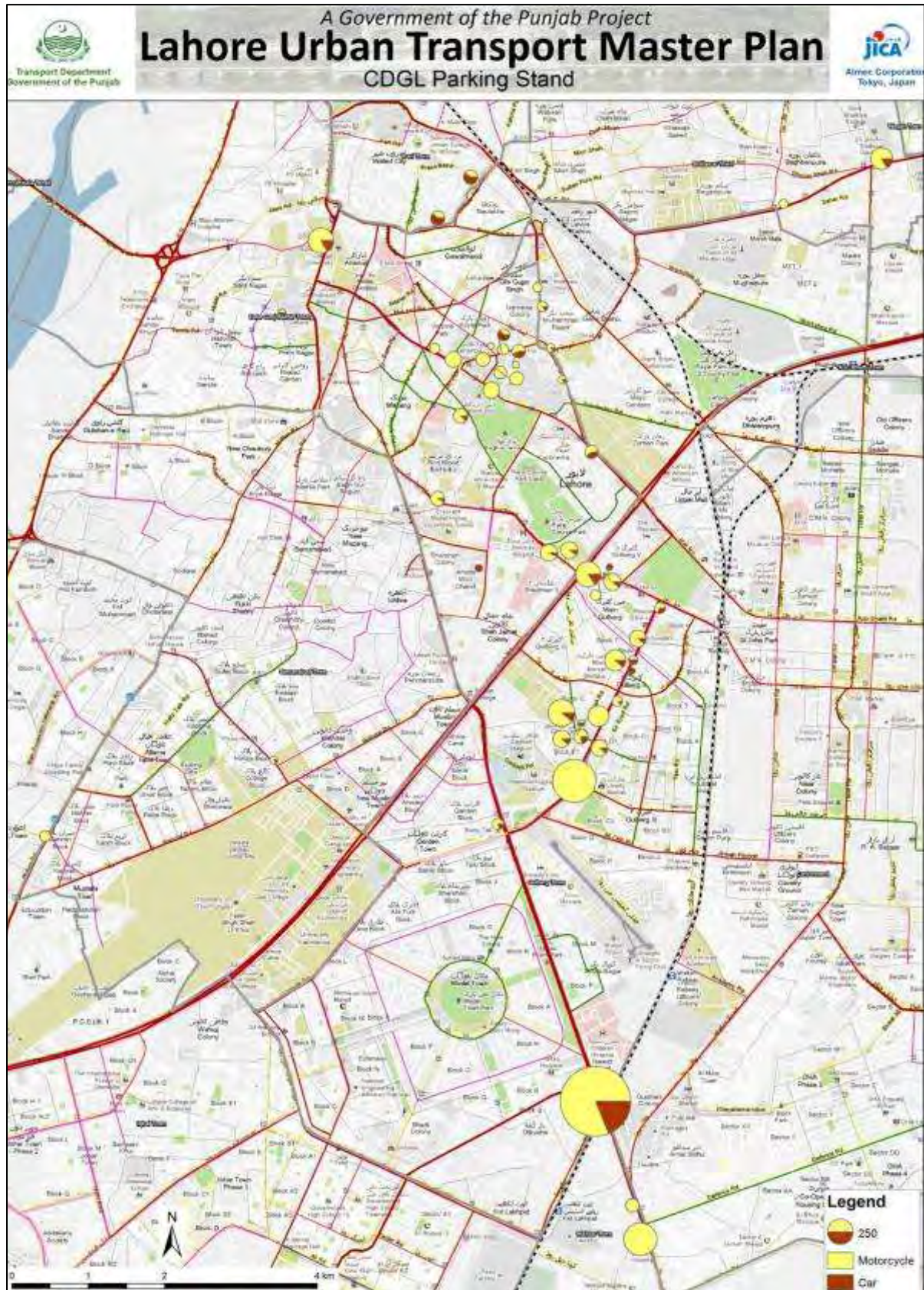


Figure 3.4.25 CDGL Parking Stands and Spaces in Lahore



Source: LUTMP Road Inventory Survey

(iii) Illegal Parking

Mostly commercial areas do not have enough parking capacity in Lahore for either on or off-street locations. Commercialization has been done in the recent past, it was without any consideration of such impacts. The illegal parking often results in severe traffic congestion. Ferozpur Road north of canal is suffering most traffic congestion in Ichhra section; as this is the major market area. Lack of parking spaces along this section results illegal parking on service road and on main Ferozpur Road, causing severe traffic congestion as depicted in Figure 3.4.26.

Figure 3.4.26 Congestion on Ferozpur Road Ichhra Section due to Illegal Parking on Service Road and Main Carriageway



Source: JICA Study Team

South of Lahore is not facing serious parking problems except along some commercial centers like Hafeez Center, Model Town Link road, Moon Market, Ghazi road. LDA has started preparing the existing land use map of the area under their jurisdiction to control existing and future land use for sustainable development. However, rest of the Lahore remains free from such policy. Existing situation is worsening with time as motorization is increasing.

3.4.2 Other Current Projects

The following '9' projects have been planned for the Study Area.

1) Conversion of Two Stroke Cab Rickshaws to CNG fitted Four Stroke Cab Rickshaws

Two stroke cab Rickshaw (TSCR) have worse environmental impacts of all vehicles. It has old technology fitted with two stroke engine, which emits unbearable noise and consumes oil that produces smoke; a major cause of respiratory problem. Central area of Lahore city

has been affected severely with this nuisance causing major health problems and environmental concerns for travelers and residents alike.

It is not possible to remove thousands of rickshaws from road, as this is a major component of public transport in the city. Transport Department decided to reduce the impact of Rickshaws by converting these to CNG fitted 4-Stroke engines; which will cause less air pollution.

Project Description:

In initial phase, 20,000 TSCR will be converted to CNG fitted Four Stroke Cab Rickshaws. Financial assistance in the form of 50% conversion cost will be provided to the TSCR owners.

Status:

PC1 has been submitted to Planning and Development Department for approval, the procedure has delayed due to budget limitations.

Location / Area:

Lahore, Gujranwala, Faisalabad, Rawalpindi, and Multan

Estimated Cost:

PKR 1052.6 Million

Financial Source:

Transport Department, GoPb

Schedule:

2011 – Onward

Implementation:

Transport Department, GoPb

2) Vehicle Inspection and Certification System (VICS)

Transport Department, GoPb intended to establish an international standard vehicle inspection and certification system for safe traffic environment.

Project Description:

IT based vehicle inspection and certification system would be established to replace old manual vehicle inspection system on Public Private Partnership basis. In 1st phase public service vehicles and commercial vehicles will be tested and certified under the system. Currently, about 150,000 public service vehicles need bi-annual certification in Punjab. Transaction Advisory services may be commissioned for the establishment of this system.

Status:

Project has been advertised for proposals, pre-bid meeting of the firms submitted EOIs was held on 4th February, 2011 in Transport Department. The last date for submission of EOI for TA was 18th February, 2011. IPDF had to open EOIs and shortlist the firm for issuance of RFP document. Once, TA is on board, RFP for the shortlisted bidders will be prepared and issued by TA.

Location/ Area:

Lahore District (will be expanded to other large cities of Punjab after pilot scheme Lahore)

Estimated Cost:

Transport Department will disclose the cost after selection of Transaction Advisor. VICS cost will be decided between investing company and Transport Department.

Financial Source:

GoPb: Transaction Advisory Services

Public Private Partnership: Vehicle Inspection and Certification System

Schedule:

2011 – Onward

Implementation:

Transport Department, GoPb

3) Establishment of Centralized Driver Licensing Authority

Project Description:

Centralized driving licensing authority will be established with latest IT equipments. The system will also assist in training of licensed drivers for further training.

Status:

At proposal stage

Location/ Area:

Punjab

Estimated Cost:

No estimate available.

Financial Source:

GoPb or Public Private Partnership

Schedule:

None

Implementation:

Transport Department, GoPb (In coordination with Excise and Taxation Department and Traffic Police, Punjab)

4) Parking Management and Company

Project Description:

To resolve the parking problems on sustainable basis, it is suggested that institutional strengthening of the CDGL should be carried out on priority basis by establishing the Lahore Parking Company (LPC) under the CDGL. LPC should be a public sector company (a special purpose vehicle) established in Lahore on the pattern of ISPARK of Turkey Istanbul. LPC should be assigned the exclusive task of planning and development of new parking facilities; and management, control, and operation of the existing public/private parking facilities in Lahore. Specifically, the LPC shall be responsible to:

- Prepare parking laws/ regulations
- Regulate and enforce parking in the city,
- Meet parking demand spaces by developing new parking lots, and park and minimizing road side parking,
- Provide incentives to the private sector for development of parking plazas,
- Develop a medium and long term plan to meet the parking needs of the city,

The LPC will generate its revenues from the following sources:

- Time based parking fee from the existing public parking spaces.
- One time seed money by Govt. of the Punjab for the establishment of LPC
- Token fee from the private parking plazas

It is proposed that:

- LPC under the CDGL may be established.
- The LPC may be the agency to regulate parking and parking fee.
- The LPC may be assigned the responsibility of all types of parking in Lahore city.
- Total revenue from parking fee may be in the range of ~PKR 1.0 to PKR 3.5 billion annually, and allocated as follows:
 - a) CDGL to receive 25% of the net parking revenue
 - b) LPC to retain 25% for its annual budget requirements.
 - c) The remaining 50% to be reserved for the development of new parking facilities by LPC.

