

7.2 LUTMP 2030 Master Plan Network Formulation

7.2.1 Base Case Transport Network

1) *Prevailing Conditions*

Analysis of current transport supply and demand has been presented at various stages of the project and particularly in relation to travel demand forecast in Volume 1, Chapter 4. It has been established that the current network demand and supply situation is adequate, as it is generally perceived and as reported in the opinion surveys. The prime causes for poor network performance and traffic congestion is not due to lack of road space and capacity deficiencies but mostly due to local reasons, which could be summarised as:

- Bad traffic mix, particularly animal drawn carts, pedestrians, bus passengers and slow moving traffic – all in the same road space due to various reasons;
- Poor lane discipline and bad driving behaviour,
- Lack of understanding of traffic rules, particularly ‘priority’ ;
- Inefficient junction design – allowing fast merging traffic from the left; and lack of intersection control (police controlled traffic signals),
- Poorly and incorrectly laid out merges and diverges on primary and secondary roads;
- Interaction between traffic, pedestrians and frontage access; and
- Total lack of signage (even the limited signage is poorly planned, designed and located) and enforcement of traffic rules.

These comments are based on observations and also the result of several different types of surveys conducted by the Study.

2) *Need for Road Network Hierarchy*

Urban roads perform many functions besides providing passage for moving vehicles and pedestrians. These functions may be broadly classified as: environmental, access, local traffic and through traffic. Not all functions need to be performed by any one road, but for purpose of planning and design, the function need to be recognised and appropriate design standards applied. When defining the function of road; assessment must be made of all the activities on and along the road. Therefore, when planning a road; a balance must be achieved between traffic capacity, operating speed, environment, safety and the convenience of road users including pedestrians. Therefore, the benefits to be achieved by classifying and managing road hierarchy could be summarised as:

- When environment and access functions are given priority, activities related to building frontage may be allowed – **Access/ Local roads/ Streets/ Service roads**
- Where traffic movement is given priority, activities incompatible with traffic flow may be restricted, provided the safety (pedestrian) is not compromised – **Secondary/ Distribution roads**; and
- Capacity of roads could be immensely improved by segregating different types of traffic, and limiting access to adjoining roads, reducing the number of intersections and vehicular conflicts – **Primary roads**
- In addition, Lahore has major intercity roads passing through or terminating on the outskirts. These roads have function of '**Trunk Roads**'; and the **M-2 Motorway** which links Lahore with the northern Punjab also performs the intercity linkage function.
- The road capacity in urban areas is more a function of junction design performance and control/ operation. This is essential in such that city needs all four types of roads, and the Motorways/ Trunk Roads for inter-city travel, and their connectivity through efficient junctions – **that is what makes an efficient hierarchical road network.**

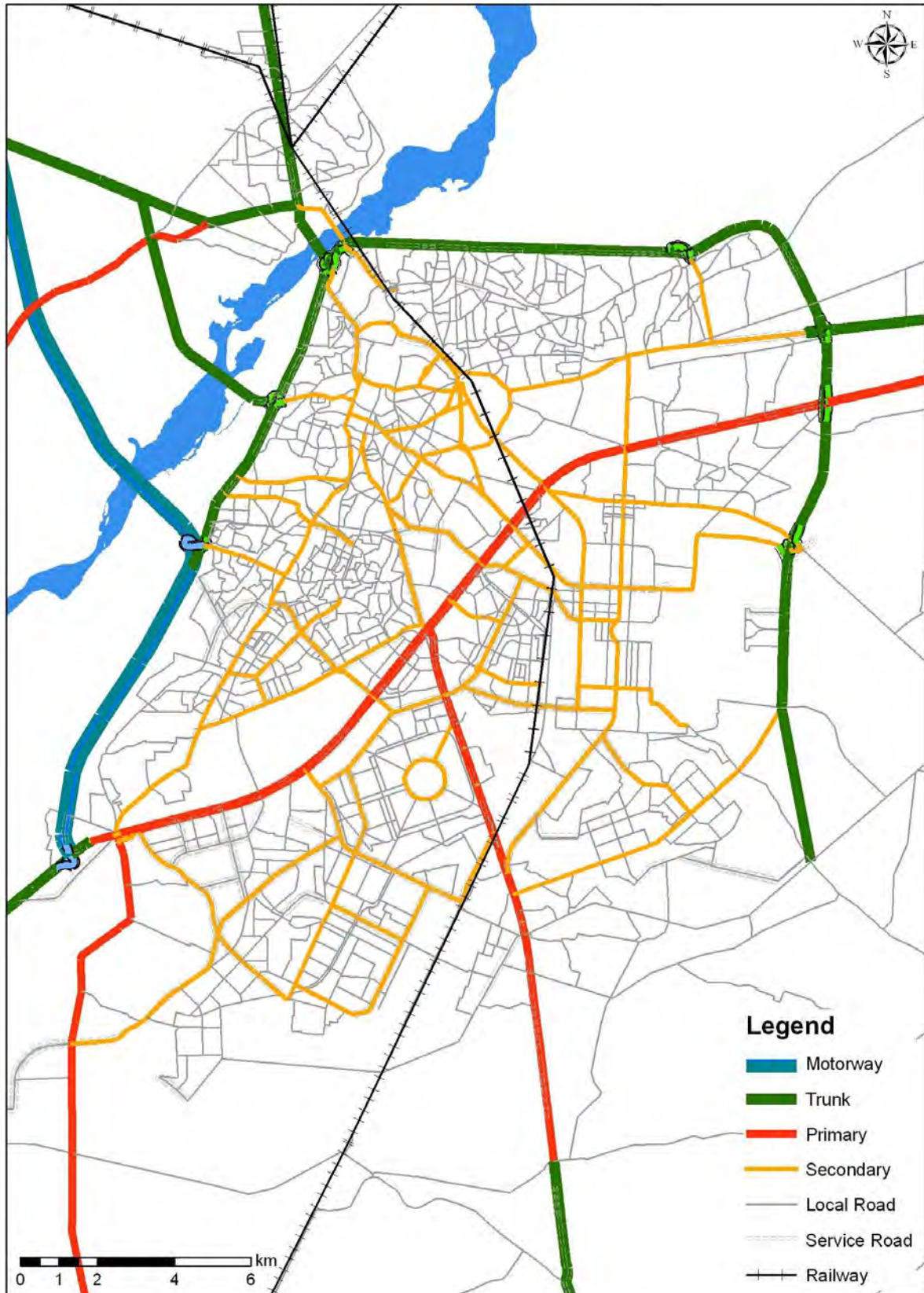
A road Hierarchy for Lahore was considered to be essential. Currently a number of radial primary routes provide access to Lahore from all directions with considerable capacity – even with excess capacity (e.g. current capacity of M-2 and LRR). Now that the LRR is a reality (after 20 years of its proposal), extending the primary network to the heart of the city is not essential. There is a need to strengthen the distribution network and access roads with clearly identified priorities. This is to ensure that there is adequate capacity to feed and distribute traffic to/ from the primary and higher level network to/ from the city. This is emphasized as essential for the road network to work in an integrated and efficient manner to provide reasonable speed for all long and short distance users. As a result the study approach was to define the existing (2010) road network hierarchy in the light of above criterion, based on surveyed information and best international practices. This hierarchy is illustrated in Figure 7.2.1 for the Study Area network.

3) Proposed Hierarchical Road Network and Current (2010) Performance

The current 2010 road network hierarchy as defined by the study is illustrated in Figure 7.2.1 and its characteristics under the current road traffic condition are summarised in Table 7.2.1. The Study Area road network as illustrated does have good road density, except in the inner city areas. The areas in the outskirts still rely mostly on a single road

and basic low-grade street / rural unpaved roads (not in the LUTMP network) – such as GT Road to the east Barki Road and Bedian Road in the South-east. Similarly in the south-west and south the local and secondary road network is quite sparse and requires strengthening. On the other hand inner areas to the north of Railways and most of the western areas between Bund Road and major arterial roads lack well defined secondary/ distribution roads. Cantonment, DHA, Gulberg and Model Town areas are well laid out in terms of local and secondary road network.

Figure 7.2.1 Current (2010) Road Network Hierarchy



Source: JICA Study Team

Table 7.2.1 Current (2010) Road Network and Performance Indicators

Road Type	km	% of Network	Av. Speed (kph)	V/C Ratio	Network PCU*km (Daily)		Network PCU*Hrs (Daily)	
					('000)	%	('000)	%
Motorway	52	2%	59	0.67	2,049	11%	35	8%
Trunk	185	8%	47	0.55	5,635	31%	120	26%
Primary	127	5%	38	0.48	2,316	13%	61	13%
Secondary	212	9%	34	0.40	3,297	18%	98	21%
Local	1,818	76%	31	0.21	4,641	26%	149	32%
Total	2,395	100%	39	0.37	17,938	100%	463	100%

Source: JICA Study Team

The LUTMP hierarchically defined road network performance under the 2010 traffic situation is summarized in Table 7.2.1 and illustrated in Figure 7.2.2. The poorly planned network development is quite evident from the lower percentage of primary and secondary network in each category. Particularly secondary network is only 8% of the Study Area roads but carries 18 % of the PCU*kms and 21 % of the PCU*Hrs. Internationally there is no ideal split of road network by primary/ secondary and local roads. It depends on the form of the city, its geography (rivers etc.), and location relative to other regional centres. It can be seen that about 42 % of PCU*kms are on the motorway and trunk roads with only 10 % of the share of the network. This indicates considerable internal-external and through traffic demand on the Study Area network – requiring that due consideration be paid to the regional traffic within the Study Area.

The average daily travel speed by road type shows that most of the network operates at above 30kph. It should be noted that it is not peak period speed or by direction. The LUTMP model is strategic in nature and deals with average daily traffic volumes as 9% of the daily volumes. (Derived from cordon, screenline and traffic count surveys).

Figure 7.2.2 Current (2010) Road Network Performance



Source: JICA Study Team

4) 2020 and 2030 Road Network Performance and Capacity Deficiencies

The 2010 road network as discussed above was updated to include the following on-going schemes to represent the 'base case' network for future (2020 and 2030) demand assessment. These upgrades and new constructions include:

- i. Completion of Kalma Chowk and Ferozpur Road Canal flyovers;
- ii. Upgrade of Ferozpur-Kasur Road, Multan Road and Kala Khatai Road;
- iii. Canal Bank Road widening, upgrade of Canal Bank Road beyond Thokar Niaz Baig; Barki Road; Allama Iqbal Road; and
- iv. Completion of LRR from Bedian Road to Ferozpur Road.

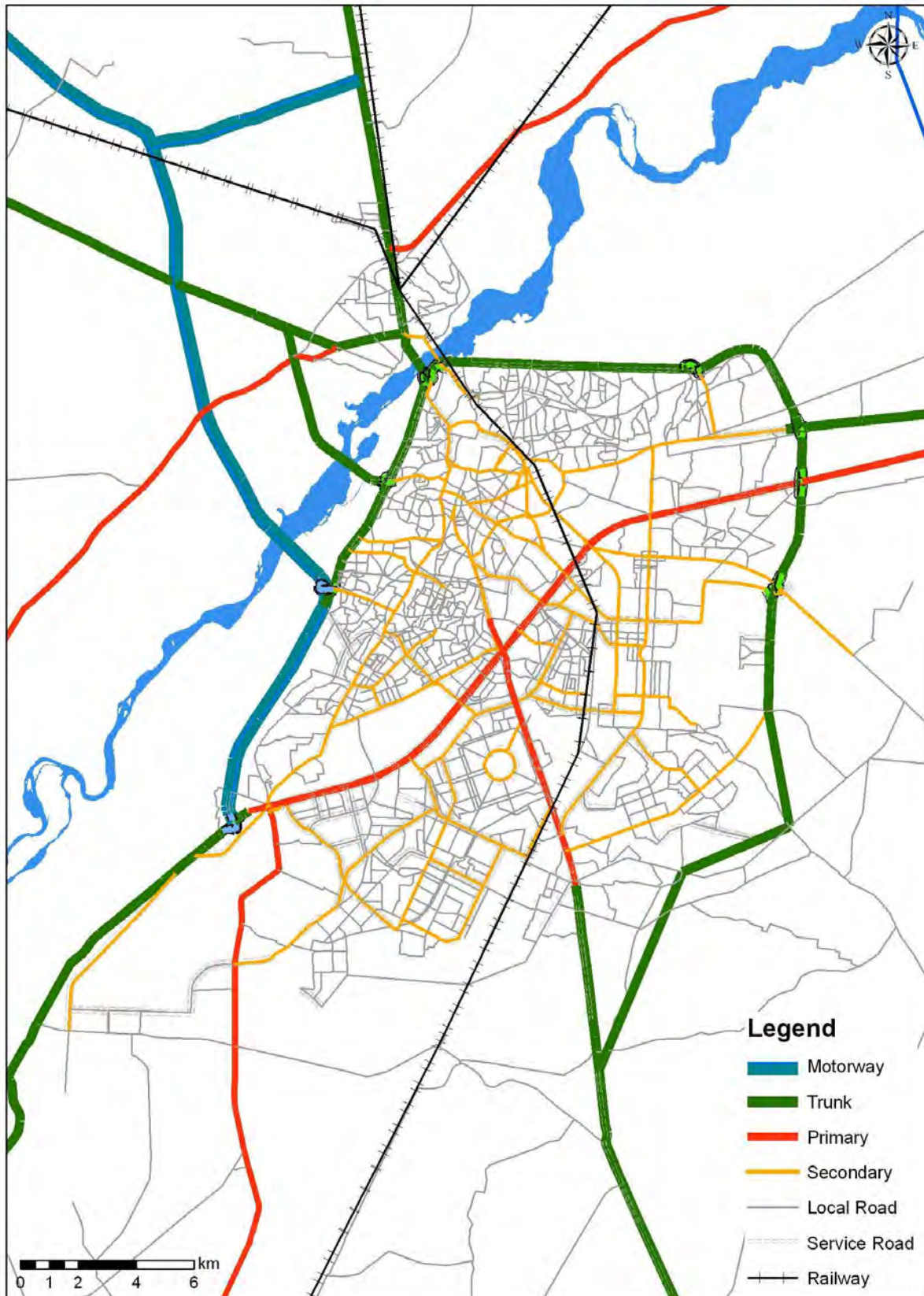
These upgrades would increase the network length by about 17 km to 2,412 km, but would have limited impact on the overall network capacity and performance. The base case network is shown in Figure 7.2.3. The 2020 and 2030 (in both cases Scenario II) traffic volumes when assigned to the base case network, the results are shown in Figures 7.2.4 and 7.2.5 respectively and summarised in Table 7.2.2.

Table 7.2.2 Base Case Road Network Performance 2020 and 2030

Road Type	km	% of Network	Network V/C Ratio		Network Av. Speed (kph)	
			2020	2030	2020	2030
Motorway	52	2%	0.92	1.15	28	9
Trunk	204	8%	0.66	0.93	27	10
Primary	152	5%	0.52	0.69	29	16
Secondary	226	9%	0.50	0.69	33	23
Local	1,777	76%	0.33	0.55	26	15
Total	2,412	100%	0.49	0.71	28	13

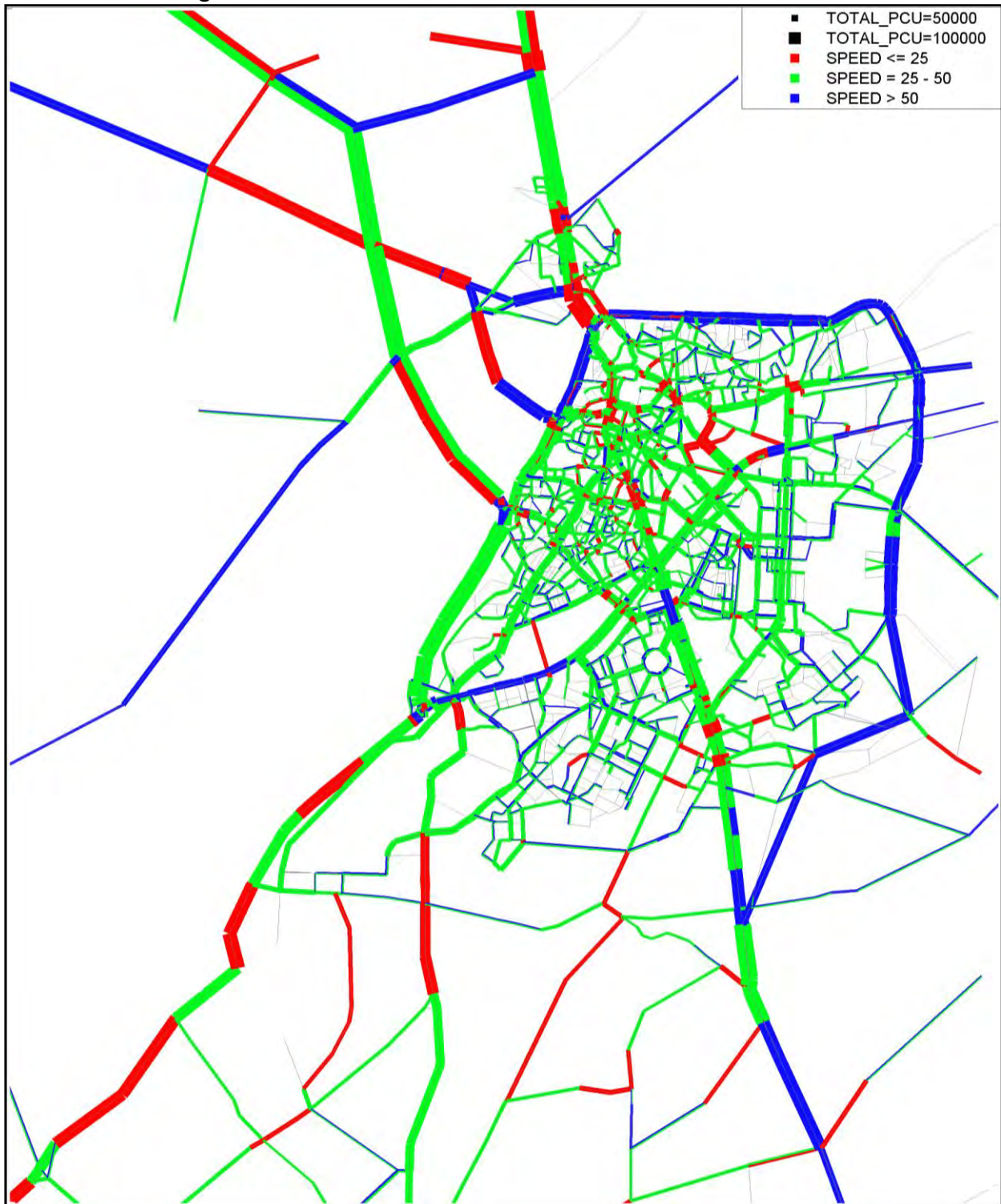
Source: JICA Study Team

Figure 7.2.3 Base Case Road Network Hierarchy



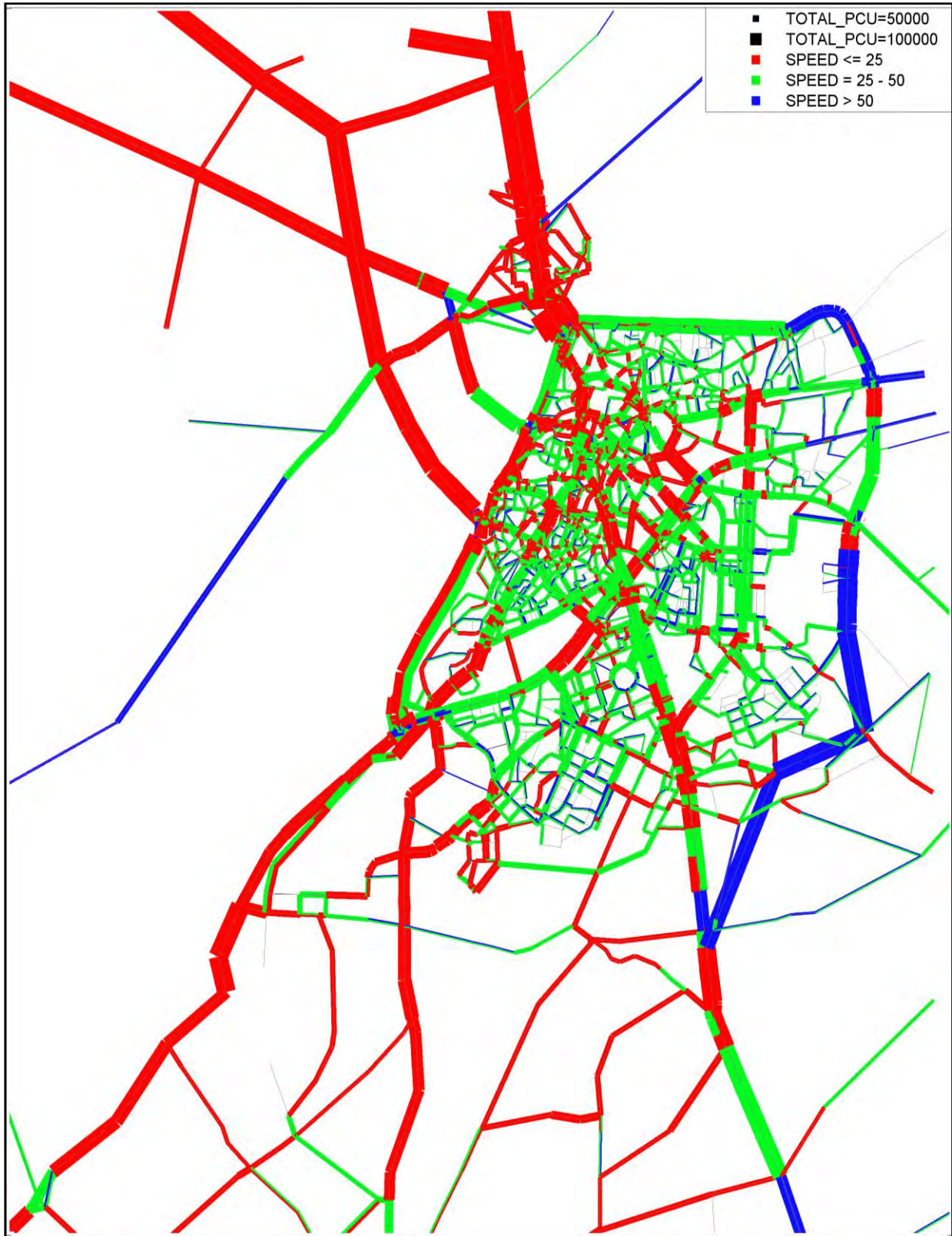
Source: JICA Study Team

Figure 7.2.4 Base Case Road Network Performance - 2020



Source: JICA Study Team

Figure 7.2.5 Base Case Road Network Performance - 2030



Source: JICA Study Team

Under the 2020 Scenario II, travel demand the exception of local network all other road types would be at V/C ratio in excess of 0.5 and the overall network speed would drop from the base case speed of about 40 kph to 28 kph. The trunk roads, primary and secondary network would be overloaded at various locations. Figures illustrates main bottlenecks would be Ravi Bridges, Multan Road (N-5), Raiwind Road, adjacent local Roads and sections of Ferozpur Road. However, the situation would be tolerable, but not conducive to a functioning modern metropolis with close to 13 million inhabitants with growing car ownership and increasing income levels.

By 2030 the situation will be further exasperated with more than doubling of the traffic volumes (see Volume 2, Chapter 4, demand forecast). The 2030 network performance posts a much bleaker picture. Almost all of the network would be above V/C ratio of 0.5 and all roads with the exception of local streets would be at level of service D or worst. Average speed except on secondary roads would drop below 20 kph. The inner city area roads may show a somewhat better picture with many roads above 25 kph, but it should be noted that the LUTMP strategic demand model does not take account of very short trips (mostly intra-zonal) in the inner-city area. With that additional volumes, which could be realised at more detailed modelling level would show much more congested local/ street network. This situation is not sustainable.

The Study Area base case road network was systematically upgraded, starting with improvement to the capacity and connectivity of the secondary road network, improvement to junctions and better utilization of service roads through 1-way operation if possible; or at least 1-way at entry and exit, but 2-way flow along the service road sections. It was estimated that additional 20 % capacity could be realised by such improvements when coupled with serious removal of encroachment and zero-tolerance for roadside activities such as hawkers, motor vehicle repairs, storage of goods for sale, garbage storage and collection, and other such activities which limit road capacity. The analysis showed that further road improvement/ upgrading would be necessary to have sustainable network speeds in 2020 and 2030.

All proposed and committed road schemes were then analysed for:

- their role and contribution to the network hierarchy,
- constructability, likely land take, and impact on community, and
- the '*need*' for in an integrated sustainable network.

The deferred (as may be considered later if needed – through proper planning and feasibility studies) are:

- Wahdat Road – Already good dual-2, with additional Right of Way (RoW),

simple management would be adequate, or reconsider additional lane at the time of LUTMP BRT Line feasibility stage, not now.

- Walton Road Area – Serves No purpose, why?
- PIA Main Boulevard Housing Society – Poor connectivity, duplicates other local roads and passes through established housing areas.
- Jallo Morr to Siphon – Rural (Not in LUTMP scope to provide rural links)
- Kot Pindi Das Road – Rural (Not in LUTMP scope to provide rural links)

The 2020 demand forecast scenarios were tested including all TEPA and C&W and other proposed projects, except those listed above. The network performance was evaluated, and it was found to be seriously deficient in meeting the future travel demand. As a result the whole network was hierarchically developed and iteratively evaluated. The additional projects based on road hierarchical upgrade i.e. local to secondary upgrades, and so on were developed both for 2020 and for 2030, again based on when a project is needed. These physical/ structural details of the full master plan projects are given in the next Section (7.3) of this Chapter. The final LUTMP 2030 Master Plan is illustrated in Figure 7.2.6, and key projects are outline below:

Figure 7.2.6 LUTMP 2030 Highway Master Plan Network



Source: JICA Study Team

Key highway projects for implementation are:

- Lahore – Sialkot Motorway to LRR in the north;
- M-2 Upgrade to Dual 4 up to Kala Shah Kaku (KSK) bypass;
- Upgrade KSK by Pass to Dual-3;
- Motorway interchanges with Lahore-Sheikhupura Road and additional interchange with Muridke Road from Chand Bagh;
- Lahore-Sheikhupura Road Upgrade to Dual-3;
- Multan Road (N-5) Upgrade to Dual-3;
- Sharaqpur Road upgrade and connect across Ravi to LRR south-west section;
- LRR southern and western sections;
- New secondary road network to relieve Multan Road (N-5);
- Raiwind Road upgrade; and additional Secondary Roads upgrade south of Sua Asil Road;
- Additional secondary roads in the north west of GT Road (N-5)
- Shahdara Bypass; and additional secondary road improvements;
- 2 New Ravi bridges (one adjacent to old Ravi Bridge and another next to Saggian Bridge)
- Construction of some missing links in the south west of Lahore to improve connectivity of existing roads;
- Additional Pak Railway crossings in south west and from Noor Jahan Road to Sham Road;
- New link from UET to Zafar Ali Road using disused railway links via Dharampura and Mian Mir;
- Upgrade of Ek-Moria and Do-Moria railway underpasses;
- Upgrade of similar rail crossings (underpasses) to Dual-2;
- Defence Road upgrade;
- Construction of Southern bypass – left over from 1980 structure plan;
- Development of secondary road network almost entirely from existing roads in the northern and western parts of Lahore.
- Upgrade of all Local roads to Secondary level in the area: south of LRR and north of Sua Asil Road between Ferozepur Road and Multan Road quadrant; also addition of new Secondary roads to improve connectivity.

Full 4-stage LUTMP travel demand model runs were carried with full highway master

plan network; including complete integrated public transport master plan for 2020 and 2030. Highway projects were then selected according to the need i.e. to be included in 2020 or later in 2030. The whole network was tested for their operational performance, until 2020 and 2030 and provides acceptable and sustainable level of service in the Study Area. The highway network operational performance is discussed next, and is followed by the Public Transport (PT) network development programme. The 2020 and 2030 road traffic volumes and resulting average speed are depicted in Figures 7.2.7 and 7.2.8 and are summarised in Table 7.2.3 and 7.2.4 respectively.

