminals Project – Tentative Implementation Schedule

Project Components/ Activities	Year, 2000+							
	13	14	15	16	17	18	19	20
Prepare Master Plan of all Projects and Commission General Consultant to Oversee the Complete Project								
Public Transport Terminals								
Feasibility study for public transport terminal relocation								
Design study for public transport facilities detailed design								
Construction of proposed terminals								
Operation of proposed terminals								
Traffic management planning and design study of terminals								
Freight Terminals								
Comprehensive freight planning study								
Detail design study for the freight terminals								
Construction of freight terminal facilities								
Operation of freight terminal facilities								
Traffic management planning and design study of terminals								
Steel Industry/ Market Relocation								
Feasibility and Design study for shifting the steel market								
Development of Industrial area								

Source: JICA Study Team

8.5.3 [TM19] Feasibility Study for Traffic Demand Management Measures

1) Introduction

Traffic/ transport/ travel demand management (TDM) is a general term for various strategies that increase transport system efficiency. TDM treats mobility as a means to an end, rather than an end in itself. It emphasizes the movement of people and goods, rather than motor vehicles, and so gives priority to more efficient modes (such as walking, cycling, car-pooling, and public transit), particularly under congested traffic conditions. It prioritizes travel based on the value and costs of each trip, giving high value trips and lower cost modes priority over, lower value high cost travel, in doing so increase overall system efficiency.

The TDM is 'carrot and stick approach', and would fail if adequate alternative transport is not available. For example, restricting cars into the city centre during peak periods could only be implemented if alternative public transport is reliable, efficient and comfortable, coupled with direct access to amenities through integrated station design. Therefore, following projects are assumed to be completed and operational prior to study/ implementation of TDM project;

- Rail mass rapid transit system (Green line) and some of the bus rapid transit lines should be operational;
- Connecting communities (smart roads) and traffic circulation system design, and

public and freight transport terminals traffic management projects would have been completed;

Presently, there is no concept of TDM in Lahore; however its need would be evident as the congestion increases over time, and ad-hoc solutions of spot problem fixing are no longer have impact. This will put extra strain over the scarce road space and poorly managed network of Lahore through mode growth (car ownership growth is estimated to be 45 % by 2030). This vehicle growth cannot be stopped due to increase in income levels and local culture. But the rate of growth could be reduced by sustainable management of the people and goods movement in the city's network. This would require some tough decisions in limiting vehicle ownership, and parking restraint policies, totally contrary to the current trends of trying to meet traffic demand at all cost. This will also require tough political decisions, contrary to current belief that we can build our way out of congestion – no nation has done it, how we could do - That is where and when TDM will come in, so we should prepare for it now.

Individual TDM strategies can only affect a small portion of total travel, and their benefits would appear modest with respect to any particular problem, however, overall impacts are cumulative and have synergy. When all benefits and costs are considered, TDM programs are the most cost effective way to improve travel condition for all and for the overall benefit of the community. Key steps involved in the development and implementation of TDM measures could be summarized as follows, and some of the commonly applied traffic demand management measures practiced in the developed and developing countries are listed in Table 8.5.3.

Policy and Planning Reforms

More funding for alternative modes, increased support for TDM programs, changes in land use planning practices etc.

Changes in Travel Options and Incentives

Improved walking and cyclcing facilities, improved bus and and public transit services, more compact and mixed land use development, increased parking fees, road user charges for peak periods, reduced transit fares.

Travel Pattern Changes

Shifts in travel time, destination, mode, route choice, and frequency.

Outcomes of TDM Measures

Reduced traffic congestion, accrued revenue from and parking charges and road user charges, accident reductions, energey conservation, pollution emission reductions,

improved mobility for non-vehicle owners, and most of better environment.

Table 8.5.3 Traffic Demand Management Strategies

Improves Transport Options	Incentives	Land Use Management	Policies and Programs
Bike/ Transit integration	Parking pricing	Location-efficient development	Campus transport management
Car sharing	Commuter financial incentives	Car free planning	Commuter trip reduction
Flex-time	Distance-based fares	New urbanism	Freight transport management
Guaranteed ride home	Fuel tax increases	Parking management	Least-Cost planning
HOV Priority	Non-motorized encouragement	Smart growth	Market reforms
Non-motorized improvements	Pay-as-you-drive vehicle insurance	Traffic calming	Performance Evaluation
Rideshare programs	Road pricing	Transit oriented development	TDM marketing
Taxi improvements	Better land values near transit nodes	Compact development	TDM Programs
Telework			Tourist transport management
Transit improvements			

Source: JICA Study Team

2) Project Components

The proposed feasibility study is to be conducted in the medium term timeframe. Its key objectives are to prepare comprehensive TDM program for Lahore for next 20 years. The project objectives are to review and develop various TDM options/ strategies in order to improve the available transport options for travelers in Lahore under local conditions. Some provide incentives to change trip time, route choice, mode selection, or even alternative destination, while others reduce the need to travel at all through more efficient land use practices. Most individual TDM strategies affect small portion of total travel; so this study should develop a comprehensive TDM program of a number of measure to be implemented collectively; which would have significant effects on travel behavior, and the measureable social and environmental benefits. The TDM program should cover the following;

- *Congestion Reduction*
  - ✓ Reduces traffic congestion delays and associated travel costs
- *Road User Charges and Parking Fees*
  - ✓ Increased revenue to support public transport costs
- *Consumer Savings (Vehicle Cost)*
  - ✓ Consumers capital cost saving for not owning a car/ motorcycle
- *Transport Choice*
  - ✓ Improved travel options, particularly for non-vehicle available group

- *Road Safety*
  - ✓ Reduced accidents, and less social cost due to fewer fatalities
- *Environmental Protection*
  - ✓ Reduced air, and noise pollution, and better environmental
- *Efficient Land Use*
  - ✓ Supports land use strategies, compact development requiring less green filed sites and less urban sprawl, short trips.
- *Community Livability*
  - ✓ Improved environment quality for the community as whole.
- *Economic Development*
  - ✓ Supports community's economic objectives, such as increased productivity, employment, and increase property values, more equitable.
- *Physical Fitness and Health*
  - ✓ More physical activities, through increased walking and cycling

3) Implementation Strategy and Schedule

This is assumed that TPU would have achieved technical capacity in transport planning, and traffic management planning by the year 2015 to be able to implement such a project. However, it is recommended that international consultant should be commissioned to work with TPU staff for preparing this feasibility study due to its complex and advance scope of multi-disciplinary traffic demand management tasks.

This project could be used as capacity building exercise, and selected transport planners and traffic engineers should work as counterpart staff to the international consultant for OJP. After, the study local staff should have enough training to improve, modify and implement the TDM strategies in as the implementation starts in earnest. The tentative project implementation schedule is outlined in Table 8.5.4.

Table 8.5.4 [TM19] TDM Project Tentative Implementation Schedule

Project Activity/ Components	2016	2017
Project Preparation and Commissioning of International Consultant		
Feasibility Study for TDM measures		

Source: JICA Study Team

8.6 Core Program-2 – Road Sub-sector Projects

8.6.1 [R44 and R45] Shadbagh and Samanabad Areas – Secondary Roads Development

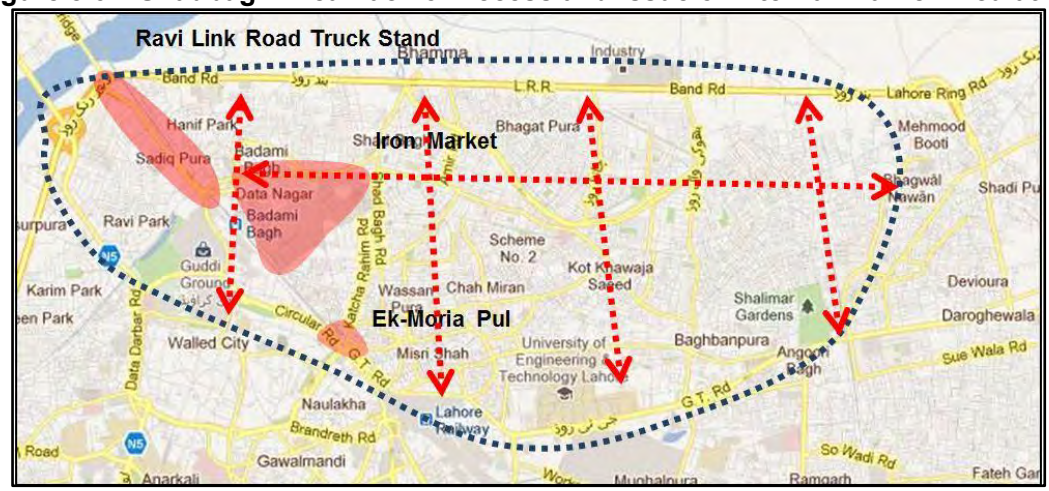
1) Introduction

As discussed, road network hierarchy is essential for the overall road network performance. This has been the essence of LUTMP 2030 Road Sub-sector development. The road network hierarchy, particularly development of secondary and local road network is non-existent in these two dense urban areas of Lahore. The result is total traffic chaos, road blocks, bottlenecks due to encroachments or narrowing of roads, junction grid-lock due to lack of proper priority junctions, or signalized junction control. These areas have been given priority for the improvement of the road network, overall better traffic conditions and social and environmental benefits, rather than just as simple high EIRR of the projects.

2) Shadbagh and Samanabad Areas

Shadbagh and Samanabad areas are part of old Lahore area, and its community and the urban fabric is a compact mix of land use and activities. Shadbagh area can be regarded as land locked between Lahore Ring Road, G.T. Road, Ravi Link Road and the Pakistan Railways in the east. The access to the area is limited, and has no links with the Trunk or Primary road network. Traffic access to this area is mostly *'Ek-Moria pull'* a four-lane underpass to cross the railway track, with no channelization or area based traffic circulation system in place. The numbers of railway crossings are limited, and have not been increased in line with increase in population and commercial activity in the area since 1947. Figure 8.6.1 illustrates the area, and the constraints to internal traffic circulation and access issues.