Off-street parking facilities will be provided in the first phase. TEPA has to create a cell for

parking management under the Director, Traffic Engineering. TEPA will coordinate with ISPARK (Turkish Municipality, Parking Company) for the acquisition of technology and capacity building to streamline and manage off-street parking.

Status:

The Chief Minister Punjab, during the presentation on Transport Delegation’s visit to Turkey, was pleased to desire as under:

“The parking facilities in Lahore city will be developed on fast track and concessionaire rights of the existing parking facilities will be assigned to a single agency. The Secretary Transport will hold meeting with Director General LDA and concerned stakeholders to prepare a comprehensive proposal for development, up gradation and regulation of the parking facilities in the city on the pattern of ISPARK Istanbul who shall be approached for assistance and an agreement will be signed with them. The draft agreement will be ready before the forthcoming visit of Istanbul’s Mayor in June 2010 and signed”.

PC-II for the establishment of the Parking Company has been prepared by the Urban Unit, and forwarded to the City District Government of Lahore.

Summary for establishment of parking company has been forwarded to Chief Minister via DCO and Chairman P&D by Transport Department.

Location/ Area:

Lahore District

Estimated Cost:

No Cost estimate is available.

Financial Source:

TEPA/ LDA/ CDGL Parking Company

The LPC shall be responsible to develop required parking facilities under its own arrangement; PPP and/or Private Sector alone!

Schedule:

2011 – Onward

Implementation:

1. Parking Management: TEPA
2. Parking Company: CDGL

5) Construction of New Parking Plazas

TEPA has planned to construct parking plazas, especially in historic old city of Lahore.

Project Description:

Proposed parking plazas locations are listed below and showed in figure 3.4.27

1. Model Town Link Road
2. Outside Delhi Gate (Near Tonga Stand)
3. Outside Mochi Gate (In Circular Garden)
4. Outside Shah Alam Gate (In Circular Garden)
5. Outside Masti Gate (In Circular Garden)
6. Railway Station (Near Taxi Stand)
7. Moon Market Allama Iqbal Town (Near Parking Stand)
8. Halli Road, Gulberg (Rear of Chen One)
9. Outside Lohari Gate (In Circular Garden)
10. NilaGumbad (Fountain Site)
11. M.M. Alam Road (Doongi Ground)
12. In front of KEM University (Adjacent to Hostel)
13. In front of PIC Shadman-II (Rear of KFC)
14. In front of H. KarimBuksh, Liberty
15. Adjacent to Delhi Muslim Hostel, Anarkali
16. Behind Old Tolington Market
17. Behind Naqi Market
18. Victoria Park, Shahrah-e-Quaid-eAzam
19. Behind Regal Cinema – Mall Road
20. Behind Dayal Singh Mansion
21. Liberty Commercial Area
22. Near Gulberg Plaza, Liberty (In front of Salt and Pepper Restaurant) - Completed

Status:

Neela Gumbad project is delayed due to the lack of funding. For the rest, feasibility studies are in process.

Location/ Area:

As listed

Estimated Cost:

PKR 800 million per Parking Plaza

Total Cost: PKR 17 billion

Financial Source:

PPP/ BOT, or funded by LDA, GoPb.

Schedule:

2011 – 2016

Implementation:

Traffic Engineering and Transport Planning Agency (TEPA, LDA)

Figure 3.4.27 Locations of Proposed Parking Plazas



Source: TEPA

6) Improvement of 52 Junctions

Project Description:

- For each of the 52 Junctions, Traffic Signals will be either installed or repaired;
- Signals timing will be coordinated with adjacent signals in the network.
- Geometric design of the junctions will be evaluated and re-designed based on the requirement;
- Pedestrian crossing phased and lane marking and traffic control devices will be installed at each junction;

Status:

In evaluation stage; Junctions which will be prioritized and financing mechanism will be agreed with LDA/ GoPb.

Location/ Area:

List of the junctions is given in Table-3.4.1, and location map is shown in location map Figure 3.4.28

Estimated Cost:

PKR 50 million/ Intersection

Total Cost: PKR 2.6 billion

Financial Source:

GoPb

Schedule:

2011 - 2016

Implementation:

Traffic Engineering and Transport Planning Agency (TEPA)

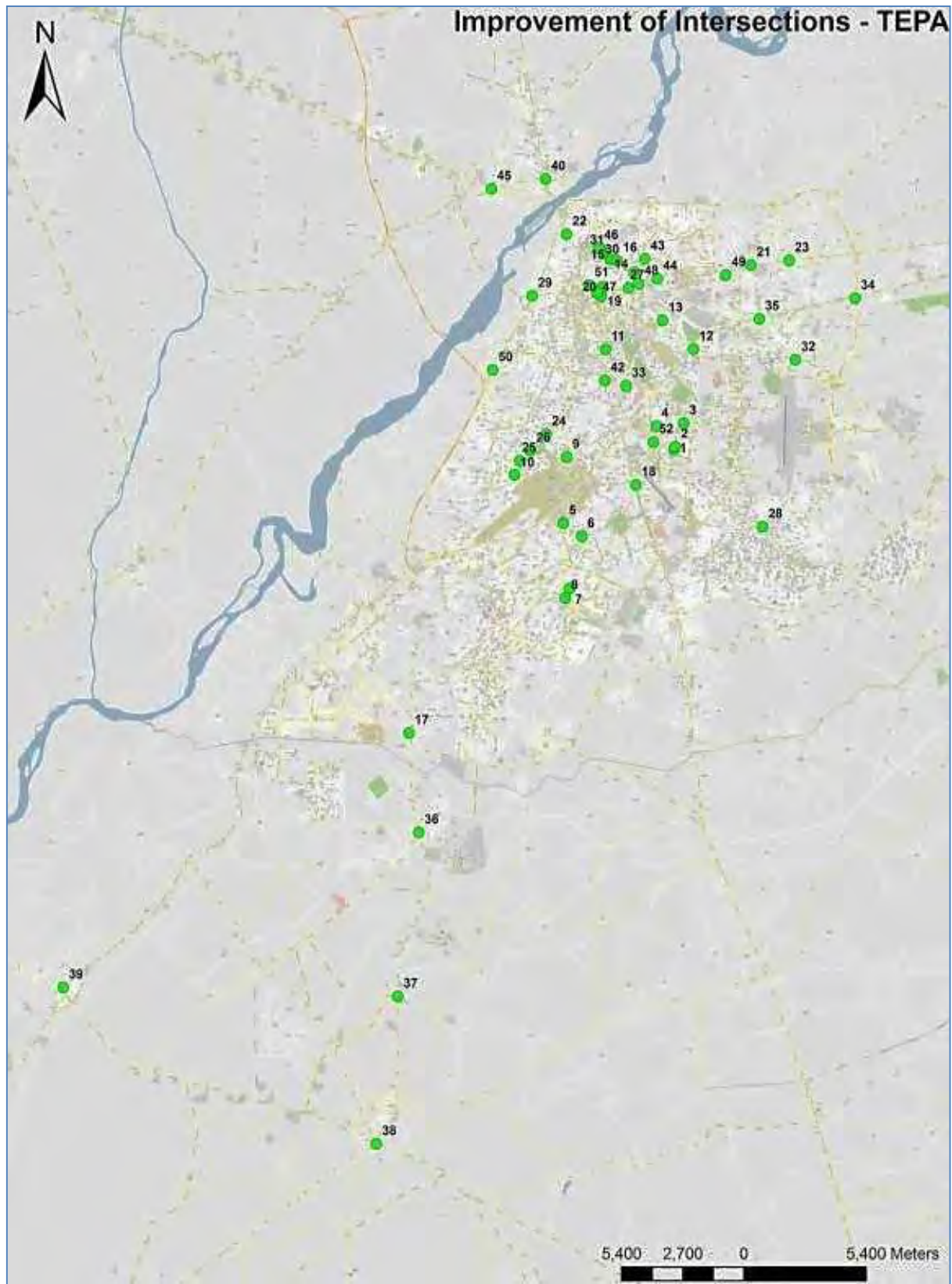
Table 3.4.1 List of Junctions Planned for Improvement by TEPA

No.	Name of Intersections
1	Pizza Hut, M. M Alam Road
2	KFC, M. M Alam Road
3	MCB, Gurumangat Road
4	B-Block, ZahoorElahi Road
5	Faisal Chowk, Faisal Town
6	Central Flats, Faisal Town
7	Muhammad Ali Chowk, College Road
8	KhokharChowk, College Road
9	Dubai Chowk, A. I. Town
10	Karim Block Market ,Wahdat Road
11	WarisChowk ,Queens Road
12	Dharampura Y Junction
13	Taj Crown Cinema, GarhiShahu
14	Do Moria Outer, Circular Road
15	Kashmiri Gate Outer, Circular Road
16	Sheranwala Outer, Circular Road
17	Bhubatian, Raiwind Road
18	Nursery Chowk, Model Town
19	MEO Hospital, Gawalmandi
20	Shah Alam Inner, Circular Road
21	SukhNeher, G. T. Road
22	Kasurpura, Ravi Road
23	Daroghawala, G.T. road
24	Chenab Pully, A. I. Town
25	Karim Block Drain, A. I. Town
26	Double Pull, GulshanIqbal Park