Table 7.2.3 Master Plan Road Network and Performance Indicators - 2020

Road Type	km	% of Network	Av. Speed (kph)	V/C Ratio	Network PCU*km (Daily)		Network PCU*Hrs (Daily)	
					('000)	%	('000)	%
Motorway	52	2%	28	0.84	2,569	10%	91	12%
Trunk	279	11%	37	0.57	9,805	37%	266	34%
Primary	129	5%	39	0.47	2,915	11%	76	10%
Secondary	502	20%	37	0.35	6,186	23%	167	21%
Local	1,571	62%	28	0.25	4,903	19%	177	23%
Total	2,533	100%	34	0.41	26,378	100%	776	100%

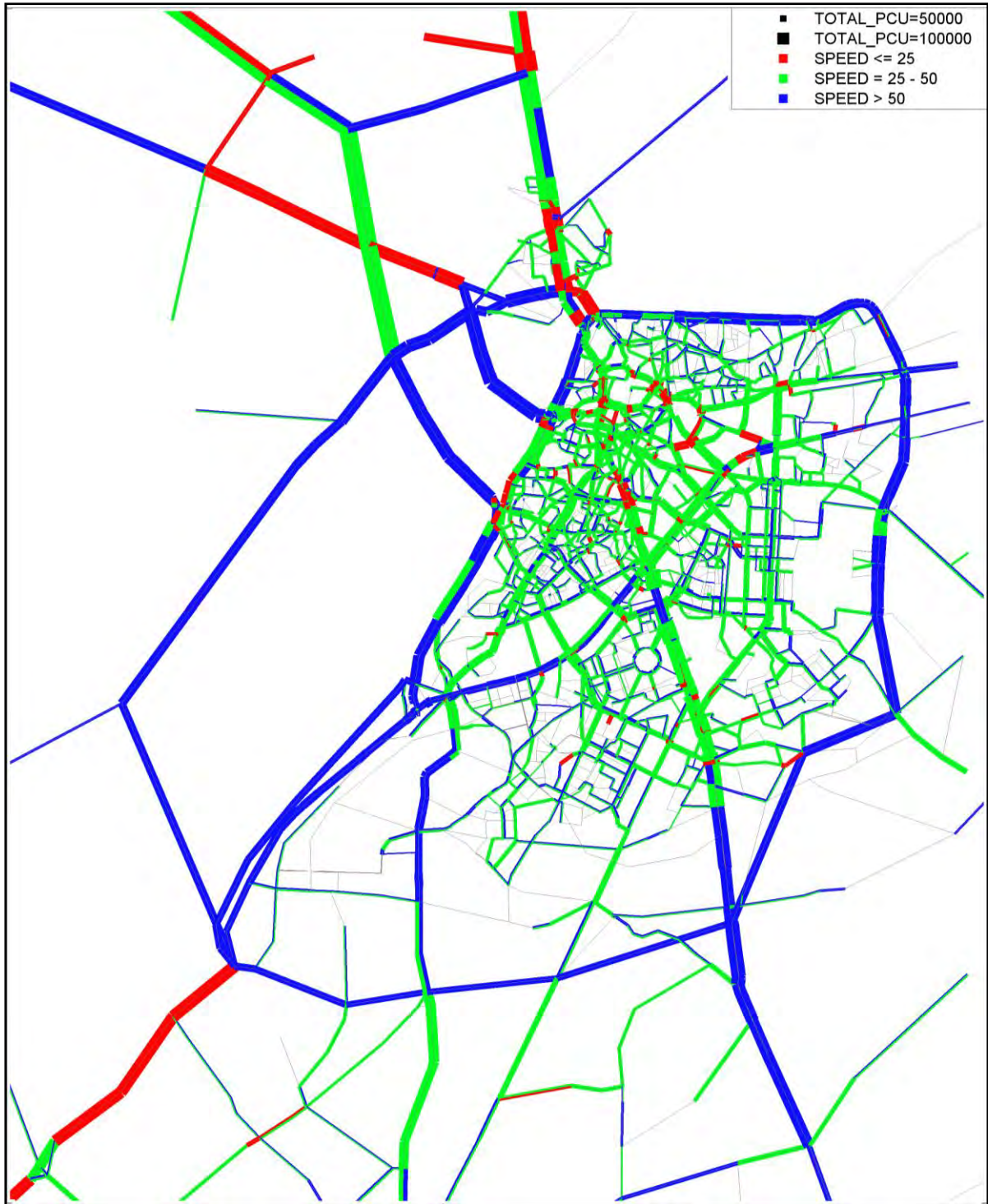
Source: JICA Study Team

Table 7.2.4 Master Plan Road Network and Performance Indicators - 2030

Road Type	km	% of Network	Av. Speed (kph)	V/C Ratio	Network PCU*km (Daily)		Network PCU*Hrs (Daily)	
					('000)	%	('000)	%
Motorway	89	3%	39	0.69	4,600	12%	117	10%
Trunk	279	11%	39	0.73	13,043	34%	332	29%
Primary	129	5%	33	0.54	3,519	9%	108	9%
Secondary	626	24%	31	0.50	11,076	29%	352	31%
Local	1,499	57%	28	0.33	6,609	17%	239	21%
Total	2,622	100%	34	0.53	38,846	100%	1,149	100%

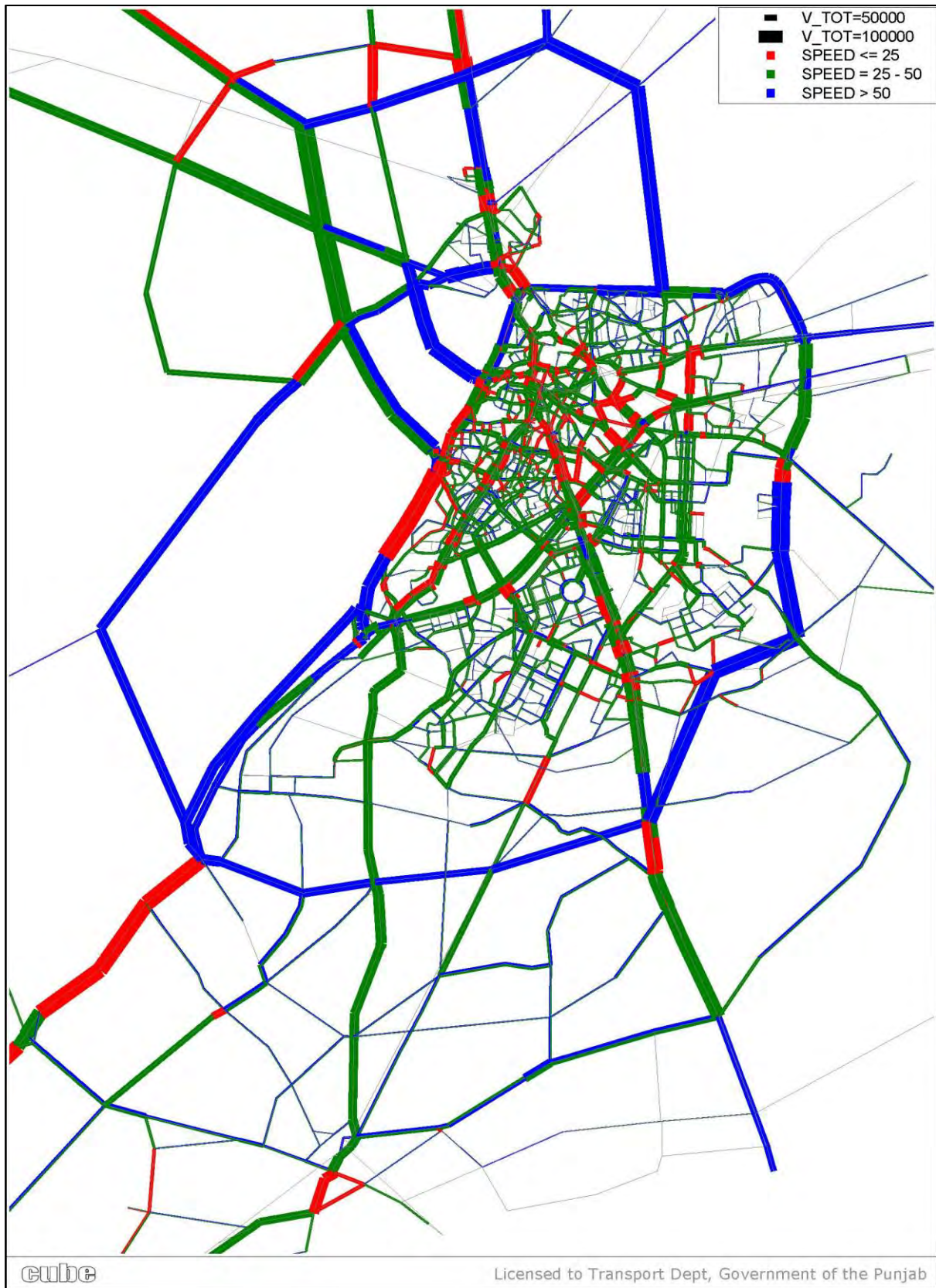
Source: JICA Study Team

Figure 7.2.7 Highway Master Plan Network Performance - 2020



Source: JICA Study Team

Figure 7.2.8 Highway Master Plan Network Performance - 2030



Source: JICA Study Team

It can be seen that through proper planning and structured highway network development with an overall increase of only 210km of new roads (9 % increase over 2010) more than double the traffic volumes (PCU*km) are accommodated without much degradation to network-wide speed – down to 34 kph in 2030 from around 40 kph in 2010. The main strategy was to create coherent secondary road network - increased by 400 km, mostly from existing local roads by getting rid of encroachment, junction improvements and limited widening/ remodelling – where appropriate. The local road network would decrease to about 1,500 km from 1,800km in 2010). This would provide major environmental benefits to the remainder of the local roads due to reduced traffic volumes. It can be seen from Table 7.2.4 that the major road network (Motorways and Trunk roads would be at around 40kph, and Secondary roads at 31kph, while local roads at just under 30 kph. It may be argued that Motorway and trunk roads should have higher average speeds, but this would require major motorway and trunk road programme which could be financially unsustainable within the GoPb budget. Another way to look at the network is to introduce further secondary road network when the areas to the west and north of Ravi are developed, which would take away local traffic of these major trunk roads.

In addition, it is also necessary to mention that: a major regional study is required to fully realise the impact and implications of external and through traffic, considered to be beyond the scope of this project. Pakistan Railway could also assist in taking away considerable external and through bus traffic off these regional roads, but again it is difficult to fully assess the impact of such regional modal shift and the level of investment required, to achieve such a shift, given the poor state and lack of capacity in Pak Rail network system. The impact of such a massive investment would or could also adversely impact the available budget for transport infrastructure programme for Lahore. Alternative would be to get National Highway Authority/ Federal Government to fund these developments to the national road network.

5) Current Public Transport Network and Systems

The Public Transport (PT) is a serious issue in Lahore and its operation and lack of performance has been discussed elsewhere. Lahore is fortunate to have 38 ~ 40 % Public Transport mode share (even with such poor and dilapidated services – as public without private vehicle have no choice). However broad PT demand has been discussed in Chapter 2 (Volume 2) Travel demand forecast are detailed in Chapter 4 (Volume 1). In brief there are currently about 53 Government '*notified*' bus routes (Large bus or some time called as HOV routes). These 53 routes are incorporated in the LUTMP '*strategic*' modelling process.

In addition 16 inter-city bus routes representing long distance travel along motorway and

trunk roads were also incorporated in the model. Thus there were 69 total bus routes representing major bus travel in/ out and intra-city travel. Table 7.2.5 describes some of the key features of the current bus network in the Study Area. It can be seen that for network of about 2,400 km the bus services cover just over 1,000 km. The rest of the road network (more than half) is left to the mercy of para-transits, legal and illegal wagon operations. The total demand does not even yield one boarding per trip. This shows the sparse coverage of the Study Area by the 'notified' bus routes, and the remainder trips are assigned to the para-transits (see Figure 7.2.9).

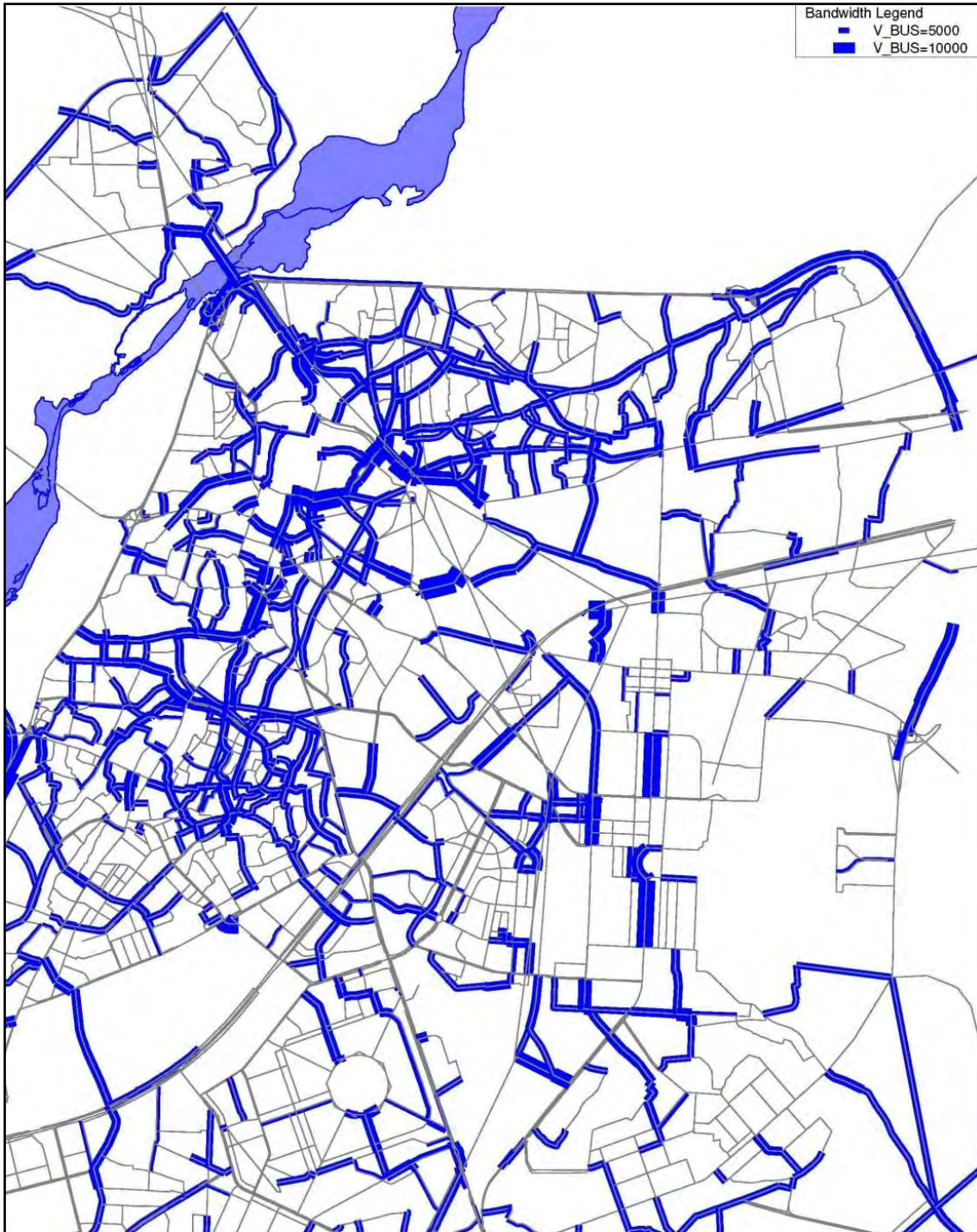
Further analysis showed that about 30 % of travel is (pax*km) is on the para-transit modes – a very high proportion resulting in in-efficient use of road space. Figure 7.2.10 shows the density of bus routes in the Study Area and on the road network to/ from the Study Area. Majority of the routes are concentrated on main roads – some roads carrying 5+ routes along the entire length from outside the city to the inner city area, like Ferozpur Road and Multan Road. Again it is a clear reflection of how much of the inner city area is not covered by regular bus routes. There may be excuse of lack of road space (width) but once the secondary road network is developed/ upgraded as described in the highway development programme, new routes could be introduced to serve these inner city areas.

Table 7.2.5 Local and Long Distance Bus Route Network and Demand

Number of Routes	Route-KM	Bus Stops	Total Boardings ('000)	Total PT Demand ('000)
Local - 53	1,040	4,000	3,994	2,870
Inter-city	These routes are from the Study Area cordon to bus termini		672	574

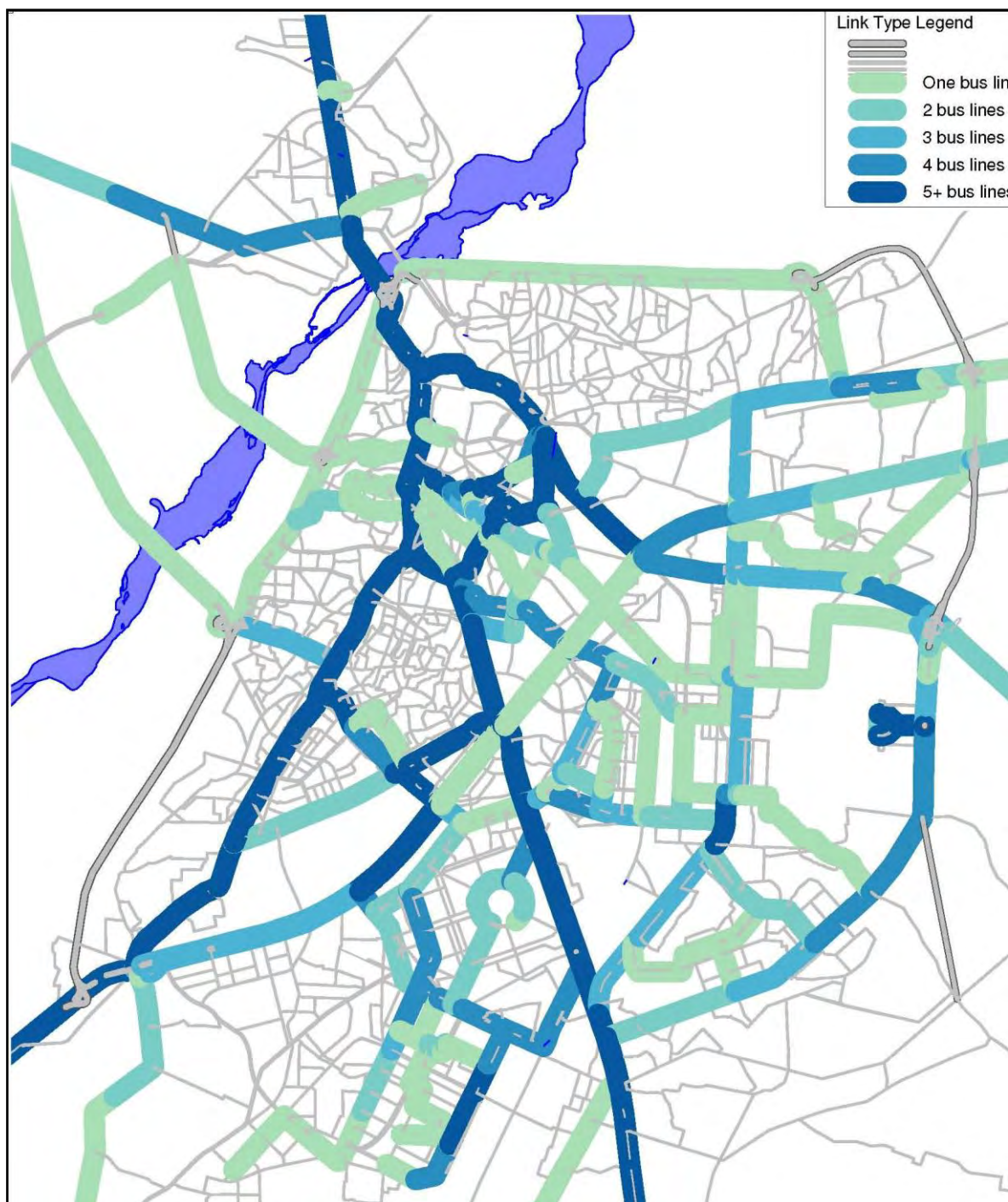
Source: JICA Study Team

Figure 7.2.9 Para-transit – 2010 Passenger Volumes



Source: JICA Study Team

Figure 7.2.10 Bus Network - 2010 Density of Bus Routes



Source: JICA Study Team

In addition, route by route patronage analysis indicated a vast difference between the daily boardings by route. About one third of the routes daily patronage is less than 15,000 boardings. 25 routes have daily boardings of 15,000 to 40,000 per day and the remainder carry in excess of 40,000 pax daily. There are some high utilization routes, which need further analysis, and such an analysis is out-side the scope of this strategic planning study, and could only be carried out in a comprehensive bus operations and route

rationalisation study, based on much more detailed network representation of operational routes and further disaggregated travel demand in the inner city area.

6) LUTMP Master Plan Public Transport Network and Systems

Analysis of the 2010 network as described above not only indicated poor coverage but also lack of high capacity bus system for major demand corridors. Future PT demand has been discussed elsewhere, and is again summarised below in Table 7.2.6

Table 7.2.6 PT Travel Demand for LUTMP Master Plan (2020 and 2030 Scenario-2)

Area	Person Trips			Growth over 2010	
	2010	2020-S2	2030-S2	2020	2030
Internal	2,870,000	3,562,000	4,204,000	24%	46%
External	574,000	669,000	798,000	17%	39%
Total	3,444,000	4,231,000	5,002,000	23%	45%

Source: JICA Study Team

It can be seen that total travel demand for public transport would exceed 5 million trips by 2030, a modest increase of about 45% over the next 20 years. However, the current unplanned, ill-organised poorly served bus network and mixture of Paratransit as a public transport system for over 16 million inhabitants is not sustainable. High demand corridors were analysed according to the demand and a comprehensive high capacity mass transit (bus and rail based) system is planned through an iterative process using the LUTMP strategic demand forecast model. The 2020 and 2030 public transport system characteristics internal to the Study Area are summarised in Table 7.2.7.

Table 7.2.7 LUTMP Master Plan – Key Characteristics of Public Transport System

Line / Route	2010	2020	2030
Bus Lines	53	44*	44*
BRT Lines	-	7	5
RMTS Lines	-	1	3
Bus Route Km	1,040	840	840
BRT Line KM	-	148	95
RMTS Line KM	-	27	78
BRT Stations	-	260	150
RMTS Stations	-	22	68
Bus Boardings	4,616,000	4,660,000	3,855,000
BRT Boardings	-	1,533,000	1,404,000
RMTS Boardings	-	760,000	2,074,000
% Bus Boardings	100%	67%	53%
% BRT Boardings	-	22%	19%
% RRMTS Boardings	-	11%	28%
Total Boardings	4,616,000	6,953,000	7,333,000

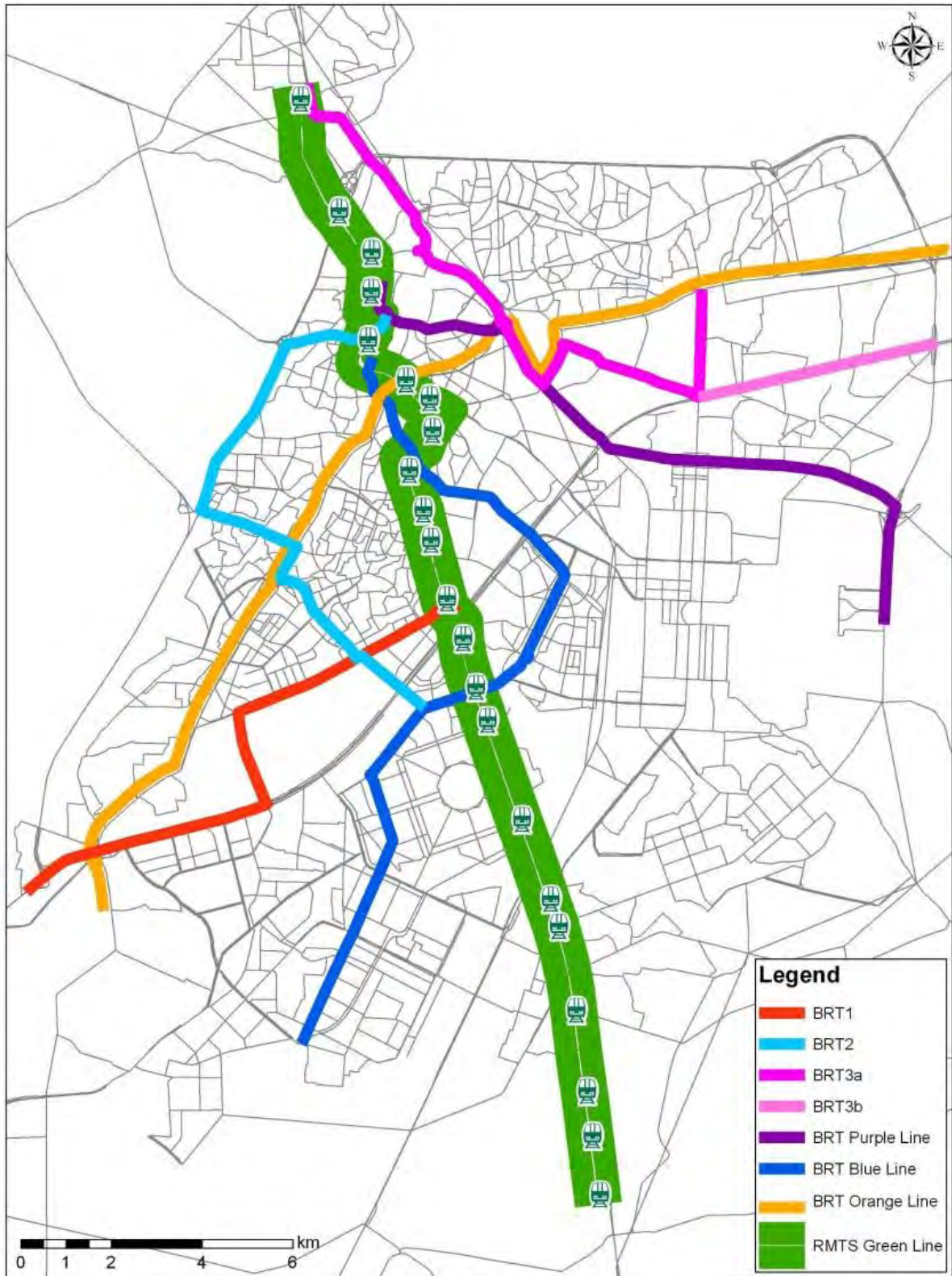
Note: 9 Bus routes were deleted –as these routes were competing with the Mass Transit Lines
 Source: JICA Study Team

It can be seen that how higher capacity systems would continue to take up the future travel demand (growth) and bus share of number of passengers would be similar to 2010.

Conversion of two lines (Orange and Blue to RMTS) is also essential as the loadings on these lines could not be sustained using a road based (BRT) system. At this stage the analysis is strategic, and would require further investigation at the feasibility study stage of each line. Additional patronage from Bus could be diverted to the BRT/ RMTS systems in the future years through better feeder route planning. In the LUTMP master planning the bus planning is limited to removing the competing nine (9) routes from the bus operations as these were operating almost parallel to the mass transit systems along majority of their length.

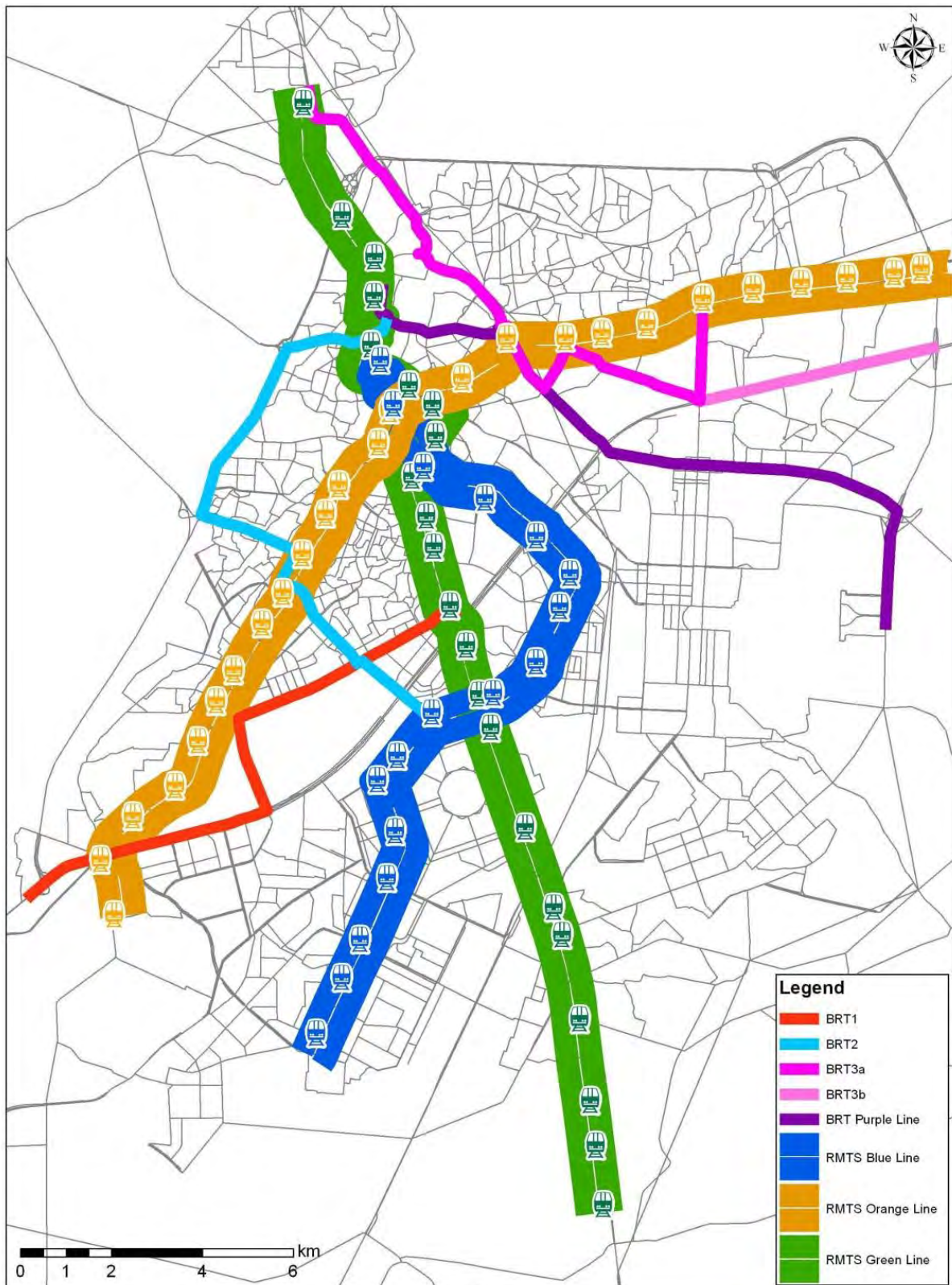
The proposed four of the eight routes (BRT and/ or RMTS) are based on the LRMTS study outputs and are reconfirmed here through LUTMP model for their viability and sustainability. However, the purple route is downgraded to be a BRT up to 2030. Similarly Orange and Blue lines are also proposed to be BRT lines up to 2020, and converted to rail based system after that. The exact timing of such conversion would be subject of further studies. The key question is more likely to be the availability of funding rather than the level of demand. The proposed BRT and RMTS systems are depicted in Figures 7.2.11 and 7.2.12 for 2020 and 2030 respectively.

Figure 7.2.11 RMTS and BRT 2020 Alignments



Source: JICA Study Team

Figure 7.2.12 RMTS and BRT 2030 Alignments



Source: JICA Study Team

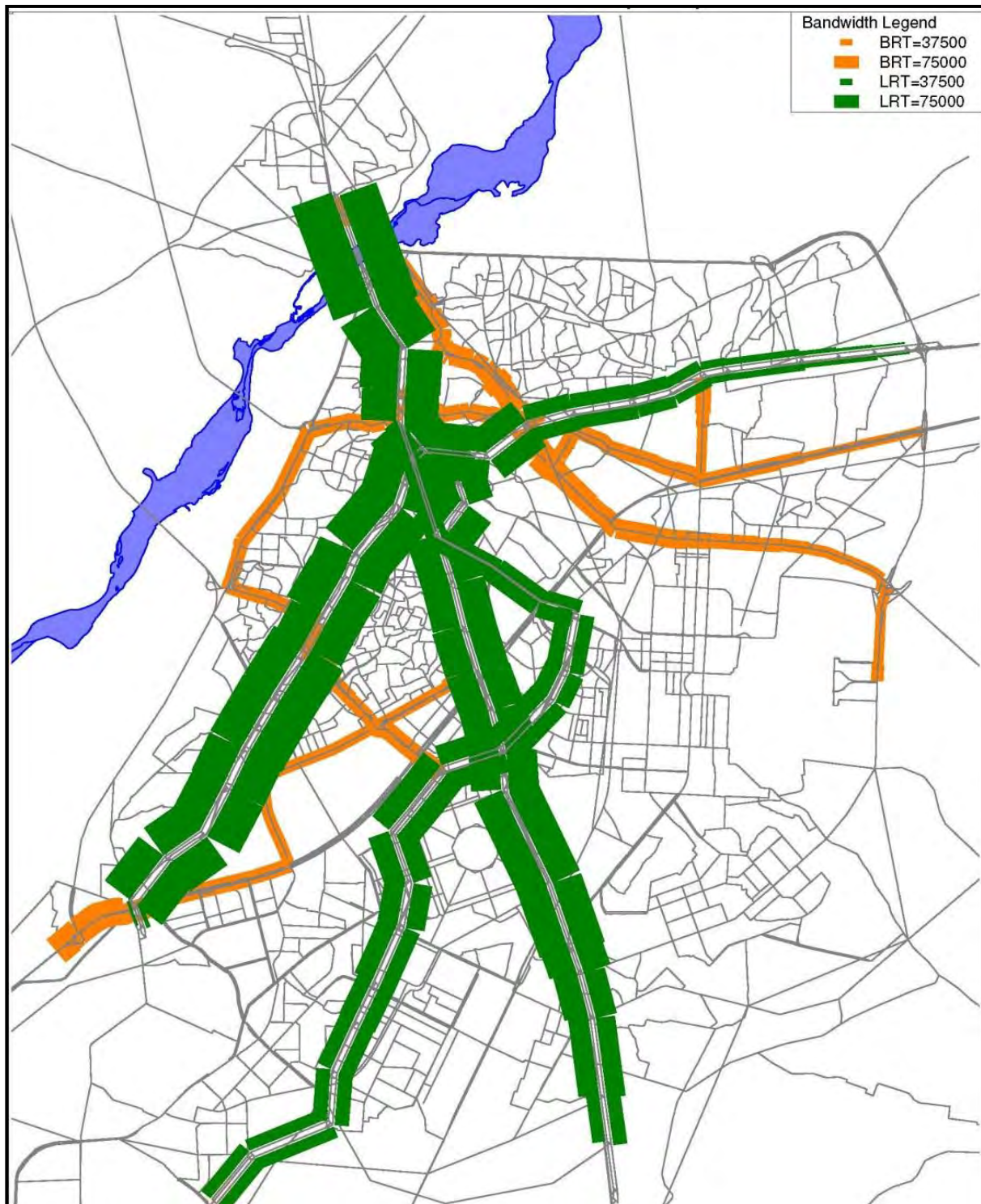
The RMTS and BRT 2030 passenger volumes are illustrated in Figure 7.2.13. The bus and para-transit volumes are excluded so that a direct assessment of the mass transit volumes could be made. The bus, para-transit (including feeder) volumes are shown in Figure 7.3.14. The performance of each of the eight BRT/ RMTS line is summarized in the Table 7.2.8.