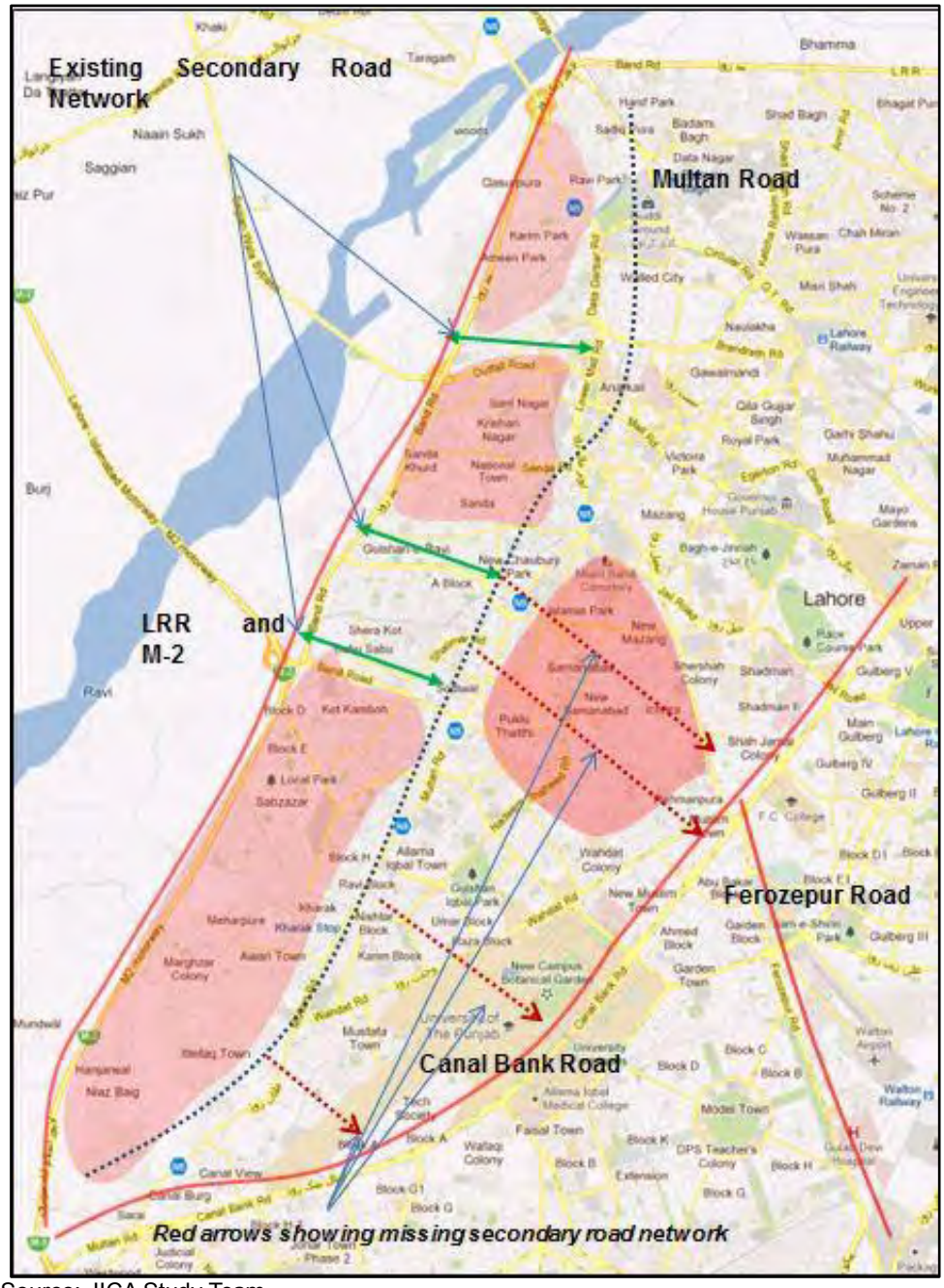
Figure 8.6.1 Shadbagh Area Lack of Access and Issue of Internal Traffic Circulation



Source: JICA Study Team

Samanabad area has three main secondary roads Gulshan-e-Ravi, Bund Road East, and Outfall Road which extends to Multan Road. There is lack of access from these major trunk and primary roads, and the inter-connectivity of secondary roads is also limited. This results in traffic convergence on to Multan Road and Ferozepur Road junctions to access the area, which also has limited internal secondary road network for local distribution of traffic from the external primary network. Figure 8.6.2 below illustrates these network deficiencies in the Samanabad area.

Figure 8.6.2 Samanabad Area Lack of Internal Secondary Roads and External Linkages



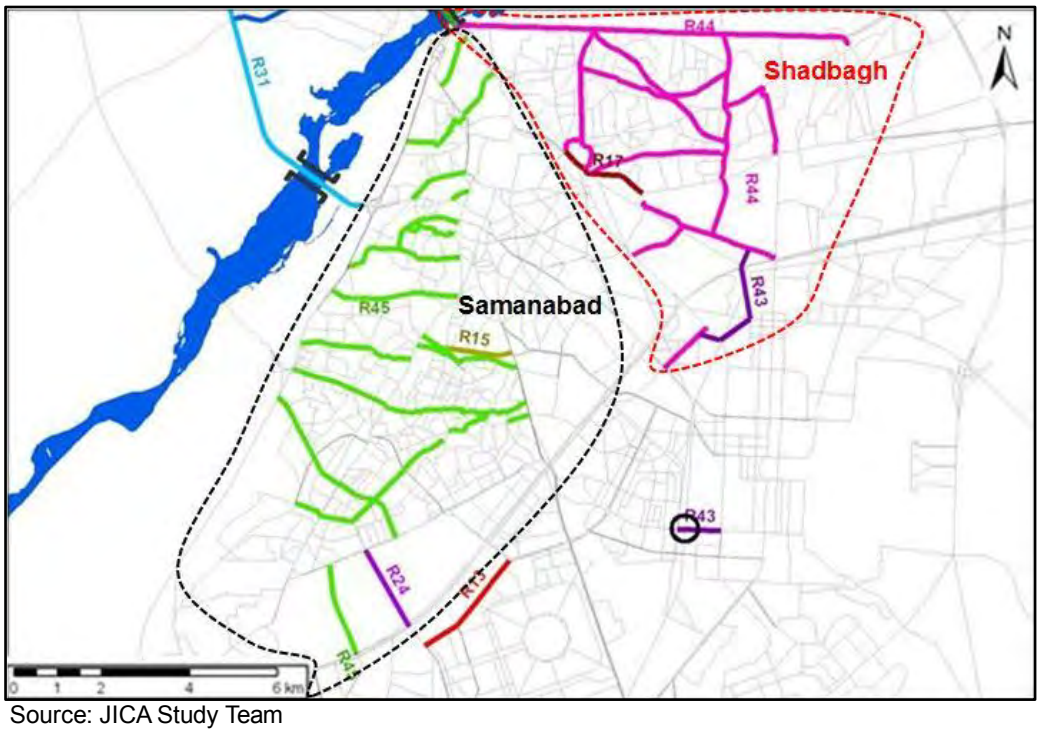
Source: JICA Study Team

3) Project Components

This project includes improvements (remodeling/ re-construction, and construction of small sections of new roads to improve connectivity/ linkages) of internal roads to a uniform secondary and local road standards, as described in Chapter 7, Section 7.1.2 of this report. The identification of these roads was the outcome of LUTMP model assignment process, which detailed the roads/ sections with capacity deficiencies. The road sections identified through LUTMP modelling are defined below under two project headings; namely Roads 'R44' for Shadbagh area, and 'R45' for Samanabad area. As a result, and through local area surveys it was decided to propose linkages between the primary roads, by the development of secondary road network to increase the overall road network performance. Shadbagh and Samanabad area are especially focused to handle extra traffic demand in future from external zones to inner area of Lahore.

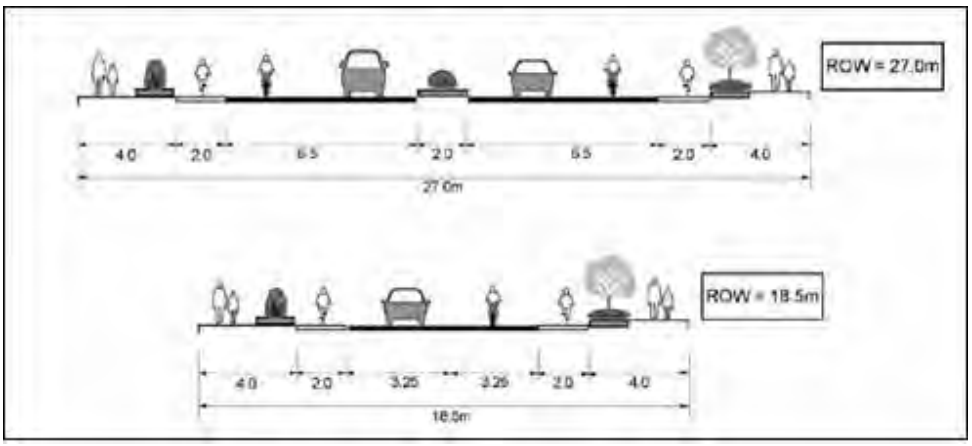
Proposed secondary road network development is shown in Figure 8.6.3. The secondary road network to be developed should either adopt the standards specified, in section 7.1.2 or due to local area land constraints may adopt the cross section outlined in Figure 8.6.4 and further illustrated in Figure 8.6.5. Bus bays should be designed and implemented by giving proper access to pedestrians as shown in Figure 8.6.6. Whereas, street concept designs for dense urban areas are depicted in Figures 8.6.7 and 8.6.8. These figures show that how well designed urban streets can be environment friendly and can co-exist with traffic, pedestrians, cyclists, and even at-grade public transit system.