No.	Name of Intersections
27	DalgiranChowk, Brandrith Road
28	Masjid Chowk, DHA
29	Saggian, Bund Road
30	Baba HaiderSayen
31	NayyerwastiChowk
32	Jouray Pull, ZazarShaheed Road
33	Shadman, Roundabout
34	Harbanspura, Canal Bank Road
35	Lal Pull, Canal Bank Road
36	Adda Plot, Raiwind Road
37	Pajian, Raiwind Road
38	Khara, Raiwind Road
39	Manga Mandi, Multan Road
40	Shahadra Chowk, G. T. chowk
41	Shazoo Lab, G.T. Road
42	Peer Ghazi Chowk, Ichra
43	ChowkNakhunda, Misri Shah
44	Total Petrol Pump, Misri Shah,
45	BeghumKot, Sheikhpura Road
46	Double Sarkan, LariAdda
47	LohariChowk/ Hospital Road
48	Zafarshaheed, Railway Station
49	GhasMandi, G. T. Road
50	SheraKot
51	Mori Gate/ Urdu Bazar
52	HaliChowk ,Behind PACE

Source: TEPA

Figure 3.4.28 Location of Junctions Planned for Improvement by TEPA



Source: TEPA

7) Institutional Development of Lahore Metropolitan Road Transport Authority (LRMTA) – By The Urban Unit

Project Description:

The proposed changes in the functional organization are as follows:

1. The Authority should be named Lahore Metropolitan Road Transport Authority (LMRTA) and must assimilate TEPA.
2. The Authority should be a standalone or one under the Transport Department (TD), and should not remain under LDA as there are no common objectives between the LDA and TEPA.
3. The authority should have its own Managing Director holding the titles of DG LMRTA/ Chief Metropolitan Transport Engineer (CMTE) who must control four major functional departments as follows;
 - a. Transport Planning Department
 - b. Traffic Engineering and Operations Department
 - c. QA/ QC/ Safety Department
 - d. Administrative Department
4. Each Department should be headed by its own director and to include staff to perform duties as per Job Description. The staff should generally include:
 - i. Directors of Expert Areas
 - ii. Senior Specialists
 - iii. Technical II
 - iv. Technical I
 - v. Research Associate

The proposed LMRTA shall be instituted to meet the technical demand arising due to increase in traffic conflicts, and deploy the use of advanced concepts and tools to resolve such conflicts. The charter of the Lahore Metropolitan Road Transport Authority (LMRTA) shall be as follows:

Charter of LMRTA – as defined by the Urban Unit

- Constantly and effectively build and maintain the capacity and productivity to address the Transport issues by hiring and retaining professionally qualified staff from internationally recognized universities.
- Standardize Traffic Signals, traffic Signs, Lane markings junction and road design through the implementation of the standards prescribed in the Punjab Traffic and Transport Manual.

- Establish an Intelligent Transport System cell to install area-wide Control Center and mechanisms for the efficient movement of vehicles on roadways and junctions.
- Own, update, and streamline the implementation process of the Lahore Urban Transport Master Plan Projects.
- Provide effective coordination with the Transport Planning Unit of Transport Department to speedily conceive sustainable solutions to the outstanding transport problems and to implement State of the Art Traffic Management techniques
- Ensure transport flow and reduce congestion by optimizing the signal timings relative to the traffic volume, which will reduce delays, fuel consumption and minimize vehicle emission to promote environment friendly transport system
- Improve public transport service delivery by studying feasibility of providing exclusive bus lane at different corridors of the city; which will enhance passenger mobility and reduce travel time
- Improve road safety for road users by conducting road safety audit of the accident prone corridors/ intersections/ stretches in the city and will be responsible for their remedial measures and implementation

Functions of LMRTA – as defined by the Urban Unit

The LMRTA shall exercise and discharge the following powers and functions, such as;

- To plan, prepare and conduct Transport Modelling
- To perform Urban Transport planning studies and to make strategic plans for the sustainability of transport system.
- To develop Transport Management Plans
- To review and approve opening year and twenty (20) year Traffic Impact Analyses for the new developments
- To develop and implement Regional Impact Assessment and the associated monetary infrastructure concurrency Procedures for large developments.
- To conduct the Pre-feasibility and Feasibility Analyses of Streets, Highways, and Expressways.
- To develop, promote, design, and implement BRT/HOV systems and infrastructure
- To establish sustainable Rail Rapid Mass Transit System (RMTS)
- To classify and develop a numbering mechanism of Streets, Highways, and Expressways.
- To design comprehensive plans for Traffic Signals.

- To develop complete system and proper mechanism for Traffic Signing and Marking and its Maintenance.
- To Design Roadway Traffic Lighting Plans and to make improvements by recognizing the deficiencies in the design
- To install Traffic Telemetric Devices and Systems.
- To design and install Wrong-way signals.
- To Design Bus Rapid Transit (BRT) and High Occupancy Vehicle Lanes (HOV) and to make comprehensive strategies for its sustainability.
- To design Rail Rapid Mass Transit system and to develop strategies for the future.
- To recognize Utility Conflicts to Transport infrastructure and to make plans for its improvements.
- To develop comprehensive and high quality Intelligent Traffic System to meet the international standards.
- To develop, implement, improve, and maintain Urban Traffic Control System.
- To establish a comprehensive Incident Management system.
- The authority would also be responsible for road closures, detour plans, and general Maintenance of Traffic through Work Zones and for Special Events.
- To plan, design, maintain and improve Bus Stations and Truck Stops and Public Rest Areas.
- To conduct traffic and other necessary surveys.
- To carry out the signalized and un-signalized Intersection Studies and its improvements.
- To perform Interchange Studies
- To perform Parking Studies and to prepare Parking Systems and Plans.
- To develop a comprehensive plan and mechanism for Weigh Station.
- To carry out Pedestrian Studies and to make plans for pedestrian safety.
- To conduct Arterial Studies and develop plans for corridor improvement.
- To plan, design, and implement Traffic Calming Measures on Streets and Roadways
- To perform comprehensive Network planning Studies.
- To carryout Ramp Metering Studies
- To conduct Toll Plaza studies and manage and control Toll Plaza Operation
- To perform Expressway Merge, Diverge, Weaving, On-ramps, and Off ramps Studies
- To conduct Signal Timing, Phasing, and Coordination Studies.
- To develop complete roadway plans.

- To review the Roadway Design Plans and to ensure their compliance and adherence to the standards provided in the latest versions of the Punjab
- Geometric Design Manual (PGDM) for Streets, Roadways, and Expressways; and the Punjab Traffic and Transport Manual (PUTTM); and any other manual providing guidelines and policies for the Safe, Uniform, Efficient, and Pedestrian Friendly design of Roadway Plans for livable cities; as may be developed or updated from time to time by the Transport Department or the Urban Sector Policy and Management Unit (P&D Department).
- To perform Safety Audit Studies and to take appropriate actions for the improvement of safety.
- To conduct Mass Transit Studies.
- The authority would perform Park and Ride Studies and would make plans for improvements.
- The authority would also be responsible for providing and conducting Traffic related Training of Traffic Police Wardens.
- To plan and conduct Seminars on different topics for the improvement and sustainability of the Transport system.

Status:

Proposal by the Urban Unit

Location/ Area:

Lahore (Metropolitan) Area

Estimated Cost:

No Cost Estimate available

Financial Source:

GoPb

Schedule:

Proposal stage

Implementation:

Planning and Development Department, GoPb

8) Establishment of Multimodal Truck Terminal in Sheikhpura

Project Description:

This terminal will facilitate the General Public with Spacious (*sic*) sitting arrangements, waiting halls, canteen, parking areas, and CCTV Cameras for safety point of view. Project pertains to Building and Road components and will be carried out by the Engineering staff

of District Government through skilled pre-qualified contractors under the supervision of the consultant.

Status:

Land has been acquired for the Terminal, whereas the contractor and consultant will be hired for the construction and supervision.

Location/ Area:

Sheikhupura Lahore Bypass, location map is reproduced in Figure 3.4.29.

Estimated Cost:

No Cost Estimate available

Financial Source:

City District Government of Sheikhupura, GoPb

Schedule:

2011 – Onward

Implementation:

City District Government of Sheikhupura

Figure 3.4.29 Location Map of Sheikhupura Truck Terminal



Source: City District Government Sheikhupura

9) Traffic Education and Travel Behavior – by Traffic Police

The objective of this program is to improve the travel behavior on road by providing complete knowledge of road sense. This is only possible through proper setup of educational institutes and through other media programmes. The main purpose of this traffic education will be;

- Awareness to general public about traffic rules and regulations;
- To maintain road discipline among road users;
- To sensitize the public regarding significance of road safety;

- To educated students who play an efficient role to sensitize the citizen about traffic discipline.

The established goals of this program to produce awareness about; Traffic Rules, Traffic Signals, Traffic Signs, Line/ Lane System, Cell Phone, Seat Belt, Helmet, Lights/ Indicators, LCD, Pedestrians and about valid driving licensing.

Project Description:

(i) On-going Programmes of Traffic Education

- To visit all the Academic Institutions to deliver lectures on Road Traffic;
- To approach all quarters of the society through special programs and special campaigns;
- Public Seminars and Workshops on Traffic awareness;
- To hold Traffic Weeks, Traffic Walks, Traffic Rallies, Traffic Mela;
- TV Programs;
- Literature distribution like leaflets, pamphlets, and handbills

(ii) Planned Programs of Education

- Summer Camps
- Traffic Internship Program
- Arrange Traffic Campus
- TV Talk Shows
- Traffic Awareness Campaigns in professional and traders organizations;
- Working with Private Sector;
- Working with Government Institutions;

(iii) Proposed Projects of Traffic Police for Traffic Education

- Establishment of Authorized Driver Training Institutions
- High Profile Traffic Instructors Courses
- Professional Training of Traffic Officers
- Traffic TV Channel
- Theme Village
- Short Refresher Courses for Traffic Wardens;
- Public Service Messages on Electronic Media

Status:

Following things has been achieved and others are either in pipeline or in proposed stage;

1. City Traffic Police, Website: www.ctplahore.gop.pk

All requisite information about traffic rules and regulations, traffic education brochures, traffic police works and units, campaigns, licensing forms, first aid information, contacts, new updates etc.