Table 7.2.8 LUTMP 2030 – RMTS and BRT System Performance Key Characteristics

Project Code	Project Description	System	Daily Boarding			Max Line Load (Pax Per Hr Per Direction – PPHPD)		
			2020	2030	% Growth	2020	2030	% Growth
PT06	Green Line	RMTS	759,000	980,000	29	17,200	21,900	28
PT07	Orange Line	2020 BRT/ 2030 RMTS	510,000	743,000	46	9,500	20,100	102
PT08	Blue Line	2020 BRT/ 2030 RMTS	270,000	379,000	40	5,600	11,200	100
PT09	Purple Line	BRT	129,000	276,000	114	1,800	3,700	137
PT10	BRT Line 1 (Red)	BRT	88,000	285,000	224	2,100	6,800	219
PT11	BRT Line 2 (Light Blue)	BRT	109,000	331,000	204	1,500	3,700	164
PT12	BRT Line 3a (Pink)	BRT	161,000	265,000	65	3,200	3,500	12
PT13	BRT Line 3b (Pink)	BRT	167,000	248,000	49	2,700	3,200	19
Totals			2,193,000	3,507,000	60	N/A		

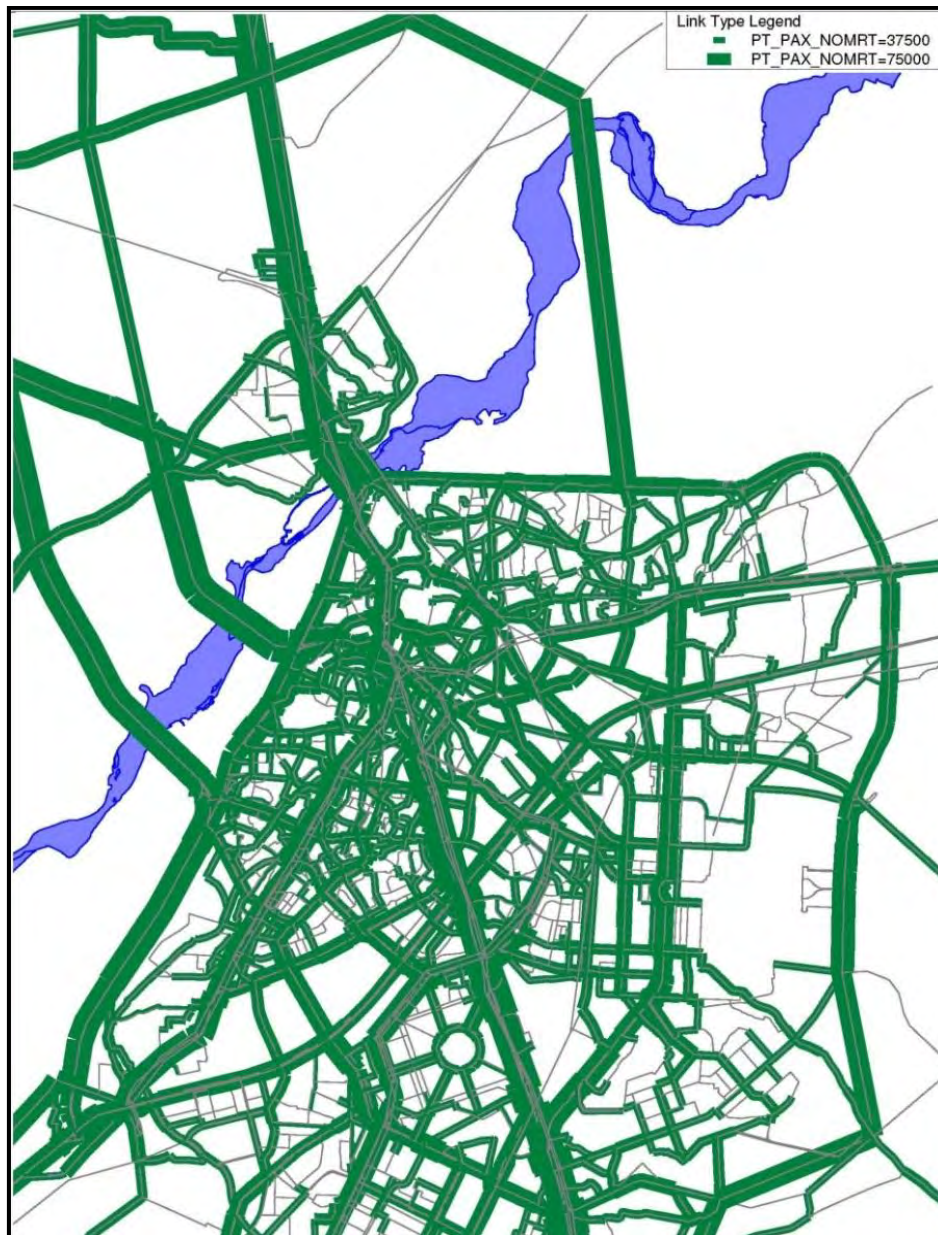
Source: JICA Study Team

Figure 7.2.13 Scenario-2, 2030 Public Passenger Demand on RMTS and BRT Lines



Source: JICA Study Team

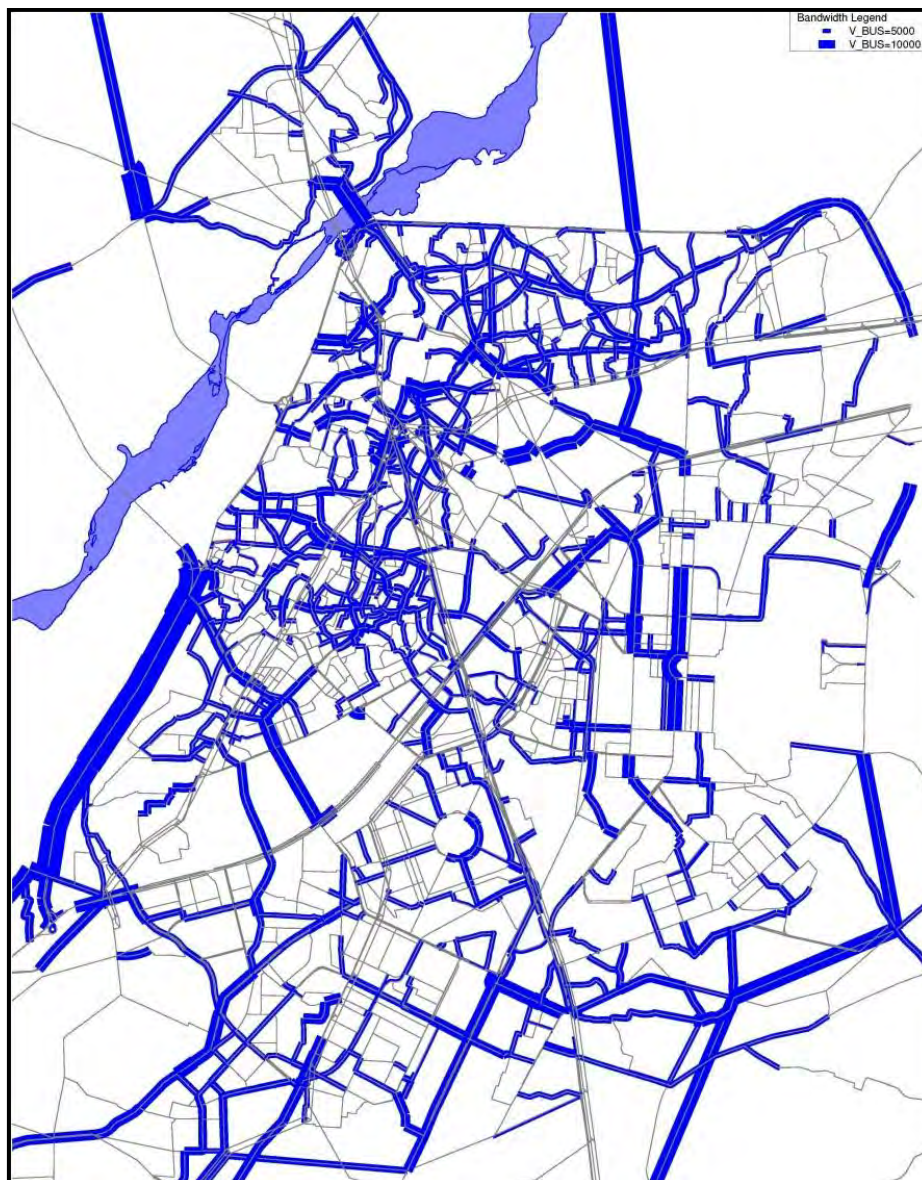
Figure 7.2.14 2030 Public Transport Passengers, Excluding RMTS and BRT Lines



Source: JICA Study Team

The above analysis demonstrates that an increase of about 1.6 million person trips from 2010 to 2030 would need to be accommodated to retain the PT mode share. This could only be done efficiently through a well-developed, public transport network as developed for the 2030 LUTMP Master Plan. It shows that it is essential to provide efficient higher capacity (than just HOV bus routes) network of Bus Rapid Transit and Rail-based mass transit systems. It should also be noted from Figure 7.2.14 that having provided the mass transit systems there would still be need for bus services and para-transit trips as feeder and local services. The 2030 Para-transit only trips are shown in Figure 7.2.15.

Figure 7.2.15 2030 Public Transport Passengers, Para-transit Trips Only



Source: JICA Study Team

Previous studies, since 1991 Master Plan has advocated the introduction of Light Rail Transit System, but has not been implemented. Now we have reached a stage where further delay in the provision of high capacity public transport system would be very detrimental for the city's transport system, and its sustainability. A balanced and integrated public/ private transport system must exist in any thriving metropolitan area. Neither private nor public transport mode alone can provide an efficient system. Failure to provide much improved public transport system would drive the low-middle income households to purchase motorcycles and use them – away for public transport, where its share is already on the decline.

7.3 Profile of Major LUTMP 2030 Projects

7.3.1 Public Transport Projects

1) Committed Public Transport Projects

Some projects for improving existing public transport are committed or planned, funded by state budget. These existing committed public transport projects are supposed to be a part of the Master Plan up to 2030. Through the reviews of government plans and discussions with counterpart agencies, all committed projects were included and are listed in the following Table 7.3.1.

Table 7.3.1 Committed Public Transport Projects

Project No.	Project Code	Project Description	Original Schedule	Implementing Agency	Cost (PKR)	Funding Source
PT01	C.1	Multimodal Inter-City Bus Terminals in Lahore	2012 – Onward	TD, GoPb	N/A	GoPb and BOT/ PPP
PT02	C.2	Effective and Efficient School Bus System	2012 – Onward	TD with Education Department, GoPb	N/A	GoPb and PPP
PT03	C.3	Up-grading of Bus Stands	2012 – Onward	TD, GoPb	N/A	GoPb or PPP
PT04	C.4	Integrated Bus Operation	-	LTC	6,410 million	Lahore Transport Company
PT05	C.5	Establishment of Multimodal Bus Terminal at Shahdara	2012 – Onward	District Government of Sheikhpura, GoPb	N/A	District Government of Sheikhpura, GoPb

Source: JICA Study Team

1) LUTMP 2030 Proposed Public Transport Projects

The proposed public transport projects for 2020 and 2030 are identified and outlined in Section 7.1.1 and given in Tables 7.1.2 and 7.1.3. The proposed projects are described in the following section.

PT06: Green Line (RMTS)

The Green Line (27 km) has been planned with 12 km underground section, 12 stations, and viaduct section of 15 km with 10 stations. The line follows Ferozpur Road corridor, starting in the south just north of the Hudhara Drain Road Bridge and through Mall Road ending at Shahdara across the Ravi River.

Project Corridor: Ferozpur Road/ Mall Road/ Ravi Road/ Shahdara

Capital Cost 2,583 (USD Million)

Depot: The 2 Depot have been planned as follows;

- Main Depot (192,828 m²) is planned near Shadab Colony Station.
- North Depot (74,981 m²) is planned near Shahdara Station

Figure 7.3.1 Location Map of RMTS Green Line Alignment

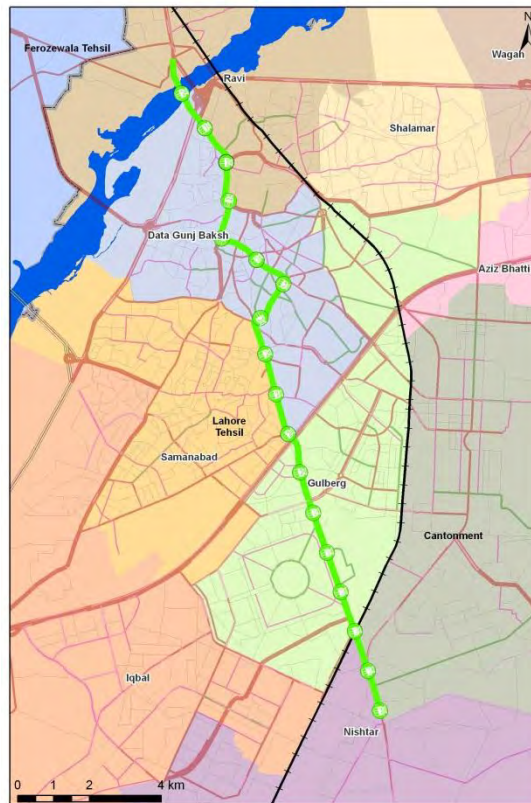
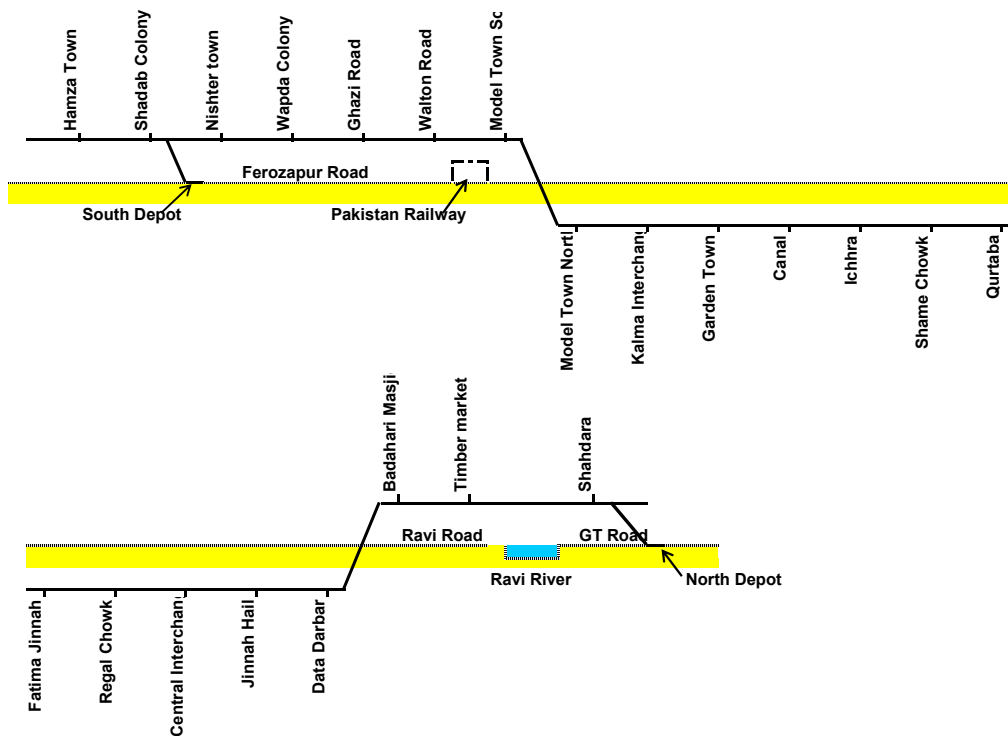


Figure 7.3.2 Planned Layout of RMTS Green Line Alignment and Station Locations



Source: JICA Study Team

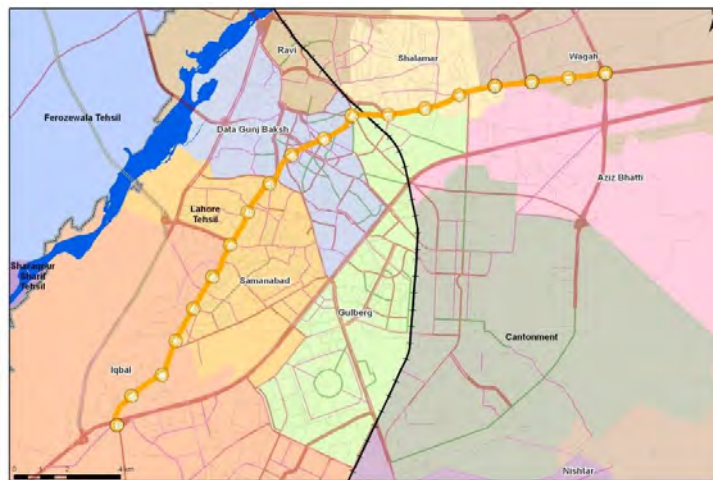
PT07: Orange Line (Initially BRT and then RMTS)

The Orange Line (27.1 km) as a RMTS has been planned with underground section of 6.9 km with 6 stations and viaduct section of 20.2 km with 20 stations. Orange Line as a BRT project would require a full feasibility study along the proposed corridor.

Project Corridor: Raiwind Road/ Multan Road/ Macloed Road/ Railway Station/ G.T. Road

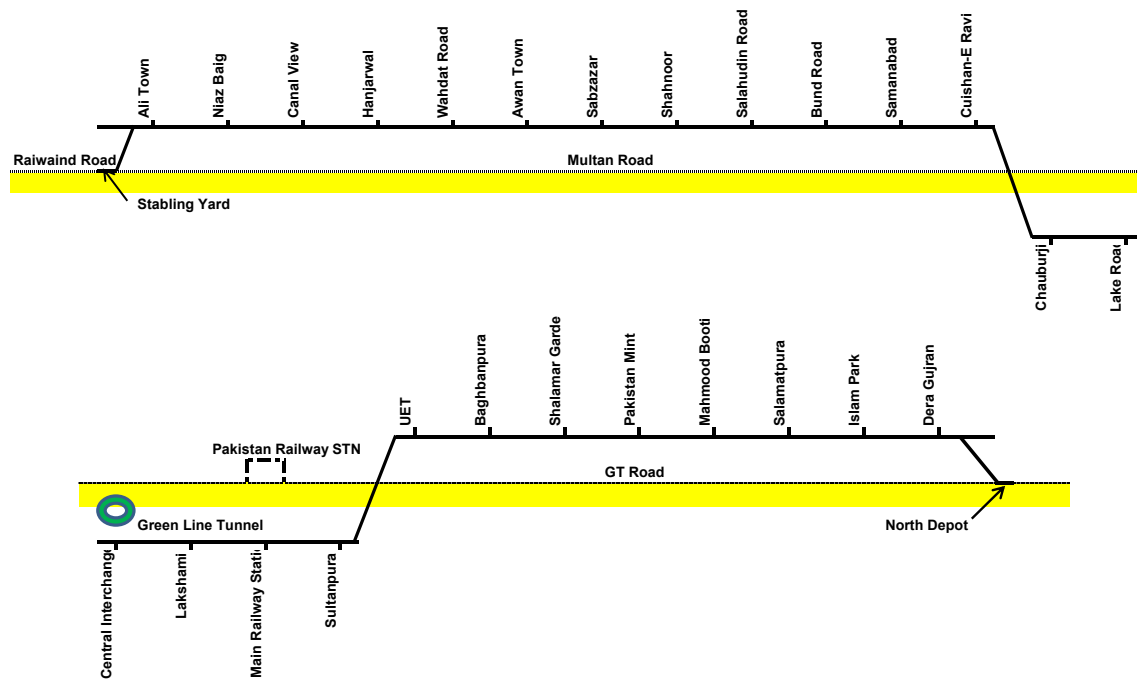
Capital Cost: [(RMTS) 2,330 (USD Million)], [(Initial BRT) 62.8 (USD Millions)]

Figure 7.3.3 Location Map of RMTS Orange Line Alignment



Source: JICA Study Team

Figure 7.3.4 Planned Layout of RMTS Orange Line Alignment and Station Locations



Source: JICA Study Team

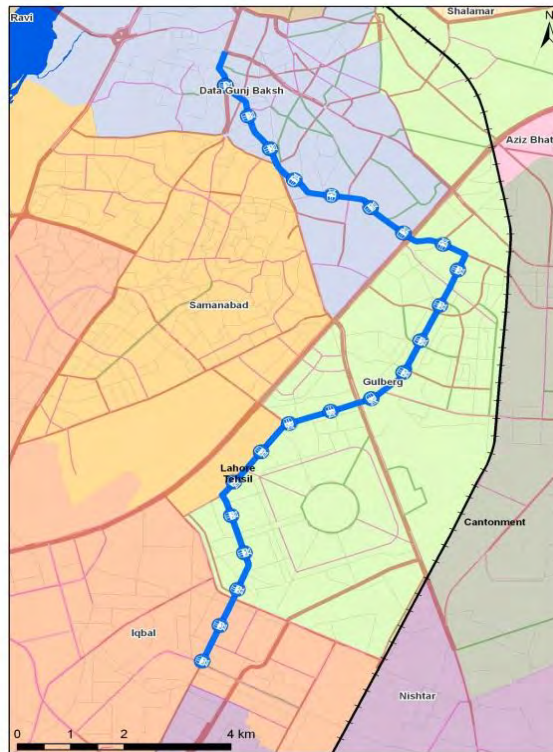
PT08: Blue Line (Initially BRT and then RMTS)

Blue Line (24.0 km) as a RMTS has been planned with underground section of 4 km with 3 stations and viaduct section of 20.0 km with 17 stations. Blue Line as a BRT project would require a full feasibility study along the proposed corridor.

Project Corridor: Township/ Gulberg Boulevard/ Jail Road

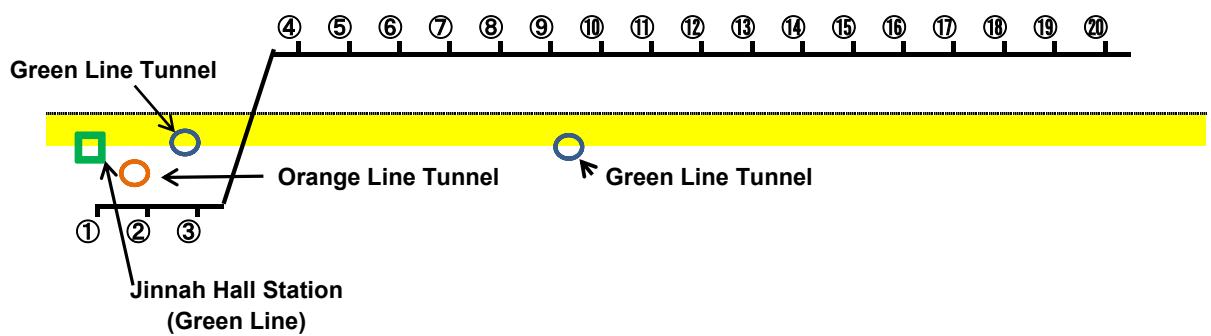
Capital Cost: [(RMTS) 1,908 (USD Million)], [(Initial BRT) 50.9 (USD Million)]

Figure 7.3.5 Location Map of RMTS Blue Line Alignment



Source: JICA Study Team

Figure 7.3.6 Planned Layout of Blue Line RMTS Alignment and Station Locations



Source: JICA Study Team

PT09: Purple Line (BRT)

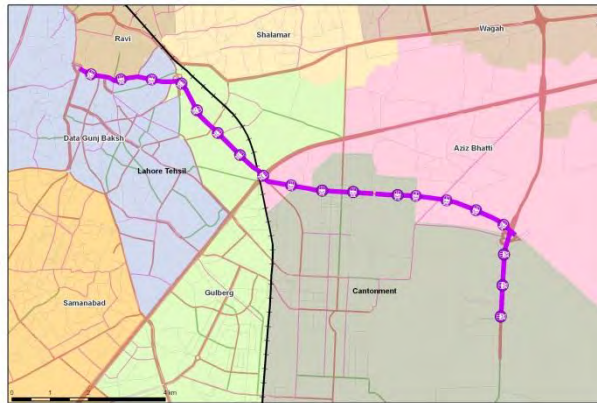
Purple Line as a BRT project would require a full feasibility study along the proposed corridor.

Project Corridor: Township/ Gulberg Boulevard/ Jail Road

Capital Cost: 38.9 (USD Million)

Length: 19.0 km

Figure 7.3.7 Location Map of Purple Line BRT Corridor



Source: JICA Study Team

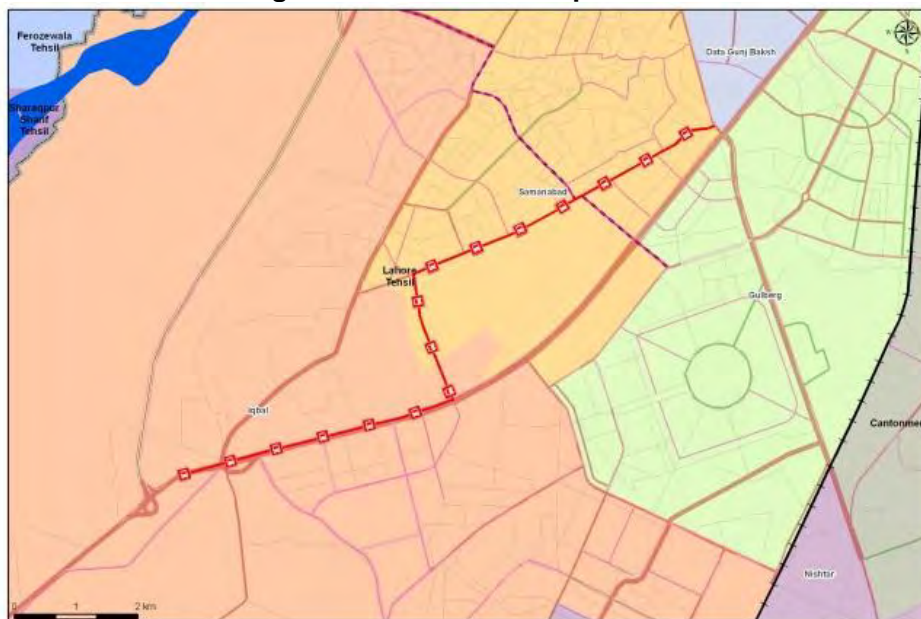
PT10: BRT Line 1

Project Corridor: Thokar, Canal Bank Road, Punjab University, Wahdat Road, Muslim Town, Ferozpur Road

Capital Cost: 30.5 (USD Million)

Length: 14.1 km

Figure 7.3.8 Location Map of BRT Line 1



Source: JICA Study Team

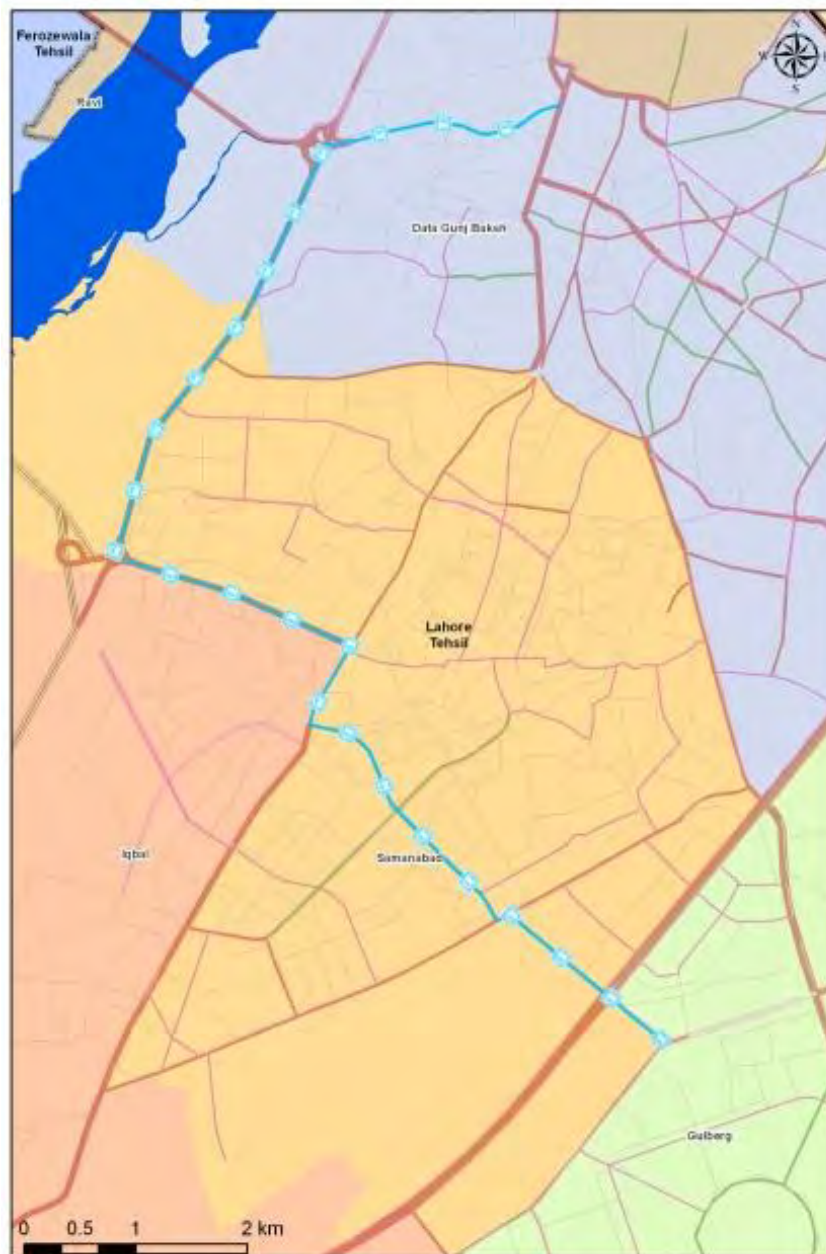
PT11: BRT Line 2

Project Corridor: Barkat Market, Jamia Punjab Road, Punjab University, Sarfraz Naeemi Road, Multan Road, Bund Road, LRR, Sagianwala Bypass, Bhatti Chowk.