Figure 8.6.3 Proposed Secondary Roads (R44 and R45) Development



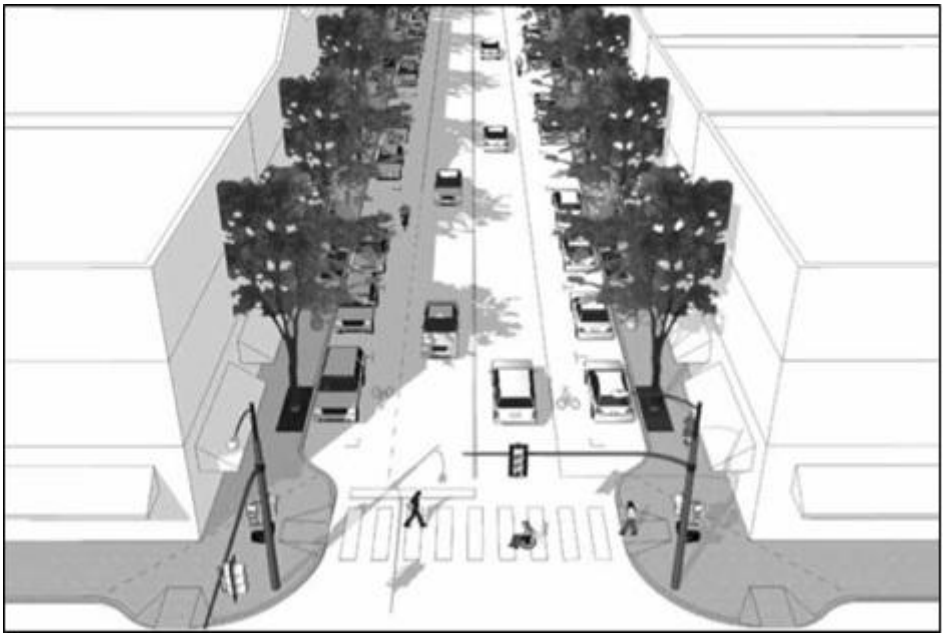
Source: JICA Study Team

Figure 8.6.4 Proposed Urban Secondary Road Cross Section



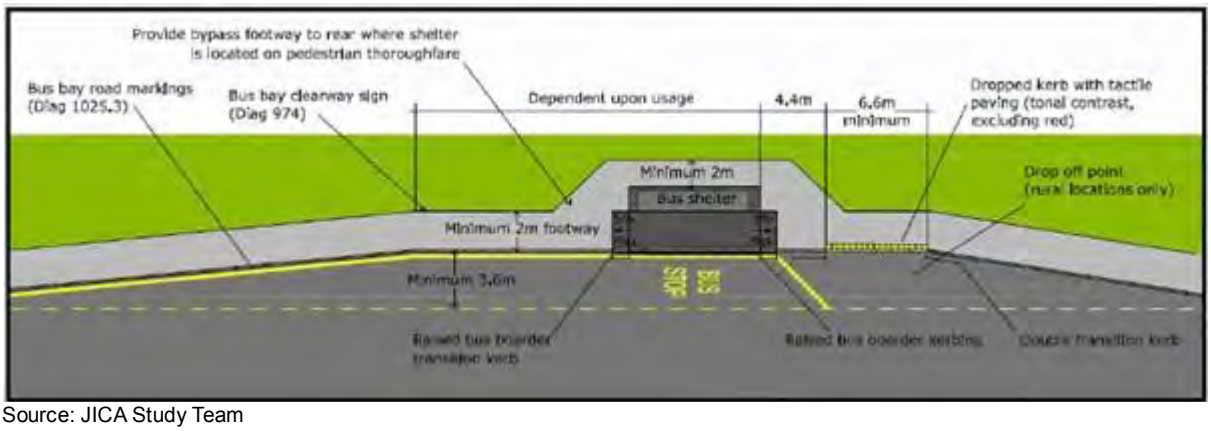
Source: JICA Study Team

Figure 8.6.5 Urban Secondary Concept Design



Source: JICA Study Team

Figure 8.6.6 Bus Bay Concept Design for Secondary Roads



Source: JICA Study Team

Figure 8.6.7 Urban Street Concept Design for Dense Populated Area

Source: JICA Study Team

Figure 8.6.8 Urban Street Concept Design, Pedestrians, Cars, Buses and at-Grade LRT Coexist, in Pleasant Urban Environment

Source: JICA Study Team

4) Project Implementation Strategy and Schedule

TEPA should review each link improvement proposed in the project for its potential improvement or new construction following the above cross sectional design guidelines. Each secondary road link should be classified in to secondary, urban secondary or local road. Urban secondary should be designed by giving more priority to pedestrians, cyclists and community activities; whereas secondary roads would be prioritized for traffic. Local street network should be similar to urban secondary roads, with additional provision for access to adjacent facilities.

TEPA should do detailed study of all these proposed roads, and prepare their feasibility study or studies for the approval of project from GoPb. TPU should be the project monitoring authority, and would be responsible for further prioritisation of road sections included in the two projects within the scope of the LUTMP 2030 overall project

prioritization. The project is expected to take up rest of the decade, and should be implemented in stages. Cost estimates for both projects are given in Chapter 7, Section 7.5, along with project evaluation results at macro level. A tentative schedule is given below in Table 8.6.1

Table 8.6.1 [R44 and R45] Tentative Implementation Schedule

Project Activity	Year 2000+								
	12	13	14	15	16	17	18	19	20
Project preparation									
Road Re-modelling and Construction									

Source: JICA Study Team

8.6.2 [R57] Development of Secondary Roads in South-west Lahore

1) Introduction

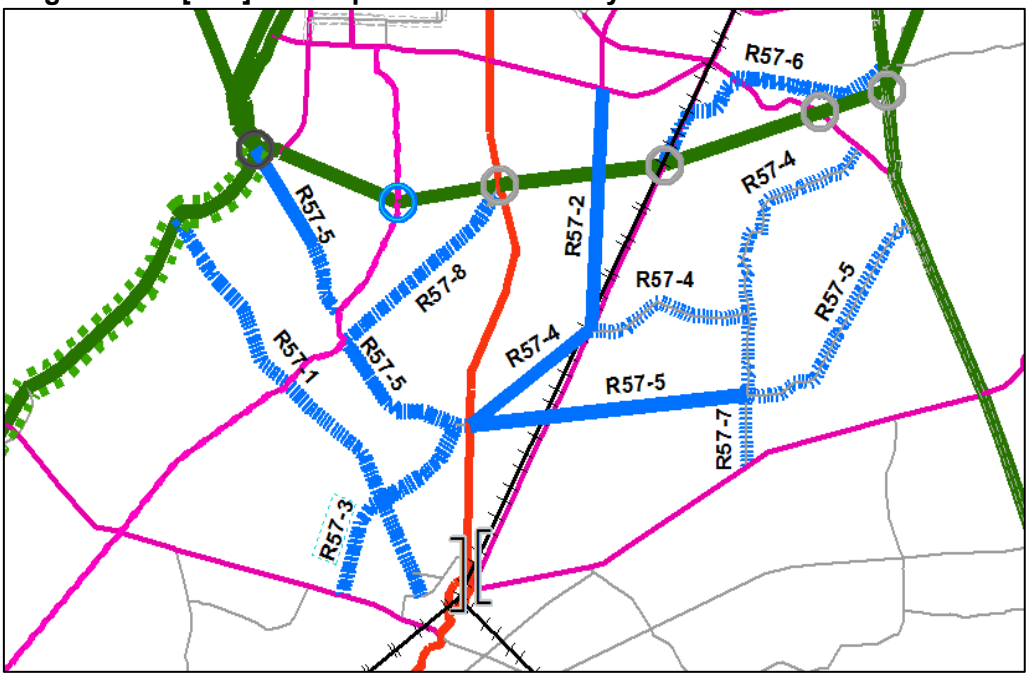
LUTMP 2030, proposed and committed road sub-sector projects have been discussed in Chapter 7, Section 7.1.2, and details are presented in Annex-1. The committed projects included all on-going, planned, committed and proposed projects by the relevant government departments and agencies, mostly by the C&W and LDA/ TEPA. The Study also reviewed and included projects from other studies. In the past development of Lahore transport infrastructure was guided by the 1991 Lahore master plan, prepared by JICA. This was followed by the LDA Lahore 2021 master plan. Both of these master plans had proposed extensive urban development in the south-west quadrant of Lahore. This urban development was supported by road network.

The LDA 2021 master plan proposed road network is without hierarchy, and is not supported by the corresponding travel demand analysis. It also does not take account of the recent major transport infrastructure developments in the area, like LRR, RMTS along Ferozepur Road. LUTMP 2030, after taking these factors into account has proposed major road network developments in the south-west. Most of the proposed projects involve upgrading of exiting local roads to primary or secondary standards, to support the trunk road network of LRR, Ferozepur Road, Raiwind Road, Multan Road, and M-2 Motorway.

However, LDA/ TEPA required inclusion of some new secondary roads and upgrade of existing road to secondary standards, based on the commitments from private sector to develop the area in the near future. LUTMP 2030 is not rigid, and it is only a framework for the development of transport infrastructure. Building of new secondary roads/ or remodeling exiting roads to higher standards would be appropriate under the LUTMP 2030, provided the primary and truck road network could support such upgrades. The LDA/ TEPA proposed upgrades/ re-modelling and new roads were reviewed, majority of the proposed roads were already in the LUTMP 2030, but needed upgrades. Inclusion of proposed new links was also reviewed; and those links which fully supported the network

structure, hierarchy and enhanced connectivity have been included in LUTMP 2030. The proposed upgrades and new roads under this project 'R57' are shown in the following Figure 8.6.9.

Figure 8.6.9 [R57] Development of Secondary Roads in South-west Lahore



Source: JICA Study Team

2) Project Components

Road sub-sector project R57 total length is 93.6 km, and each of the eight (8) section length is given below in Table 8.6.2. No project costing or evaluation has been carried out, as the Project R57 is considered as committed, and would be supported by the private sector developments in the area.

Table 8.6.2 [R57] Road Section Details

R57 – Section	Section Length (km)		
	New Construction	Remodelling	Total
1	13.9	-	13.9
2	-	7.1	7.1
3	6.5	-	6.5
4	12.7	4.8	17.5
5	16.2	12.2	28.4
6	8.8	-	8.8
7	4.6	-	4.6
8	6.8	-	6.8
Total	**69.5**	**24.1**	**93.6**

Source: JICA Study Team

3) Project Implementation Strategy and Schedule

LDA/ TEPA would review each link its importance and contribution of the private sector towards its implementation, only then it should be implemented. The project timeframe is set as the LDA 2021 master plan, i.e. Completion by 2020.

8.7 Action Plan 2020 – Implementation

8.7.1 Implementation Schedule and Responsible Agency

1) Implementation Schedule

Indicative implementation schedule of the committed and LUTMP proposed projects to be implemented by 2020 is given in Tables 8.7.1 to 8.7.3 for the Public Transport, Road Sub-sector and Traffic Management projects respectively, together with the investments required by year. This schedule was determined based on the result of overall Multi-criteria Assessment (MCA) evaluation of projects.

Public Transport Projects

All committed projects were allocated to short-term (2012-15) and medium-term (2016-2020). Among proposed projects, RMTS Green Line and seven (7) BRT lines are proposed as Core Program-1 of the Action Plan to be implemented by 2020. Particularly for RMTS Green Line and BRT Orange Line (to be converted to RMTS by 2030), the first investment should be done in the short-term (by 2015).

Road Sub-sector Projects

All committed projects are scheduled for implementation in the short and medium term similarly to the public transport projects. Proposed road projects for implementation during the Action Plan period are mostly less expensive, requiring remodelling of existing roads coupled with the proposed traffic management measures to improve the much needed network efficiency.

Traffic Management Projects

Most of the committed and proposed projects are allocated for short and medium term. This is due to the urgency and low-cost features of these projects.

2) Responsible Agency

Tables 8.7.4 to 8.7.6 show the responsibility allocation of project implementation among existing government agencies for public transport, roads and traffic management projects respectively. Note that this allocation assumes the present organizational/ institutional setup. If this changes in the future, the responsibility goes automatically to the redefined agency. However, Transport Department (TD) oversees and monitors implementation of these projects.