2. 24 Hour Helpline, “1915”

- General Traffic info on roads;
- Closures/ Diversions Plans
- Guidance about directions, routes, means of transport
- Information about license, traffic ticket, fines, etc.
- Repairs, digging, road cuts, and constructions;
- Accident/ fire information;
- Alerts on emerging situation, mob action, processions,
- Vehicle breakdown help;

3. Radio Channel, Rasta FM 88.8

- Every 5 minutes traffic updates;
- Bus, trains, flights updates;
- Breaking news and regular updates,
- Latest weather reports,
- Traffic talk, public calls etc.

Location/ Area:

Lahore District

Estimated Cost:

No Cost Estimate Available

Financial Source:

GoPb

Private Sector for Publicity Campaigns

Schedule:

On-going, and 2011 – Onward

Implementation:

City Traffic Police of Lahore

10) Traffic Management Plan of City

City Traffic Police is concentrating strongly on road engineering with the coordination of TEPA and other concerned agencies. Over the last few years, Traffic in the Lahore city has become a great challenge for Higher Authorities. Management and Planning Cell of City Traffic Police deal with this matter. They are planning new routes for better and

smooth Traffic circulation.

City Traffic Police already has the following capabilities to deal with the traffic of Lahore;

- Traffic wireless control system;
- Radio channel “88.8 FM” for public awareness;
- Help line 1915 to help and guide the traffic;
- Information through website, www.ctplahore.gop.pk;
- Best internal communication system;
- Effective VVIP/ VIP route management;
- Lahore is divided in to 37 traffic sectors to regulate and manage the flow of traffic.

Traffic Police is still facing big traffic issues in managing the traffic of Lahore, and therefore has established Planning and Management Cell to look after up to some extent and wants to improve through other small planning projects;

Project Description:

Traffic Police wants to improve the existing capabilities for improvement in traffic management for city of Lahore through following proposed measures;

- Increase in traffic management sectors of Traffic Police for Lahore;
- Improvement in communication system;
- Setting new wireless control units;
- Separate traffic unit against encroachment;
- Separate traffic Anti-Parking unit;
- Mobile workshops;
- Health treatment for operating officers;
- Coordination with head of markets

Status:

Proposals will be prepared and discussed with GoPb. Help of international agencies will be taken in this regard for enhancement of traffic management capabilities of Traffic Police;

Location/ Area:

Lahore District

Estimated Cost:

No Cost Estimate Available

Financial Source:

GoPb

Public Private Partnership

Schedule:

2011 – Onward

Implementation:

City Traffic Police of Lahore

3.4.3 Planning Direction

In the context of above discussion on traffic management situation; north of Lahore, especially surrounding areas of the Walled City; is suffering with stark issues of mobility and accessibility, worsening through various factors, contributing directly or indirectly such as traffic safety, non-motorized traffic, heterogeneous traffic, lack of parking facilities, encroachments, etc.

South of Lahore is the recent development over the last few decades; whereas north is the old development which continued to expand in a radial pattern from the Walled City without any traffic and transport planning. This resulted in deterioration of existing transport environment, critically impacting the socio-economic conditions of this area. This area has mixed land use of service sector, restaurants, educational institutions etc. and believed as the CBD area of Lahore District.

1) Improvement of Traffic Management of Surrounding Areas of the Walled City

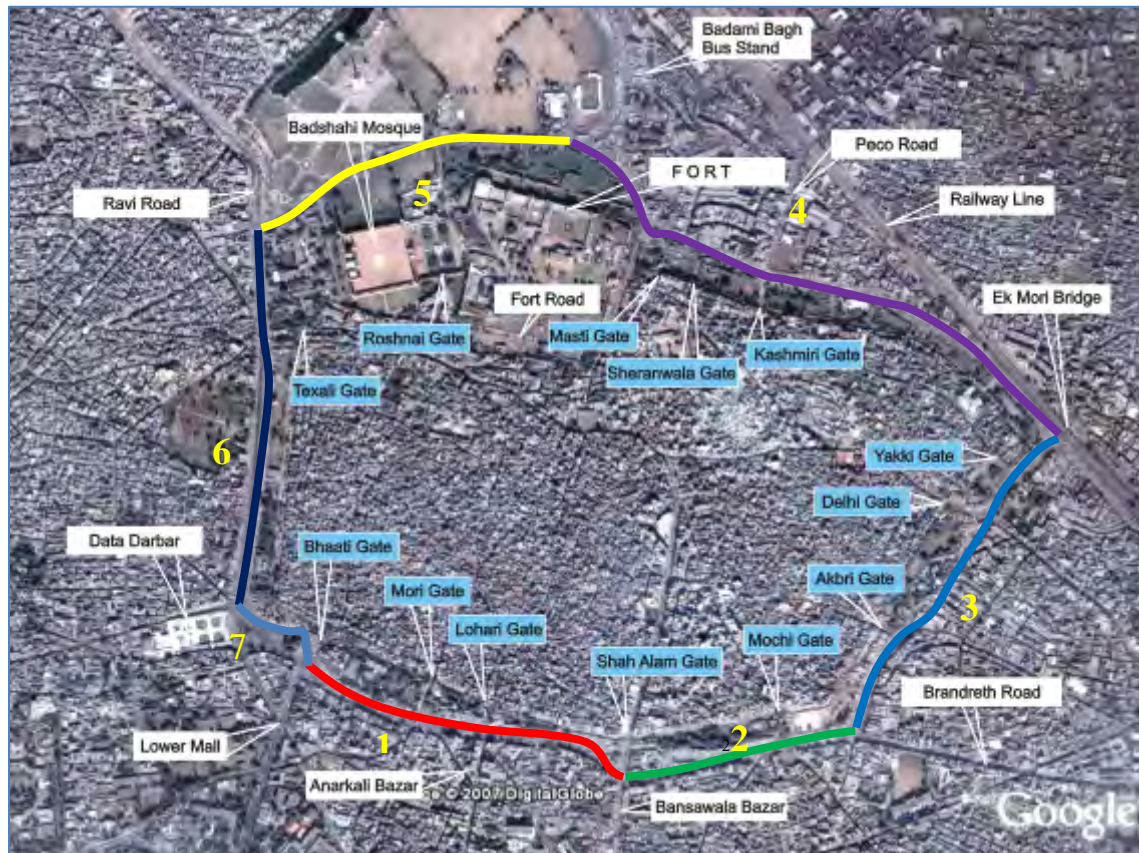
The table below shows the observed average travel speed on the Circular Road surrounding the Walled City, the traditional trade centre of Lahore. During afternoon to evening period, travel speed on the Circular Road drops sharply along most of its sections. In addition, it is reported by TEPA that there are at least 68 bottleneck intersections at present in the surrounding areas of the Walled City.

Table 3.4.2 Average Travel Speed of Circular Road by Section, 2008

No.	FROM	TO	Average Speed (Km/h)			Length Km	Average Km/h
			Morning	Afternoon	Evening		
1	BhatiChowk	ShahalmiChowk	28	14	9	1.00	13
2	ShahalmiChowk	Crown Adda	24	13	11	0.65	14
3	Crown Adda	EikMoria	21	12	9	1.00	13
4	EikMoria	NayyarWasti	28	18	19	1.58	21
5	NayyarWasti	YadgarChowk	27	29	26	0.92	27
6	YadgarChowk	Data Darbar	25	26	19	1.05	23
7	Data Darbar	Bhati Gate	19	18	14	0.35	17
Total Route (Sections 1-7)			25	17	14	6.55	17

Source: LRMTS Study, MVA Asia 2008

Figure 3.4.30 Location of Listed Road Sections



Source: LRMTS Study, MVA Asia 2008.

This needs immediate attention of authorities to conduct a comprehensive traffic management study covering all facets as described above to prepare a pragmatic traffic demand management plan for this area to revitalize its economy and social structure to provide sustainable mobility and accessibility.

LUTMP intends to propose a set of traffic management projects to alleviate the serious traffic situation of this area. Although some projects have a long-term nature, most projects should be implemented in the short- to medium-term. These projects will form the core of the LUTMP Action Plan.

2) Strengthening Management

The Action Plan of LUTMP aims to come up with various counter measure to tackle the following issues.

(i) Rules and Regulations

In general, traffic related regulations are insufficient, ineffective and obsolete; moreover, enforcement of rules is quite weak, which globally implies a chaotic and an in-disciplined traffic on roads, and therefore results in high rates of loss of life, injuries and damages to properties. This is exacerbated by the diversity of the traffic mix in Lahore. The traffic laws

are not applied on cyclists, animal-drawn carts, hand-pushed carts and pedestrians, even though these modes make up around 70% of the total road users. The typical traffic enforcement fines are quite low and are in the range of around PKR 50 to PKR 300. Also there are no appropriate punishments for damaging the road infrastructure; and compensation for a death in a road accident is around only PKR 10,000 with a third party insurance. Road safety is globally declining resulting in increase in number of fatalities per year.