Capital Cost: 30.1 (USD Million)

Length: 14.3 km

Figure 7.3.9 Location Map of BRT Line 2



Source: JICA Study Team

PT12: BRT Line 3a

Project Corridor: Shahdara, Old Ravi Bridge, G.T. Road, Badami Bagh Bus Terminal, Badshahi Mosque, Circular Road, Allama Iqbal Road, Garhi Shahu, G.T. Road, Shalamar Link Road, Shalamar Gardens.

Capital Cost: 28.1 (USD Million)

Length: 15.7 km

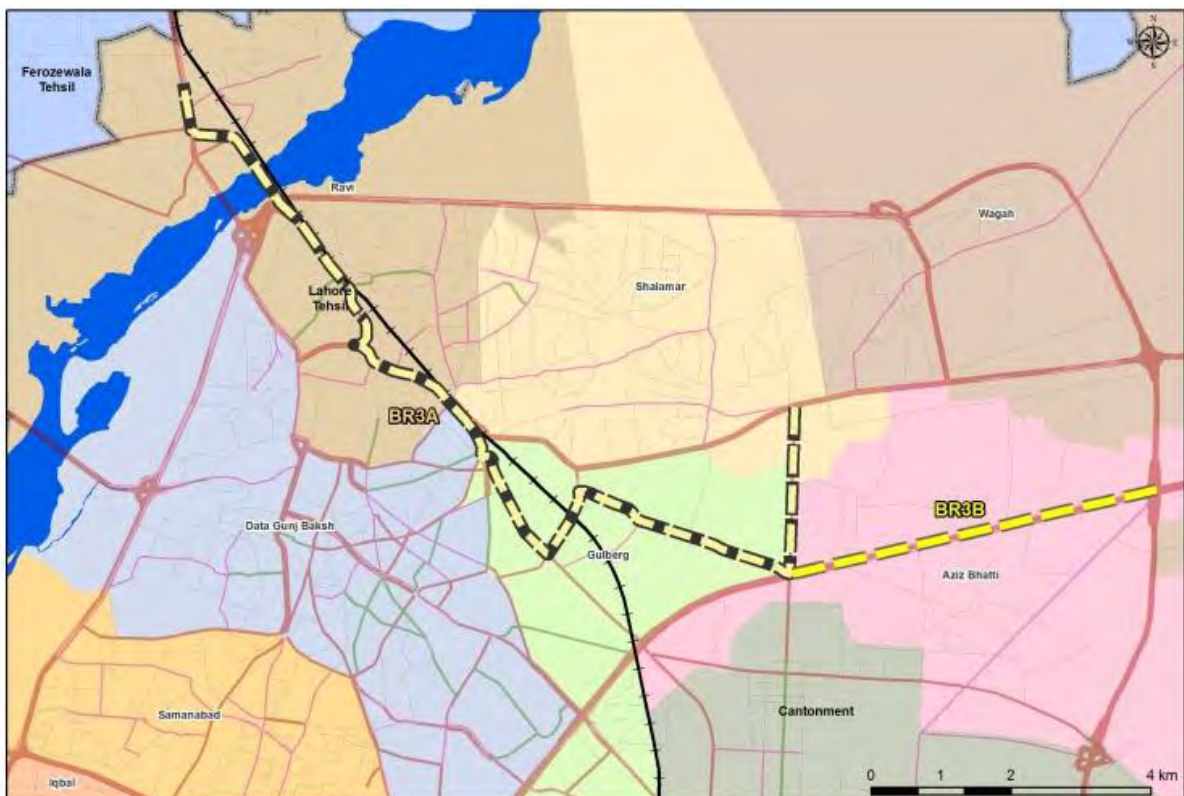
PT13: BRT Line 3b

Project Corridor: Shahdara, Old Ravi Bridge, G.T. Road, Badami Bagh Bus Terminal, Badshahi Mosque, Circular Road, Allama Iqbal Road, Garhi Shahu, G.T. Road, Canal Bank Road, Harbanspura.

Capital Cost: 35.2 (USD Million)

Length: 19.1 km

Figure 7.3.10 Location Map of BRT Lines 3a and 3b



Source: JICA Study Team

7.3.2 LUTMP 2030 Road Sub-Sector Projects

1) Committed and Proposed Road Projects for 2020 and 2030

The proposed road projects for 2030 include new construction of motorway, trunk, Primary and Secondary roads. The existing Secondary road network should be

expanded to cover the fast growing outer areas. Since construction of primary road in urbanized area is very difficult, the development of Secondary roads is very crucial, as these should have at least 4–8 lanes with an adequate curbside and traffic control system.

In general, the ideal density of arterial road network (including primary and secondary roads) in urban area is said to be about 3.5 km/km². For the urban area of Lahore, secondary roads are to form a diverse road network.

2) Committed and Proposed Road Projects – 2020

The projects committed or proposed by TEPA, C&W or JICA Study Team are listed in Table 7.3.2.

Table 7.3.2 List of Committed and Proposed Road Projects by 2020

Project No. (Code)	Project Description	Length (km)	Proposed Lanes	Project Type	Proposed By	Status
Road Sub-sector Projects – Committed						
R01 (12001)	Construction of LRR (Airport – Ferozepur Road)	13.3	D-3	Committed	C&W	On-Going/ 2012-13
R02 (12002)	Construction of Kalma Chowk Flyover	3.4	D-3	Committed	C&W	Completed 2011
R03 (12003)	Construction of Canal Bank Road Flyover	3.3	D-2	Committed	C&W	On-Going/ 2012
R04 (12004)	Remodeling of Canal Bank Road	15.6	D-3	Committed	TEPA	Completed 2012
R05 (12005)	Remodeling of Barki Road (LRR – Green City)	3.6	D-2	Committed	C&W	Completed 2012
R06 (12006)	Remodeling of Kala Khatai Road	26.9	D-2	Committed	C&W	On-Going/ 2012
R07 (12007)	Remodeling of Allama Iqbal Road	3.3	D-4	Committed	C&W	On-Going/ 2012
R08 (12008)	Remodeling of Multan Road	11.3	D-3	Committed	C&W	Completed 2011
R09 (12009)	Remodeling of Thokar Niaz Baig Road	11.0	D-2	Committed	C&W	Completed 2012
R10 (120010)	Remodeling of Lahore Ferozepur Road	23.6	D-3	Committed	C&W	Completed 2012
Road Sub-sector Projects – LUTMP Proposed						
R11 (20002)	Barki Road (Green City – BRB Canal)	6.8	D-2	Remodeling	LUTMP	Proposed
R12 (20003)	Bedian Road (DHA – LRR – Ferozepur Road)	26.3	D-2	Remodeling	LUTMP	Proposed
R13 (20004)	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	2.8	D-3	Remodeling	TEPA	Proposed
R14 (20005)	Link Peco Road – Ferozepur Road	1.9	D-2	Remodeling	LUTMP	Proposed
R15 (20006)	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)	1.5	D-2	Remodeling + Construction	TEPA	Proposed
R16 (20007)	Old Ravi Bridge and Road (Bridge 0.5km)	1.2	D-3	Remodeling + Construction	TEPA	Proposed
R17 (20008)	G.T. Road (Cooper Store - Ek-Moria Pul)	2.1	D-2	Remodeling	TEPA	Proposed
R18 (20010)	College Road (Ghaus-e-Azam Road to Defence Road)	6.9	D-2	Remodeling + Construction	TEPA	Proposed
R19 (20011)	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)	12.9	D-3	Remodeling + Construction	TEPA	Proposed
R20 (20020)	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	7.1	D-3	Remodeling + Construction	TEPA	Proposed

Project No. (Code)	Project Description	Length (km)	Proposed Lanes	Project Type	Proposed By	Status
R21 (20021)	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)	1.6	D-3	Remodeling	TEPA	Proposed
R22 (20023)	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	14.2	D-3	Remodeling	LUTMP	Proposed
R23 (20024)	Madrat-e-Millat Rd - Defence Road	2.6	D-3	Construction	TEPA	Proposed
R24 (20027)	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	2.4	D-3	Construction	LUTMP	Proposed
R25 (20041)	Kamahani Lidher Road (Ferozepur Road – Lahore Bedian Road)	8.8	D-2	Remodeling + Construction	C&W	Committed
R26 (20043)	Sua Asil Road (Ferozepur Road – Raiwind Road)	22.0	D-2	Remodeling	C&W	Committed
R27 (20044)	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	17.8	D-2	Remodeling	C&W	Committed
R28 (20046)	Kahna Kacha Road (Kahna Station – Ferozepur Road)	7.1	D-2	Remodeling	C&W	Committed
R29 (20049)	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) (Bridge 0.7km)	37.4	D-3	Remodeling	LUTMP	Proposed
R30 (20049)	Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)	2.4	D-3	Construction + Remodeling	LUTMP	Proposed
R31 (20050)	Saggianwala Bypass Road (Ring Road – Sharaqpur Road) (Bridge 0.6km)	6.7	D-4	Remodeling + Construction	LUTMP	Proposed
R32 (20050)	Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	1.9	D-4	Remodeling + Construction	LUTMP	Proposed
R33 (20052)	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	17.7	D-3	Remodeling + Construction	LUTMP	Proposed
R34 (20053)	Manga-Raiwind Road (Multan Road – Raiwind Road)	15.8	D-3	Remodeling + Construction	LUTMP	Proposed
R35 (20054)	Southern Bypass South Road (Ferozepur Road – College Road)	9.9	D-3	Construction	TEPA	Proposed
R36 (20055)	Southern Bypass North Road (Canal Bank Road – M-2)	3.9	D-3	Remodeling + Construction	TEPA	Proposed
R37 (20056)	Raiwind-Pattoki Road (Raiwind City – Boundary of the Study Area)	19.8	D-3	Remodeling	LUTMP	Proposed
R38 (20057)	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	12.9	D-3	Remodeling	LUTMP	Proposed
R39 (20060)	Defence Road (Multan Road – Ferozepur Road)	14.3	D-3	Remodeling	LUTMP	Proposed
R40 (20061)	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Southern Loop)	3.5	D-3	Construction	LUTMP	Proposed
R41 (20081)	Construction of LRR West (Multan Road – M2)	15.6	D-3	Construction	C&W	Committed
R42 (20082)	Construction of LRR South (Ferozepur Road – Multan Road)	21.8	D-3	Construction	C&W	Committed
R43 (20091)	Secondary Roads in Dharampura Area	5.1	D-2	Remodeling + Construction	LUTMP	Proposed
R44 (20092)	Secondary Roads in Shadbagh Area	41.0	D-2	Remodeling	LUTMP	Proposed
R45 (20093)	Secondary Roads in Samanabad Area	46.0	D-2	Remodeling	LUTMP	Proposed

Note: Further details of these road projects are illustrated in *Volume-I, Annex-I*.

Source: JICA Study Team

3) Proposed Road Projects by 2030

The road sub-sector projects proposed for LUTMP 2030 are listed in Table 7.3.3 and depicted in Figure 7.1.9.

Table 7.3.3 List of Proposed Road Projects by 2030

Project No. (Code)	Project Name	Length (km)	Lanes	Project Type	Proposed By	Status
R46 (30,002)	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	7.6	D-3	Remodeling	LUTMP	Proposed
R47 (30,002)	Lahore-Islamabad Motorway (M-2) (Lahore-Sheikhupura Road – Boundary of the Study Area) (Bridge 0.6km)	17.3	D-4	Remodeling	LUTMP	Proposed
R48 (30,002)	Lahore-Islamabad Motorway (M-2) (Bund Road – Lahore-Sheikhupura Road)	11.6	D-4	Remodeling	LUTMP	Proposed
R49 (30,004)	N-5- Multan Road (Lahore Ring Road Southern Loop – Boundary of the Study Area)	31.3	D-3	Remodeling	LUTMP	Proposed
R50 (30,005)	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	33.2	D-3	Remodeling + Construction	LUTMP	Proposed
R51 (30,006)	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	33.8	D-3	Remodeling + Construction	LUTMP	Proposed
R52 (30,008)	Sheikhupura Muridke Road (G.T. Road – M-2)	52.7	D-3	Remodeling	LUTMP	Proposed
R53 (30,010)	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	5.0	D-3	Remodeling	LUTMP	Proposed
R54 (30,028)	Link Kala Shah Kaku – Lahore-Sialkot Motorway	4.2	D-3	Construction	C&W	Committed
R55 (30,028)	Lahore-Sialkot Motorway (Bridge 0.8km)	32.0	D-4	Construction	C&W	Committed
R56 (30,028)	Link G.T. Road Lahore-Sialkot Motorway	0.3	D-3	Construction	C&W	Committed
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	Remodeling + Construction	LDA/ TEPA/ Developer	Proposed

Note: Further details of these road projects are illustrated in *Volume-I, Annex-I*.
Source: JICA Study Team

7.3.3 LUTMP 2030 Traffic Management Projects

1) Committed Traffic Management Projects

The following committed projects are on-going or at various stages with GoPb departments/ agencies and are included in LUTMP 2030 as an integral component. The committed projects are listed below in Table 7.3.4 which also outlines their status.

Table 7.3.4 Committed Traffic Management Projects

Project No.	Project Description	Cost (USD Million)	Funding Source
TM01	Establishment of Centralized Driver Licensing Authority	N/A	GoPb
TM02	Parking Management Company	N/A	GoPb
TM03	Traffic Education Center	N/A	GoPb
TM04	Traffic Control Plan of City	N/A	GoPb
TM05	Vehicle Inspection and Certification System	N/A	GoPb/ PPP
TM06	Construction of New Parking Plazas	207.1	GoPb/ PPP
TM07	Construction of Pedestrian Bridges	1.8	GoPb
TM08	Improvement of 52 Junctions	30.5	GoPb

Project No.	Project Description	Cost (USD Million)	Funding Source
TM09	Ferozpur Road Pilot Project	28.3	GoPb
TM10	Conversion of Two Stroke Rickshaw into CNG Fitted Four Stroke Rickshaw	12.4	GoPb
TM11	Remodeling of Inner and Outer Circular Road	14.1	GoPb

Source: JICA Study Team

2) LUTMP Proposed Traffic Management Projects

In addition to the above committed projects, the study has given a full and due consideration to the role of traffic management in the LUTMP 2030. This has been defined and discussed for the traffic management project identification, selection and development in Section 7.1.3. The Following section provides an outline project description and its scope within the LUTMP 2030 for each of the twenty traffic management projects, TM12 to TM31 are listed in Table 7.1.11. The location of each project is depicted in Figure 7.1.10 under six sub-areas, a–f.

A. Road Network Operation

A.1 [TM12] Junction Design and Traffic Signal Network Improvement – CBD

Description: This project is aimed to conduct a complete diagnosis of existing traffic situation and junction design, and traffic signal operation in the area. Road network and junctions designs improvement are proposed particularly to accommodate non-motorized traffic (pedestrians and bicycles). New ITS based signalized network should be established with a central control, as a pilot project.

Scope: There are about total 26 major junctions in this area. Road junction improvement and coordinated traffic signal network is proposed and to be implemented.

Area: Central (b); **Capital Cost:** USD 4.0 Million

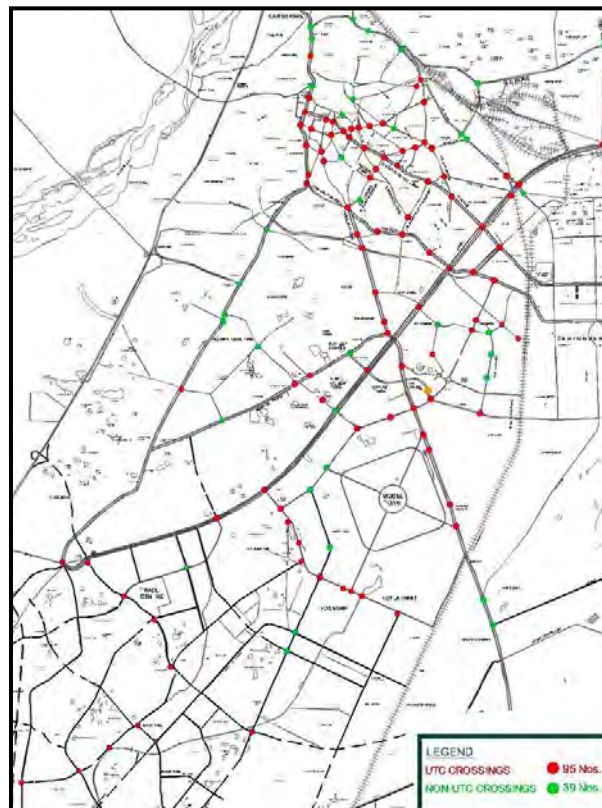
A.2 [TM13] Existing Junctions Design and Network Improvement

Description: This project will consist of three components for each junction improvement; First; build transport database, junctions topographic layout, Second; replacement of existing Non-UTC traffic signal controllers to UTC type, Third; junction design improvement, signal design and network connection of all signalized junctions.

Scope: Total major junctions in Lahore city are about 250, and this project is to cover initially 134 signalized junctions which are identified in Figure 7.3.13. Other non-signalized junctions could be studied for conversion to signalized type at a later stage.

Area: Lahore City (a); **Project Cost t:** USD 30.0 Million

Figure 7.3.11 UTC and Non-UTC Traffic Signalized Junctions in Lahore



Source: TEPA

A.3 [TM14] Road Function and Capacity Improvement Program

Description: This project is aimed to enhance the existing road operational capacity by minimizing the road side activities. This will include increasing the road capacity by permanently or temporarily removing the encroachments: parking, vendors, shops, or illegal construction of houses. This will consist of three major components; First; sufficient laws and regulations should be prepared for strict land use control and enforcement, and later curb future encroachment activities. Second, prepare comprehensive road network public right of way plan for identification of encroachments of the road network. Illegal encroachment removal operation should be launched to remove the existing encroachment, immediately. Third, street vendors used to occupy space on temporary and daily basis; will not be easy to remove them. A continuous effort and strict monitoring would be required to curb such encroachments. On other hand, separate commercial facilities should be developed to accommodate all such vendors in a mix land use pattern in all large communities after identification of land area.

Scope: Development of existing right of way plan using the GIS of whole road network right of way should be measured and compared with public right of way records. Prepare comprehensive existing encroachment removal plan.

Mainly include following components; legal framework, fine system development, illegal encroachment database development, and street vendor control.

Area: Lahore City (a); **Capital Cost:** USD 2 Million

B. Traffic Management

B.1 [TM15] Low Occupancy Vehicles – Public Transport for City Outskirts

Description: Outskirts areas of Lahore in the south and east, south and south west have limited or no public transport system. This project is aimed to deploy low occupancy vehicles like Wagons, and may be Qingqis in the outskirts with defined routes. This would also provide feeder service to RMTS, BRT, and Bus transport system.

Scope: Feasibility study for low occupancy vehicle routes to be integrated with the city urban transport system in the outskirts to provide public transport to rural areas.

Area: Outskirts of Lahore City and North of Ravi River (c&f); **Capital Cost:** USD 5.0 Million

B.2 [TM16] Traffic Circulation System Design and Implementation

Description: This is to improve traffic circulation system in the urban center, and other dense parts of CBD. Detail traffic study would formulate an optimal traffic circulation plan for the CBD of Lahore.

Scope: This project should design the traffic circulation system based on traffic simulation, and propose traffic management and control devices plan. This will also include one way street system, installation of traffic control devices and pavement markings etc.

Area: Lahore City (a); **Project Cost:** USD 20 Million (Approximate)

B.3 [TM17] Public and Freight Transport Terminals

Description: Public transport terminal locations in Lahore are not optimal. Freight truck stands are illegally operating along many area and corridors of Lahore due to lack of logistic planning. All such facilities should be relocated to appropriate places with access to urban centres and limit to regional road network. Small delivery trucks and local bus services distribute goods and passengers in the city and other areas.

Scope: This project would have following key components;

- i. Feasibility study for the relocation and site selection of public and freight transport terminals;
- ii. Detailed design of these terminal facilities considering access to transport

network both local and regional;

- iii. Construction of public transport (3) and freight terminals (3);

Area: Lahore City and North of Ravi River (a&c); **Capital Cost:** USD 100 Million

B.4 [TM18] Linking Communities – Smart Roads

Description: This is an approach that manages competing interests for limited road space by giving priority use of the road to different transport modes at particular times of the day. All road users will continue to have access to all roads. However, certain routes will be managed to work better for cars, while others will be managed for public transport, cyclists, and pedestrians. It would have the following salient features;

- This would encourage walking by facilitating good pedestrian access to and within the activity centres in periods of high demand;
- Buses are to be given priority along key public transport routes that link activity centres during peak periods;
- Cars would be encouraged to use alternative routes around activity centres to reduce the level of through traffic;
- Bicycles would be encouraged through development of cycle network;
- While trucks would have access at all times to the Trunk road network, these may be given priority on important routes that link freight terminals through the regional network;

Scope: Operational road network simulation model needs to be developed with greater detail than the LUTMP strategic demand model.

Area: Lahore City (a); **Capital Cost:** USD 4.0 Million

B.5 [TM19] Feasibility Study for Traffic Demand Management (TDM) Measures

Description: There are many TDM measures which are practiced worldwide specially in developed countries. TDM measures which suitable for the local traffic and transport environment should be evaluated. This study should set the direction for future TDM strategy for the city, and recommend future needs.

Scope: Evaluation of different TDM measures implemented in many developing and developed countries. Develop options for the implementation of such measures, according to the local conditions and their acceptability to public.

Area: Lahore City (a); **Capital Cost:** USD 2.5 Million

B.6 [TM20] RMTS and BRT Station Area Traffic Management

Description: Rail based Mass Rapid Transit and Bus Rapid Transit stations will be the

major multi-modal interchange points; so there needs to be traffic management plan for all station areas of RMTS and BRT lines. Feeder service, private vehicles, and modes like Rickshaws, Wagons and Qingqis need to be given access to avoid traffic chaos around the stations.

Scope: To be conducted with feasibility study of each line.

Area: Lahore City (a); **Capital Cost:** USD 1.5 Million (Approx.)

C. Non-Motorized Traffic

C.1 [TM21] Planning and Design Study for Non-Motorized Traffic

Description: Study for the development of pedestrian friendly city including improvement of the accessibility for the vulnerable road users. North of Lahore should be studied in detail and practical road improvements, junction improvements, traffic circulation in coordination with NMTs movements, landscaping, and NMTs user friendly facilities should be planned, and designed. Certain areas could be planned as pedestrian only areas depending upon the requirement.

Scope: This will include the detailed traffic management plan for the non-motorized traffic which includes pedestrians, bicycles, and wheelchairs. Areas should be designed with road access design, walkways, and traffic calming measures.

Area: North of Canal and South of Ravi River (d); **Capital Cost:** USD 1.5 Million

C.2 [TM22] Non-Motorized Traffic Facilities Construction

Description: NMTs planned proposals will be implemented by this project

Scope: Road geometric design, junctions design improvement, walkways, bicycle paths construction, and other proposed measures for handicap persons.

Area: North of Canal and South of Ravi River (d); **Capital Cost:** USD 6 Million

C.3 [TM23] Pedestrian and Bicycle Path Network

Description: Newly developed housing communities in last few decades; like DHA, Model Town, Gulberg, Johar Town areas do not include pedestrian or bicycle facilities at all. Traffic is moving at high speed as compared to densely mixed areas north of the canal. Pedestrians and cyclist are always at risk as they are forced to mix with fast moving traffic in the same road space.

This project objective is to study and design facilities for pedestrians and cycles to make the transport system more sustainable and environment friendly.

Scope: Study to provide segregated or mixed NMT path network with full connectivity

with commercial centres, and communities. This project will include the implementation of the proposed measures.

Area: Central (b) and South of Canal (e); **Capital Cost:** USD 5 Million

D. Parking Management

D.1 [TM24] Comprehensive Parking System Development

Description: This includes comprehensive planning and design study for on-street and off-street parking facilities. This study would lead to the construction and operation of such facilities in Lahore. Parking Management Company should be established before the start of this project.

Scope: Project will include the following components:

- i. Parking policy, guidelines and design standards development;
- ii. Parking system facilities planning and design.

Area: North of Canal, and South of Canal (d&e); **Capital Cost :** USD 2.5 Million

D.2 [TM25] Parking Facilities Implementation

Description: Parking facilities construction based on the facilities proposed and designed in comprehensive parking system development project.

Scope: This will include the construction/ provision of on-street and off-street parking facilities, removal of encroachments, and enforcement mechanism for illegal parking control/ management.

Area: North of Canal, and South of Canal (d&e); **Capital Cost:** USD 60 Million (Approx.)

D.3 [TM26] Park and Ride Facilities Development

Description: Park and Ride facilities may be provided in order to attract private car users to public transport system. People can walk; take cycle, motorcycle or car to Park and Ride facility, and take BRT or RMTS to the CBD area.

Scope: Park and Ride facilities to be planned at mass transit line terminals and at the stations if feasible. To be studied in conjunction with the BRT/ RMTS line feasibility studies.

Area: Lahore City (a); **Capital Cost:** USD 75 Million (Approx.)

E. Enforcement of Traffic Rules and Regulations

E.1 [TM27] Traffic Enforcement Strengthening Program

Description: Traffic enforcement is the best way to control traffic violations, improve

traffic safety of NMTs and other vehicles, stop reckless driving, and streamline traffic flow. Automatic traffic violations central database should be established which would assist in interactive traffic enforcement in the field and detecting vehicles with repeated violations. It would be necessary to do the capacity development of traffic police for efficient enforcement of traffic laws.

Scope: This project could have following components;

- i. Traffic violations automated central record;
- ii. Capacity development of traffic police;
- iii. Provision of controlled space for vehicles detention;

Area: Lahore City (a); **Capital Cost:** USD 3 Million (Approx.)

F. Traffic Safety

F.1 [TM28] Traffic Calming

Description: Road in Lahore have wide right-of-way, and specially in the newly developed south and south-west side areas. This is to apply road design and traffic management techniques to control traffic speeds in these areas for pedestrian, cyclist safety and better environment.

Scope: The project objectives are to include preparation of detailed design of traffic calming measures and their implementation.

Area: South of Canal (e); **Capital Cost:** USD 6 Million

F.2 [TM29] Traffic Safety Education Improvement

Description: Sense of safety is most important for safe travel behaviour for both motorized and non-motorized traffic. This awareness can be developed through proper education during early childhood, primary school, secondary school, and drivers training.

Traffic Safety should be mandatory part of the syllabus of students in school. This should be specifically designed in context of existing traffic environment by the traffic safety experts.

Scope: Project will include designing and conduct of traffic safety course as mandatory part of education at all possible levels. Public seminars, talk shows should be organized to improve road safety sense in the young generation who are most vulnerable and reckless.

Area: Lahore City (a); **Capital Cost:** USD 1 Million

G. Intelligent Transportation System

G.1 [TM30] Intelligent Transportation System Development

Description: This project will consist of three components; First; study for urban traffic control and information system development. Second; will include installation of CCTV cameras and traffic detectors to control and collect real time traffic data, and use for incident management system. Third; centralization of the signal control system in order to provide area-wide real time adaptive traffic control system.

Section for the data collection and processing and dissemination for the traffic information will also be established. This whole project includes extensive component of local capacity development to operate, maintain and further expand the system to wider area.

Scope: Project will include the following components;

- i. Study for Urban Traffic Control and Information System Development
- ii. Centralized Urban Traffic Control Center
- iii. Traffic Signals Equipment and CCTV Surveillance System
- iv. Incident Management System
- v. Information Dissemination System
- vi. Parking Management System Provisions
- vii. Enforcement System, FM Radio Channel
- viii. Operation and Management of the whole ITS system

Area: Lahore City (a); **Capital Cost:** USD 38 Million

H. Standards and Guidelines

H.1 [TM31] Local Standards and Guidelines Development

Description: Local standards and guidelines related traffic engineering are a pre-requisite for bringing the conformity in transport facilities design. This would help to avoid unsafe and poor designs based on perception and intuitions.

Scope: These standards need to be developed considering local conditions and should involve local and international experts in each field in the design review team.

Following standards or guidelines will be developed under this project to be used in Lahore;

- i. Road Geometric Design
- ii. Traffic Control Devices

- iii. Parking Design
- iv. Traffic Signal System Design
- v. Pavement Design
- vi. Development Traffic Impact Assessment Guidelines
- vii. Traffic Safety Standards and Guidelines

Area: Lahore City (a); **Capital Cost:** USD 1.5 Million

7.4 Evaluation of Major Master Plan Projects

In this Section, major projects in Section 7.3 are evaluated from the economic, financial and environmental points of view, based on the methodology of Strategic Environmental Assessment (SEA). Finally, these projects are prioritized and classified into the short-, medium- and long-term projects.

7.4.1 LUTMP 2030 Economic Evaluation of Projects

1) Methodology and Assumptions

Following the method of social cost-benefit analysis, all the public transport and road projects comprising the maximum network were evaluated from the economic or social point of view. As the economic benefits of a project, two direct effects by the projects were taken into consideration; one was savings in Vehicle Operating Cost (VOC) and the other was savings in Travel Time Cost (TTC). They were measured by so-called “with-and without” comparison, that is, comparison of traffic assignment results on a network with the project and without the project.

There are many projects to be evaluated and a main purpose of evaluation is to put a comparative priority on each project. Therefore, the following assumptions and standardizations were adopted for simplification and convenience of comparison.

- 1) **Construction Period** is assumed to be three years of 2017 to 2019 for the road and BRT projects. Construction cost was distributed among the three years, based on the previous studies. In case of RMTS projects, and large-scale highway construction projects, the construction period is assumed to be five years of 2015 to 2019. In case of public transport projects, Rolling stock (or Bus Fleet) cost of the project was allocated only in 2019.
- 2) **Project Life** is thirty years after starting operation. No residual value is considered.
- 3) **Traffic Assignment** was done for the year of 2020 and 2030, and the economic benefits were estimated for the two years and an interpolation was done for intermediate years. The economic benefits have been calculated from the results of traffic assignment. After 2030, economic benefit was assumed not to change.
- 4) **Three Indicators of Economic Viability** have been calculated from the annual cost and benefit streams:
 - B/C (Cost Benefit Ratio)
 - Net Present Value (NPV)
 - EIRR (Economic Internal Rate of Return)

- 5) **Social Discount Rate** was assumed at 12 %, which is generally used in Pakistan.
- 6) **Annual Maintenance Cost** of a road project was assumed to be 1.0 % of construction cost of the project. As for a public transport project, annual operation and maintenance cost was estimated separately for each project.
- 7) **Economic Cost** of a project was assumed to be 85 % of the financial cost of the project.
- 8) **Exchange Rate** was set as USD 1.00 = PKR 80.00 on December 2010.