Table 8.7.1 Indicative Implementation Timetable for Public Transport Projects

Project No.	Project Description		Project Cost (USD Million)	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Committed Projects													
PT001	C.1	Multimodal Inter-City Bus Terminals in Lahore	-	**2**									
PT002	C.2	Effective and Efficient School Bus System	0.01	**2**									
PT003	C.3	Up-gradation of Bus Stands	-	**2**									
PT004	C.4	Integrated Bus Operation	80.1	**3**									
PT005	C.5	Establishment of Multimodal Bus Terminal at Shahdara	-	**4**									
LUTMP 2020 Proposed Projects													
PT006	RMS1	LRMTS Green Line	2,583.0	**5**									
PT007	RMS2	LRMTS Orange Line (as a BRT)	74.5	**8**									
PT008	RMS3	LRMTS Blue Line (as a BRT)	58.6	**8**									
PT009	BRT1	BRT Purple Line	40.8	**3**									
PT010	BRT2	BRT Line 1	30.7	**3**									
PT011	BRT3	BRT Line 2	30.5	**3**									
PT012	BRT4	BRT Line 3a	28.7	**3**									
PT013	BRT5	BRT Line 3b	35.3	**3**									

Source: JICA Study Team

Table 8.7.2 Indicative Implementation Timetable for Road Sub-sector Projects

Project No.	Project Description	Project Cost (USD Million)	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Committed Projects												
R01	Construction of LRR (Airport – Ferozepur Road)	113.0	**3**									
R02	Construction of Kalma Chowk Flyover	17.5	**3**	Completed 2012								
R03	Construction of Canal Bank Road Flyover	17.1	**3**									
R04	Remodeling of Canal Bank Road	43.8	**3**	Completed 2012								
R05	Remodeling of Barki Road (LRR – Green City)	2.0	**3**									
R06	Remodeling of Kala Khatai Road	10.8	**3**									
R07	Remodeling of Allama Iqbal Road	16.1	**3**									
R08	Remodeling of Multan Road	46.4	**3**	Completed 2012								
R09	Remodeling of Thokar Niaz Baig Road	4.8	**3**									
R10	Remodeling of Lahore Ferozepur Road	17.5	**3**									
LUTMP 2020 Proposed Projects												
R11	Barki Road (Green City – BRB Canal)	17.0	**3**									
R12	Bedian Road (DHA – LRR – Ferozepur Road)	142.0	**5**									
R13	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	6.9	**3**									
R14	Link Peco Road – Ferozepur Road	6.7	**3**									
R15	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)	5.3	**3**									
R16	Old Ravi Bridge and Road **(Bridge 0.5km)**	5.3	**3**									
R17	G.T. Road (Cooper Store - Ek-Moria Pull)	6.3	**3**									
R18	College Road (Ghaus-e-Azam Road to Defence Road)	14.0	**3**									
R19	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)	35.0	**3**									

Project No.	Project Description	Project Cost (USD Million)	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020
R20	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	29.9	**3**									
R21	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)	4.0	**3**									
R22	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	52.5	**3**									
R23	Madrat-e-Millat Road - Defence Road	10.9	**3**									
R24	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	6.0	**3**									
R25	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)	26.4	**3**									
R26	Sua Asil Road (Ferozepur Road – Raiwind Road)	130.7	**5**									
R27	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	91.7	**3**									
R28	Kahna Kacha Road (Kahna Station – Ferozepur Road)	29.9	**3**									
R29	Sharaqpur Road (Lahore Ring Road – Saggian Walla Bypass) **(Bridge 0.7km)**	202.0	**5**									
R30	Lahore-Sheikhupura Road (Saggian Walla Bypass – G.T. Road)	20.4	**3**									
R31	Sagianwala Bypass Road (Ring Road – Sharaqpur Road) **(Bridge 0.6km)**	43.4	**3**									
R32	Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	16.2	**3**									
R33	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	57.6	**3**									
R34	Manga-Raiwind Road (Multan Road – Raiwind Road)	43.5	**3**									
R35	Southern Bypass South Road (Ferozepur Road – College Road)	57.0	**3**									
R36	Southern Bypass North Road (Canal Bank Road – M-2)	19.7	**3**									
R37	Raiwind-Pattoki Road (Raiwind City – Boundary of the Study Area)	73.3	**3**									
R38	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	54.2	**3**									
R39	Defence Road (Multan Road – Ferozepur Road)	60.1	**3**									
R40	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Sothern Loop)	20.8	**3**									
R41	Construction of LRR West (Multan Road – M2)	121.9	**5**									
R42	Construction of LRR South (Ferozepur Road – Multan Road)	201.2	**5**									
R43	Secondary Roads in Dharampura Area	38.9	**3**									
R44	Secondary Roads in Shadbagh Area	102.5	**5**									
R45	Secondary Roads in Samanabad Area	115.0	**3**									
R46	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	41.0	**3**									
R47	M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of the Study Area) **(Bridge 0.6km)**	89.0	**3**									

Project No.	Project Description	Project Cost (USD Million)	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020
R48	M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	64.6	**3**									
R49	N-5- Multan Road (Lahore Ring Road Sothern Loop – Boundary of the Study Area)	109.7	**5**									
R50	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	116.1	**5**									
R51	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	118.3	**5**									
R52	Sheikhupura Muridke Road (G.T. Road – M-2)	284.4	**5**									
R53	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	22.9	**3**									
R54	Link Kala Shah Kaku – Lahore-Sialkot Motorway	25.1	**3**									
R55	Lahore-Sialkot Motorway **(Bridge 0.8km)**	128.0	**5**									
R56	Link G.T. Road Lahore-Sialkot Motorway	2.2	**3**									
R57 (Optional)	Construction and remodeling of Secondary roads - south of LRR in the south-western quadrant between Ferozepur Road and Multan Road	**N/A**	**10**	**Tentative Program Defined by LDA/ TEPA and Development Based**								

Source: JICA Study Team

Table 8.7.3 Indicative Implementation Timetable for Traffic Management Projects

Project No.	Project Description	Project Cost (USD Million)	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Committed Projects												
TM01	Establishment of Centralized Driver Licensing Authority	**N/A**	**3**									
TM02	Parking Management Company	**N/A**	**3**									
TM03	Traffic Education Center	**N/A**	**2**									
TM04	Traffic Control Plan of City	**N/A**	**3**									
TM05	Vehicle Inspection and Certification System (VICS)	**N/A**	**4**									
TM06	Construction of New Parking Plazas	207.1	**6**									
TM07	Construction of Pedestrian Bridges	1.8	**3**									
TM08	Improvement of 52 Junctions	30.5	**7**									
TM09	Ferozepur Road Pilot Project	28.3	**3**									
TM10	Conversion of Two Stroke Rickshaw into CNG Fitted Four Stroke Rickshaw	12.4	**4**									
TM11	Remodeling of Inner and Outer Circular Road	14.1	**3**									
LUTMP 2020 Proposed Projects												
TM12	A.1 Junction Design and Traffic Signal Improvement – CBD	4.0	**3**									
TM13	A.2 Existing Junctions Design and Network Improvement	30.0	**4**									
TM14	A.3 Road Function and Capacity Improvement Program	2.0	**2**									
TM15	B.1 Low Occupancy Vehicles Planning for Outskirt/ Rural Areas	5.0	**2**									
TM16	B.2 Traffic Circulation System Design and Implementation	20.0	**5**									
TM17	B.3 Public and Freight Transport Terminals	100.0	**8**									

Project No.	Project Description	Project Cost (USD Million)	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020
TM18	B.4 Linking Communities - Smart Roads	4.0	**4**									
TM19	B.5 Feasibility Study for Traffic Demand Management Measures	2.5	**2**									
TM20	B.6 RMTS and BRT Station Area Traffic Management	1.5	**2**									
TM21	C.1 Planning and Design Study for Non-Motorized Traffic	1.5	**3**									
TM22	C.2 Non-Motorized Traffic Facilities Implementation	6.0	**4**									
TM23	C.3 Pedestrian and Bicycle Path Network	5.0	**3**									
TM24	D.1 Comprehensive Parking System Development	2.5	**3**									
TM25	D.2 Parking Facilities Implementation	60.0	**6**									
TM26	D.3 Park and Ride Facilities Development	75.0	**6**									
TM27	E.1 Traffic Enforcement Strengthening Programme	3.0	**3**									
TM28	F.1 Traffic Calming	6.0	**2**									
TM29	F.2 Traffic Safety Education Improvement	1.0	**2**									
TM30	G.1 Intelligent Transportation System Development	38.0	**5**									
TM31	H.1 Local Standards and Guidelines Development	1.5	**5**									

Source: JICA Study Team

Table 8.7.4 Public Transport Project – Responsible Agency

Project No.	Project Code	Project Description	Cost (USD Million)	Assumed Year in Operation	Proposed by:	Responsible Agency
Public Transport – Committed Projects						
PT01	C.1	Multimodal Inter-City Bus Terminals in Lahore	-	2014	TD	TD
PT02	C.2	Effective and Efficient School Bus System	0.01	2014	TD	TD
PT03	C.3	Up-gradation of Bus Stands	-	2015	TD	TD
PT04	C.4	Integrated Bus Operation	80.1	2015	LTC	LTC
PT05	C.5	Establishment of Multimodal Bus Terminal at Shahdara	-	2017	TD	TD
Public Transport – LUTMP 2020 Proposed Projects						
PT06	RMS1	LRMTS Green Line	2,583.0	2020	TD	TD
PT07	RMS2	LRMTS Orange Line (as a BRT)	74.5	2015	LUTMP	LTC
PT08	RMS3	LRMTS Blue Line (as a BRT)	58.6	2020	LUTMP	LTC
PT09	BRT1	BRT Purple Line	40.8	2020	LUTMP	LTC
PT10	BRT2	BRT Line 1	30.7	2020	LUTMP	LTC
PT11	BRT3	BRT Line 2	30.5	2020	LUTMP	LTC
PT12	BRT4	BRT Line 3a	28.7	2020	LUTMP	LTC
PT13	BRT5	BRT Line 3b	35.3	2020	LUTMP	LTC