Management of the public space available in Lahore is poor, resulting in disorderly traffic mixed with various modes, many encroachments and illegal parking, and few facilities for pedestrians and cyclists. Lahore is characterized by a disorderly traffic mixed with pedestrians, animal-drawn carts, hand-pushed carts, bicycles, motorbikes, rickshaws, Qingqi, cars, vans, mini-buses, inter-city coaches, trucks etc. The animal driven carts and the other slow-moving non-motorized vehicles need to be eliminated from using the main carriageway and separated from general traffic. These slow modes cause disturbance in traffic resulting in acceleration of other faster passenger vehicles and prompting severe traffic accidents. It is observed that such animal driven vehicles and slow modes are frequently parked beside shoulder or move close to the pedestrians and create many health problems.

Wide spread encroachments of roadside, both permanent and temporary, reveal a lack of parking policy in Lahore; they block sidewalks in many locations and inhibit both pedestrian and vehicular flows. For instance, large solid waste containers are placed on main roads, from where they are hauled away every day. They obstruct traffic and, while this procedure eases solid waste collection, it is clearly contrary to any modern principles of traffic management. Due to encroachments, the slow modes and two wheelers have to come on high speed lanes which make travelling difficult and increase the risk of accidents as well as traffic congestion. There is a strip/ liner commercial development along the transportation corridors without proper offsets, set-backs and access management as per planning and building bye-laws; causing severe encroachments and traffic jam. Moreover, traffic police does not have the adequate authority to remove encroachments.

On the other hand, facilities for pedestrians and cyclists are either non-existent or inadequate. These are the most vulnerable groups and are the victims of 50% road accidents. Most sidewalks are in poor condition or encroached by parked vehicles or commercial activities, forcing pedestrian to walk on the street and therefore affecting traffic safety and vehicle speed.

Figure 3.4.31 Disorderly Traffic Mix in Lahore



Source: LRMTS Study, 2007

(ii) Physical Infrastructure

Management of the physical infrastructure, of particular concern is road maintenance. The poorly developed transport network in Lahore is under-maintained. One of the key weaknesses in the system is indeed relatively low priority given to the maintenance of existing infrastructure. Some roads are in completely dilapidated condition resulting in frequent pavement failures and require full rehabilitation. Road maintenance is generally ignored till reconstruction becomes due and essential. Secondary and tertiary road / drainage networks in lower income parts of the city have been neglected and become impassable in the rainy season for pedestrians and vehicles alike.

(iii) Traffic Control

Traffic control devices include all signs, signals, markings and devices placed on or adjacent to, a street or highway by, and is obviously a key element in managing traffic flow. There is no standard practice of using uniform traffic control devices in Punjab. The only Manual for Uniform Traffic Control Devices available is the NTRC Manual for Signs, Signals and Markings (1989), which has never been modernized. Furthermore, there are many gaps and missing areas in the NTRC Manual e.g. work zone area, school children signage etc. Many of the traffic signals (only 120 in Lahore city) are inoperative and signage system is totally inadequate. In Lahore, traffic signals are largely being managed by TEPA as originally stipulated. There was a period in the late 1990s when the traffic signal functions were re-assigned to an agency responsible for civil works, with the result that most signals ceased to function. In recent years, some signals have been installed and managed by other agencies, such as the GoPb Communications and Works Department, the National Highway Authority (on National Route N-5) and The

Cantonment Board, which is managing about 50 signal installations in the Defence Housing Areas. Similarly, traffic signs and road markings are placed and maintained by TEPA, CDGL and PHA, and also by other agencies engaged in road construction. For the sake of efficiency, uniformity and economy, it would be desirable to combine these functions in a city-wide single traffic agency.

(iv) Management of the Drivers

The current situation in Lahore is also worsened by a weak management concerning the drivers, both private and public transports, with a considerable proportion that are lacking proper training and licensing, while roads are often without basic markings and signage. Commuters and transporter have globally no traffic sense resulting in a chaos like situation. A lack of operators discipline in this complex environment reduces traffic capacity further and increases safety concerns. Traffic police also suffers from inadequate strength and needs further training. There is finally a significant safety issue concerning the motorbikes use, sometimes transporting more than two riders, commonly without helmet for both driver and passengers. The general situation causes a failure to follow traffic rules, which in turns leads to a worsening in levels of congestion and contribute to road accidents rate.

(v) Other Management Issues

Other management issues are the rationalization of on-street parking and occupied road-side space by vendors. It is necessary to remove these encroachments for safe and comfortable pedestrian sidewalks.

Volume-II – Chapter-4

**ENVIRONMENTAL AND SOCIAL
CONSIDERATIONS**

FINAL REPORT

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

4 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**4.1 Present Condition in the Study Area**

In general, existing environment condition is described in several components which further subdivided various environmental items. However, expression of the components and items often varies with projects and relevant competent organizations, government and donors. According to Guidelines for the Preparation of Environmental Reports (Government of Pakistan, November 1997), in order to describe a brief but clear picture of the existing environmental resources the following four components are described:

- i. Physical resources – topography, soils, climate, surface water, groundwater, geology/ seismology;
- ii. Ecological resources – fisheries, aquatic biology, wildlife, forests, rare and endangered species;
- iii. Human and economic development – population and communities, industries, basic infrastructure, institutions, transportations, land use planning etc.;
- iv. Quality of life values – socioeconomic values, public health, recreational sources, aesthetic values, archaeological or historic treasures, cultural values.

In this report existing environment are expressed in three components: i.e. social environment, natural environment and environmental pollution and sub-divided environmental items as mentioned above mostly referring to JICA Guidelines for Environmental and Social Considerations.

- a) Social Environment – Land acquisition and resettlement, local economy, land use and utilization of local resources, social institutions/ split of communities, existing social infrastructure and services, transport and traffic conditions, the poor, indigenous or ethnic people; gender, children's rights, misdistribution of benefit and damage, local conflict of interests, cultural property and heritage, fishing rights, water rights and rights of commons; public health and sanitation, infectious diseases such as HIV/ AIDS, working condition, hazard/ risk, accidents and severance;
- b) Natural Environment – Topography and geology, soil erosion, groundwater, river, canal and storm water drainage; flora, fauna and biodiversity; protected areas, landscape, meteorology, global warming;
- c) Environmental Pollution – Air pollution, water pollution, soil contamination, bottom sediment, waste, noise and vibration, ground subsidence, offensive odor, visual intrusion.

4.1.1 Social Environment

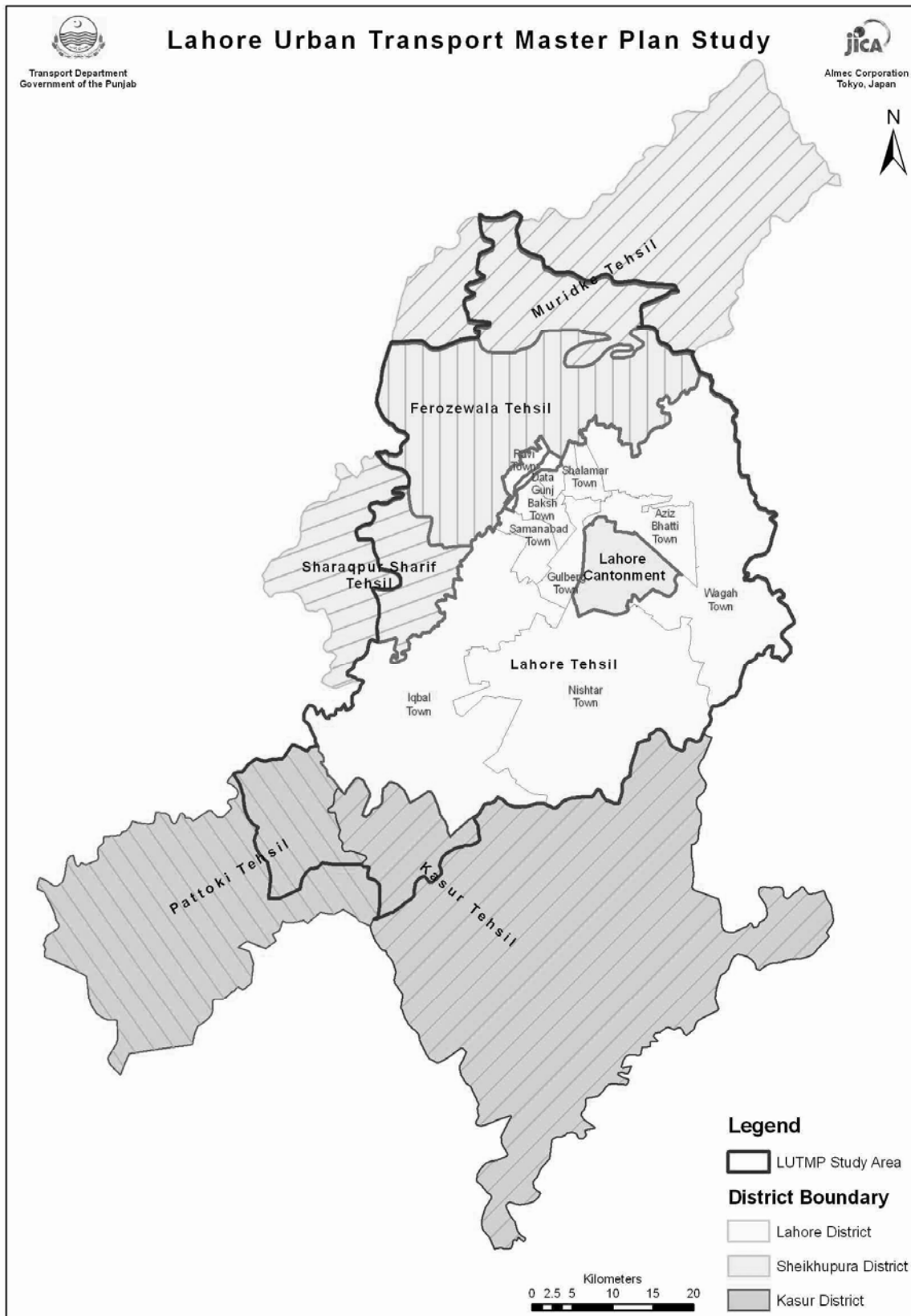
1) Political and Administrative Structure

The Study Area composes of whole of Lahore District, parts of Kasur District, and Sheikhpura Districts as shown in Figure 4.1.1. Tehsil is lower level of administration boundary under district administration in Pakistan. The Study Area includes Lahore District: 2 Tehsils, Lahore and Cantonment; Part of Sheikhpura District: parts of Tehsils of Ferozewala, Muridike, and Sharaqpur; and part of Kasur District: Tehsils Kasur and Pattoki adjoining Lahore District in the South-west and South. Today, Lahore District has spread over 1,772 km²: over 80 % of the total area is occupied by three towns of Iqbal Town, Nishtar Town and Wagha Town.