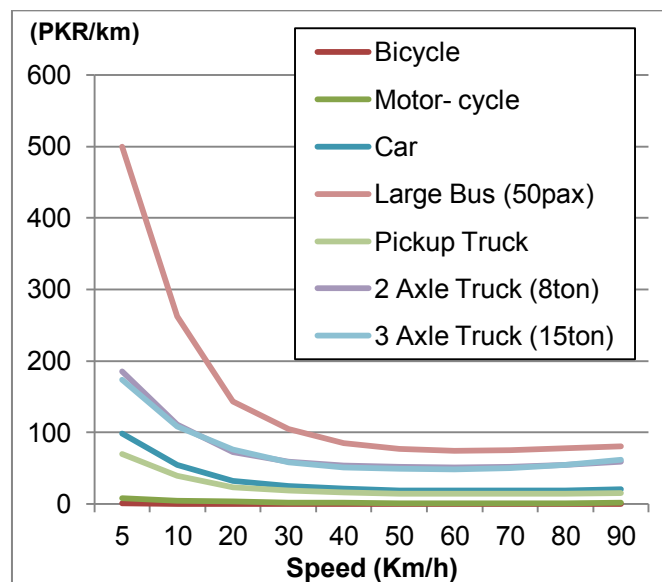
2) VOC and TTC

As savings in VOC and TTC were selected as the economic benefit of a project, unit costs of VOC and TTC were required to estimate those benefits. The unit costs were estimated in 2010.

(i) VOC (Vehicle Operating Cost)

The following figure shows the VOCs by vehicle types used in this study for a range of speeds. The important is that the VOC should be a function of vehicle speed so that the improvement of road condition would be duly reflected as economic benefit.

Figure 7.4.1 Vehicle Operating Cost by Vehicle Speed (Economic Cost)



Source: JICA Study Team

(ii) VOT (Value of Time)

VOT is an important parameter to determine the modal split of passenger traffic, and to provide the basis for economic evaluation of the proposed project. Based on the result of Willingness-To-Pay (WTP) survey conducted in this study, the value was estimated by

mode of transport as summarized in Table 7.4.1. This value was assumed to grow at the same growth rate as per-capita GDP used in this study.

Table 7.4.1 The Study Estimated Value of Time (VOT)

(PKR/ Minute.)	2010	2020	2030
(1) Car/ Truck	3.68	5.03	7.49
(2) Motor-cycle	1.81	2.47	3.68
(3) Rickshaw/ Qingqi	1.34	1.83	2.73
(4) Bicycle	1.34	1.83	2.73
(5) Wagon	1.43	1.96	2.91
(6) Bus	1.42	1.94	2.89
(7) A/C Bus	2.23	3.05	4.54

Source: JICA Study Team

3) Economic and Financial Evaluation Results

Economic benefit and estimated economic internal rate of return (EIRR) of each project is given in the following tables. As the threshold of EIRR is 12 %, most projects are judged economically feasible with several expectations. EIRRs of BRT projects were higher than that of RTMS projects. Generally, many projects show extraordinarily high EIRR because of sever congestion in “without project” case.

Due to the excessive simplification of the method, the EIRR should be referred to only for project prioritization.

(i) Public Transport Projects

Table 7.4.2 Public Transport Project Economic Evaluation Results

Public Transport Projects						
Project No.	Project Code	Project Description	Length (km)	Capital Cost (USD million)	O&M Cost (USD million/ year) in 2020	EIRR (%)
PT06	RMS1	Green Line (RMTS)	27.0	2,583	32.8	12.1
PT07	RMS2	Orange Line (RMTS)	27.1	2,330	32.1	10.3
PT08	RMS3	Blue Line (RMTS)	24.0	1,908	26.1	8.0
PT07	RMS2	Orange Line (BRT)	27.1	74.5	38.1	18.8
PT08	RMS3	Blue Line (BRT)	24.0	58.6	20.2	16.7
PT09	BRT1	Purple Line (BRT)	19.0	40.8	5.5	15.5
PT10	BRT2	BRT Line 1	14.1	30.7	5.0	37.6
PT11	BRT3	BRT Line 2	14.3	30.5	3.7	43.5
PT12	BRT4	BRT Line 3a	15.7	28.7	8.0	20.3
PT13	BRT5	BRT Line 3b	19.1	35.3	8.0	

Source: JICA Study Team

Table 7.4.3 Road Sub-sector Project Economic Evaluation Results

Project No.	Project Code	Project Description	Length (km)	Project Cost (USD million)	O&M Cost (USD million)	EIRR (%)
R11	20002	Barki Road (Green City – BRB Canal)	6.8	17.0	0.17	15.6
R12	20003	Bedian Road (DHA – LRR – Ferozepur Road)	26.3	142.0	1.42	15.6
R13	20004	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	2.8	6.9	0.07	11.6
R14	20005	Link Peco Road – Ferozepur Road	1.9	6.7	0.07	11.6
R15	20006	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)	1.5	5.3	0.05	11.6
R16	20007	Old Ravi Bridge and Road (Bridge 0.5km)	1.2	5.3	0.05	56.0
R17	20008	G.T. Road (Cooper Store - Ek-Moria Pul)	2.1	6.3	0.06	11.6
R18	20010	College Road (Ghaus-e-Azam Road to Defence Road)	6.9	14.0	0.14	17.8
R19	20011	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)	12.9	35.0	0.35	37.3
R20	20020	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	7.1	29.9	0.30	17.8
R21	20021	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)	1.6	4.0	0.04	11.6
R22	20023	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	14.2	52.5	0.53	10.7
R23	20024	Madrat-e-Millat Road - Defence Road	2.6	10.9	0.11	11.6
R24	20027	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	2.4	6.0	0.06	11.6
R25	20041	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)	8.8	26.4	0.26	15.6
R26	20043	Sua Asil Road (Ferozepur Road – Raiwind Road)	22.0	130.7	1.31	10.7
R27	20044	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	17.8	91.7	0.92	10.7
R28	20046	Kahna Kacha Road (Kahna Station – Ferozepur Road)	7.1	29.9	0.30	10.7
R29	20049	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) (Bridge 0.7km)	37.4	202.0	2.02	6.1
R30		Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)	2.4	20.4	0.20	6.1
R31	20050	Sagianwala Bypass Road (Ring Road – Sharaqpur Road) (Bridge 0.6km)	6.7	43.4	0.43	13.3
R32		Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	1.9	16.2	0.16	13.3
R33	20052	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	17.7	57.6	0.58	30.2
R34	20053	Manga-Raiwind Road (Multan Road – Raiwind Road)	15.8	43.5	0.44	10.7
R35	20054	Southern Bypass South Road (Ferozepur Road – College Road)	9.9	57.0	0.57	26.6
R36	20055	Southern Bypass North Road (Canal Bank Road – M-2)	3.9	19.7	0.20	26.6
R37	20056	Raiwind-Pattoki Road (Raiwind City – Boundary of the Study Area)	19.8	73.3	0.73	10.7
R38	20057	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	12.9	54.2	0.54	17.8
R39	20060	Defence Road (Multan Road – Ferozepur Road)	14.3	60.1	0.60	17.8

Project No.	Project Code	Project Description	Length (km)	Project Cost (USD million)	O&M Cost (USD million)	EIRR (%)
R40	20061	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Sothern Loop)	3.5	20.8	0.21	15.6
R41	20081	Construction of LRR West (Multan Road – M2)	15.6	121.9	1.22	23.0
R42	20082	Construction of LRR South (Ferozepur Road – Multan Road)	21.8	201.2	2.01	15.6
R43	20091	Secondary Roads in Dharampura Area	5.1	38.9	0.39	35.2
R44	20092	Secondary Roads in Shadbagh Area	41.0	102.5	1.71	11.6
R45	20093	Secondary Roads in Samanabad Area	46.0	115.0	0.48	11.6
R46	30002	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	7.6	41.0	0.41	13.2
R47		M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of the Study Area) (Bridge 0.6km)	16.5	89.0	0.89	13.2
R48		M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	11.3	64.6	0.65	13.2
R49	30004	N-5- Multan Road (Lahore Ring Road Sothern Loop – Boundary of the Study Area)	31.3	109.7	1.10	15.7
R50	30005	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	33.2	116.1	1.16	15.7
R51	30006	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	33.8	118.3	1.18	13.3
R52	30008	Sheikhupura Muridke Road (G.T. Road – M-2)	52.7	284.4	2.84	13.3
R53	30010	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	5.0	22.9	0.23	6.1
R54	30028	Link Kala Shah Kaku – Lahore-Sialkot Motorway	4.2	25.1	0.25	20.4
R55		Lahore-Sialkot Motorway (Bridge 0.8km)	32.0	128.0	1.28	20.4
R56		Link G.T. Road Lahore-Sialkot Motorway	0.3	2.2	0.02	20.4
R57	Optional	Construction and remodeling of Secondary roads - south of LRR in the south-western quadrant between Ferozepur Road and Multan Road	93.6	The Road Projects will be executed by LDA/ TEPA in conjunction with the developer's contribution towards capital cost.		

Source: JICA Study Team

7.4.2 LUTMP 2030 Financial Evaluation of Projects

1) Methodology and Assumptions

Among the projects comprising the maximum network, income generating projects such as railway projects were evaluated from the financial viewpoint, by comparing cash inflow (fare revenue) and cash outflow (construction cost and operation and maintenance cost). Overall profitability of a project was measured with the Financial Internal Rate of Return (FIRR), not considering the distribution of the profit. This is because the purpose of analysis is just for priority setting on projects.

Main assumptions for the financial analysis are as follows:

- 1) **Construction Period** is assumed to be three years of 2017 to 2019 for BRT projects. Construction cost was distributed among the three years, based on the

previous studies. In case of RMTS project, the construction period is assumed to be five years of 2015 to 2019. Rolling stock (or Bus Fleet) cost of the project was allocated only in 2019.

- 2) **Project Life** is thirty years after starting operation. No residual value is considered.
- 3) **Traffic Assignment** was done for the year of 2020 and 2030, and the revenues were estimated for the two years and an interpolation was done for intermediate years. After 2030, revenues were assumed not to change.
- 4) **Fare Revenue** was calculated based on the following fare setting and the result of traffic assignment which provided the usage. Fares are assumed to be the same as existing A/C bus in Lahore for BRT and RMTS.

Table 7.4.4 Fare Setting for Public Transport A/C Bus, BRT and RMTS Project

Distance Band	Fare (PKR)
0-5 km	15
5-9 km	20
9-13 km	23
13-17 km	25
Above 17 km	30

Source: Daewoo Urban A/C Bus Service Fare in 2010

- 5) **Miscellaneous Revenues** were assumed as 3% of fare revenue, and added to fare revenues.
- 6) **Impact of Inflation** has been incorporated in the revenue projections as an annual increase of 6%. In addition, 4% of inflation rate applied to O&M cost.

2) Financial Evaluation Results

The following table summarizes the results of financial evaluation. The trend of FIRR results seems to be different by the project. FIRR of RMTS Green line is higher than both: Orange and Blue Lines. FIRR results of BRTs are high, compared with that of RMTS lines.

Table 7.4.5 Financial Evaluation Results of RMTS and BRT Projects

Project No.	Project Description	Length (km)	Capital Cost (USD million)	O&M (USD million/ year) 2020	Revenue (USD million)		FIRR (%)
					2020	2030	
PT06	RMTS Green Line	27.0	2,583.0	32.8	70.1	242.7	7.1
PT07	RMTS Orange Line	27.1	2,330.0	32.1	48.9	149.2	5.7
PT08	RMTS Blue Line	24.0	1,908.0	26.1	51.7	154.4	4.9
PT07	BRT Orange Line	27.1	74.5	38.1	43.1	139.9	21.0
PT08	BRT Blue Line	24.0	58.6	20.2	41.4	128.0	17.9
PT09	BRT Purple Line	19.0	40.8	5.5	24.8	134.8	16.1
PT10	BRT Line 1	14.1	30.7	5.0	19.2	107.7	24.9
PT11	BRT Line 2	14.3	30.5	3.7	22.4	108.6	26.5
PT12	BRT Line 3a	15.7	28.7	8.0	44.5	172.8	16.3
PT13	BRT Line 3b	19.1	35.3	8.0			

Source: JICA Study Team

7.4.3 LUTMP 2030 Environmental Evaluation of Projects

1) Methodology and Assumption

Regarding project selection/ prioritization, Multi-Criterion Assessment (MCA) is used. In terms of the environmental assessment, following four environmental criteria are included as it is desirable to comply with the JICA Guidelines for Environmental and Social Considerations, regardless of extent of its contribution to the overall MCA evaluation process.

Table 7.4.6 Environmental Criteria for MCA

Criteria	Indicator	Expected Major Impacts
1	Impacts on Social Environment-1	Land acquisition and resettlement
2	Impacts on Social Environment-2	Location of project site
3	Environmental Pollution	Increase of NO _x and PM _x emissions
4	Impacts on global warming	Increase of CO ₂ emissions

Source: JICA Study Team

Table 7.4.7 Rating and Weighting for the Criteria in MCA

Indicator	Projects Concerned	Rating (Score)					Weight (%)	
		1	3	5	8	10		
1	Land acquisition and resettlement	Road project	Construction (Required land cost > USD 10 million)	Construction (Required land cost less than USD 10 million)	Remodeling, X road length > 10km (No new land required)	Remodeling, road length less than 10km (No new land required)	Soft approach, only such as institutional improvement	40
2	Location of Project site	Public Transport project/Traffic Management	Mostly CBD and/or densely populated urban area	Urban area	Suburban area	Rural area	Soft approach, only such as institutional improvement	20
3	Increase of Air Pollutants (NO _x /PM _x) emissions	Common	Significant increase - 1) Construction (Required land cost > USD 10 million), 2) Remodeling (> 30km, 4 lanes and > 10km with 6/8 lanes	Some increase - 1) Construction (Required land cost less than USD 10 million), 2) Remodeling < 10km with 6 lanes and > 30 km with 4 lanes	Almost no change	Some reduction (Bus transport improvement/Traffic management)	Significant reduction (RMTS/ BRT)	20
4	Increase of CO ₂ emissions		20					

Notes 1: a) According to World Bank and ADB Guidelines (and JICA implicitly recognizes), in case of number of project affected persons (PAPs) is more than 200 the project is classified into Category A, which require full EIA study and Resettlement Action Plan for compensation and supporting PAPs. **b)** In case of occurrence of land acquisition, it is not sufficient to compensation of required land value to land owner. Because the land acquisition and resettlement may affect not only to land, but also to relating assets, livelihood, income etc. of Project Affected Persons (PAPs). Thus, total cost required would include cost of compensation and assistance of PAPs as well as land acquisition cost. In case of no new land requirement such as remodeling of the existing road, matter of land acquisition and resettlement may enlarge with increase in length of road section and traffic volume.

Note 2: If the project sites are located in CBD and/or densely populated urban areas, it may often raise more disputes and conflicts among stakeholders over issues relating to misdistribution of benefit and damage, compensation and support of PAPs than other areas.

Note 3: In general, road transport may dominantly generate both air pollutants and CO₂ emissions resulting in air pollution and global warming in transport sector. In contrast to this, railway transport such as RMTS/BRT may bring about co-benefits in terms of air quality and global warming.

Source: JICA Study Team

2) Environmental Evaluation Results

The following Table 7.4.8 summarizes the results of environmental evaluation of LUTMP Public Transport, Road Sub-sector and Traffic Management Projects.

Table 7.4.8 Environmental Evaluation of LUTMP 2030 Projects

Project No.	Project Code	Project Description	Length (km)	Land Acquisition and Resettlement		Location		Environmental Pollution		Global Warming		Total Score	Rank
				Rating	Weight	Rating	Weight	Rating	Weight	Rating	Weight		
Committed Public Transport Projects													
PT01	C.1	Multimodal Inter-City Bus Terminals in Lahore	-	3	0	1	0	8	0	8	0	5	B
PT02	C.2	Effective and Efficient School Bus System	-	5	0	3	0	8	0	8	0	6	B
PT03	C.3	Up-grading of Bus Stands	-	3	0	3	0	8	0	8	0	5	B
PT04	C.4	Integrated Bus Operation	-	3	0	3	0	8	0	8	0	5	B
PT05	C.5	Establishment of Multimodal Bus Terminal at Shahdara	-	1	0	1	0	10	0	10	0	5	B
LUTMP 2030 Proposed Public Transport Projects													
PT06	RMS1	Green Line (RMTS)	27.0	1	0	1	0	10	0	10	0	5	B
PT07	RMS2	Orange Line (Initially BRT)	27.1	1	0	1	0	10	0	10	0	5	B
PT08	RMS3	Blue Line (Initially BRT)	24.0	1	0	1	0	10	0	10	0	5	B
PT09	BRT1	Purple Line (BRT)	19.0	8	0	3	0	10	0	10	0	8	A
PT10	BRT2	BRT Line 1	14.1	8	0	3	0	10	0	10	0	8	A
PT11	BRT3	BRT Line 2	14.3	8	0	3	0	10	0	10	0	8	A
PT12	BRT4	BRT Line 3a	15.7	8	0	3	0	10	0	10	0	8	A
PT13	BRT5	BRT Line 3b	19.1	8	0	3	0	10	0	10	0	8	A
Road Sub-sector Projects - Committed													
R01	12,001	Construction of LRR (Airport – Ferozpur Road)	13.3	1	0	5	0	1	0	1	0	2	C
R02	12,002	Construction of Kalma Chowk Flyover	3.4	3	0	1	0	3	0	3	0	3	C
R03	12,003	Construction of Canal Bank Road Flyover along Ferozpur Road	3.3	3	0	1	0	3	0	3	0	3	C
R04	12,004	Remodeling of Canal Bank Road	15.6	5	0	3	0	1	0	1	0	3	C
R05	12,005	Remodeling of Barki Road (LRR – Green City)	3.6	8	0	5	0	3	0	3	0	5	B
R06	12,006	Remodeling of Kala Khatai Road	26.9	5	0	3	0	3	0	3	0	4	B
R07	12,007	Remodeling of Allama Iqbal Road	3.3	8	0	3	0	3	0	3	0	5	B
R08	12,008	Remodeling of Multan Road	11.3	5	0	3	0	1	0	1	0	3	C
R09	12,009	Remodeling of Thokar Niaz Baig Road (Thokar – Defence Road)	11.0	5	0	3	0	3	0	3	0	4	B
R10	12,010	Remodeling of Ferozpur Road (Lahore Bridge – Mustafa Abad)	23.6	5	0	3	0	1	0	1	0	3	C
Road Sub-sector Projects – LUTMP Proposed													
R11	20002	Barki Road (Green City – BRB Canal)	6.8	8	0	3	0	3	0	3	0	5	B
R12	20003	Bedian Road (DHA – LRR – Ferozpur Road)	26.3	5	0	3	0	3	0	3	0	4	B
R13	20004	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	2.8	8	0	3	0	3	0	3	0	5	B
R14	20005	Link Peco Road – Ferozpur Road	1.9	8	0	3	0	3	0	3	0	5	B
R15	20006	Link Ferozpur Road - Nalay Wali Road (Completion of link between Ferozpur and Multan Road)	1.5	8	0	3	0	3	0	3	0	5	B
R16	20007	Old Ravi Bridge and Road (Bridge 0.5km)	1.2	8	0	1	0	3	0	3	0	5	B

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Project No.	Project Code	Project Description	Length (km)	Land Acquisition and Resettlement		Location		Environmental Pollution		Global Warming		Total Score	Rank
				Rating	Weight	Rating	Weight	Rating	Weight	Rating	Weight		
R17	20008	G.T. Road (Cooper Store - Ek-Moria Pul)	2.1	8	0	1	0	3	0	3	0	5	B
R18	20010	College Road (Ghaus-e-Azam Road to Defence Road)	6.9	8	0	3	0	3	0	3	0	5	B
R19	20011	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)	12.9	5	0	3	0	3	0	3	0	4	B
R20	20020	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	7.1	3	0	3	0	3	0	3	0	3	C
R21	20021	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)	1.6	8	0	3	0	3	0	3	0	5	B
R22	20023	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	14.2	5	0	3	0	1	0	1	0	3	C
R23	20024	Madrat-e-Millat Road - Defence Road	2.6	3	0	3	0	3	0	3	0	3	C
R24	20027	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	2.4	8	0	3	0	3	0	3	0	5	B
R25	20041	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)	8.8	1	0	3	0	3	0	3	0	2	C
R26	20043	Sua Asil Road (Ferozepur Road – Raiwind Road)	22.0	1	0	5	0	3	0	3	0	3	C
R27	20044	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	17.8	1	0	5	0	3	0	3	0	3	C
R28	20046	Kahna Kacha Road (Kahna Station – Ferozepur Road)	7.1	3	0	5	0	3	0	3	0	3	B
R29	20049	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) (Bridge 0.7km)	37.4	5	0	3	0	1	0	1	0	3	C
R30		Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)	2.4	3	0	3	0	3	0	3	0	3	C
R31	20050	Sagianwala Bypass Road (Ring Road – Sharaqpur Road) (Bridge 0.6km)	6.7	3	0	3	0	3	0	3	0	3	C
R32		Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	1.9	3	0	3	0	3	0	3	0	3	C
R33	20052	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	17.7	1	0	3	0	3	0	3	0	2	C
R34	20053	Manga-Raiwind Road (Multan Road – Raiwind Road)	15.8	3	0	5	0	3	0	3	0	3	B
R35	20054	Southern Bypass South Road (Ferozepur Road – College Road)	9.9	3	0	3	0	3	0	3	0	3	C
R36	20055	Southern Bypass North Road (Canal Bank Road – M-2)	3.9	3	0	3	0	3	0	3	0	3	C
R37	20056	Raiwind-Pattoki Road (Raiwind City – Boundary of the Study Area)	19.8	5	0	3	0	3	0	3	0	4	B
R38	20057	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	12.9	5	0	3	0	1	0	1	0	3	C
R39	20060	Defence Road (Multan Road – Ferozepur Road)	14.3	5	0	3	0	3	0	3	0	4	B

Project No.	Project Code	Project Description	Length (km)	Land Acquisition and Resettlement		Location		Environmental Pollution		Global Warming		Total Score	Rank
				Rating	Weight	Rating	Weight	Rating	Weight	Rating	Weight		
R40	20061	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Sothern Loop)	3.5	3	0	3	0	3	0	3	0	3	C
R41	20081	Construction of LRR West (Multan Road – M2)	15.6	1	0	3	0	1	0	1	0	1	C
R42	20082	Construction of LRR South (Ferozpur Road – Multan Road)	21.8	1	0	5	0	1	0	1	0	2	C
R43	20091	Secondary Roads in Dharampura Area	5.1	1	0	3	0	3	0	3	0	2	C
R44	20092	Secondary Roads in Shadbagh Area	41.0	5	0	3	0	1	0	1	0	3	C
R45	20093	Secondary Roads in Samanabad Area	46.0	5	0	3	0	3	0	3	0	4	B
R46	30002	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	7.6	8	0	5	0	3	0	3	0	5	B
R47		M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of the Study Area) (Bridge 0.6km)	16.5	5	0	5	0	1	0	1	0	3	B
R48		M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	11.3	5	0	5	0	1	0	1	0	3	B
R49	30004	N-5- Multan Road (Lahore Ring Road Sothern Loop – Boundary of the Study Area)	31.3	5	0	5	0	1	0	1	0	3	B
R50	30005	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	33.2	5	0	5	0	1	0	1	0	3	B
R51	30006	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	33.8	5	0	5	0	1	0	1	0	3	B
R52	30008	Sheikhupura Muridke Road (G.T. Road – M-2)	52.7	5	0	5	0	1	0	1	0	3	B
R53	30010	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	5.0	8	0	5	0	3	0	3	0	5	B
R54	30028	Link Kala Shah Kaku – Lahore-Sialkot Motorway	4.2	3	0	8	0	3	0	3	0	4	B
R55		Lahore-Sialkot Motorway (Bridge 0.8km)	32.0	1	0	8	0	1	0	1	0	2	C
R56		Link G.T. Road Lahore-Sialkot Motorway	0.3	3	0	8	0	3	0	3	0	4	B
R57	Optional	Construction and remodeling of Secondary roads - south of LRR in the south-western quadrant between Ferozpur Road and Multan Road	93.6	<i>The Road Projects will be executed by LDA/ TEPA in conjunction with the developer. No environmental assessment is considered essential at this stage as each sub-project must be examined on its own merits.</i>									
Traffic Management Projects – Committed													
TM01	-	Establishment of Centralized Driver Licensing Authority	-	10	0	10	0	8	0	8	0	9	A
TM02	-	Parking Management Company	-	10	0	10	0	8	0	8	0	9	A
TM03	-	Traffic Education Center	-	10	0	10	0	8	0	8	0	9	A
TM04	-	Traffic Control Plan of City	-	10	0	10	0	8	0	8	0	9	A
TM05	-	Vehicle Inspection and Certification System (VICS)	-	10	0	10	0	8	0	8	0	9	A
TM06	-	Construction of New Parking Plazas	-	1	0	3	0	8	0	8	0	4	B
TM07	-	Construction of Pedestrian Bridges	-	3	0	3	0	8	0	8	0	5	B
TM08	-	Improvement of 52 Junctions	-	1	0	3	0	8	0	8	0	4	B

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Project No.	Project Code	Project Description	Length (km)	Land Acquisition and Resettlement		Location		Environmental Pollution		Global Warming		Total Score	Rank
				Rating	Weight	Rating	Weight	Rating	Weight	Rating	Weight		
TM09	-	Ferozpur Road Pilot Project	-	3	0	3	0	8	0	8	0	5	B
TM10	-	Conversion of Two Stroke Rickshaw into CNG Fitted Four Stroke Rickshaw	-	1	0	8	0	8	0	8	0	5	B
TM11	-	Remodeling of Inner and Outer Circular Road	-	1	0	8	0	8	0	8	0	5	B
Traffic Management Projects – LUTMP Proposed													
TM12	A.1	Junction Design and Traffic Signal Improvement – CBD	-	1	0	8	0	8	0	8	0	5	B
TM13	A.2	Existing Junctions Design and Network Improvement	-	8	0	10	0	8	0	8	0	8	A
TM14	A.3	Road Function and Capacity Improvement Program	-	10	0	10	0	8	0	8	0	9	A
TM15	B.1	Low Occupancy Vehicles Planning for Outskirt/ Rural Areas	-	10	0	10	0	8	0	8	0	9	A
TM16	B.2	Traffic Circulation System Design and Implementation	-	10	0	10	0	8	0	8	0	9	A
TM17	B.3	Public and Freight Transport Terminals	-	1	0	10	0	8	0	8	0	6	B
TM18	B.4	Linking Communities - Smart Roads	-	3	0	10	0	8	0	8	0	6	B
TM19	B.5	Feasibility Study for Traffic Demand Management Measures	-	10	0	10	0	8	0	8	0	9	A
TM20	B.6	RMTS and BRT Station Area Traffic Management	-	5	0	10	0	8	0	8	0	7	A
TM21	C.1	Planning and Design Study for Non-Motorized Traffic	-	10	0	10	0	8	0	8	0	9	A
TM22	C.2	Non-Motorized Traffic Facilities Implementation	-	3	0	10	0	8	0	8	0	6	B
TM23	C.3	Pedestrian and Bicycle Path Network	-	3	0	10	0	8	0	8	0	6	B
TM24	D.1	Comprehensive Parking System Development	-	10	0	10	0	8	0	8	0	9	A
TM25	D.2	Parking Facilities Implementation	-	1	0	10	0	8	0	8	0	6	B
TM26	D.3	Park and Ride Facilities Development	-	10	0	10	0	8	0	8	0	9	A
TM27	E.1	Traffic Enforcement Strengthening Programme	-	10	0	10	0	8	0	8	0	9	A
TM28	F.1	Traffic Calming	-	10	0	10	0	8	0	8	0	9	A
TM29	F.2	Traffic Safety Education Improvement	-	10	0	10	0	8	0	8	0	9	A
TM30	G.1	Intelligent Transportation System Development	-	3	0	10	0	8	0	8	0	6	B
TM31	H.1	Local Standards and Guidelines Development	-	10	0	10	0	8	0	8	0	9	A

Source: JICA Study Team

The ranking thresholds used in project ranking are given in Table 7.4.9.

Table 7.4.9 Ranking Threshold in Environmental Evaluation

Ranking	Extent of Negative Impact	Total Score
A	Little or negligible impacts	10 to 7
B	Not significant but some impact	7> to 3
C	Significant impact	3 >

Note 1: Public transport and traffic management projects may cause in general little negative impact. However, if the project sites are located in CBD and/or densely populated urban areas, and land acquisition and resettlement are required, it may raise disputes and conflicts among stakeholders over compensation and/or relocation of PAPs including encroachment and illegal occupants. Therefore, severe rating value such as 1 or 3 was applied to some projects of public transport and traffic management.

Source: JICA Study Team

Results of environmental evaluation ranking are briefly described below:

- Projects of ranking C (significant negative impacts expected) are mostly those of construction of roads.
- Projects of ranking B (not significant but some negative impacts expected) are those of RMTS, remodeling of roads (shorter length), and some projects of traffic management and bus transport improvement.
- Projects of ranking A (Little or negligible negative impacts expected) are those of BRT and most of the traffic management projects

7.4.4 Environmental and Social Considerations in MCA

1) Scope of Environmental and Social Considerations

In this study, it is required that Initial Environmental Examination (IEE) level study for several priority projects including scenarios of the regional development plan as well as reviewing existing IEE/ EIA level should be studied separately. In these studies some elements of Strategic Environmental Assessment (SEA) must also be examined.

2) Methodology of Environmental and Social Considerations

(a) Role and Components of Strategic Environmental Assessment

In the JICA Guidelines for Environmental and Social Consideration (April, 2010), SEA is defined as “an assessment being implemented at the policy, planning and program level rather than a project-level EIA.”

In general most of the components of a SEA are the following:

- Comprehensive assessment with integrated evaluation by environmental and social considerations as well as economic, financial, operational and technical factors at the program, plan and policy levels;
- Impact assessment at the early decision-making stage (e.g. planning stage);
- Consideration of alternatives;
- Public participation and information disclosure at the earliest stages;
- Assessment of accumulated impacts beyond one project, if sub-projects are involved.

Regarding major components of SEA, as for comprehensive assessment is concerned, it is conducted by using MCA as described in the previous section. As for public participation and information disclosure at the earlier stage frequent meetings with stakeholders were already held including International Seminar (four times) in the Study.

(b) Examination of Environmental and Social Considerations in the Master Plan

Examination of Environmental and Social Considerations were conducted for the following four types of projects/ plans.

- Public Transport – RMTS, BRT and Bus Transport Improvement projects
- Road Transport projects
- Traffic Management projects
- Urban Development plans

(c) Methodology for IEE Level Study

i) Setting of Environmental Components

- According to JICA Guidelines for Environmental and Social Considerations, anticipated impacts to be assessed include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.
- In addition to the direct and immediate impacts of projects, the derivative, secondary, and cumulative impacts as well as impacts associated with indivisible projects will also be assessed with regard to environmental and social considerations, so far as it is rational.
- In this examination thirty five (35) environmental items/ components (social environment, natural environment and environmental pollution) are selected with taking into considerations the above and laws and relevant guidelines of Pakistan Government as well as feature of the project and location of project. These components are given in Table 7.4.10.