Source: JICA Study Team

Table 8.7.5 Road Sub-sector Projects – Responsible Agency

Project No.	Project Description	Cost (USD Million)	Assumed Year in Operation	Proposed by:	Responsible Agency
Road Sub-sector – Committed Projects					
R01	Construction of LRR (Airport – Ferozepur Road)	113.0	2015	C & W	C & W
R02	Construction of Kalma Chowk Flyover	17.5	2015	C & W	C & W
R03	Construction of Canal Bank Road Flyover	17.1	2015	C & W	C & W
R04	Remodeling of Canal Bank Road	43.8	2015	TEPA	TEPA
R05	Remodeling of Barki Road (LRR – Green City)	2.0	2015	C & W	C & W
R06	Remodeling of Kala Khatai Road	10.8	2015	C & W	C & W
R07	Remodeling of Allama Iqbal Road	16.1	2015	C & W	C & W
R08	Remodeling of Multan Road	46.4	2015	C & W	C & W
R09	Remodeling of Thokar Niaz Baig Road	4.8	2015	C & W	C & W
R10	Remodeling of Lahore Ferozepur Road	17.5	2015	C & W	C & W
Road Sub-sector – LUTMP 2020 Proposed Projects					
R11	Barki Road (Green City – BRB Canal)	17.0	2020	LUTMP	C & W
R13	Bedian Road (DHA – LRR – Ferozepur Road)	6.9	2021	TEPA	TEPA
R14	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	6.7	2021	LUTMP	TEPA
R15	Link Peco Road – Ferozepur Road	5.3	2021	TEPA	TEPA
R16	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)	5.3	2018	TEPA	TEPA
R17	Old Ravi Bridge and Road **(Bridge 0.5km)**	6.3	2019	TEPA	TEPA
R18	G.T. Road (Cooper Store - Ek-Moria Pull)	14.0	2020	TEPA	TEPA
R19	College Road (Ghaus-e-Azam Road to Defence Road)	35.0	2018	TEPA	TEPA
R33	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)	57.5	2022	LUTMP	TEPA
R35	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	57.0	2022	TEPA	TEPA
R36	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)	19.7	2022	TEPA	TEPA
R39	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	60.1	2022	LUTMP	C & W
R43	Madrat-e-Millat Road - Defence Road	38.9	2018	LUTMP	TEPA
R44	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	102.5	2018	LUTMP	TEPA
R45	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)	115.0	2017	LUTMP	TEPA
R46	Sua Asil Road (Ferozepur Road – Raiwind Road)	41.0	2022	LUTMP	NHA
R47	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	89.0	2022	LUTMP	NHA
R48	Kahna Kacha Road (Kahna Station – Ferozepur Road)	64.6	2022	LUTMP	NHA
R52	Sharaqpur Road (Lahore Ring Road – Saggian Walla Bypass) **(Bridge 0.7km)**	284.4	2031	LUTMP	C & W

Project No.	Project Description	Cost (USD Million)	Assumed Year in Operation	Proposed by:	Responsible Agency
R53	Lahore-Sheikhupura Road (Saggian Walla Bypass – G.T. Road)	22.9	2027	LUTMP	C & W
R54	Sagianwala Bypass Road (Ring Road – Sharaqpur Road) **(Bridge 0.6km)**	25.0	2022	C & W	C & W
R56	Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	2.2	2022	C & W	C & W
R57 (Optional)	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	N/A	2012 To 2020	LDA/ TEPA	LDA/ TEPA

Source: JICA Study Team

Table 8.7.6 Traffic Management Projects – Responsible Agency

Project No.	Project	Cost (USD Million)	Assumed Year in Operation	Proposed by:	Responsible Agency
Traffic Management – Committed Projects					
TM01	Establishment of Centralized Driver Licensing Authority	-	2016	TD	TD
TM02	Parking Management Company	-	2018	TEPA	TEPA
TM03	Traffic Education Center	-	2014	Traffic Police	Traffic Police
TM04	Traffic Control Plan of City	-	2015	Traffic Police	Traffic Police
TM05	Vehicle Inspection and Certification System (VICS)	-	2021	TD	TD
TM06	Construction of New Parking Plazas	207.1	2020	TEPA	TEPA
TM07	Construction of Pedestrian Bridges	1.8	2016	TEPA	TEPA
TM08	Improvement of 52 Junctions	30.5	2021	TEPA	TEPA
TM09	Ferozepur Road Pilot Project	28.3	2022	TEPA	TEPA
TM10	Conversion of Two Stroke Rickshaw into CNG Fitted Four Stroke Rickshaw	12.4	2019	TD	TD
TM11	Remodeling of Inner and Outer Circular Road	14.1	2015	TEPA	TEPA
Traffic Management – LUTMP 2020 Proposed Projects					
TM12	A.1 Junction Design and Traffic Signal Improvement – CBD	4.0	2015	LUTMP	TEPA
TM13	A.2 Existing Junctions Design and Network Improvement	30.0	2019	LUTMP	TEPA
TM14	A.3 Road Function and Capacity Improvement Program	2.0	2015	LUTMP	TEPA and CDGL
TM15	B.1 Low Occupancy Vehicles Planning for Outskirt/ Rural Areas	5.0	2017	LUTMP	LTC
TM16	B.2 Traffic Circulation System Design and Implementation	20.0	2018	LUTMP	TEPA
TM17	B.3 Public and Freight Transport Terminals	100.0	2021	LUTMP	TEPA and CDGL
TM18	B.4 Linking Communities - Smart Roads	4.0	2019	LUTMP	TEPA
TM19	B.5 Feasibility Study for Traffic Demand Management Measures	2.5	2018	LUTMP	TEPA
TM20	B.6 RMTS and BRT Station Area Traffic Management	1.5	2023	LUTMP	TEPA
TM21	C.1 Planning and Design Study for Non-Motorized Traffic	1.5	2017	LUTMP	TEPA
TM22	C.2 Non-Motorized Traffic Facilities Implementation	6.0	2021	LUTMP	TEPA
TM23	C.3 Pedestrian and Bicycle Path Network	5.0	2017	LUTMP	TEPA
TM24	D.1 Comprehensive Parking System Development	2.5	2015	LUTMP	TEPA

Project No.	Project	Cost (USD Million)	Assumed Year in Operation	Proposed by:	Responsible Agency
TM25	D.2 Parking Facilities Implementation	60.0	2024	LUTMP	TEPA
TM27	D.3 Park and Ride Facilities Development	3.0	2015	LUTMP	Traffic Police
TM28	E.1 Traffic Enforcement Strengthening Programme	6.0	2015	LUTMP	TEPA
TM29	F.1 Traffic Calming	1.0	2018	LUTMP	Traffic Police and 1122
TM31	F.2 Traffic Safety Education Improvement	1.5	2017	LUTMP	TEPA

Source: JICA Study Team

8.7.2 Action Plan Projects – Investment Plan

1) Proposed Investment Program

Table 8.7.7 shows investment summary of LUTMP for the Action Plan period. Public transport projects share about 75% of the total, while road and traffic management share 17 % and 8 %, respectively.

The budget envelope estimated in Chapter 5 of this report is USD 2.3~6.9 billion for the Action Plan period (2011 to 2020). The planned investment falls in this range. However, the percentage of the investment to Lahore's GDP is on the high side at 2.6 % for the action plan period. This is about 3 times of the current level of investment. Private sector finance should be sought for these projects and measures to raise government revenue should be taken. However, level of the proposed investment on transport infrastructure is not considered too high. In Thailand, during the high-growth period, this investment level reached 7-8 % of the GDP.

Table 8.7.7 Planned Investment Summary (USD million)

Period (Year)	Short Term 2012-2015	Medium Term 2016-2020	Total
Public Transport	1,499	3,021	4,520
Road Sub-sector	450	570	1,020
Traffic Management	146	363	509
Total	***2,095***	***3,954***	***6,049***

Source: JICA Study Team

Possible reduction of public investment has been estimated assuming PPP scheme on the proposed RMTS/ BRT projects. This was done assuming a percentage of contribution from the private sector as shown in Table 8.7.8. The reduction was estimated at about USD 751.5 million equivalent to 26% of the total investment. Although investment amount is small compared to RMTS, BRT seems to be hopeful to curtail the cost to the government by attracting private funding or some form of PPP for the proposed public transport projects.

Table 8.7.8 Cost Reduction by Applying PPP Scheme to RMTS/ BRT Projects

Project No.	Project Description	Project Cost (USD million)	EIRR (%)	FIRR (%)	Private Sector (%)	Cost to Gov't (USD million)
PT06	RMTS Green Line	2,583.0	12.1	7.1	20	2,066.4
PT07	Orange Line (as a BRT)	74.5	18.8	21.0	100	0.0
PT08	Blue Line (as a BRT)	58.6	16.7	17.9	80	11.7
PT09	BRT Purple Line	40.8	15.5	16.1	50	20.4
PT10	BRT Line 1	30.7	37.6	24.9	100	0.0
PT11	BRT Line 2	30.5	43.6	26.5	100	0.0
PT12	BRT Line 3a	28.7	20.4	16.3	50	14.4
PT13	BRT Line 3b	35.3			50	17.7
Total		**2,882.1**			**26.1**	**2130.5**

Source: JICA Study Team

2) Cost Recovery from Urban Development Benefit

This should be taken into account to implement RTMS in Lahore. RTMS projects are economically feasible in general, while financial viability is low and its financing becomes a critical issue.

Traditionally, private railway companies have constructed railways on the understanding that capital costs would be recovered through fare revenues. Recently, however, railway development has become increasingly complicated due to the change of passengers' demand, stricter regulation on safety, more sophisticated equipment, social/ environmental requirement and so on. Thus the required cost has soared to the extent that it needs government support. This may be a direct subsidy from the government to railway companies. However, if the government funding capability is limited, other revenue sources should be sought for, under the permission and institutional arrangements of the government. Some of the initiatives that could be expanded further in Lahore, are not limited to, but could include the following:

(a) **Property Assessment Taxes:** In addition to land taxes, many cities also impose property assessment taxes. These taxes constitute a major portion of the revenue of cities. For example in Kuala Lumpur, Malaysia, it constitutes 62 % of the operating revenue of the city. Property assessments are based on the annual rental value of a property. Differential assessment rates are determined based on the type of property, e.g. residential, industrial, commercial, vacant land, utility or government land. Assessments are collected twice a year by the city from all property owners in the city. Key to establishing such a system in Lahore will depend on establishing a comprehensive valuation list of all properties in the city.

(b) **Betterment Charges:** Betterment charges are imposed to compensate for the improved value that is accrued to the property owners as a result of constructing a

public facility, such as railway stations, access roads and drainage facility in the area. The landowners who benefit from the facility will be required to pay a betterment charge to the city. However, for this to be effective an equitable formula for determining betterment charges has to be derived that would be acceptable to the affected community. For example, landowners who gain access to a newly constructed urban railway could be assessed proportionately to also pay a part of the compensation cost for the removed houses. Similarly, landowners who lose a portion of their land to railway construction projects should be compensated only after taking into account the improved land value of the remaining portion of their land. The introduction of land development techniques, such as land readjustment, where betterment values are equitably incorporated in the land re-plotting exercise is an effective method of practically applying these charges.

(c) **Development Charges:** Development charges are applied as an urban planning tax that is imposed on the developer at the time of applying for development permission from LDA. Development charges constitute about 6% of the operating revenue in the case of Kuala Lumpur. The development charge includes payment for the improved value of land as a result of rezoning or increased densities given to the landowner as a result of revisions / amendments to the authorized plan. Development charges are also collected by the city as in lieu payments for the non-provision of facilities, such as car parking areas and school sites, as required under the planning standards. The funds are used by the city to provide the necessary facilities in a coordinated manner.

Although application of these initiatives needs careful examination before these are implemented, the revenue potential is huge, presumably at an order of several tens of billion rupees. It is recommended for GoPb to investigate the possibility in relation to LDA's land use rules and regulations.