The administrative structure has been changed after promulgation of Local Government Ordinance (2001). Districts, City Districts, Tehsils/ Towns and Union Council's Administrations have been created. Lahore was declared as City District and divided into six towns. In 2005, six towns were further divided to create nine towns in CDGL (Figure 4.1.1). Now, Lahore City District comprises of nine towns which are administrated by each Town Municipal Administration (TMA). The Lahore cantonment is separately administered by cantonment board and provision of core facilities is the responsibility of Lahore Cantonment Board.

Local Government Ordinance 2001 changed local administration. Before 2001, in urban areas, local bodies which performed services were metropolitan corporations, municipal corporations, municipal committees and town committees; whereas in rural areas, district and union councils performed these functions. After 2001, major local level services have been transferred to local governments. These include primary education, health, water supply and sanitation. Three tiers of local government have been developed in the form of district/ city district, Tehsil/ Town and union council administration.

Figure 4.1.1 The Study Area



Source JICA Study Team

2) Demographic

(i) Population Characteristics

Urbanization in Lahore has spread beyond its administrative boundaries, although the city continues to be the center of the growing metropolis. The total population of the Study Area is 9.9 million; including: Lahore District population of 8.65 million and 0.37 million of Kasur and 0.9 million of Sheikhpura. However, most of the population is concentrated in the center of Lahore, while the rest of the areas are sparsely developed, and mostly rural except for narrow strips along arterial roads showing a ribbon development.

Most recent population analysis of LUTMP Phase-I is given in the Table 4.1.1. 8.6 million People reside in Lahore District and 82% of which are urban dwellers. The population growth rate of 2.7 % since the 1998 Census is much higher than the national and provincial population growth rates of 2.02 % and 2.03% per annum respectively. The Study Area population accounts for 10.6 % of the total population, and 25.5 % of the urban population of the Punjab Province.

The Lahore Urban Transport Master Plan Study Area is about 42 % larger than Lahore District due to inclusion of parts of Kasur and Sheikhpura districts. Rural populace is still dominant in these two adjoining areas and thus urban residents account for 76 % in the Study Area. The reason of inclusion of these two areas into the Study Area is simply to compare the result with the 1991 JICA Master Plan. The population growth rate of 2.59 % of the Study Area is slightly lower than that of Lahore District.

Table 4.1.1 Demographic Comparison – Study Area Context

Description		Pakistan	Punjab Province	Lahore District	Study Area	LUTMP % of Punjab	
1	Area (km ²)	Year	796,096	205,345	1,772	3,044	1.5
2	Population (,000)	Dec-2010	168,258	93,682	8,652	9,928	10.6
3	Urban Population (,000)	Dec-2010	65,330	29,722	7,097	7,572	25.5
4	Urban Population (%)	Dec-2010	39.5	31.7	82	76	-
5	Census Population (,000)	1998 Census	132,352	73,621	6,319	7,307	9.9
6	Annual Growth Rate (% per annum)	1998-2010	2.02	2.03	2.65	2.59	-

Source: Punjab Development Statistics

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(ii) Social Migration

According to 1998 Census, 897 thousand migrants in urban Lahore were reported. It constituted 17.4 % of total urban population. There are three main types of migration, i.e., inter-provincial, intra-provincial and international migration. In the census data, 10.1 % came from other provinces, 71.7 % of intra-provincial migrated from other districts and 16.9 % from other countries. In Lahore, primary reasons of migration are better economic opportunities and larger and high-quality educational facilities.

(iii) Religion

As per percentage of population by religion Muslims account for 97.22 %, Christians about 2.31 %, and Ahmadis 0.2 %. While other minorities Sikhs, Hindus and other are very small in numbers. Population by religion is given in Table 4.1.2.

Table 4.1.2 Population by Religion in Punjab Province (1998)

Religion	Total		Urban		Rural	
	1,000 Persons	%	1,000 Persons	%	1,000 Persons	%
Total	73,621	100	23,019	100	50,602	100
1 Muslim	71,575	97.22	22,156	96.25	49,419	97.67
2 Christian	1,700	2.31	753	3.27	947	1.87
3 Ahmadi	181	0.25	85	0.37	96	0.19
4 Hindu	93	0.13	15	0.07	78	0.15
5 Scheduled Castes	24	0.03	3	0.01	21	0.04
6 Others	48	0.06	7	0.03	41	0.08

Source: Population and Housing Census, 1998

(iv) Ethnic Structure

The main castes and groups of the Lahore District are Arain, Jut, Rajput, Mughal, Sheikh, Komboh, Gujjar, and Pathan. Besides, there are also village artisans, which include Lohars (blacksmith), Tarkhan (carpenter), Kumahrs (potters), Mochis (cobblers), Machhis (water-carries), barbers and weavers etc.

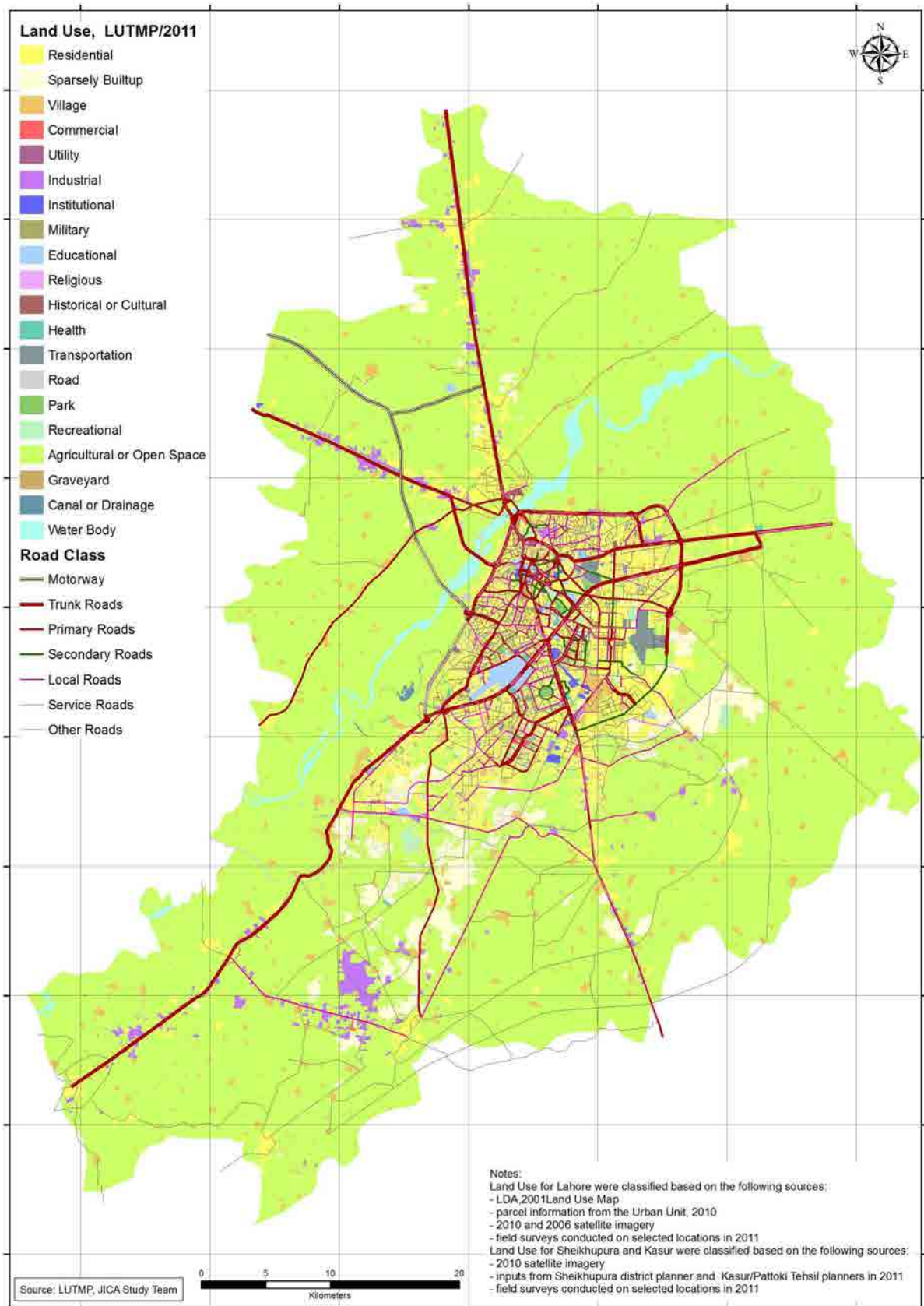
(v) Mother Tongue

As for languages used for communication between parents and their children in any household, Punjabi is predominant (86.2 %), followed by Urdu (10.2 %), Pashto (1.9 %) and Siraiiki (0.4 %), and other (0.13 %).