Table 7.4.10 Environmental Components for an IEE Level Study

Environmental Component		Remarks/ Comments
A. Social Environment		
1	Involuntary Resettlement (Land Acquisition and Resettlement)	Land acquisition and/or resettlement to secure Right of Way and land for transport related facilities and structures
2	Local economy	Situation of employment and livelihood etc.
3	Land use and utilization of local resources	Change of land use and utilization of local resources
4	Social institutions	Social infrastructure and local decision-making institutions, split of communities
5	Existing social infrastructures and services	Other than Transport infrastructures and services
6	Transport and traffic conditions	Including non-mechanized transport and walks
7	The poor, indigenous of ethnic people	1) Peoples living in slum areas (Katchi Abbadis) and below poverty level, 2) dignity, human rights, economics and cultures of ethnic minority group
8	Gender Issues	Consideration of gender equality and women's empowerment
9	Children's Rights	Interruption of children's schooling and increase in number of children encountered traffic accidents)
10	Misdistribution of benefit and damage	Equality of benefits and losses and equality involved in development process
11	Local conflict of interests	Possible cause for destruction of community structures
12	Cultural property and heritage	Cultural, religious, archaeological and heritage sites
13	Fishing Rights, Water Rights and Rights of Common	Existence of rights ownership
14	Public health and Sanitation	Health condition, prevalence of diseases and sanitary condition
15	Infectious diseases such as HIV/AIDS	Other developing countries infection of HIV/AIDS were often reported due to contact of workers with HIV/AIDS affected people at their camp.
16	Working condition	Including occupational safety
17	Hazard/ Risk (disaster, security)	Including cyclone, seismicity, free from danger (safety and security)
18	Accidents	Traffic accidents and accidents during construction work
B. Natural Environment		
1	Topography and Geology	Specific/valuable feature of topography and geology
2	Soil erosion	Susceptibility to erosion or landslide
3	Groundwater	Major water supply resources of the area
4	River, canal and storm water drainage	1) River and canal flow; 2) Storm water drainage water conditions
5	Flora, Fauna and Biodiversity	1) Valuable and endangered species; 2) Trees and green spaces along the roads and surrounding areas
6	Protected areas	1) National Parks, Nature Reserves, Bird Sanctuaries etc. 2) City parks
7	Landscape and visual amenity	Esthetic value of green area and landmarks
8	Meteorology	Change of local climate condition
9	Global Warming	Greenhouse gas emissions from vehicles and construction machines

Environmental Component		Remarks/ Comments
C. Environmental Pollution		
1	Air pollution	Air pollutants emissions such as NO _x and PM _x from vehicles and construction work
2	Water pollution	Discharge of water pollutants during construction work
3	Soil contamination	Contamination of toxic materials in soil
4	Bottom sediment	Contamination of toxic materials in bottom sediment of water bodies
5	Waste	Waste generation during construction work
6	Noise and Vibration	Noise and vibration due to vehicles and construction work
7	Ground Subsidence	Situation of foundation and pumping up of groundwater
8	Offensive odor	Bad smell due to exhaust emission and factories

Source: JICA Study Team

ii) Identifying Project activity

Activities which might affect environmental impacts due to the projects are identified for three stages of implementation, i.e. (a) planning, (b) construction and (c) operation stages.

iii) Identifying of Anticipated Environmental Impacts-1, Formulation of Impact Matrix

By correspondence of each activity to each environmental item extent of anticipated environmental impacts are evaluated one by one with rating.

Anticipated environmental and social impacts due to the project are identified, predicted and evaluated with rating for 35 items according to the scoping procedure as given above in Table 7.4.9.

Rating of the impacts on each item

In general, both positive (beneficial) impact (+) and negative (adverse) impact (-) are expected due to the project activities for the three (planning, construction and operation) stages. Thus the following rating criteria are adopted depending on the extent of impacts:

A (+/-) --- Significant positive/negative impact is expected,

B (+/-) --- Positive/negative impact is expected to some extent,

C (+/-) --- Extent of positive/negative impact is unknown or not clear (Further examination is needed. It should be taken into consideration that impacts may become clearer as study progresses.),

Blank --- Negligible or No impact is expected.

Overall rating --- Overall rating is determined by adopting the worst (negative) value of rating among the three stages.

Extent of anticipated environmental impacts is identified one by one according to the rating corresponding to each activity to each environmental item and the results are expressed with the formulated Impact Matrix.

iv) Identification of Anticipated Environmental Impacts-2, Provisional Scoping

Anticipated environmental impacts are identified and described for each environmental item with provisional scoping table.

v) Possible Mitigation Measures

The above mentioned impacts should be fully taken into considerations to conduct further baseline survey in case of lack of required information and to examine the possible mitigation measures and monitoring as much as possible.

- Baseline survey will be done to make further understanding of existing environment and the effects expected to be caused by the project activities.
- Mitigation measures will minimize the negative impact to an acceptable level through the planning, construction and operation phases. Monitoring is required to ensure that the specified mitigation measures are properly carried out through construction and operation stages.

3) Results of IEE Level Study-1, Overall Comparison of the Projects

Table 7.4.11 shows that the overall comparison of the results. Project categorizations according to JICA Guidelines for Environmental and Social Considerations are also shown in the final column of this Table.

Table 7.4.11 Overall Comparison of the Projects by IEE Level Study

Environmental Component		RMTS	BRT	Road Const.	Road Remod.	Traffic Mgmt.	Bus Improv.	Urban Dev.
A. Social Environment								
1	Involuntary Resettlement (Land Acquisition and Resettlement)	A-	C-	A-	B-	B-	B-	A-
2	Local economy	B+	B+	B+	B+	B+	B+	B+
3	Land use and utilization of local resources	B-	B-	B-	B-	B-	C-	A-
4	Social institutions	A-	B-	A-	B-	B-	B-	A-
5	Existing social infrastructures and services	B-	B-	B-	B-	C-	C-	B-
6	Transport and traffic conditions	B-	B-	B-	B-	C-	C-	B-
7	The poor, indigenous of ethnic people	B-	B-	C-	C-	C-	C-	C-
8	Gender Issues	C-	C-	C-	C-	C-	C-	C-
9	Children's Rights	C-	C-	C-	C-	C-	C-	C-
10	Misdistribution of benefit and damage	A-	B-	A-	B-	B-	B-	A-
11	Local conflict of interests	A-	B-	A-	B-	B-	B-	A-
12	Cultural property and heritage	A-	C-	B-	B-	B-	B-	B-
13	Fishing Rights, Water Rights and Rights of Common	C-	C-	C-	C-	C-	C-	C-
14	Public health and Sanitation	B-	B-	B-	B-	C-	C+	B-
15	Infectious diseases such as HIV/AIDS	B-	B-	B-	B-	B-	B-	B-
16	Working condition	B-	B-	B-	B-	B-	C-	B-
17	Hazard/ Risk (disaster, security)	B-	B-	B-	B-	C-	C-	B-
18	Accidents	B-	B-	B-	B-	B-	B-	B-
B. Natural Environment								
1	Topography and Geology	A-	C-	B-	B-	C-	C-	C-
2	Soil erosion	A-	C-	B-	B-	C-	C-	B-

Environmental Component		RMTS	BRT	Road Const.	Road Remod.	Traffic Mgmt.	Bus Improv.	Urban Dev.
3	Groundwater	B-	B-	B-	B-	C-	C-	B-
4	River, canal and storm water drainage	B-	B-	B-	B-	C-	C-	B-
5	Flora, Fauna and Biodiversity	B-	B-	B-	B-	B-	B-	B-
6	Protected areas	C-	C-	C-	C-	C-	C-	C-
7	Landscape and visual amenity	B-	B-	B-	B-	C-	C-	B-
8	Meteorology	C-	C-	C-	C-			C-
9	Global Warming	B-	B-	B-	B-	C-	C-	C-
C. Environmental Pollution								
1	Air pollution	A-	B-	A-	B-	B-	B-	A-
2	Water pollution	A-	B-	B-	B-	C-	C-	A-
3	Soil contamination	A-	B-	B-	B-	C-	C-	B-
4	Bottom sediment	C-	C-	C-	C-	C-	C-	C-
5	Waste	A-	B-	B-	B-	B-	B-	A-
6	Noise and Vibration	A-	B-	A-	B-	B-	B-	A-
7	Ground Subsidence	C-	C-	C-	C-			C-
8	Offensive odor	C-	C-	C-	C-	C-	C-	C-

Note 1: Overall Rating (Magnitude of impacts); In general, both positive (beneficial) impact (+) and negative (adverse) impact (-) are expected due to the project activities. A (+/-) - Serious impact is expected, B (+/-) - Some impact is expected, C (+/-) - Extent of impact is unknown or not clear (Further examination is needed. It should be taken into consideration that impacts may become clear as study progresses.), Blank - Negligible or No impact is expected. Overall Rating corresponds to the worst value of rating for three stages.

Note 2: C.5, C.6 and C.7 - Assuming in cases of relocation and/or land requirement, and construction of transport related structures in CBD and/or densely populated urban areas.

Source: JICA Study Team

Public Transport (RMTS) Projects

For the RMTS projects considerable area of land would be required for stations (elevated stations and underground station) and elevated sections, depots and multimodal terminals. In addition, a large scale of construction work may cause significant negative impacts, especially in Walled City and high-density urban area. Therefore, RMTS projects are classified as Category A.

In this regards, for RMTS Green Line an EIA level study was conducted in the Reference Design to comply with ADB Safeguard Policies. In the Reference Design stage, unexpectedly major environmental impacts are also examined in detail such as land acquisition and resettlement plan (LARP) for Project Affected Persons (PAPs) including entitlement matrix, quantitative prediction of air quality improvement, measures to protect archaeological and historical sites.

For the RMTS Orange Line project about the same scale of land requirement and construction work is required according to the Feasibility study 2007. At the next step, Reference Design stage, similar to that of the RMTS Green Line, the environmental impacts will be studied.

Public Transport (BRT) Projects

In general little negative impacts are expected of BRT projects. However, some change of existing alignment would be necessary due to encroachment by mosques and other

structures in the Walled City area and in central urban areas. Thus, BRT projects are classified as Category B.

Road Transport Projects – Construction of Motorway, Trunk Roads etc.

In case of new construction of Motorway, Trunk Road etc. considerable area of permanent land for road, RoW, related structures (including flyovers, bridges, underpasses, interchanges), and for construction site, would be required. Therefore, land acquisition and resettlement may occur at a larger scale. In addition, construction of structures is also expected to be of larger scale like 4 km length new road bridge across Ravi River. These activities may cause significant impact. Therefore, these projects are classified as Category A.

Road Sub-sector Projects - Remodeling of Existing Roads

In the case of remodeling of existing roads ROW is mostly available. Thus, land acquisition and resettlement may occur at a small scale. However, if the project area is located in high-density, urban consensus of local communities and citizens is an important issue. In general, these projects are classified as Category B.

Traffic Management Projects

Projects are expected to improve vehicular air pollution and greenhouse gases emission due to reducing idling time of vehicles travelling at optimal speed and tend to decrease traffic accidents. However, if the project sites are located in CBD and/ or densely populated urban areas, and land acquisition and resettlement are required, it may raise issues and create conflicts among stakeholders over compensation and/or relocation of PAPs including encroachment and illegal occupants. Therefore, projects are classified as Category B or C, depending on the project.

Bus Transport Improvement Projects

Projects are expected to enhance efficient passenger transportation. However, if the project sites are located in CBD and/or densely populated urban areas, and land acquisition and resettlement are required, it may raise issues and disputes among stakeholders similar to the traffic management projects. Therefore, projects are classified as Category B or C, depending on the project.

Urban Development Plans

Plan of each project relevant to urban development scenario is not in the scope of work as all projects are tested against a single urban development scenario. Therefore at present to examine IEE level study is not necessary. However, projects are as a whole classified into Category A or B through coarse examination.

4) Results of IEE Level Study – General Suggestions and Recommendation

a) Compliance with Both Laws of Pakistan and JICA Guidelines for the Environmental and Social Considerations

Take fully into considerations the differences of relevant environmental laws and regulations, procedure of Environment Approval, EIA Categorization and the land acquisition and resettlement policy between the two: JICA Guidelines and Pakistan.

There are gaps in the compensation and resettlement assistance between Pakistan Government and foreign donors. For example, resettlement assistance to illegal occupants for eligibility and non-depreciated value of structures and assets for valuation are included in the donors’ policy, while there are no such considerations for compensation measures in Pakistan laws as shown in Table 7.4.12.

Table 7.4.12 Comparison of Land Acquisition Policies between Pakistan and International Donors including WB, ADB and JICA

No.	Existing Pakistan Land Acquisition Procedure	Donor's Involuntary Resettlement Policy*
1	Land compensation only for titled land owners or holders of customary rights	Lack of title should not be a bar to compensation and/or rehabilitation.
		Non-title holders are to be rehabilitated
2	Crop losses compensation provided only to registered landowners and lease/sharecrop tenants (Non-registered are often deprived).	Crop compensation is provided to landowners and sharecrops/lease tenants according to their shares whether they are registered or not.
3	Tree losses are compensated on the basis of officially fixed rates by the Forest and Horticulture Departments.	Tree losses are compensated according to actual worth of affected trees based on market rates.
4	Land valuation based on the median registered land transfer rate over the previous 3 years.	Land valuation is to be based on current replacement (market) value.
5	Structures valuation based on official rates, with depreciation deducted from the gross value.	Valuation of structures based on current market value/ cost of new construction of the structure.
6	Land Acquisition Collector (LAC) is the only pre-litigation final authority to decide disputes and address complaints regarding quantification/ compensation for the affected lands and other assets.	Complaints and grievance are resolved informally through community participation in the Grievance Redress Committees (GRC), local governments, NGO and/ or local-level community based organizations.

Source: JICA Study Team

b) Land Use Rules 2009

The GoPb enacted new land use rules on 10th February, 2009 based on the 1975 Lahore Development Authority Act. The Rules intend to determine land use in “controlled” areas according to land use classification. In Lahore land use plan in any development should comply with land use classification and sub-classification of the Rules.

c) Public Participation

As described in Volume II Chapter 4.3 Public participation is another pillar of SEA, information disclosure and public participation should be fully considered for all the

stakeholders from early stage of planning for obtaining thorough understanding and consensus of the people and communities. In addition, delay or suspension of the project implementation and a split of communities may occur. Full consideration is to be given to minimize misdistribution of benefits and damage, and to avoid local conflict of interest.

d) Alternative Comparisons

Proposed projects should be evaluated with alternatives including “no action” or do nothing case in the SEA process. In the Feasibility Study of Lahore Ring Road Southern Loop project following four alternative routes (A1, A, C and D) in the project area and alternative D was selected finally as shown in Table 7.4.13.

Table 7.4.13 Comparison of Alternative Routes for Lahore Ring Road Southern Loop

No.	Evaluation Item	Alternative A1	Alternative A	Alternative C	Alternative D
1	Utility Services Upgrades	++	++	+	+
2	Right of Way Restrictions/	+++	+++	+	+
3	Height Restrictions	+++	++	-	-
4	Constructability Constraints	+++	+++	+	+
5	Off-Site Improvements	+++	+++	+	+
6	New Interchanges	+	++	++	++
7	Parallel Roads	++	+++	-	-
8	Environmental Impacts	+++	++	++	+
9	Economic And Financial Viability	+	++	+	+++

Note 1: Extent of negative impact - (+++) High, (++) Medium, (+) Low, (-) Negligible

Note 2: “No action” and Alternative B cases are excluded.

Source: JICA Study Team

e) Environmental Components to be Considered

- Impact on global warming: reduction of CO₂ emission is not estimated quantitatively.
- Vulnerable social groups such as poor and gender aspects.

5) Results of IEE Level Study-2, Suggestions and Recommendation for Major Components/ Items

(a) Land Acquisition and Resettlement Issues

One of the most critical issues in development projects is land acquisition and resettlement. In the transport development if the land for the Right of Way (ROW) is required for the alignment and related structures, land acquisition and resettlement issues would need to be considered.

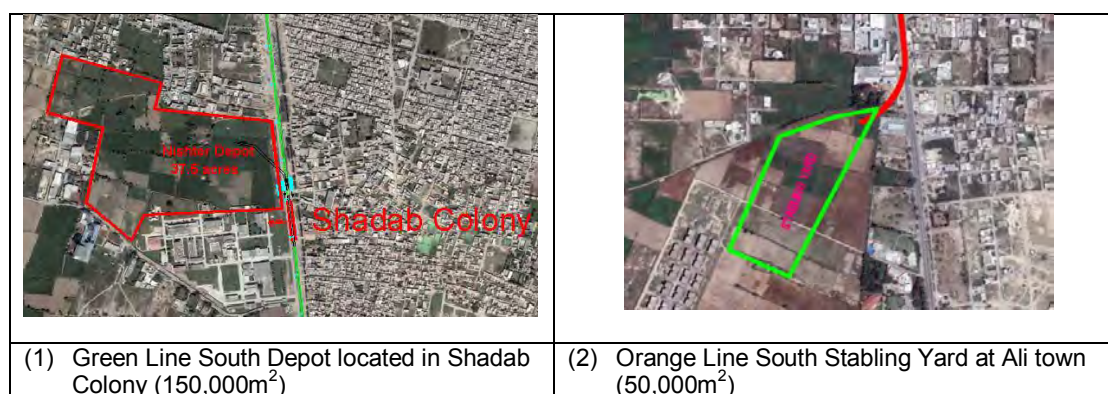
In order to make it clear that the occurrence of land acquisition and resettlement, following survey are required in general:

- Survey of ownership, usage and usufruct rights of the project site.
- Inventory survey on facilities and structures along corridor/ road and encroachment on the ROW. --- Identify the occurrence and features of land acquisition and resettlement and anticipated PAPs through the detailed survey of RoW based on Cadestral map.
- Survey on legal and institutional framework for resettlement and compensation.

If the occurrence of land acquisition and resettlement are anticipated, project proponent should provide adequate information to PAPs and consult with stakeholders including PAPs to reach an agreement or thorough understanding of the issues from an early stage of the project plan as much as possible.

Project proponent should also formulate LARP (Land Acquisition and Resettlement Plan) according to both Pakistan Laws and JICA Guidelines and monitor result of the compensation and restoring living conditions and livelihood after implementation.

Figure 7.4.2 Examples of Project Site – RMTS Depots



Source: LRMTS Studies

b) Special Concerns with Archaeological and Heritage Sites

There are no archaeological sites protected under the Federal Antiquities Act near or adjacent to the alignment and works area. However, the RMTS alignments will run through important historic areas of Lahore and close to a number of historical buildings. Therefore, there is some possibility of impacts on currently unidentified archaeological deposits. In this regard, special concerns of examination of possible impacts and mitigation measures are to be undertaken.

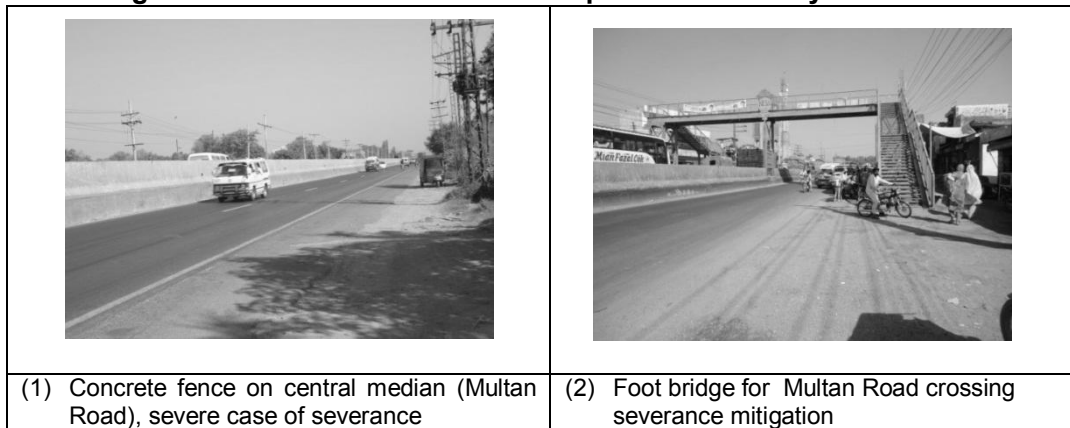
c) Measures to Avoid and/ or Minimize Split of Community/ Severance

Road structure should be somewhat elevated structure with underpass for non-motorized transport and walking at appropriate stretch/ interval to be provided and not at-grade for the length of the project.

To avoid split of community and interference of cattle movement devices such as

underpass and walking bridge are required for road structure design. According to C&W Department, LRR EIA study report was submitted to EPD and they have received an Environmental Approval.

Figure 7.4.3 Measures to Minimize Split of Community/ Severance



Source: JICA Study Team

d) Working Condition

A large scale of construction work including underground station requires a large number of construction workers would be engaged in the work. Thus, safety and health condition of the workers may be jeopardized due to construction work.

- Prepare tangible safety considerations for individuals involved in the project, such as the installation of safety equipment which prevents accidents, and management of hazardous materials.
- Plan and implement intangible measures for individuals involved in the project, such as the establishment of a safety and health program, and safety training for workers etc.

e) Infectious Diseases such as HIV/ AIDS

In general, road construction workers, and construction vehicle drivers are considered as having high potential for the spread of sexually transmitted diseases (STDs) and HIV/AIDS virus due to their mobility. Infection with HIV/AIDS and venereal disease was often reported at worker's camps during road construction in other countries.

f) Topographical and Geological Impacts

In transport projects considerable scale topographical and geological alteration are expected for road and railway constructions such as a bridge crossing of Ravi River and underground sections and stations of RMTS. In these cases precise topographical and detailed geotechnical survey are necessary at the Detailed Design phase. In Reference Design of RMTS Green Line the survey by drilling exploratory boreholes and measuring geotechnical parameters such as standard penetration test (SPT) and field permeability

test etc., were conducted and due care was taken to note the existence of any archeological deposits.

g) Measures Against Inundation

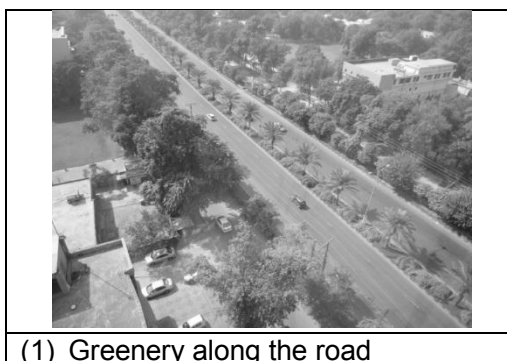
There is some possibility of inundated water to result in flooding of structures/ facilities, especially underground station due to poor drainage condition of the project area.

h) Flora, Fauna and Ecosystem

A tree-cutting permit shall be secured by the contractor prior to removal of vegetation. In general, for every tree felled, four trees need to be planted to compensate for the loss in vegetation.

Selection of appropriate species and the design of the planting and maintenance program shall be carried out by the contractor in close consultation with the Forestry Department.

Figure 7.4.4 Endangered Greenery along Main Boulevard Gulberg



Source: JICA Study Team

i) Global Warming

In case of category A project, increase or reduction of greenhouse gases emissions due to the project should be roughly estimated quantitatively in order to make the extent of negative/positive impact more persuasive.

In this regards, CO₂ emission is applicable as an indicator of greenhouse gases emissions using appropriate emission factor.

j) Air Pollution

In case of category A project, increase or reduction of vehicle exhaust emissions due to the project should be roughly estimated quantitatively in order to make the extent of the negative/positive impact more persuasive.

In this regards, NO_x, PM_x and other pollutants due to vehicles emissions are applicable as indicators of air pollutants emissions using appropriate emission factor.

In the Reference Design Study of RMTS Green Line the ambient air quality effects of

traffic emissions were evaluated for seven locations at the busiest and most congested areas such as Badshahi Masjid Chowk along the corridor using the CALINE4 dispersion model.

k) Formulation of Environmental Management Plan Including Monitoring

Anticipated negative impacts should be fully taken into considerations to conduct further necessary baseline survey and examine the mitigation measures including avoidance and monitoring as much as possible.

- Baseline survey will be conducted to make further understanding of existing environment and affects expected to be caused by the project activities.
- Mitigation measures will minimize the adverse impact to an acceptable level through the planning, construction and operation phases. Monitoring is required to ensure that the specified mitigation measures are properly implemented throughout the construction and operation stages.

In general, to ensure the implementation of mitigation measures including monitoring, a comprehensive environmental management plan is needed. The plan portrays expected impacts, mitigation measures and responsible organizations for planning, construction and operation stages of a project.

7.4.5 Overall MCA of LUTMP 2030 Projects

1) Road and Public Transport Project

When the public sector invests in transport facilities, the primary purpose is “the public service”, or the social benefit. The proposed projects were evaluated for their economic IRRs to assign priority accordingly. The social benefit of a given project can be paraphrased as its impact in serving the twin purposes of reducing the operational cost of all the transport means available and reducing the travel time of all passengers on the available transport means (both users and non-users).

In addition, the projects are evaluated on the following aspects of implementation.

- A.** Economic Viability
- B.** Traffic Demand (Contribution to the improvement of transport capacity),
Operational aspects
- C.** Consistency with Land Use
- D.** Financial Viability
- E.** Environmental and Social Impacts

As a first step, the scores are aggregated per project and are used to prioritize. Each project is evaluated by the threshold defined in the following Table 7.4.14.

Table 7.4.14 Ranking Threshold by Evaluation Criteria

Criteria		Weight	Indicator	X	Y	Z
A. Economic Return		0.4	Economic IRR	X>20%	20>X>12%	12%>X
B. Demand in 2020	Road	0.15	(Veh.* km)/km	X>30,000	30,000-10,000	10,000<X
	Public Transport		Pax/day	X>800,000	800,000-500,000	500,000<X
C. Consistency with Land Use Plan		0.15	-	Contribute	Supportive	No Relation
D. Financial Return		0.15	Financial IRR	X>5%	5>X>2%	2%>X or No income
E. Environmental Evaluation		0.15	(SEC result)	No impact (no mark)	Some impact (+)	Serious impact (++)

Source: JICA Study Team

As the second step, the rankings by five criteria were aggregated into a single rank, taking such process as (1) to give five points to rank “A”, three points to rank “B” and one point to rank “C”, (2) to add up each point after multiplication with “weight”, and (3) Classify into “Short-term” if the total is greater than 3.5 points; rank “Medium-term” if the total is greater than 2.5 and less than 3.5; otherwise “Long-term”. Results of the evaluation are given in Table 7.4.15 for the LUTMP Projects

Table 7.4.15 MCA Evaluation Results of LUTMP 2030 Public Transport and Road Projects

No. Project Code	Project Description	Length (km)	EIRR	Demand 2020	Land Use	FIRR	Env.	Total Score	Rank	Remarks	
			Weights								
			0.4	0.15	0.15	0.15	0.15				
Public Transport Projects – Committed											
PT01	C.1	Multimodal Inter-City Bus Terminals in Lahore	-	-	-	3	1	5	-	S	On-going
PT02	C.2	Effective and Efficient School Bus System	-	-	-	1	1	5	-	S	On-going
PT03	C.3	Up-grading of Bus Stands	-	-	-	1	1	5	-	S	On-going
PT04	C.4	Integrated Bus Operation	-	-	-	1	1	5	-	S	On-going
PT05	C.5	Establishment of Multimodal Bus Terminal at Shadara	-	-	-	3	1	5	-	S	On-going
Public Transport Projects – LUTMP Proposed											
PT06	RMS1	RMTS Green Line	27.0	1	5	5	5	3	3.1	M	LUTMP
PT07	RMS2	RMTS Orange Line (Initially BRT)	27.1	1	3	5	3	3	2.5	L	LUTMP
PT08	RMS3	RMTS Blue Line (Initially BRT)	24.0	1	3	5	3	3	2.5	L	LUTMP
PT09	BRT1	BRT Purple Line	19.0	3	1	5	5	5	3.6	S	LUTMP
PT10	BRT2	BRT Line 1	14.1	5	1	5	5	5	4.4	S	LUTMP
PT11	BRT3	BRT Line 2	14.3	5	1	5	5	5	4.4	S	LUTMP
PT12	BRT4	BRT Line 3a	15.7	5	3	5	5	5	4.7	S	LUTMP
PT13	BRT5	BRT Line 3b	19.1	5	3	5	5	5	4.7	S	LUTMP
Road Sub-sector Projects – LUTMP Committed											
R01	12001	Construction of LRR (Airport – Ferozpur Road)	13.3	-	1	5	1	1	-	S	On-going
R02	12002	Construction of Kalma Chowk Flyover	3.4	-	1	5	1	1	-	S	Completed
R03	12003	Construction of Canal Bank Road Flyover	3.3	-	1	5	1	1	-	S	On-going
R04	12004	Remodeling of Canal Bank Road	15.6	-	1	5	1	1	-	S	Completed

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No. Project Code	Project Description	Length (km)	EIRR	Demand 2020	Land Use	FIRR	Env.	Total Score	Rank	Remarks	
			Weights								
			0.4	0.15	0.15	0.15	0.15				
R05	12005	Remodeling of Barki Road (LRR – Green City)	3.6	-	1	5	1	3	-	S	On-going
R06	12006	Remodeling of Kala Khatai Road	26.9	-	1	5	1	3	-	S	On-going
R07	12007	Remodeling of Allama Iqbal Road	3.3	-	1	5	1	3	-	S	On-going
R08	12008	Remodeling of Multan Road	11.3	-	1	5	1	1	-	S	Completed
R09	12009	Remodeling of Thokar Niaz Baig Road	11.0	-	1	5	1	3	-	S	On-going
R10	12010	Remodeling of Lahore Ferozepur Road	23.6	-	1	5	1	1	-	S	Completed
Road Sub-sector Projects – LUTMP Proposed											
R11	20002	Barki Road (Green City – BRB Canal)	6.8	3	3	3	1	3	2.7	M	LUTMP
R12	20003	Bedian Road (DHA – LRR – Ferozepur Road)	26.3	3	3	3	1	3	2.7	M	LUTMP
R13	20004	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)	2.8	1	1	5	1	3	1.9	L	LUTMP
R14	20005	Link Peco Road – Ferozepur Road	1.9	1	1	5	1	3	1.9	L	LUTMP
R15	20006	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)	1.5	1	1	5	1	3	1.9	L	Committed
R16	20007	Old Ravi Bridge and Road (Bridge 0.5km)	1.2	5	5	1	1	3	3.5	M	Committed
R17	20008	G.T. Road (Cooper Store - Ek-Moria Pul)	2.1	1	1	5	1	3	1.9	L	Committed
R18	20010	College Road (Ghaus-e-Azam Road to Defence Road)	6.9	3	3	3	1	3	2.7	M	Committed
R19	20011	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)	12.9	5	5	3	1	3	3.8	S	Committed
R20	20020	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)	7.1	3	3	3	1	1	2.4	L	Committed
R21	20021	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)	1.6	1	1	5	1	3	1.9	L	Committed
R22	20023	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)	14.2	1	1	3	1	1	1.3	L	LUTMP
R23	20024	Madrat-e-Millat Road - Defence Road	2.6	1	1	5	1	1	1.6	L	Committed
R24	20027	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)	2.4	1	1	5	1	3	1.9	L	Committed
R25	20041	Kamahana Lidher Road (Ferozepur Road – Lahore Bedian Road)	8.8	3	3	3	1	1	2.4	L	Committed
R26	20043	Sua Asil Road (Ferozepur Road – Raiwind Road)	22.0	1	1	3	1	1	1.3	L	Committed
R27	20044	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)	17.8	1	1	3	1	1	1.3	L	Committed
R28	20046	Kahna Kacha Road (Kahna Station – Ferozepur Road)	7.1	1	1	3	1	3	1.6	L	Committed
R29	20049	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) (Bridge 0.7km)	37.4	1	3	1	1	1	1.3	L	Committed
R30		Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)	2.4	1	3	1	1	1	1.3	L	LUTMP
R31	20050	Saggianwala Bypass Road (Ring Road – Sharaqpur Road) (Bridge 0.6km)	6.7	3	1	1	1	1	1.8	L	LUTMP
R32		Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	1.9	3	1	1	1	1	1.8	L	LUTMP
R33	20052	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	17.7	5	5	3	1	1	3.5	M	LUTMP
R34	20053	Manga-Raiwind Road (Multan Road – Raiwind Road)	15.8	1	1	3	1	3	1.6	L	LUTMP
R35	20054	Southern Bypass South Road (Ferozepur Road – College Road)	9.9	5	5	3	1	1	3.5	M	LUTMP
R36	20055	Southern Bypass North Road (Canal Bank Road – M-2)	3.9	5	5	3	1	1	3.5	M	Committed

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No. Project Code	Project Description	Length (km)	EIRR	Demand 2020	Land Use	FIRR	Env.	Total Score	Rank	Remarks	
			Weights								
			0.4	0.15	0.15	0.15	0.15				
R37	20056	Raiwind-Pattoki Road (Raiwind City – Boundary of the Study Area)	19.8	1	1	3	1	3	1.6	L	LUTMP
R38	20057	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	12.9	3	3	3	1	1	2.4	L	LUTMP
R39	20060	Defence Road (Multan Road – Ferozpur Road)	14.3	3	3	3	1	3	2.7	M	LUTMP
R40	20061	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Southern Loop)	3.5	3	3	3	1	1	2.4	L	LUTMP
R41	20081	Construction of LRR West (Multan Road – M2)	15.6	5	5	3	1	1	3.5	M	Committed
R42	20082	Construction of LRR South (Ferozpur Road – Multan Road)	21.8	3	3	3	1	1	2.4	L	Committed
R43	20091	Secondary Roads in Dharampura Area	5.1	5	5	5	1	1	3.8	S	LUTMP
R44	20092	Secondary Roads in Shadbagh Area	41.0	1	1	5	1	1	1.6	L	LUTMP
R45	20093	Secondary Roads in Samanabad Area	46.0	1	1	5	1	3	1.9	L	LUTMP
R46	30002	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	7.6	3	3	3	1	3	2.7	M	LUTMP
R47		M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of the Study Area) (Bridge 0.6km)	16.5	3	3	3	1	3	2.7	M	LUTMP
R48		M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	11.3	3	3	3	1	3	2.7	M	LUTMP
R49	30004	N-5- Multan Road (Lahore Ring Road Southern Loop – Boundary of the Study Area)	31.3	3	3	1	1	3	2.4	L	LUTMP
R50	30005	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	33.2	3	3	1	1	3	2.4	L	LUTMP
R51	30006	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	33.8	3	1	1	1	3	2.1	L	LUTMP
R52	30008	Sheikhupura Muridke Road (G.T. Road – M-2)	52.7	3	1	1	1	3	2.1	L	LUTMP
R53	30010	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	5.0	1	3	1	1	3	1.6	L	LUTMP
R54	30028	Link Kala Shah Kaku – Lahore-Sialkot Motorway	4.2	5	3	1	1	3	3.2	M	LUTMP
R55		Lahore-Sialkot Motorway (Bridge 0.8km)	32.0	5	3	1	1	1	2.9	M	LUTMP
R56		Link G.T. Road Lahore-Sialkot Motorway	0.30	5	3	1	1	3	3.2	M	LUTMP
R57	Optional	Construction and remodeling of Secondary roads - south of LRR in the south-western quadrant between Ferozpur Road and Multan Road	93.6	MCA was not conducted as project EIRR, FIRR and Landuse not available.					Project is LDA/ TEPA/ Private Developer Promoted.		