8.7.3 Institutional Reform

Institutional reform is critical for urban transport sector development of Lahore as mentioned in Chapter 5 of this report. The following actions are needed immediately.

(1) To Set Up a Preparatory Committee for Institutional Reform

A large scale institutional reform plan was suggested in this Master Plan, aiming at integration of transport-related organizations into self-sustainable agencies. It may take a time to reach a consensus for the reform. As an action plan, establishment of a preparatory committee for the reform is strongly recommended. This committee shall be an inter-departmental one, operated under the initiatives of the Transport Department.

(2) To Set Up a Professional Group for Preparation of PPP Projects

There are many projects expected to be implemented by applying a PPP scheme. In GoPb, as well as the central Government, however, no professional agency deals with such projects. The world's experiences show a successful PPP project will be never brought about without the initiative of the public side. In this sense, a PPP study group should be set up under the Transport Department, possibly in TPU. Some expertise for demand forecast is required for the relevant studies.

(3) To Study Legal Arrangement for the Urban Planning Determination

Non-stopping urbanization is in progress with non-stop in the suburban area. Therefore, it is undoubtedly an urgent need to stop new construction in the designated right of way of the future roads in the Master Plan. An effective legal arrangement should be taken and the preparatory works should be immediately started.

Volume-I – Annex-I

LUTMP PROPOSED ROAD SUB-SECTOR PROJECTS

FINAL REPORT

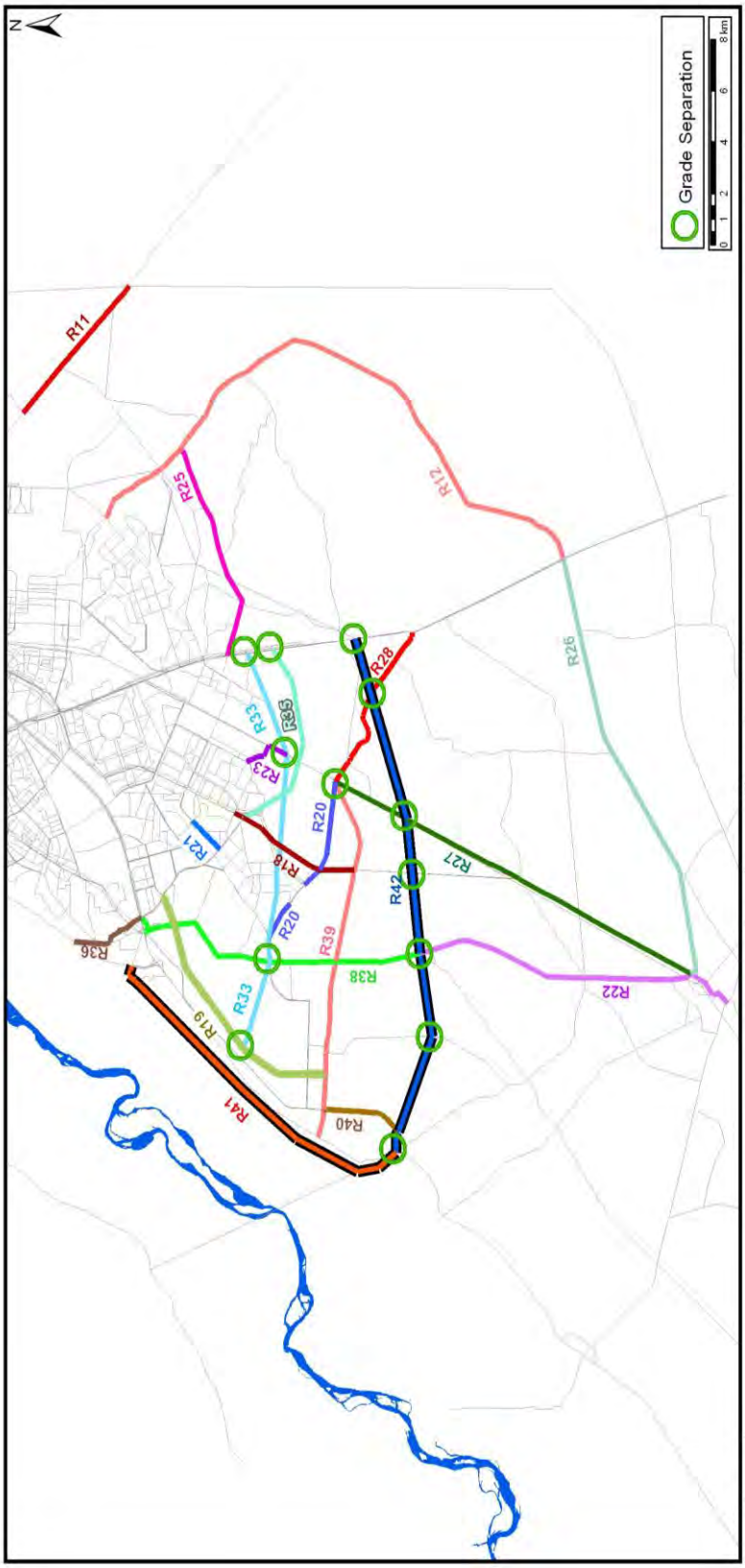
ANNEX 1 - LUTMP Proposed Road Sub-sector Projects

LUTMP Proposed Road Sub-sector projects are described in Section 7.3.2 of Chapter 7 and listed in Table 7.3.2 and 7.3.3. Figures in this appendix show the geographical location of these projects. The following table gives the page number where project alignment is shown.

Project No.	Project Code	Project Description	Page No.
R11	20002	Barki Road (Green City – BRB Canal)	A-4
R12	20003	Bedian Road (DHA – LRR – Ferozepur Road)	A-4
R13	20004	Shabbir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	A-5
R14	20005	Link Peco Road – Ferozepur Road	A-5
R15	20006	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)	A-5
R16	20007	Old Ravi Bridge and Road **(Bridge 0.5km)**	A-5
R17	20008	G.T. Road (Cooper Store - Ek-Moria Pull)	A-5
R18	20010	College Road (Ghaus-e-Azam Road to Defence Road)	A-4
R19	20011	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)	A-4
R20	20020	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	A-4
R21	20021	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)	A-4
R22	20023	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	A-4
R23	20024	Madrat-e-Millat Road - Defence Road	A-4
R24	20027	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	A-5
R25	20041	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)	A-4
R26	20043	Sua Asil Road (Ferozepur Road – Raiwind Road)	A-4
R27	20044	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	A-4
R28	20046	Kahna Kacha Road (Kahna Station – Ferozepur Road)	A-4
R29	20049	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) **(Bridge 0.7km)**	A-6
R30	20049	Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)	A-5
R31	20050	Sagianwala Bypass Road (Ring Road – Sharaqpur Road) **(Bridge 0.6km)**	A-5
R32	20050	Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	A-5

Project No.	Project Code	Project Description	Page No.
R33	20052	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	A-4
R34	20053	Manga-Raiwind Road (Multan Road – Raiwind Road)	A-7
R35	20054	Southern Bypass South Road (Ferozepur Road – College Road)	A-4
R36	20055	Southern Bypass North Road (Canal Bank Road – M-2)	A-4
R37	20056	Raiwind-Pattoki Road (Raiwind City – Boundary of LUTMP Study Area)	A-7
R38	20057	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	A-4
R39	20060	Defence Road (Multan Road – Ferozepur Road)	A-4
R40	20061	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Sothern Loop)	A-4
R41	20081	Construction of LRR West (Multan Road – M2)	A-4
R42	20082	Construction of LRR South (Ferozepur Road – Multan Road)	A-4
R43	20091	Secondary Roads in Dharampura Area	A-5
R44	20092	Secondary Roads in Shadbagh Area	A-5
R45	20093	Secondary Roads in Samanabad Area	A-5
R46	30002	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	A-8
R47	30002	M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of LUTMP Study Area) **(Bridge 0.6km)**	A-8
R48	30002	M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	A-8
R49	30004	N-5- Multan Road (Lahore Ring Road Sothern Loop – Boundary of LUTMP Study Area)	A-7
R50	30005	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	A-7
R51	30006	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	A-8
R52	30008	Sheikhupura Muridke Road (G.T. Road – M-2)	A-8
R53	30010	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	A-8
R54	30028	Link Kala Shah Kaku – Lahore-Sialkot Motorway	A-8
R55	30028	Lahore-Sialkot Motorway **(Bridge 0.8km)**	A-8
R56	30028	Link G.T. Road Lahore-Sialkot Motorway	A-8
R57	Optional	Construction and remodelling of Secondary roads - south of LRR in the south-western quadrant between Ferozepur Road and Multan Road	A-9

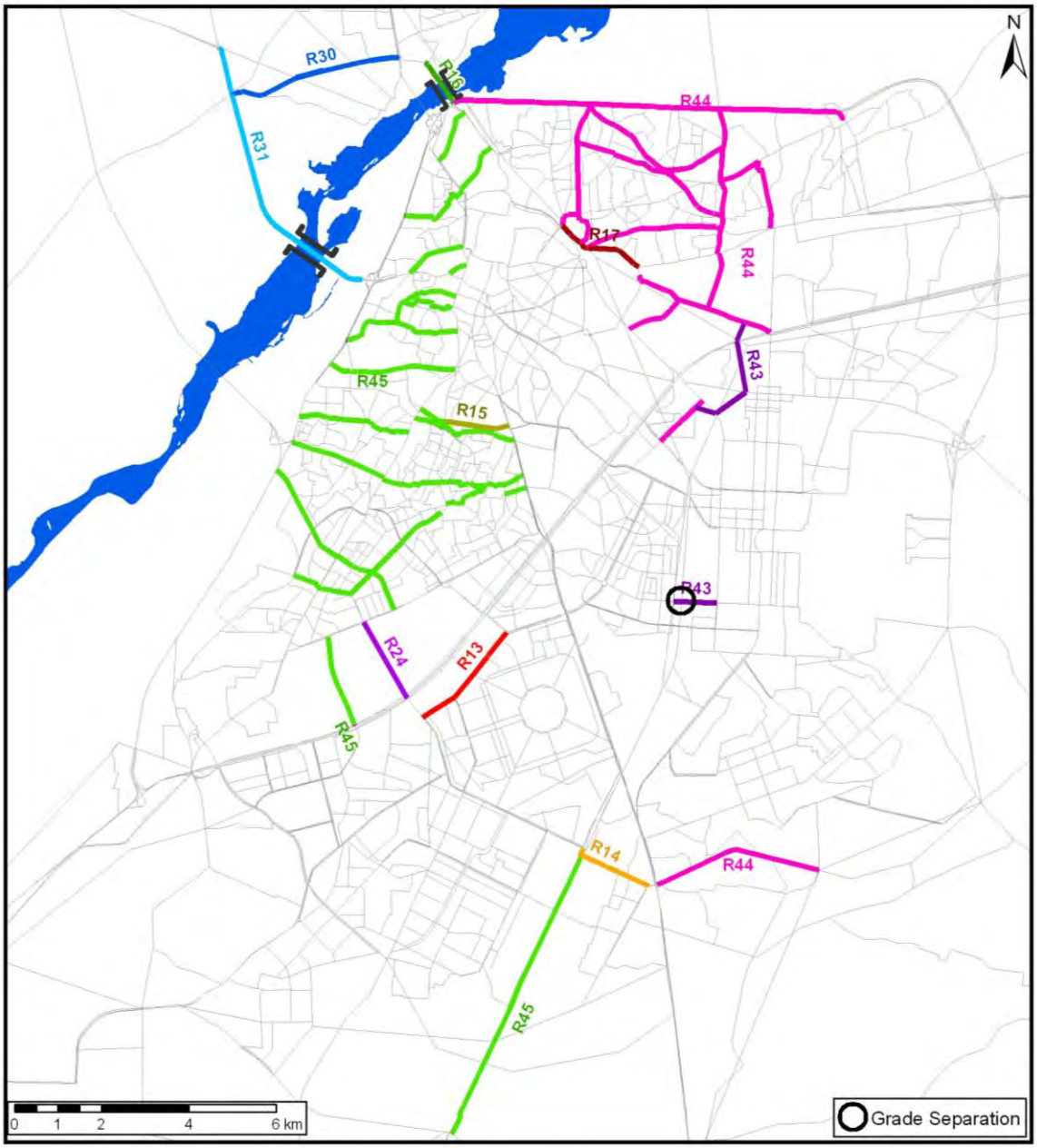
Figure 1 LUTMP Proposed Road Sub-sector Projects