3) The Study Area Land Use

Land in the Study Area is classified as predominantly agricultural use or vacant except residential, commercial, industrial and transport use in the City area as shown in Figure 4.1.2; and in Table 4.1.3.

Figure 4.1.2 Land Use Map of the Study Area



Source: JICA Study Team

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**(i) Land Use in Lahore Area**

In the Study Area, Lahore City area is characterized by the following three concentric zones which represent the generalized built-up form.

(a) Inner or Central Zone

This zone including the historic Walled City is a combination of residential, commercial and small-scale industrial activities. Non-residential uses like retail and wholesale commerce, cottage industry and warehousing are intermingled with historically purely residential neighbourhoods.

(b) Intermediate Zone

This zone is largely planned as a mixture of housing, its related activities and services.

(c) Outer Zone

This zone represents typical urban sprawl characteristics comprising new housing schemes sponsored by public as well as private sector.

The specialized functions and services are, however, concentrated in the inner zone thereby generating a large amount of travel between these zones and thus the need for an efficient public transport system is amply visible.

Land use data of Lahore Area, which was surveyed in 2001 shows that land is mostly covered by vacant or under agricultural use (76.2 %), followed by residential use (9.8 %) and cantonment (4.0 %). Transportation use including network and terminals use cover about 1.9%.

Table 4.1.3 Land Use in Lahore Area* (2001-2002)

Land use		Area (ha)	%
1	Residential	22,715	9.8
2	Commercial	1,737	0.7
3	Educational	1,419	0.6
4	Institutional	998	0.4
5	Industrial	2,455	1.1
6	Graveyards	637	0.3
7	Parks/Recreational	1,608	0.7
8	Vacant/Agricultural	175,854	76.2
9	Transportation (including primary network and terminals)	4,449	1.9
10	Villages	3,820	1.7
11	Water Bodies	5,711	2.5
12	Cantonment	9,267	4.1
Total		230,670	100.0

Source: Integrated Master Plan for Lahore-2001

* Note: Area Refers to 2001 Integrated Master Plan Study area.

(ii) Land Use for Agricultural Activity

The agriculture land use is most commonly cultivated in the Study Area are wheat, fodder, cotton, and rice.

4) Socio-economic Structure

(i) Household (HH) Structure:

According to Integrated master Plan for Lahore-2001 household size of Lahore has been progressively growing over past 40 years. In Lahore District, it increased from 5.8 (persons per HH) in 1961 to 7.2 (persons per HH) in 1998. According to LUTMP household survey average household size in the Study Area is 5.6. This shows a considerable decline since 1998 census. These changes in household size can be attributed to the following reasons:

- In the process of urbanization, male member of the family first moves to an urban area and other members join him in due course;
- The house ownership in low income group is very restrictive, joint family system prevails, consequently the household size increases over a period of time;
- For economic reasons and rising cost of living, the people whether having blood relation or not, prefer to live and expend together.

(ii) Household Condition

According to Population Census 1998, about 68 % of total population of Lahore owned a house, 22 % rented a house and the rest stayed free.

Lahore city is facing severe shortage of housing. Although data are limited and not recent, two milestone statistics of 1980 and 1998 showed the situation. Majority of these housing units comprised two to three rooms, with 3 inhabitants per room on average. During this period, the number of inhabitants per unit increased from 6.7 to 7.1. It is an adverse phenomenon not experienced in other countries where household size becomes small as a city grows with economic development. Such household congestion is attributed to high density in urban areas of Lahore.

In addition, the most severely affected segment of the population is the low income group. In urban areas (over 70 % of the annual incremental demand for housing is of low income group who find it extremely difficult to secure developed land plots and construct houses in the schemes by the public sector and cooperative societies.

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(iii) Household Income Distribution

Household income distribution in Lahore of 2000-01 is calculated by using base data of household income distribution survey of Punjab (Urban) for the year 1996-97 and is outlined in Table 4.1.4.

Table 4.1.4 Household Income Distribution in Lahore (2000-01)

Household (%)		Monthly Household Income (PKR)* (1996-97)	LUTMP (Urban + Rural)	
			% HH	Income
1	0.47	< 1,000	< 2,000	0.2
2	1.26	1,001-1,500		
3	3.19	1,501-2,000		
4	5.74	2,001-2,500	2,000-4,000	1.1
5	6.18	2,501-3,000		
6	7.68	3,001-3,500		
7	7.8	3,501-4,000		
8	15.24	4,001-5,000	4,000-6,000	3.7
9	12.17	5,001-6,000		
10	8.48	6,001-7,000	> 6,000	95
11	31.79	> 7,000		

Note 1: * Household Integrated Economic Survey, 1996-97

Source: Integrated Master Plan for Lahore-2001

Recent data on the distribution of average household income per annum was reported by Urban Unit Lahore, 2007-08 as given in Table 4.1.5. The table indicates majority of the households (20 %) earn about PKR 200,000 to PKR 300,000, about 19 % earn PKR 100,000 to PKR 150,000 and only less than 2 % earn less than PKR 50,000 per annum. These figures show that most of the people living in Lahore earn reasonable amount of money to support themselves as compared to other cities and rural areas of the Punjab.

Table 4.1.5 Distribution of Household Income in Lahore

Household Income (PKR/year)	% of HH in Lahore	% of HH in the Study Area
1 < 25,000	0.7	0.2
2 25,000 - 50,000	1.4	1.1
3 50,000 - 75,000	5.5	3.7
4 75,000 - 100,000	10.0	7.5
5 100,000 - 150,000	18.9	18.6
6 150,000 - 200,000	15.5	17.4
7 200,000 - 300,000	19.5	17.9
8 300,000 - 500,000	13.0	18.0
9 > 500,000	12.7	15.7
10 Don't know	2.8	0.0
Total	100.0	100.0

Source: The Urban Unit, Lahore, 2007-2008

(iv) Human Development Index

Human Development Index (HDI) is a tool of measuring development by combining indicators of life expectancy at birth, adult literacy rate, mean years of schooling, educational attainment and income as measured by real gross domestic product per capita. The HDI is used as a comparative measure to assess life expectancy, literacy and standards of living with other countries worldwide. It is also a standard means of measuring well-being, especially child welfare and is used to distinguish whether the country is a developed, a developing or in under-developed stage, and also to calculate the impact of economic policies on quality of life. Data for estimating the district HDI has been gathered from 1998 population census, 2004-05 Core Welfare Indicator Questionnaire (CWIQ) and Pakistan demographic survey (1999 and 2003). Three indices (Health, education and income) have been developed, and mean values of these indices have been used to calculate HDI.

As detailed in Table 4.1.6, Lahore District enjoys better human development than other three cities of the Punjab. At the same time it attained the top ten ranking among the cities of Pakistan. According to UNDP categorization of high (more than 0.80), medium (0.50 to 0.80) and low (below 0.50) level of development, Lahore District emerges in medium level and near to high level HDI.

Table 4.1.6 Human Development Index of Lahore District and Other Cities of Punjab

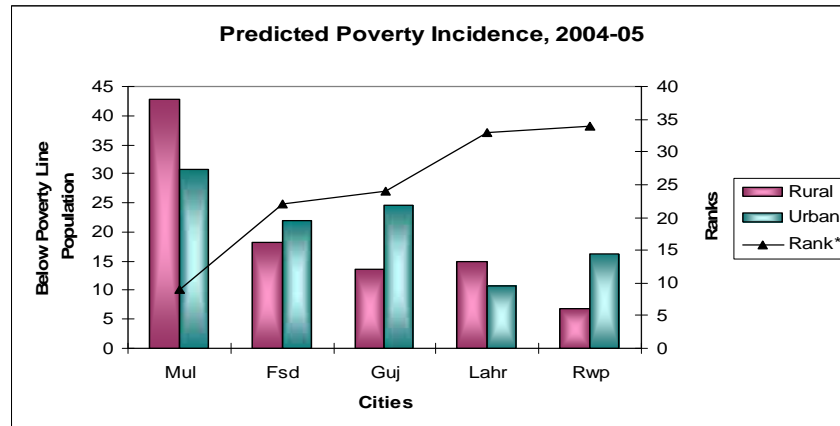
	Area	HDI (2005)	HDI (1998)	Annual Rate of Change (% p.a.)
1	Punjab Province	0.620	0.516	2.7
2	Gujranwala	0.696	0.562	3.1
3	Lahore	0.689	0.600	2.0
4	Faisalabad	0.672	0.600	1.7
5	Multan	0.643	0.531	2.8
6	Rawalpindi	0.638	0.600	0.9

Source: Aamir and Haroon (2007)

(v) Poverty Incidence

The poverty incidence is calculated by estimating the percentage of people who live below the poverty line within the district. Among the five major cities of the Punjab, Lahore shows a middle level development but rural population is much poorer than urban population. Lahore as whole is at 33rd rank among the districts of the Punjab indicating that the poverty is lowest in Lahore and Rawalpindi then other districts of Punjab as illustrated in Figure 4.1.3.