Note 1: S: Short Term, M; Medium Term, L: Long Term
Source: JICA Study Team

2) MCA Evaluation of Traffic Management Project

Traffic Management Projects – Evaluation Criteria

Traffic management projects will be most effective in alleviating of traffic congestion, improving traffic safety and mobility of non-motorized transport user. Especially, the alleviation of traffic congestion will contribute to improvement of air pollution, along project site. Therefore, these three items will be the main criteria for the traffic management project evaluation. On the other hand, feasibility of these projects depends on capacity of executing agencies, project cost and technical difficulty. Taking into these things, the prioritization of traffic management projects is evaluated by the following eight (8) criteria components:

- A.** Congestion Alleviation: Contribution to the alleviation of traffic congestion. This will contribute to the improvement of air pollution along project sites, from view point of environmental consideration;
- B.** Contribution to Traffic Safety;
- C.** Contribution to Non-Motorized Transport User;
- D.** Environmental Evaluation;
- E.** Institutional Capacity: Some projects will require new law, new legal system and inter-sectoral coordination among relevant agencies. Therefore, its difficulty will be divided into 3 grades;
- F.** Implementation Experience;
- G.** Technical Difficulties: Some projects would require application of new technology, so its difficulty will be divided into 3 grades; and
- H.** Scale of Cost

The following Table 7.4.16 shows the evaluation criteria and its ranking threshold.

Table 7.4.16 Evaluation Criteria for Traffic Management Projects

Evaluation Criteria		Weight	X	Y	Z
A. Congestion Alleviation		0.20	Big Effect	Some Effect	Less Effect
B. Contribution for Traffic Safety		0.20	Big Effect	Some Effect	Less Effect
C. Contribution to Non-motorized Transport		0.20	Big Effect	Some Effect	Less Effect
D. Environmental Evaluation		0.10	No impact	Some impact	Serious impact
Capacity of Executing Agencies	E. Institutional Capacity	0.05	No Difficulty	Some Difficulty	Serious Difficulty
	F. Implementation	0.05	Enough	Some	No
	G. Technical Difficulties	0.05	No Difficulty	Some Difficulty	Serious Difficulty
H. Scale of Cost		0.15	Low	Medium	High

Source: JICA Study Team

Rankings by five criteria were aggregated into single rank, taking such process as: (1) to give five points to rank “A”, three points to rank “B” and one point to rank “C”, (2) to add up each point after multiplication with “weight”, and (3) Classify into “Short-term” if the total is greater than 3.5 points, rank “Medium-term” if the total is between 2.5 and 3.5; otherwise “Long-term”.

Results of the evaluation of the traffic management projects are given for the committed projects in Table 7.4.17, and for the LUTMP proposed projects in Table 7.4.18.

Table 7.4.17 Evaluation Results of Committed Traffic Management Projects

Project No.	Project Description	A	B	C	D	E	F	G	H	Total Score	Ranking
		Cong.	Road Safety	NMT Traffic	Env.	Inst.	Exp.	Tech.	Cost		
		Weight									
		0.2	0.2	0.2	0.1	0.05	0.05	0.05	0.15		
TM01	Establishment of Centralized Driver Licensing Authority	3	5	1	5	3	1	3	5	3.4	M
TM02	Parking Management Company	3	3	3	5	1	1	1	5	3.2	M
TM03	Traffic Education Center	3	5	3	5	3	1	3	5	3.8	S
TM04	Traffic Control Plan of City	5	3	5	5	1	1	1	5	4.0	S
TM05	Vehicle Inspection and Certification System (VICS)	1	5	1	5	1	1	1	5	2.8	M
TM06	Construction of New Parking Plazas	3	1	1	5	5	3	3	3	2.5	L
TM07	Construction of Pedestrian Bridges	1	5	5	5	5	5	5	3	3.9	S
TM08	Improvement of 52 Junctions	5	3	3	5	1	1	1	3	3.3	M
TM09	Ferozepur Road Pilot Project	1	3	1	5	1	1	1	3	2.1	L
TM10	Conversion of Two Stroke Rickshaw into CNG Fitted Four Stroke Rickshaw	5	3	5	5	3	3	3	3	4.0	S
TM11	Remodeling of Inner and Outer Circular Road	5	3	5	5	1	1	1	5	4.0	S

Source: JICA Study Team

Table 7.4.18 Evaluation Results of LUTMP 2030 Traffic Management Projects

Project No.	Project Description	A	B	C	D	E	F	G	H	Total Score	Ranking
		Cong.	Road Safety	NMT Traffic	Env.	Inst.	Exp.	Tech.	Cost		
		Weight									
		0.2	0.2	0.2	0.1	0.05	0.05	0.05	0.15		
TM12	A.1 Junction Design and Traffic Signal Improvement – CBD	5	5	5	5	1	1	1	5	4.4	S
TM13	A.2 Existing Junctions Design and Network Improvement	4	4	4	4	1	1	1	3	3.4	M
TM14	A.3 Road Function and Capacity Improvement Program	5	4	5	5	3	3	3	5	4.5	S
TM15	B.1 Low Occupancy Vehicles Planning for Outskirt/ Rural Areas	3	2	2	5	3	1	3	5	3.0	M
TM16	B.2 Traffic Circulation System Design and Implementation	5	3	3	5	1	1	1	3	3.3	M
TM17	B.3 Public and Freight Transport Terminals	5	3	2	5	1	1	1	3	3.1	M
TM18	B.4 Linking Communities - Smart Roads	4	5	5	5	1	1	1	5	4.2	S
TM19	B.5 Feasibility Study for Traffic Demand Management Measures	3	3	3	5	1	1	1	5	3.2	M
TM20	B.6 RMTS and BRT Station Area Traffic Management	1	1	1	5	0	1	1	3	1.7	L
TM21	C.1 Planning and Design Study for Non-Motorized Traffic	3	5	5	5	0	1	1	5	4.0	S
TM22	C.2 Non-Motorized Traffic Facilities Implementation	3	5	5	5	5	5	5	5	4.6	S
TM23	C.3 Pedestrian and Bicycle Path Network	3	5	5	5	1	1	1	5	4.0	S
TM24	D.1 Comprehensive Parking System Development	4	4	4	5	1	1	1	3	3.5	S
TM25	D.2 Parking Facilities Implementation	2	2	2	1	2	2	2	2	1.9	L
TM26	D.3 Park and Ride Facilities Development	1	1	1	5	1	1	1	1	1.4	L
TM27	E.1 Traffic Enforcement Strengthening Programme	3	5	3	5	4	3	3	5	4.0	S
TM28	F.1 Traffic Calming	3	5	5	5	2	1	1	4	3.9	S
TM29	F.2 Traffic Safety Education Improvement	2	5	3	5	3	1	3	5	3.6	S
TM30	G.1 Intelligent Transportation System Development	3	2	2	2	1	1	1	2	2.1	L
TM31	H.1 Local Standards and Guidelines Development	5	5	5	5	1	1	1	5	4.4	S

Source: JICA Study Team

7.5 LUTMP 2030 Implementation

7.5.1 Implementation Schedule and Responsible Agency

1) Implementation Schedule

Table 7.5.1 presents indicative implementation schedule of the LUTMP projects already committed and proposed in LUTMP, together with needed funding by year. This schedule was determined based on the result of overall evaluation of the 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 eight BRT lines were allocated by 2020. However 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). Construction of RMTS Orange Line and Blue Line are scheduled for long-term (by 2030).

As a result, the amount of yearly investment is heavy during 2012-20 and 2025-30.

Road Projects

All committed projects are scheduled for short- and medium-term similarly to the public transport projects. Proposed projects are distributed almost equally in the plan period, i.e. 2012-30.

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 the projects.

Table 7.5.1 Indicative Implementation Timetable for Committed and Proposed Projects

Project No.	Project Description	Implementation	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Public Transport Projects – Committed																						
PT001	C.1	Multimodal Inter-City Bus Terminals in Lahore	S	2																		
PT002	C.2	Effective and Efficient School Bus System	S	2																		
PT003	C.3	Up-gradation of Bus Stands	S	2																		
PT004	C.4	Integrated Bus Operation	S	3																		
PT005	C.5	Establishment of Multimodal Bus Terminal at Shahdara	S	4																		
Public Transport Projects – LUTMP 2030 Proposed																						
PT006	RMS1	LRMTS Green Line	M	5																		
PT007	RMS2	LRMTS Orange Line (Initially BRT)	L	8																		
PT008	RMS3	LRMTS Blue Line (Initially BRT)	L	8																		
PT009	BRT1	BRT Purple Line	S	3																		
PT010	BRT2	BRT Line 1	S	3																		

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Project No.	Project Description		Implementation	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
PT011	BRT3	BRT Line 2	S	3																			
PT012	BRT4	BRT Line 3a	S	3																			
PT013	BRT5	BRT Line 3b	S	3																			
Road Sub-sector Projects – Committed																							
R01	Construction of LRR (Airport – Ferozepur Road)		S	3																			
R02	Construction of Kalma Chowk Flyover		S	3																			
R03	Construction of Canal Bank Road Flyover		S	3																			
R04	Remodeling of Canal Bank Road		S	3																			
R05	Remodeling of Barki Road (LRR – Green City)		S	3																			
R06	Remodeling of Kala Khatai Road		S	3																			
R07	Remodeling of Allama Iqbal Road		S	3																			
R08	Remodeling of Multan Road		S	3																			
R09	Remodeling of Thokar Niaz Baig Road		S	3																			
R10	Remodeling of Lahore Ferozepur Road		S	3																			
LUTMP 2030 Road Sub-sector Projects – Proposed																							
R11	Barki Road (Green City – BRB Canal)		M	3																			
R12	Bedian Road (DHA – LRR – Ferozepur Road)		M	5																			
R13	Shabir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)		L	3																			
R14	Link Peco Road – Ferozepur Road		L	3																			
R15	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)		L	3																			
R16	Old Ravi Bridge and Road (Bridge 0.5km)		M	3																			
R17	G.T. Road (Cooper Store – Ek-Moria Pul)		L	3																			
R18	College Road (Ghaus-e-Azam Road to Defence Road)		M	3																			
R19	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)		S	3																			
R20	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)		L	3																			
R21	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)		L	3																			
R22	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)		L	3																			
R23	Madrat-e-Millat Road - Defence Road		L	3																			
R24	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)		L	3																			
R25	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)		L	3																			
R26	Sua Asil Road (Ferozepur Road – Raiwind Road)		L	5																			
R27	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)		L	3																			
R28	Kahna Kacha Road (Kahna Station – Ferozepur Road)		L	3																			
R29	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) (Bridge 0.7km)		L	5																			
R30	Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)		L	3																			
R31	Saggianwala Bypass Road (Ring Road – Sharaqpur Road) (Bridge 0.6km)		L	3																			
R32	Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)		L	3																			

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Project No.	Project Description	Implementation	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
R33	Link Thokar Niaz Baig Canal Bank Road – Ferozepur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozepur Road)	M	3																			
R34	Manga-Raiwind Road (Multan Road – Raiwind Road)	L	3																			
R35	Southern Bypass South Road (Ferozepur Road – College Road)	M	3																			
R36	Southern Bypass North Road (Canal Bank Road – M-2)	M	3																			
R37	Raiwind-Pattoki Road (Raiwind City – Boundary of the Study Area)	L	3																			
R38	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	L	3																			
R39	Defence Road (Multan Road – Ferozepur Road)	M	3																			
R40	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Southern Loop)	L	3																			
R41	Construction of LRR West (Multan Road – M2)	M	5																			
R42	Construction of LRR South (Ferozepur Road – Multan Road)	L	5																			
R43	Secondary Roads in Dharampura Area	S	3																			
R44	Secondary Roads in Shadbagh Area	M	5																			
R45	Secondary Roads in Samanabad Area	M	3																			
R46	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	M	3																			
R47	M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of the Study Area) (Bridge 0.6km)	M	3																			
R48	M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	M	3																			
R49	N-5- Multan Road (Lahore Ring Road Southern Loop – Boundary of the Study Area)	L	5																			
R50	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	L	5																			
R51	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	L	5																			
R52	Sheikhupura Muridke Road (G.T. Road – M-2)	L	5																			
R53	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	L	3																			
R54	Link Kala Shah Kaku – Lahore-Sialkot Motorway	M	3																			
R55	Lahore-Sialkot Motorway (Bridge 0.8km)	M	5																			
R56	Link G.T. Road Lahore-Sialkot Motorway	M	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																		
Traffic Management Projects – Committed																						
TM01	Establishment of Centralized Driver Licensing Authority	M	3																			
TM02	Parking Management Company	M	3																			
TM03	Traffic Education Center	S	2																			
TM04	Traffic Control Plan of City	S	3																			
TM05	Vehicle Inspection and Certification System (VICS)	M	4																			
TM06	Construction of New Parking Plazas	L	6																			
TM07	Construction of Pedestrian Bridges	S	3																			
TM08	Improvement of 52 Junctions	M	7																			
TM09	Ferozepur Road Pilot Project	L	3																			
TM10	Conversion of Two Stroke Rickshaw into CNG Fitted Four Stroke Rickshaw	S	4																			
TM11	Remodeling of Inner and Outer Circular Road	S	3																			

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Project No.	Project Description	Implementation	Period (Year)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Traffic Management Projects – Proposed by LUTMP 2030																						
TM12	A.1 Junction Design and Traffic Signal Improvement – CBD	S	3																			
TM13	A.2 Existing Junctions Design and Network Improvement	M	4																			
TM14	A.3 Road Function and Capacity Improvement Program	S	2																			
TM15	B.1 Low Occupancy Vehicles Planning for Outskirt/ Rural Areas	M	2																			
TM16	B.2 Traffic Circulation System Design and Implementation	M	5																			
TM17	B.3 Public and Freight Transport Terminals	M	8																			
TM18	B.4 Linking Communities - Smart Roads	M	4																			
TM19	B.5 Feasibility Study for Traffic Demand Management Measures	M	2																			
TM20	B.6 RMTS and BRT Station Area Traffic Management	L	2																			
TM21	C.1 Planning and Design Study for Non-Motorized Traffic	S	3																			
TM22	C.2 Non-Motorized Traffic Facilities Implementation	S	4																			
TM23	C.3 Pedestrian and Bicycle Path Network	S	3																			
TM24	D.1 Comprehensive Parking System Development	S	3																			
TM25	D.2 Parking Facilities Implementation	L	6																			
TM26	D.3 Park and Ride Facilities Development	L	6																			
TM27	E.1 Traffic Enforcement Strengthening Programme	S	3																			
TM28	F.1 Traffic Calming	S	2																			
TM29	F.2 Traffic Safety Education Improvement	S	2																			
TM30	G.1 Intelligent Transportation System Development	L	5																			
TM31	H.1 Local Standards and Guidelines Development	S	5																			

Note: S: Short Term; M: Medium Term; L: Long Term
Source: JICA Study Team

2) Responsible Agency for Project Implementation

Table 7.5.2 shows the responsibility allocation of project implementation among government agencies. Note that this allocation assumes the present organizational/ institutional setup. If this changes in the future, the responsibility goes automatically to the redefined agency. Transport Department (TD) oversees and monitors the implementation of the LUTMP projects.

Table 7.5.2 Responsible Agency for LUTMP 2030 Project Implementation

Project No.	Project Description		Project Cost (USD million)	Assumed Year in Operation	Status	Proposed by	Responsible Agency
Public Transport Projects – Committed							
PT01	C.1	Multimodal Inter-City Bus Terminals in Lahore	N/A	2014	On-going	TD	TD
PT02	C.2	Effective and Efficient School Bus System	N/A	2014	Planned	TD	TD
PT03	C.3	Up-grading of Bus Stands	N/A	2015	Planned	TD	TD
PT04	C.4	Integrated Bus Operation	80.1	2015	Planned	LTC	LTC
PT05	C.5	Establishment of Multimodal Bus Terminal at Shahdara	N/A	2017	Planned	TD	TD
Public Transport Projects – Proposed							
PT06	RMS1	RMTS Green Line	2,583.0	2020	Designed	TD	TD
PT07	RMS2	RMTS Orange Line	2,330.0	2031	F. Study	TD	TD
PT08	RMS3	RMTS Blue Line	1,908.0	2031	Planned	TD	TD

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Project No.	Project Description		Project Cost (USD million)	Assumed Year in Operation	Status	Proposed by	Responsible Agency
PT07	RMS2	BRT Orange Line (Initially BRT)	74.5	2015	-	LUTMP	TD/ LTC
PT08	RMS3	BRT Blue Line (Initially BRT)	58.6	2020	-	LUTMP	TD/ 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
Road Sub-sector Projects – Committed							
R01	Construction of LRR (Airport – Ferozepur Road)		113.0	2015	On-going	C&W	C&W
R02	Construction of Kalma Chowk Flyover		17.5	2015	Completed	C&W	C&W
R03	Construction of Canal Bank Road Flyover		17.5	2015	On-going	C&W	C&W
R04	Remodeling of Canal Bank Road		43.8	2015	On-going	TEPA	TEPA
R05	Remodeling of Barki Road (LRR – Green City)		2.0	2015	On-going	C&W	C&W
R06	Remodeling of Kala Khatai Road		10.8	2015	On-going	C&W	C&W
R07	Remodeling of Allama Iqbal Road		16.1	2015	On-going	C&W	C&W
R08	Remodeling of Multan Road		46.8	2015	On-going	C&W	C&W
R09	Remodeling of Thokar Niaz Baig Road		4.8	2015	On-going	C&W	C&W
R10	Remodeling of Lahore Ferozepur Road		17.5	2015	On-going	C&W	C&W
Road Sub-sector Projects – Proposed							
R11	Barki Road (Green City – BRB Canal)		17.0	2020	Proposed	LUTMP	C&W
R12	Bedian Road (DHA – LRR – Ferozepur Road)		142.0	2026	Proposed	LUTMP	C&W
R13	Shabbir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)		6.9	2021	Planned	TEPA	TEPA
R14	Link Peco Road – Ferozepur Road		6.7	2021	Proposed	LUTMP	TEPA
R15	Link Ferozepur Road - Nalay Wali Road (Completion of link between Ferozepur and Multan Road)		5.3	2021	Planned	TEPA	TEPA
R16	Old Ravi Bridge and Road (Bridge 0.5km)		5.3	2018	Planned	TEPA	TEPA
R17	G.T. Road (Cooper Store - Ek-Moria Pull)		6.3	2019	Planned	TEPA	TEPA
R18	College Road (Ghaus-e-Azam Road to Defence Road)		14.0	2020	Planned	TEPA	TEPA
R19	Structure Plan Road (Shahrah Nazria-e-Pakistan – Defence Road)		35.0	2018	Planned	TEPA	TEPA
R20	EXPO-Kahna Kacha Station Road (Khayban-e-Jinnah – Kahna Kacha Station)		29.8	2024	Planned	TEPA	TEPA
R21	Main Boulevard PIA Society Road (Baig Road – Ittehad Road)		4.0	2024	Planned	TEPA	TEPA
R22	Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)		52.5	2025	Proposed	LUTMP	C&W
R23	Madrat-e-Millat Road - Defence Road		10.9	2024	Planned	TEPA	TEPA
R24	Extension of Maulana Shaukat Ali Road (Canal Bank Road – Noor-ul-Amin Road through Punjab University)		6.0	2024	Planned	TEPA	TEPA
R25	Kamahan Lidher Road (Ferozepur Road – Lahore Bedian Road)		26.4	2027	Committed	C&W	C&W
R26	Sua Asil Road (Ferozepur Road – Raiwind Road)		130.7	2030	Committed	C&W	C&W
R27	Kahna Station – Raiwind City (Kahna Kacha Approach Road – Raiwind City along Railway Line)		91.7	2027	Committed	C&W	C&W
R28	Kahna Kacha Road (Kahna Station – Ferozepur Road)		29.8	2027	Committed	C&W	C&W
R29	Sharaqpur Road (Lahore Ring Road – Saggian Wala Bypass) (Bridge 0.7km)		202.0	2030	Proposed	LUTMP	C&W
R30	Lahore-Sheikhupura Road (Saggian Wala Bypass – G.T. Road)		20.4	2028	Proposed	LUTMP	C&W
R31	Saggianwala Bypass Road (Ring Road – Sharaqpur Road) (Bridge 0.6km)		43.4	2028	Proposed	LUTMP	C&W

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Project No.	Project Description	Project Cost (USD million)	Assumed Year in Operation	Status	Proposed by	Responsible Agency
R32	Lahore-Sheikhupura Road (West) (Sharaqpur Road – Lahore-Sheikhupura Road)	16.2	2028	Proposed	LUTMP	C&W
R33	Link Thokar Niaz Baig Canal Bank Road – Ferozpur Road (Khyaban-e-Jinnah Road – Defence Road – Ferozpur Road)	57.5	2022	Proposed	LUTMP	TEPA
R34	Manga-Raiwind Road (Multan Road – Raiwind Road)	43.5	2028	Proposed	LUTMP	C&W
R35	Southern Bypass South Road (Ferozpur Road – College Road)	57.0	2022	Planned	TEPA	TEPA
R36	Southern Bypass North Road (Canal Bank Road – M-2)	19.7	2022	Planned	TEPA	TEPA
R37	Raiwind-Pattoki Road (Raiwind City – Boundary of the Study Area)	73.3	2028	Proposed	LUTMP	C&W
R38	Raiwind Road (Thokar – Lahore Ring Road Southern Loop)	54.2	2028	Proposed	LUTMP	C&W
R39	Defence Road (Multan Road – Ferozpur Road)	60.1	2022	Proposed	LUTMP	C&W
R40	Thokar Niaz Baig Canal Road Extension (Defence Road – Lahore Ring Road Southern Loop)	20.8	2028	Proposed	LUTMP	C&W
R41	Construction of LRR West (Multan Road – M2)	121.8	2024	Committed	C&W	C&W
R42	Construction of LRR South (Ferozpur Road – Multan Road)	201.2	2030	Committed	C&W	C&W
R43	Secondary Roads in Dharampura Area	38.9	2018	Proposed	LUTMP	TEPA
R44	Secondary Roads in Shadbagh Area	102.5	2018	Proposed	LUTMP	TEPA
R45	Secondary Roads in Samanabad Area	115.0	2017	Proposed	LUTMP	TEPA
R46	Lahore Bypass (G.T. Road – Kala Shah Kaku Bypass)	41.0	2022	Proposed	LUTMP	NHA
R47	M-2 – Lahore-Islamabad Motorway (Lahore-Sheikhupura Road – Boundary of the Study Area) (Bridge 0.6km)	89.0	2022	Proposed	LUTMP	NHA
R48	M-2 – Lahore-Islamabad Motorway (Bund Road – Lahore-Sheikhupura Road)	64.6	2022	Proposed	LUTMP	NHA
R49	N-5- Multan Road (Lahore Ring Road Southern Loop – Boundary of the Study Area)	109.7	2029	Proposed	LUTMP	C&W
R50	Sharif Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot Rada Kishan Road)	116.1	2029	Proposed	LUTMP	C&W
R51	North-West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	118.3	2031	Proposed	LUTMP	C&W
R52	Sheikhupura Muridke Road (G.T. Road – M-2)	284.4	2031	Proposed	LUTMP	C&W
R53	Link G.T. Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T. Road)	22.9	2027	Proposed	LUTMP	C&W
R54	Link Kala Shah Kaku – Lahore-Sialkot Motorway	25.0	2022	Planned	C&W	C&W/ NHA
R55	Lahore-Sialkot Motorway (Bridge 0.8km)	128.1	2024	Planned	C&W	C&W/ NHA
R56	Link G.T. Road Lahore-Sialkot Motorway	2.2	2022	Planned	C&W	C&W
R57	Construction and remodeling of Secondary roads - south of LRR in the south-western quadrant between Ferozpur Road and Multan Road	The Road Projects will be executed by LDA/ TEPA in conjunction with the developer's contribution towards the project capital cost.				
Traffic Management Projects – Committed						
TM01	Establishment of Centralized Driver Licensing Authority	-	2016	Planned	TD	TD
TM02	Parking Management Company	-	2018	Planned	TEPA	TEPA
TM03	Traffic Education Center	-	2014	Planned	Traffic Police	Traffic Police
TM04	Traffic Control Plan of City	-	2015	Planned	Traffic Police	Traffic Police
TM05	Vehicle Inspection and Certification System (VICS)	-	2021	Ongoing	TD	TD
TM06	Construction of New Parking Plazas	207.1	2020	Ongoing	TEPA	TEPA
TM07	Construction of Pedestrian Bridges	1.8	2016	Ongoing	TEPA	TEPA
TM08	Improvement of 52 Junctions	30.5	2021	Planned	TEPA	TEPA
TM09	Ferozpur Road Pilot Project	28.3	2022	Ongoing	TEPA	TEPA
TM10	Conversion of Two Stroke Rickshaw into CNG Fitted Four Stroke Rickshaw	12.4	2019	Planned	TD	TD

Project No.	Project Description	Project Cost (USD million)	Assumed Year in Operation	Status	Proposed by	Responsible Agency
TM11	Remodeling of Inner and Outer Circular Road	14.1	2015	Planned	TEPA	TEPA
Traffic Management Projects – LUTMP Proposed						
TM12	A.1 Junction Design and Traffic Signal Improvement – CBD	4.0	2015	Proposed	LUTMP	TEPA
TM13	A.2 Existing Junctions Design and Network Improvement	30.0	2019	Proposed	LUTMP	TEPA
TM14	A.3 Road Function and Capacity Improvement Program	2.0	2015	Proposed	LUTMP	TEPA and CDGL
TM15	B.1 Low Occupancy Vehicles Planning for Outskirt/ Rural Areas	5.0	2017	Proposed	LUTMP	LTC
TM16	B.2 Traffic Circulation System Design and Implementation	20.0	2018	Proposed	LUTMP	TEPA
TM17	B.3 Public and Freight Transport Terminals	100.0	2021	Proposed	LUTMP	TEPA and CDGL
TM18	B.4 Linking Communities - Smart Roads	4.0	2019	Proposed	LUTMP	TEPA
TM19	B.5 Feasibility Study for Traffic Demand Management Measures	2.5	2018	Proposed	LUTMP	TEPA
TM20	B.6 RMTS and BRT Station Area Traffic Management	1.5	2023	Proposed	LUTMP	TEPA
TM21	C.1 Planning and Design Study for Non-Motorized Traffic	1.5	2017	Proposed	LUTMP	TEPA
TM22	C.2 Non-Motorized Traffic Facilities Implementation	6.0	2021	Proposed	LUTMP	TEPA
TM23	C.3 Pedestrian and Bicycle Path Network	5.0	2017	Proposed	LUTMP	TEPA
TM24	D.1 Comprehensive Parking System Development	2.5	2015	Proposed	LUTMP	TEPA
TM25	D.2 Parking Facilities Implementation	60.0	2024	Proposed	LUTMP	TEPA
TM26	D.3 Park and Ride Facilities Development	75.0	2030	Proposed	LUTMP	TEPA
TM27	E.1 Traffic Enforcement Strengthening Programme	3.0	2015	Proposed	LUTMP	Traffic Police
TM28	F.1 Traffic Calming	6.0	2015	Proposed	LUTMP	TEPA
TM29	F.2 Traffic Safety Education Improvement	1.0	2014	Proposed	LUTMP	Traffic Police and 1122
TM30	G.1 Intelligent Transportation System Development	38.0	2029	Proposed	LUTMP	TEPA
TM31	H.1 Local Standards and Guidelines Development	1.5	2017	Proposed	LUTMP	TEPA

Note: Committed: officially approved by GoPb; Planned: waiting for approval.
Source: JICA Study Team

7.5.2 LUTMP 2030 Financing Program

1) Proposed Financing Program

Table 7.5.3 gives summary of investment available/ required for the LUTMP 2030 projects. Public transport projects share about 66% of the total, while road and traffic management share 28% and 6%, respectively. As compared to the other urban transport master plans conducted by JICA in Asian cities, the share of public transport projects is on the high side and road projects on the low side.