Project No.	Project Code	Project Description	Length (km)	Proposed Lanes
R11	20.002	Barki Road (Green City to BRB Canal)	6.8	D-2
R12	20.003	Bedian Road (DHA – LRR – Ferozepur Road)	26.3	D-2
R18	20.010	College Road (Ghaus-e-Azam Road to Defence Road)	6.9	D-2
R19	20.011	Structure Plan Road (ShahrahNazria-e-Pakistan – Defence Road)	12.9	D-3
R20	20.020	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	7.1	D-3
R21	20.021	Main Boulevard PIA Society Road (Balg Road – Ittehad Road)	1.6	D-3
R22	20.023	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	14.2	D-3
R23	20.024	Madrat-e-Millat Road - Defence Road	2.6	D-3
R25	20.041	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)	8.8	D-2
R26	20.043	Sua Asil Road (Ferozepur Road – Raiwind Road)	22.0	D-2
R27	20.044	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	17.8	D-2

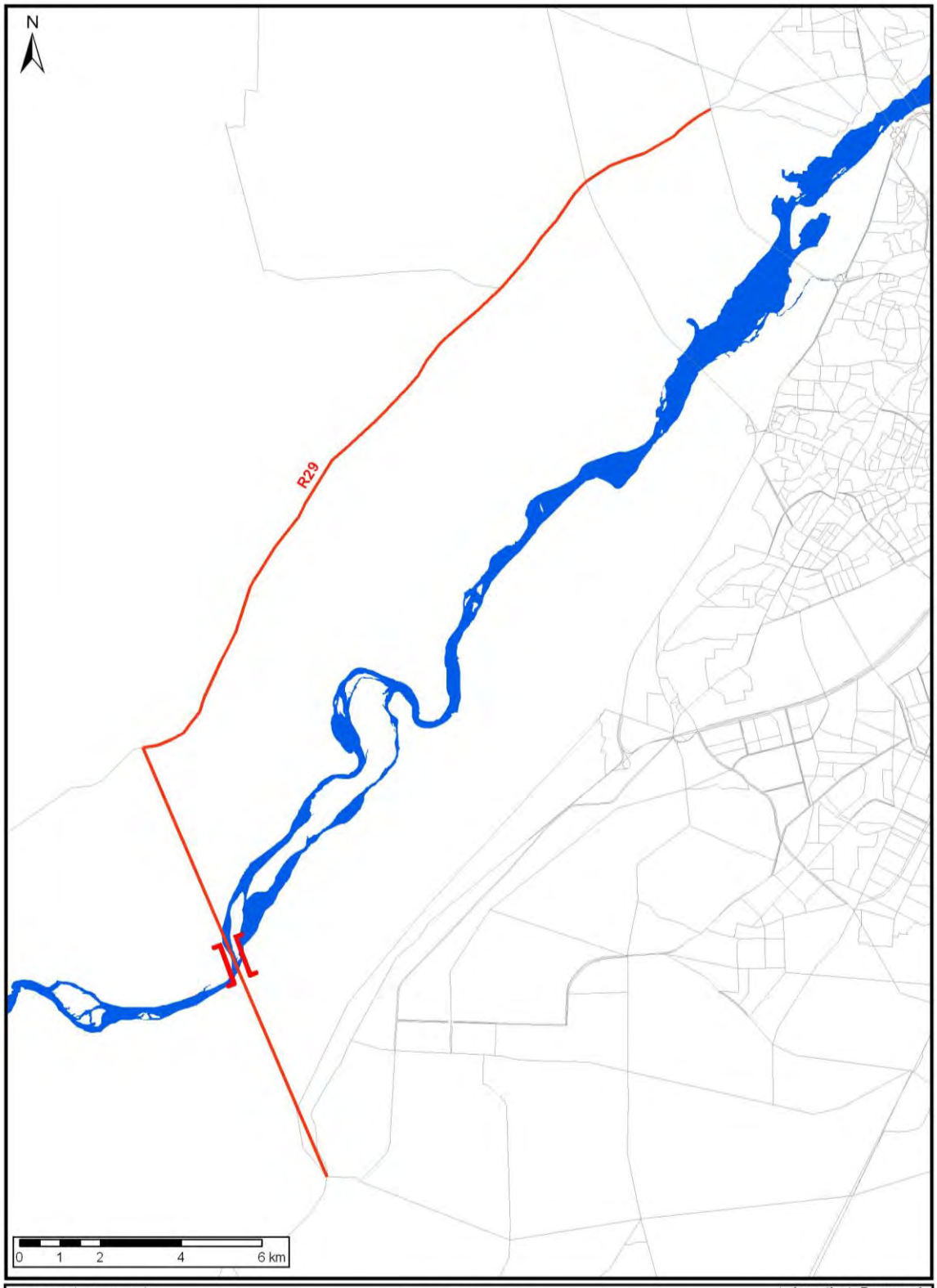
Project No.	Project Code	Project Description	Length (km)	Proposed Lanes
R28	20.046	Kahna Kacha Road (Kahna Station – Ferozepur Road)	7.1	D-2
R33	20.052	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	17.7	D-3
R35	20.054	Southern Bypass South Road (Ferozepur Road – College Road)	9.9	D-3
R36	20.055	Southern Bypass North Road (Canal Bank Road – M-2)	3.9	D-3
R38	20.057	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	12.9	D-3
R39	20.060	Defence Road (Multan Road – Ferozepur Road)	14.3	D-3
R40	20.061	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Sothern Loop)	3.5	D-3
R41	20.081	Construction of LRR West (Multan Road – M2)	15.6	D-3
R42	20.082	Construction of LRR South (Ferozepur Road – Multan Road)	21.8	D-3

Figure 2 LUTMP Proposed Road Sub-sector Projects



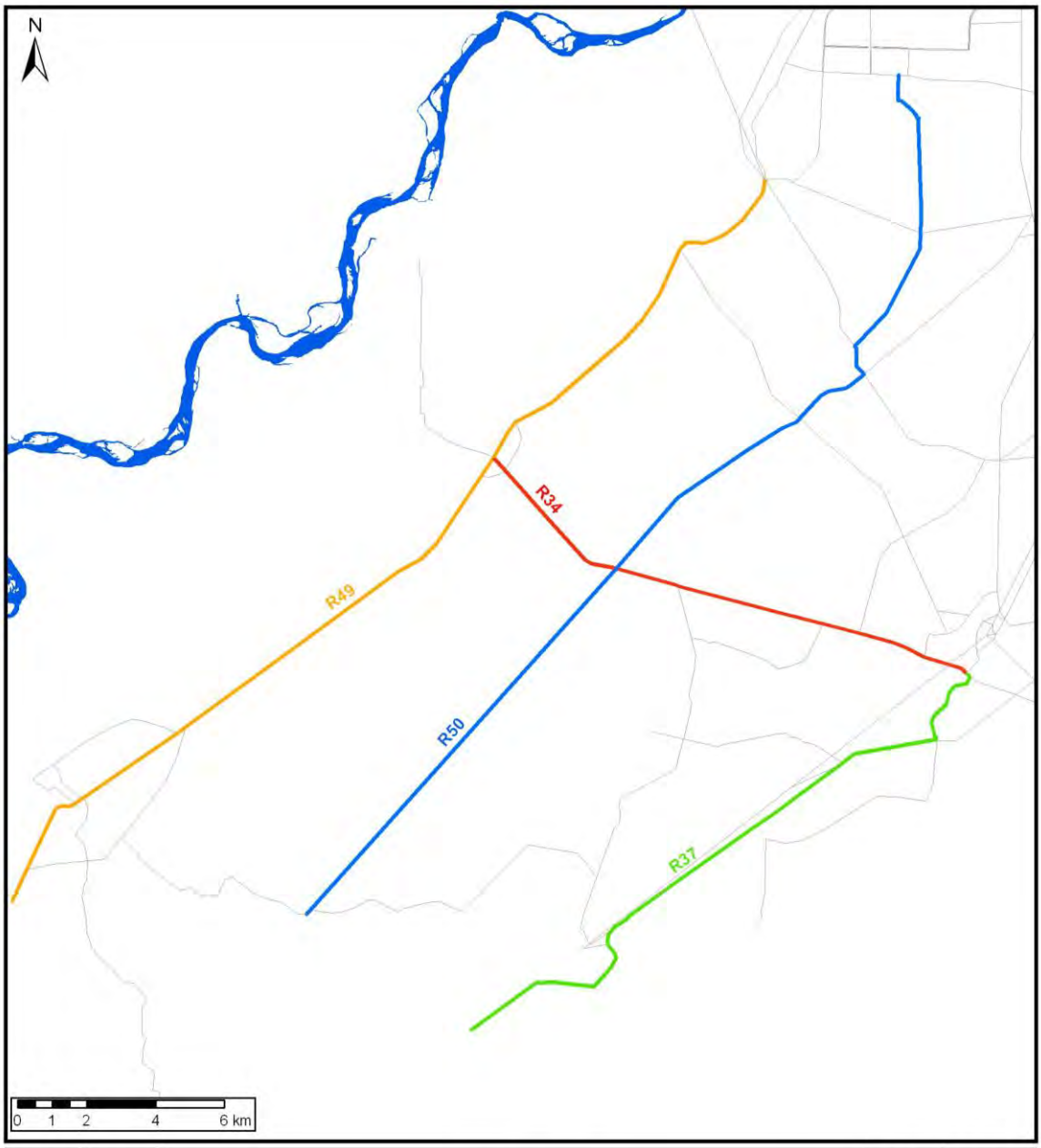
Project No.	Project Code	Project Description	Length (km)	Proposed Lanes
R13	20,004	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	2.8	D-3
R14	20,005	Link Peco Road – Ferozepur Road	1.9	D-2
R15	20,006	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)	1.5	D-2
R16	20,007	Old Ravi Bridge and Road **(Bridge 0.5km)**	1.2	D-3
R17	20,008	G.T. Road (Cooper Store - Ek-Moria Pul)	2.1	D-2
R24	20,027	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	2.4	D-3
R30	20,049	Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)	2.4	D-3
R31	20,050	Sagianwala Bypass Road (Ring Road – Sharaqpur Road) **(Bridge 0.6km)**	6.7	D-4
R32	20,050	Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	1.9	D-4
R43	20,091	Secondary Roads in Dharampura Area	5.1	D-2
R44	20,092	Secondary Roads in Shadbagh Area	68.2	D-2
R45	20,093	Secondary Roads in Samanabad Area	19.2	D-2