The budget envelope estimated in Chapter 5 of this report is USD 6.6~19.8 billion for the entire LUTMP plan period of 2012 to 2030, and USD 2.3~6.9 billion for the Action Plan period of 2012 to 2020. Compared to this budget envelop, the planned investment falls within the budget 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 that of the current level of investment. For the entire plan period, the investment is equivalent to 1.7% of the Lahore GDP.

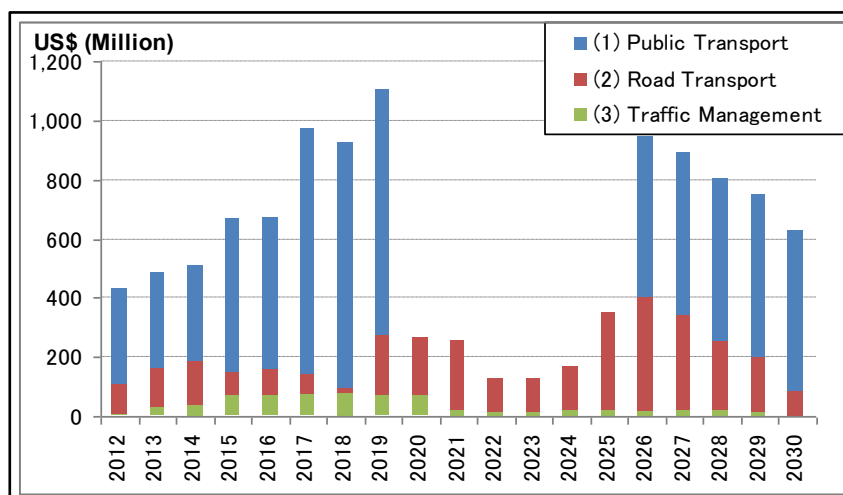
Table 7.5.3 LUTMP 2030 Planned Investment Summary (USD million)

Project	Short Term 2012-2015	Medium Term 2016-2020	Long Term 2021-2030	Total
Public Transport	1,499	3,021	2,742	7,262
Road Sub-sector	450	570	2,139	3,159
Traffic Management	146	363	154	663
Total	2,095	3,954	5,035	11,084

Source: JICA Study Team

Yearly distribution of the proposed investment is illustrated in Figure 7.5.1. As stated earlier, investment on public transport projects becomes minimal during 2020-2025. This, however, does not mean that no effort would be made to improve public transport system during this period. For the opening of the two RMTS lines (Orange and Blue) by 2030, major studies and arrangements should be made here. In addition, loan repayment for RMTS Green Line will start during this period.

Figure 7.5.1 Assumed Investment Schedule of LUTMP 2030



Source: JICA Study Team

If PPP is taken into account in the proposed RMTS/ BRT projects, how much public investment can be saved was estimated assuming a percentage of contribution from the private sector as shown in Table 7.5.4. The reduction was estimated at about USD 800 million equivalent to 11 % of the total investment.

Table 7.5.4 Cost Reduction by Applying PPP Scheme to RMTS/ BRT Projects

Project No.	Code	Project Name	EIRR (%)	FIRR (%)	Project Cost (USD million)	% Private Sector	Cost to Gov't (USD million)
PT06	RMS1	RMTS Green Line	12.1	7.1	2,583.0	20	2,066.4
PT07	RMS2	RMTS Orange Line	10.3	5.7	2,330.0	0	2,330.0
PT08	RMS3	RMTS Blue Line	8.0	4.9	1,908.0	0	1,908.0
PT07 (Initially BRT)	RMS2	BRT Orange Line	18.8	21.0	74.5	100	0.0

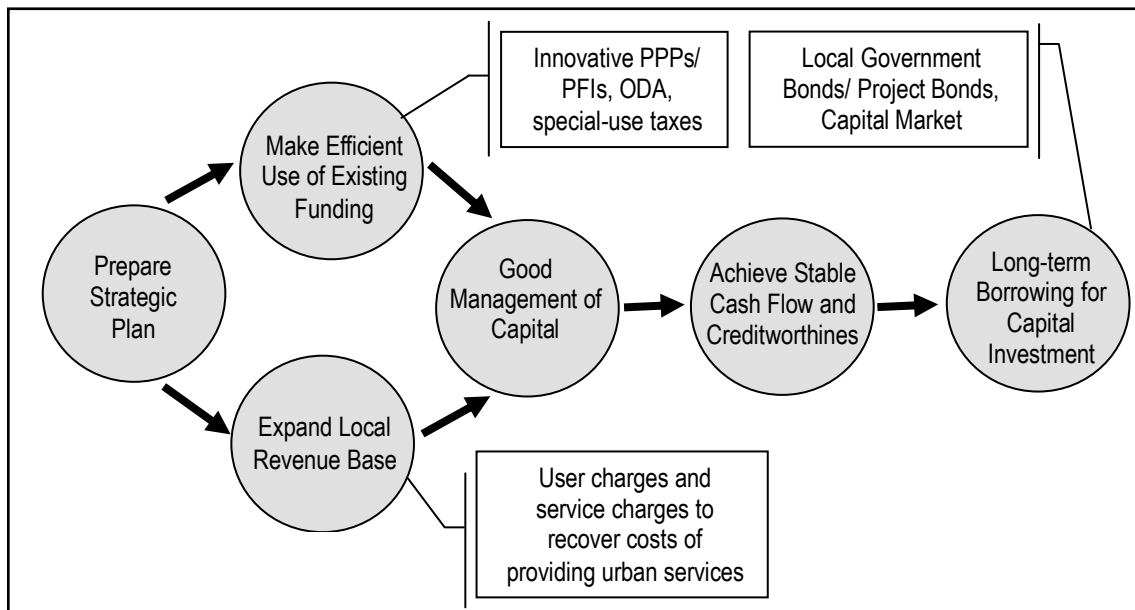
Project No.	Code	Project Name	EIRR (%)	FIRR (%)	Project Cost (USD million)	% Private Sector	Cost to Gov't (USD million)
PT08 (Initially BRT)	RMS3	BRT Blue Line	16.7	17.9	58.6	80	11.7
PT09	BRT1	BRT Purple Line	15.5	16.1	40.8	50	20.4
PT10	BRT2	BRT Line 1	37.6	24.9	30.7	100	0.0
PT11	BRT3	BRT Line 2	43.6	26.5	30.5	100	0.0
PT12	BRT4	BRT Line 3a	20.4	16.3	28.7	50	14.4
PT13	BRT5	BRT Line 3b			35.3	50	17.7
Total					7,120.1	10.6	6,368.5

Source: JICA Study Team

2) Applicable Financing Strategies

The existing revenue base of Lahore is not sufficient to fund future infrastructure projects. As part of the financial strategy, the city may have to expand the local revenue base, make efficient use of existing funding sources and exercise good management of capital financing. This process is depicted in the Figure 7.5.2 below.

Figure 7.5.2 Strategic Mobilization of Funding



Source: JICA Study Team

(ii) Efficient Use of Funding

The main funding source for Lahore is derived mainly from balancing allocations of the Federal Government. Local revenue, household investments, and external sources such as FDIs and ODA is not salient. There has to be greater efficiency in the use of these funds especially through the development of management information systems and strategic financial planning. Some of the key initiatives in this area are the following:

- (a) **Contracting Out Services:** The existing practice of contracting out urban services especially for infrastructure maintenance should continue and be expanded to new areas. This will provide greater opportunities for the private sector to participate and would generally lead to more efficient service delivery if managed well.
- (b) **Applying User Charges and Service Fees:** Direct cost recovery through user charges is usually more effective than indirect cost through property taxes. User charges are generally applied for electricity and water and as tolls for bridges and expressways. More recently, these are also used for area road pricing to discourage private transport into the city center during peak hours and to encourage the use of public transport instead. While user charges should help recover maintenance costs, the capital costs for roads and other transport infrastructure cannot be directly recovered from them. Some form of property tax may be needed to recover the capital cost.

(iii) Expansion of Local Revenue Base

While it may be difficult for local authorities to rely totally on locally generated funds to finance large urban development and infrastructure projects, it is important for city governments to expand the local revenue base within the provisions of the law. Some of the initiatives could be expanded further in Lahore. This will be further discussed in Chapter 8 of this report.

(iv) Good Management of Capital Financing

Good management of capital financing is important to reduce the prolonged financial burden of repaying long-term debts. While ODA lending is usually at subsidized rates, it does create long-term debts for the city. Refinancing ODA funds at higher commercial rates in the form of state investment credit is a popular source of funding for social investment projects in various countries in the developing world.

- (a) **Access to Capital Markets and Other Credit Finance:** It is also important to ensure funding for urban development projects. The use of stocks and shares as collateral for loans is not common and could be developed further with the strengthening of the stock market and the Securities Law. The other strategy is to introduce government-guaranteed bonds. Currently, many of the larger cities have issued municipal bonds to raise capital. It is important that in issuing bonds, the capacity of the city to repay promptly is important to ensure the long-term viability of raising finance through this means. Good management of capital finance is also related to the various types of project implementation methods that could be utilized to reduce the financial burden on the city.

(b) Effective Project Implementation Methods: Include measures, such as BOT (Build Operate and Transfer), BT (Build and Transfer) and deferred payment schemes which have been widely applied on highway and water supply projects in some developing countries. The city should also continue with further initiatives in outsourcing urban services. This could be extended to bus transport operation, public infrastructure maintenance and operation of parking facilities and other public facilities.

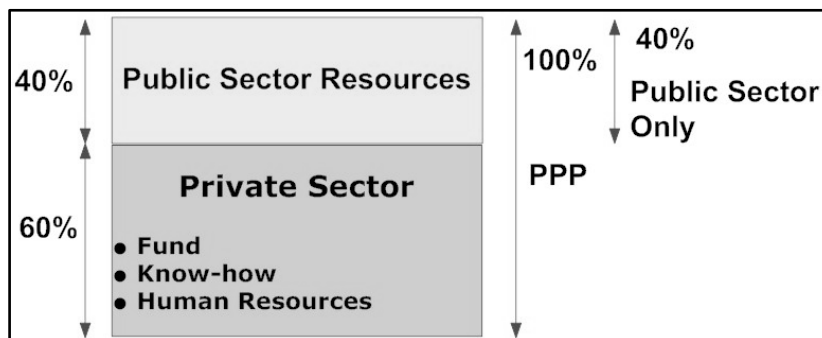
3) Application of Public-Private Partnership (PPP)

As economy and private sector grow further, application of PPP concept is becoming critical for effective management of urban and transport development and sector administration. Main aspects of the PPP are as explained below.

(i) Maximizing the Effect of Public Sector Resource Allocation

Resources in public sector such as fund and man power are very limited. A key concept of PPP is to maximize the effect of public sector resource allocation when implementing public sector projects. Under the PPP arrangement, the effect may expand to a considerable extent with the power of private sector resources (fund, knowhow and human resources) allocated to the project. In other words the public sector may be able to “leverage” the effect of the input of 40 to become the output of 100 by introducing the PPP concept as illustrated in Figure 7.5.3.

Figure 7.5.3 Effect of PPP



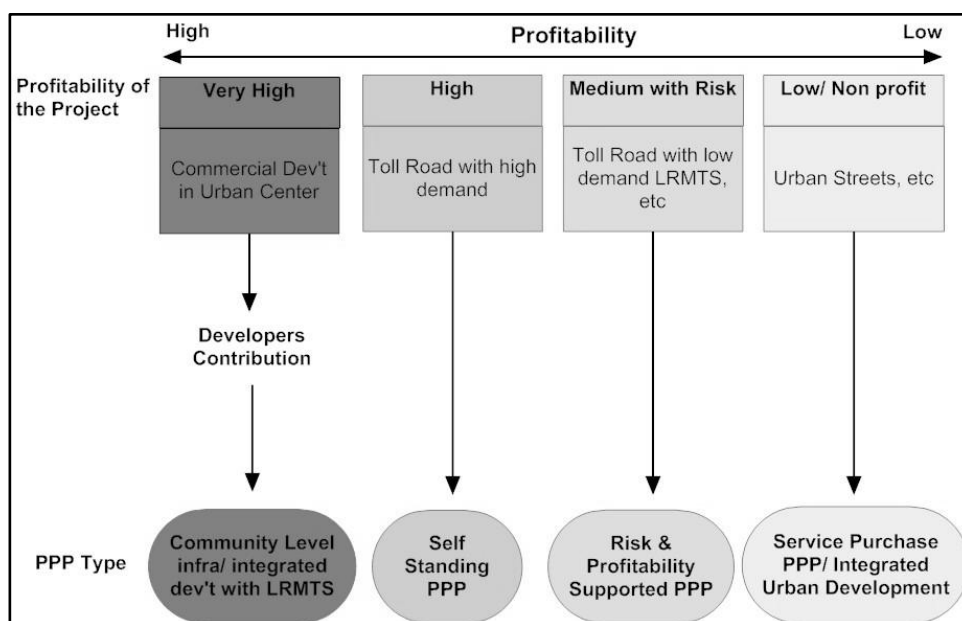
Source: JICA Study Team

(ii) Adopting Different PPP Models on the Basis of Profitability

Profitability of the project will decide what type of PPP model to be applied as shown Figure 7.5.4. Usually, urban and transport infrastructure projects have a wide range of profitability from very profitable to non-profit producing (no user charges). In LUTMP, however, the proposed projects fall mostly in the category of “Medium Profitability with Risk”, or “Low Profitability or No Profit”.

- (a) **Very High Profitability:** If the project is highly profitable such as commercial development in urban center, the GoPb could arrange a PPP on the basis of LDA's rules to ask for developer's contribution for community level infrastructure projects like Road Project R57. This PPP concept may also be applied to the integrated urban development with the RMTS systems.
- (b) **High Profitability:** When profitability is high enough for the project to be financially self-sustainable, self-standing PPP model may be applied. Example of this may be a toll road project with high traffic demand. Project of this type could go on the conventional BOT bidding procedure.
- (c) **Medium Profitability with Risk:** The third type model, risk and profitability supported PPP will be applied to those projects that have a limited degree of profitability. Majority of revenue producing projects in LUTMP will fall into this category and require a careful PPP structuring. Toll road with low traffic demand, RMTS systems, BRTs and so on are the example of this type. GoPb will have to be involved in PPP structuring in terms of necessary risk and profitability support.
- (d) **Low Profitability or Non-profit:** Service purchase PPP model may have to be applied to those projects with very low profitability where GoPb will "purchase" the service that the private sector produces by allocating GoPb's own funding resources. Examples are the public bus operation on public service obligation basis and non-revenue generating road and traffic management projects.

Figure 7.5.4 PPP Models on the Basis of Profitability



Source: JICA Study Team

(iii) Value Capturing of External Benefit of RMTS Systems

External benefit which a RMTS system (Green/ Orange Line) brings about to the City is very large and its huge investment can only be recouped when the City is able to successfully capture the value that the RMTS system creates along its corridor. Tax revenue and user charge are used to fund its construction and operation, but it is also essential to capture the value which people and business benefit from the operation of the RMTS system (beneficiary charge or betterment charge). In order to do the above, GoPb should take an initiative in applying various PPP models in implementing integrated commercial, office and residential projects that are: **a)** directly integrated with the stations/ terminals, **b)** developed in the vicinity of the station/ terminals and **c)** developed along the corridors of the RMTS systems. Thus, GoPb will be able to share a part of benefit that those PPP arrangements produce in the future to recoup its huge initial investment in the long run.

(iv) PPP Opportunities in the LUTMP Projects

There are a variety of PPP opportunities in implementing the LUTMP proposed projects are outlined in Table 7.5.5. There are many opportunities such as some of the Trunk roads to be tolled, and also some of the traffic management projects may yield revenue through user charges. The BRT projects may well be on the concession and the RMTS lines may be implemented under PPP scheme although GoPb may have to shoulder the cost of infrastructure. Some of the Secondary and Local roads may be developed through the urban development projects initiated by the private sector developers, like Road Project R57.

Table 7.5.5 PPP Opportunities in LUTMP Projects

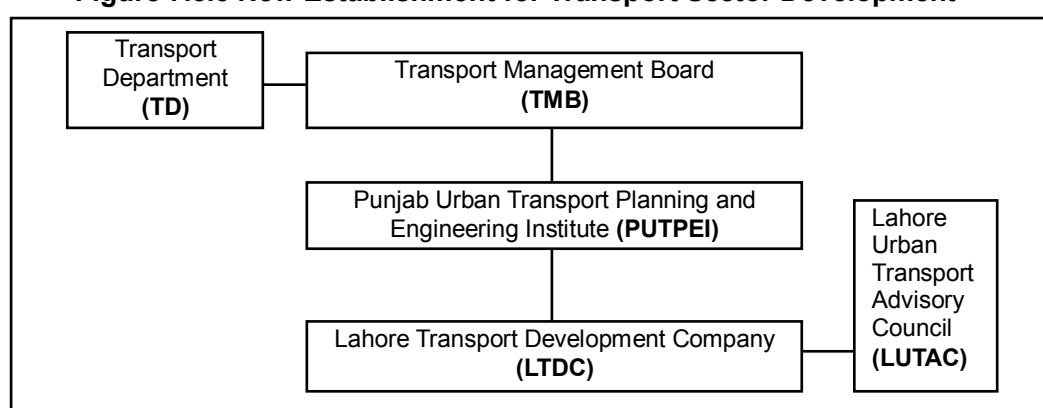
Subsector		PPP Opportunities			Remarks
		Construction	Maintenance	Operation	
Road	Motorway	yes but limited	yes	yes	With high traffic demand
	Primary Road	yes but limited	yes	yes	With high traffic demand
	Secondary Road	yes but limited	yes but limited	N/A	Through urban development
	Local Road	yes but limited	yes but limited	N/A	Through urban development
Public Transport	RMTS	yes but limited	yes	yes	Infrastructure developed by public sector
	BRT	yes	yes	yes	Concession PPP
	Bus Transportation	yes	yes	yes	Concession PPP
Traffic Management	Traffic Management	yes	yes	yes	Large support needed

Source: JICA Study Team

7.5.3 Strengthening of Transport Sector Institutional Capacity

As stated in Chapter 5 of this report, there is a crucial need to establish new organizational setup to make decisions on various transport projects from comprehensive and multidisciplinary viewpoints. For this reason, Transport Management Board (TMB), Punjab Urban Transportation Planning and Engineering Institute (PUTPEI), Lahore Transport Development Company (LTDC) and Lahore Urban Transport Advisory Council (LUTAC) are proposed for establishment to control the urban transport sector of Lahore as presented in Figure 7.5.5. This institutional setup is expected also to monitor and manage the progress of the LUTMP proposed projects.

Figure 7.5.5 New Establishment for Transport Sector Development



Source: JICA Study Team

(a) Setting-up Transport Management Board (TMB)

Transport Management Board is an inter-departmental board, chaired by the Permanent Secretary of the Transport Department (TD), comprised of the heads of transport-related organizations such as P&D, C&W, HUD&PHED/ LDA, Traffic Police, Cantonment Board, DHA and National Highway Authority (NHA).

TMB is the highest decision making body concerning transport at the provincial level and technically supported by PUTPEI, which will function as a secretariat of TMB. Regular meeting will be held once a month and ad-hoc meeting will be occasionally called by the chairman.

P&D keeps the budget allocation function and endorses all the project implementation. However, the resolutions of TMB shall be respected because P&D also sends an official presumably in-charge of budgeting for the transport sector, to the TMB as a member.

(b) Establishment of Punjab Urban Transport Planning and Engineering Institute (PUTPEI)

PUTPEI is a semi-governmental institute of research and planning of urban transport and main function is to monitor, revise and promote the Lahore Urban Transport Master Plan

(LUTMP). The Institute manages the implementation program of LUTMP and prepare the materials for discussion to TMB and acts as the secretariat. Other functions are listed below:

- To manage the progress of the current transportation master plan.
- To conduct feasibility studies on demand (contract research).
- To be a window entity for BOT/ PPP projects.
- To be a key agency to support large projects technically such as urban rail transit and BRT projects and a traffic control center project.
- To maintain and provide transport-related databases such as those developed in LUTMP, vehicle registration and driving license database.
- To assist traffic police and other organizations for capacity development.

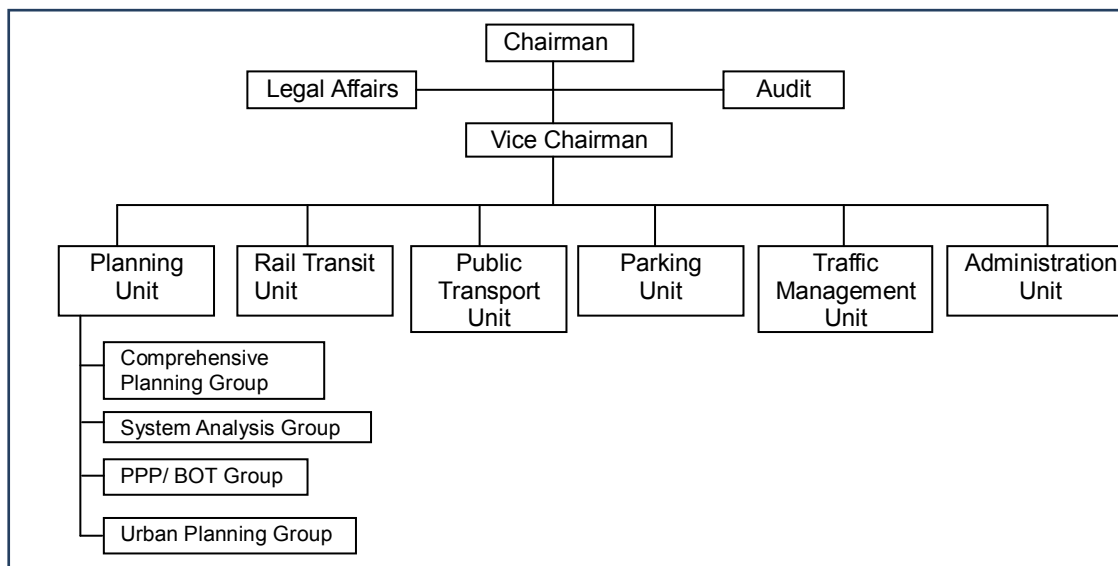
The Institute is owned by GoPb. Most part of PUTPEI's expense is financed by the provincial budget but it can have own financial source such as dividends and research commissions from LTDC (see below). In a certain period, it aims to be a financially self-sustainable institute. However, it is a non-profit organization in nature.

To achieve the listed functions, PUTPEI's initial organization would be as proposed in Figure 7.5.6, consisting of six units of administration, transport planning unit and the other four are corresponding to the four subsectors. Assuming each unit holds at least 20 professionals, the institute would be a think tank with more than 100 researchers and planners.

Under the planning unit, there is a group (sub-unit) named PPP/ BOT Group with capacity of developing a PPP/ BOT scheme for a project based on the financial analysis and a database with abundant success and failure examples. Without a high degree of expertise on PPP/ BOT in the Government side, any PPP project would hardly succeed. If the Punjab Government has an intention to carry out any PPP project, such professional group is inevitable.

The planning unit includes also urban planning group because every transportation master plan require clear vision on urban structure and land use as a base map for planning. To secure the land for future road and railway, urban planning will become more important as state the item (4) in this section.

Figure 7.5.6 Conceptual Organization of PUTPEI



Source: JICA Study Team

(c) Lahore Transportation Development Company (LTDC)

On the tier of City District, it is recommended to establish Lahore Transportation Development Company (LTDC) as an executing and administration agency. The function is near to private sector’s business, LTDC is a company and main shareholder is PUTPEI. Therefore, LTDC is a public-owned company.

As many projects come from PUTPEI, the organization of LTDC would be very similar to that of PUTPEI, consisting of five divisions (so naming to distinguish from units of PUTPEI) of planning, rail transit, public bus, parking and traffic management in addition to administration, as proposed in Figure 7.5.7. Functions of each division are as outlined in Table 7.5.6.

Table 7.5.6 Outline Functions of Six Divisions of LTDC

Division	Outline of Functions
1. Planning Division	<ul style="list-style-type: none"> • Overall planning of LTDC's activities • Interface with planning unit of PUTPEI
2. Rail Transit Division	<ul style="list-style-type: none"> • Promotion of Rail Transit Project under PPP scheme • Bidding and Selection of proponents • Interface of Public and Private • Supervision of Rail Transit Operator
3. Public Bus Division	<ul style="list-style-type: none"> • Promotion of BRT Project under PPP scheme • Bidding and Selection of proponents for BRT project • Interface of Public and Private in BRT PPP project • Supervision of BRT Operator and Bus Operator • Monitor and Revise Bus Network
4. Parking Division	<ul style="list-style-type: none"> • Contract and Supervise Parking Operator (Collector of road-side parking and off-road parking operator) • Bidding and Selection of proponents for off road parking project • Interface of Public and Private • Supervision of Parking operation
5. Traffic Management Division	<ul style="list-style-type: none"> • Signal installation and promotion of control center project • Bidding and Selection of proponents for signal and others • Execution of traffic management project • Training of traffic enforcer/ warden and traffic police
6. Administration Division	<ul style="list-style-type: none"> • Personnel Affairs and general affairs • Accounting • Various Contract • Quality Control

Source: JICA Study Team

Out of six divisions, three divisions of Rail Transit, Public Bus and Parking would yield revenue while Planning Division may yield some revenue and Administration Division none. Each of the former three is the representative body of the Government side in PPP projects. The Company as a whole aims at being financially sustainable. However, internal cross-subsidy among income generating divisions and non-income generating division would be possible.

- (1) Among six divisions, Administration Division, Planning Division and Traffic Management Division are non-profit departments, while other three of Rail Transit Division, Public Transport Division and Parking Development Division are profit divisions.
- (2) The Rail Transit Division will be indispensable, in any case, to promote the Lahore Railway Transit projects as well as the PPP Section under the Planning Division.
- (3) Lahore Transport Company can be the parent organization of the Public Transport Division of the LTDC. In the same way, Traffic Engineering and Transport Planning Agency (TEPA) can be the parent organization of the Traffic Management Division.
- (4) Reinforced TPU can be transformed to the Planning Division of LTDC.

- Maintenance and update of LUTMP
- Maintenance of transport-related database
- Integration of planning and prioritization function in the transport sector
- Planning and monitoring PPP-schemed projects, Including BRT projects
- Monitoring and planning of revision of public transport fare system
- Setting-up of a professional group responsible for review and updating of transport rules and regulations.

Institutional arrangements, their functions and interactions as stated above, are further illustrated in Figure 7.5.7.

(d) Lahore Urban Transport Advisory Council (LUTAC)

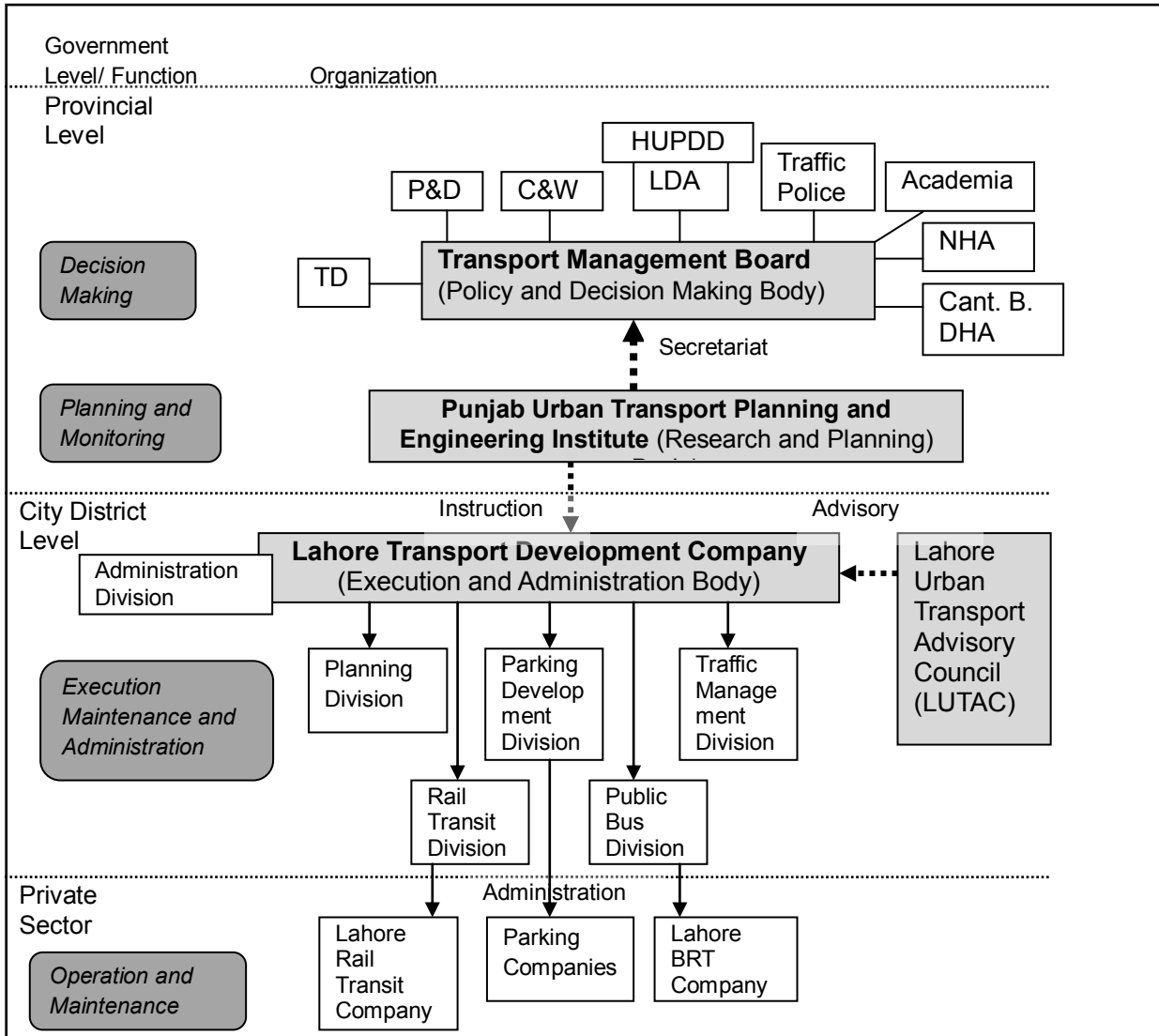
Lahore Urban Transport Advisory Council (LUTAC) should be set up in order to advise to LTDC and at the same time to watch LTDC not to behave arbitrarily. About ten council members may be appointed by the chairman of PUTPEI among people in academia, journalism, writers, and others 'notable' members of the Society.

LTDC has to request advice of the (LUTAC) council before starting new scheme or projects with strong impact upon people's daily life. On a request, the council should have a series of meeting and submit the written opinion to the CEO of LTDC. LTDC has to respect the opinion of the LUTAC although it would not obligatory to follow the opinion.

(e) Functions of Existing Related Organizations

- **TPU:** Transport Planning Unit (Transport Department) is to be a core body of the planning unit of PUTPEI
- **TEPA:** Planning section of TEPA is to be the parent of the traffic management unit and some staff will be transferred to the planning unit of PUTPEI. Operation sectors of TEPA shall be merged to LTDC.
- **LTC:** Lahore Transport Company is to be the parent of the public bus unit of PUTPEI and some operational staff shall be transferred to the public transport division of LTDC.
- **The UU:** Urban planners are to be transferred to the Urban Planning Group of Planning Unit of PUTPEI.

Figure 7.5.7 Overall Institutional Reform for Lahore Transport Sector Development



Source: JICA Study Team