Figure 3 LUTMP Proposed Road Sub-sector Projects



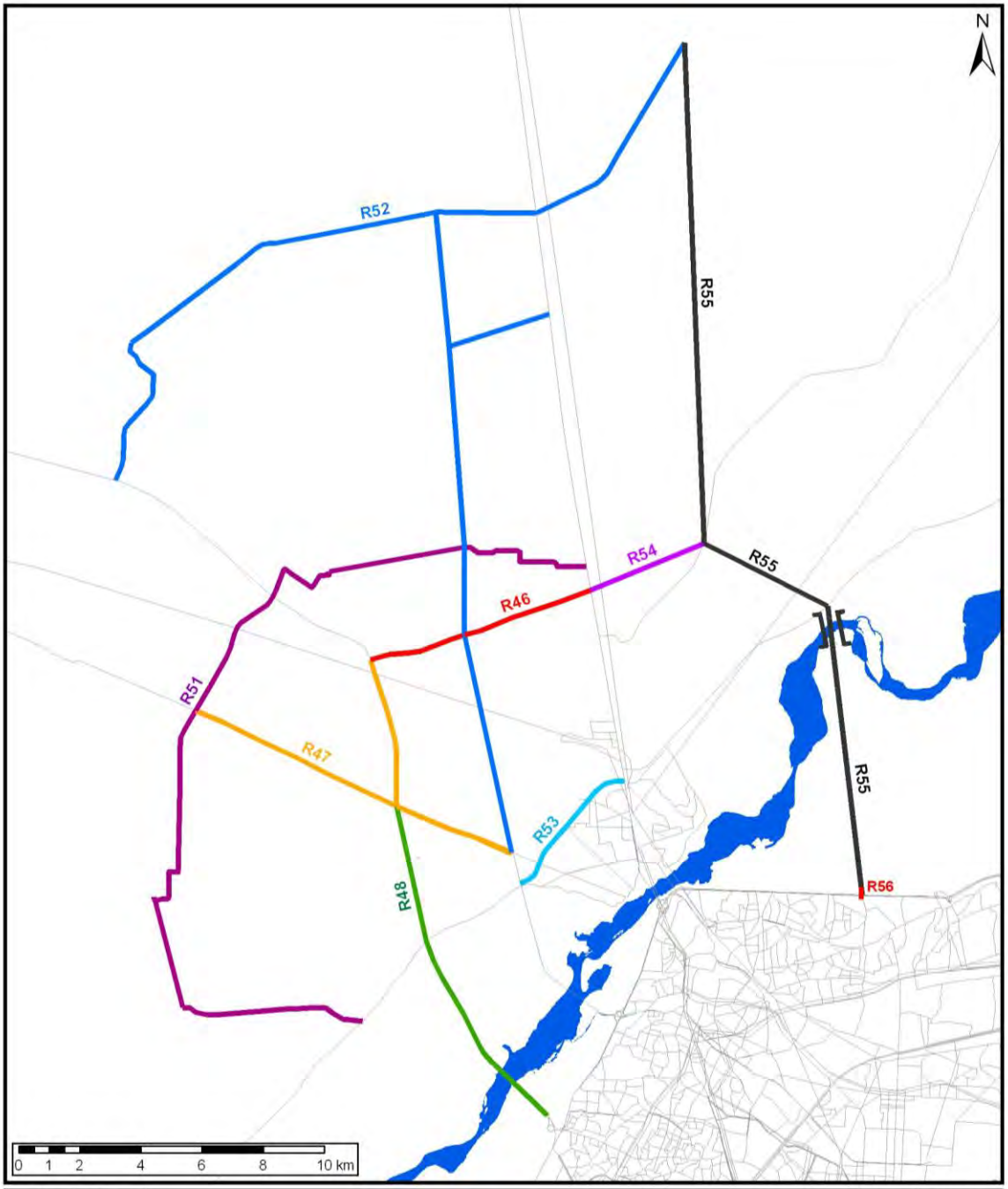
Project No.	Project Code	Project Description	Length (km)	Proposed Lanes
R29	20,049	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) **(Bridge 0.7km)**	37.4	D-3

Figure 4 LUTMP Proposed Road Sub-sector Projects



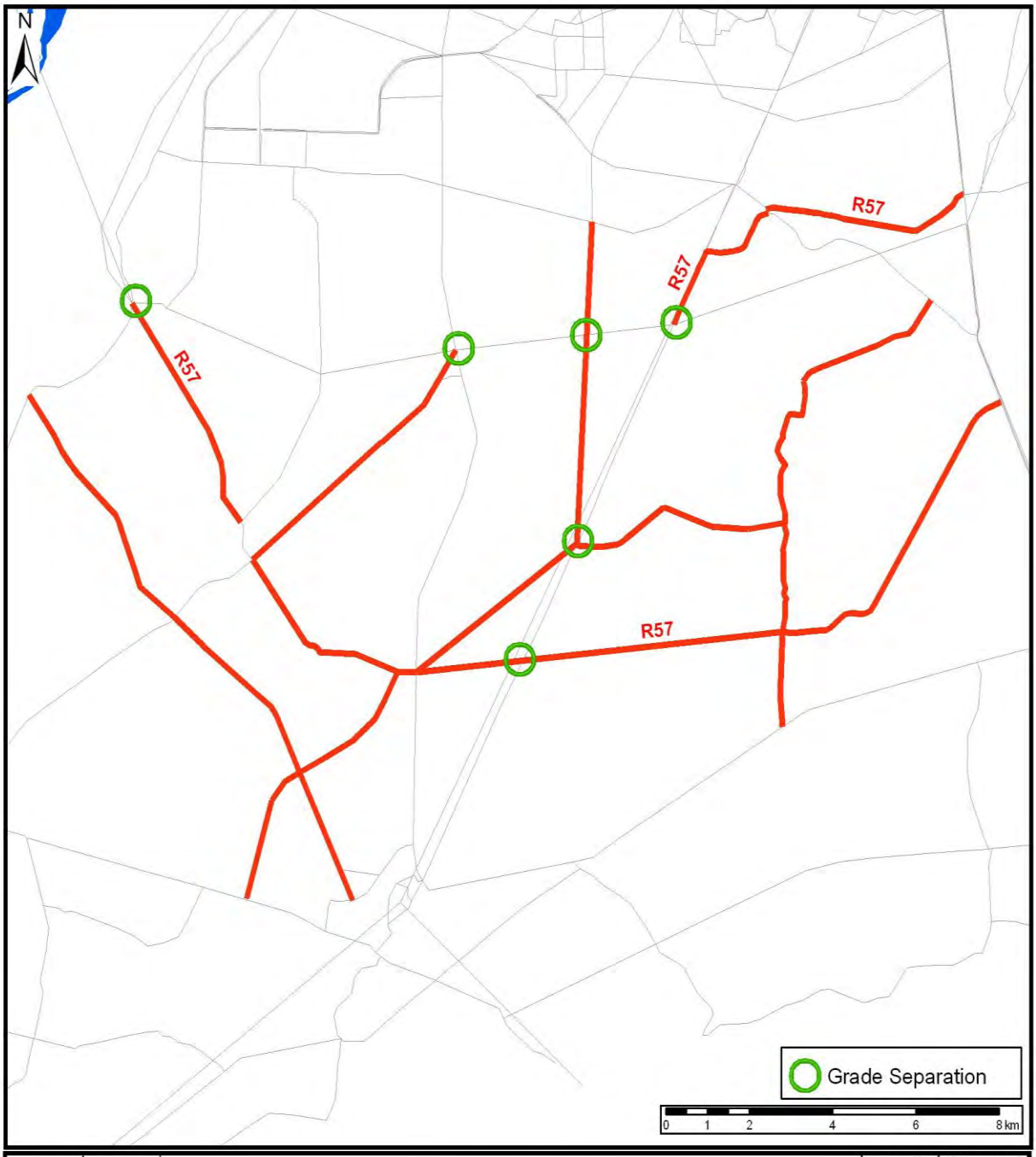
Project No.	Project Code	Project Description	Length (km)	Proposed Lanes
R34	20,053	Manga-Raiwind Road (Multan Road – Raiwind Road)	15.8	D-3
R37	20,056	Raiwind-Pattoki Road (Raiwind City – Boundary of LUTMP Study Area)	19.8	D-3
R49	30,004	N-5- Multan Road (Lahore Ring Road Sothern Loop – Boundary of LUTMP Study Area)	31.3	D-3
R50	30,005	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	33.2	D-3

Figure 5 LUTMP Proposed Road Sub-sector Projects



Project No.	Project Code	Project Description	Length (km)	Proposed Lanes
R46	30,002	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	7.6	D-3
R47	30,002	M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of LUTMP Study Area) **(Bridge 0.6km)**	17.3	D-4
R48	30,002	M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	11.6	D-3
R51	30,006	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	33.8	D-3
R52	30,008	Sheikhupura Muridke Road (G.T. Road – M-2)	52.7	D-3
R53	30,010	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	5.0	D-3
R54	30,028	Link Kala Shah Kaku – Lahore-Sialkot Motorway	4.2	D-3
R55	30,028	Lahore-SialkotMotorway **(Bridge 0.8km)**	32.0	D-4
R56	30,028	Link G.T. Road Lahore-SialkotMotorway	0.3	D-3

Figure 6 LUTMP Proposed Road Sub-sector Projects



Project No.	Project Code	Project Description	Length (km)	Proposed Lanes
R57	Optional	Construction and remodeling of Secondary Roads - south of LRR in the south-western quadrant between Ferozepur Road and Multan Road	93.6	D-3