Figure 4.1.3 Punjab Estimated Poverty Incidence 2004-05



Source: Social Development in Pakistan, SPDC Annual Review 2006-07

(vi) Industry Profile of Lahore

Land use the Study Area is mostly either vacant or agricultural field as detailed in Table 4.1.7. However, as for industrial activities as well as living conditions Lahore District has a different feature as the second largest financial hub of Pakistan. There has been a steady expansion of industries in and around Lahore since independence. Many large industrial units and modern industrial areas are located. These industrial units consist of textile, leather and rubber footwear, pharmaceutical and other industries.

The 2001 Integrated Master Plan for Lahore reported the following features of the industry in 1999:

- About 9,000 cottage and small to large scale manufacturing industries were operating in Lahore. The spectrum of industries extends from organized, large and medium sized industries, and unorganized traditional cottage industries. The latter known as the micro/cottage and small scale industries constitute an important segment of the economy. These provide maximum employment and ensure maximum utilization of local resources, both manpower and materials.
- Large scale manufacturing industries are registered under 77 categories. In 1999, out of 8,468 industrial establishments only 1,239 (about 15 %) are registered. As given in Table 4.1.7, 18.2 % of the total factories belong to metal products, followed by machinery other than electrical (13.8 %), textile products (12.6 %), food manufacturing group (7.2 %).

Table 4.1.7 Registered Factories in Lahore District (1999)

Group		Number	%
1	Food items	89	7.2
2	Beverages	24	1.9
3	Textile	156	12.6
4	Leather, Rubber and Plastic Industry	76	6.1
5	Electric machinery	70	5.6
6	Metal Industry	226	18.2
7	Machinery	171	13.8
8	Printing/Stationery	76	6.1
9	Chemicals	50	4.0
10	Building Materials	28	2.3
11	Pharmaceuticals	52	4.2
12	Transport Equipment	81	6.5
13	Furniture	13	1.0
14	Service Industry	85	6.9
15	Miscellaneous	42	3.4
Total		1,239	100

Source: Integrated Master Plan for Lahore-2001

Out of 1,239 registered factories in Lahore, 84% have employed up to 50 persons each as shown in Table 4.1.8. In addition, Kasur and Sheikhpura District small and medium size industries of textile and food processing are also located.

Table 4.1.8 Number of Employees in Industry (1999)

Number of Employees		%
1	< 10	24.6
2	10 to 50	59.6
3	51 to 100	7.3
4	101 to 250	4.7
5	251 to 500	2.0
6	501 to 1,000	0.8
7	> 1,000	1.0
8	Total	100.0

Source: Integrated Master Plan for Lahore-2001

(vii) Labour Force

In Punjab, labour force ('working' plus 'looking for work') accounted for 32 % of the provincial population during the period 2006-07. In the urban areas, an unemployment rate of 7.5 % is rather high than that of 4.7 % in the rural areas. Recent provincial statistics do not show district-level labour force. When working population had a share of 29.4 % in the provincial population during the period 2003-04, its share was 22 % in

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Lahore District due to the mass of students and other reasons. According to the labour survey done by the Urban Unit during 2007-08, Lahore labour force is characterized as mostly service workers by occupation type, social services, trades and commercial activities by industry type.

(viii) Participation of Labour Force by Occupation

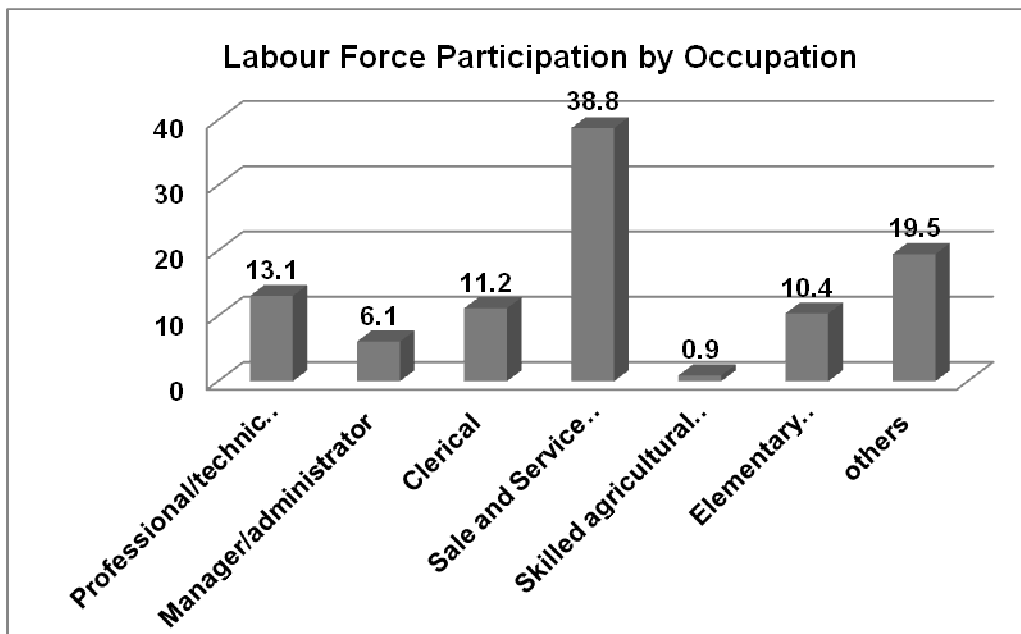
It is clear that 39 % people have been employed in the service sector during 2007-08 in Lahore, which is a significant increase from 19 % in 1998. Skilled agricultural people are very low in number and there is no prominent improvement in their ratio from 1998 to 2008. Comparison of occupation in Punjab Province and Lahore District is shown in Table 4.1.9, and Labour Force Participation by Occupation is shown in Figure 4.1.4.

Table 4.1.9 Major Occupation Groups in Punjab Province and Lahore District

Major Occupation Group		Employed Population (%)			
		Punjab Province		Lahore District	
		Jun-05		1998	2007-08
		Total	Urban		
1	Professional/Technician	6.1	11.2	14.5	13.1
2	Manager/Administrator	11.4	21.0	0.8	6.1
3	Clerical	1.2	2.8	4.7	11.2
4	Sale and Service Worker	4.8	8.8	19.2	38.8
5	Skilled agricultural worker	35.8	6.2	2	0.9
6	Elementary occupations	18.8	15.7	43	10.4
7	Others	21.8	34.4	15.8	19.5
Total		100.0	100.0	100.0	100.0

Source: Survey by The Urban Unit, Lahore

Figure 4.1.4 Labour Force Participation by Occupation in Lahore District



Source: Survey by The Urban Unit, Lahore

(ix) Distribution of Labour Force by Industry

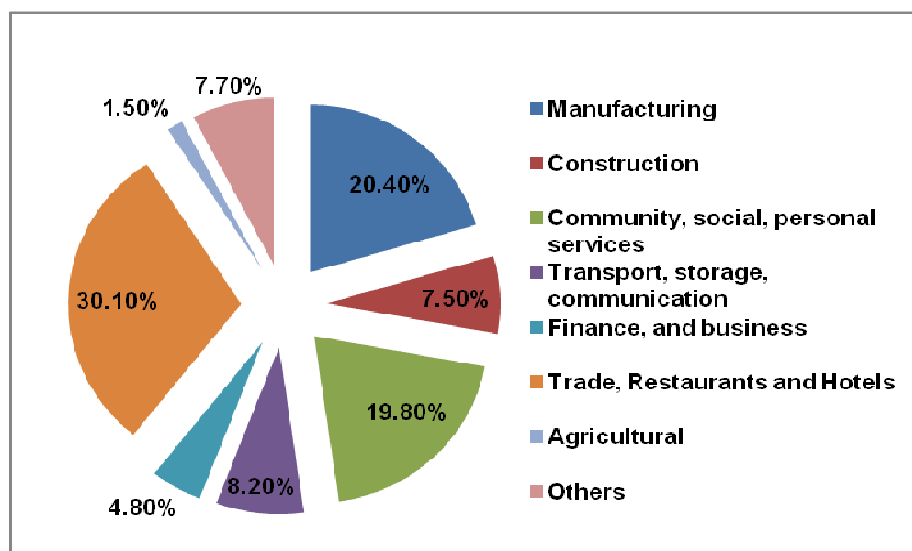
In Lahore majority of people (30 %) works in trade, restaurants and hotels sector followed by (20 %) in manufacturing sector. This is remarkable contrast with that of the Punjab Province as a whole, where agricultural sector was dominant as shown in Table 4.1.10 and Figure 4.1.5.

Table 4.1.10 Labour Force Distribution in Punjab Province and Lahore District

Industry	Employed Population (%)		
	Punjab Province	Lahore District	
	2006-07	1998	2007-08
1 Manufacturing	15.4	10.1	20.4
2 Construction	5.6	27.3	7.5
3 Community, social, personal services	13.7	19.1	19.8
4 Transport, storage, communication	5.3	7.5	8.2
5 Finance and business	1.0	6.6	4.8
6 Trade, restaurants and hotels	14.1	16.9	30.1
7 Agricultural	44.4	2.2	1.5
8 Others	0.6	10.4	7.7
Total	100.0	100.0	100.0

Source: Survey by The Urban Unit, Lahore

Figure 4.1.5 Distribution of Labour Force by Industry



Source: The Urban Unit, Lahore (2007-08)

5) Social Infrastructure and Services

(i) Water Supply

(a) Existing Water Supply Situation

According to Water and Sanitation Agency (WASA), of LDA, water in Lahore City is supplied by WASA for about 85% population of Lahore City, whereas about 11 %

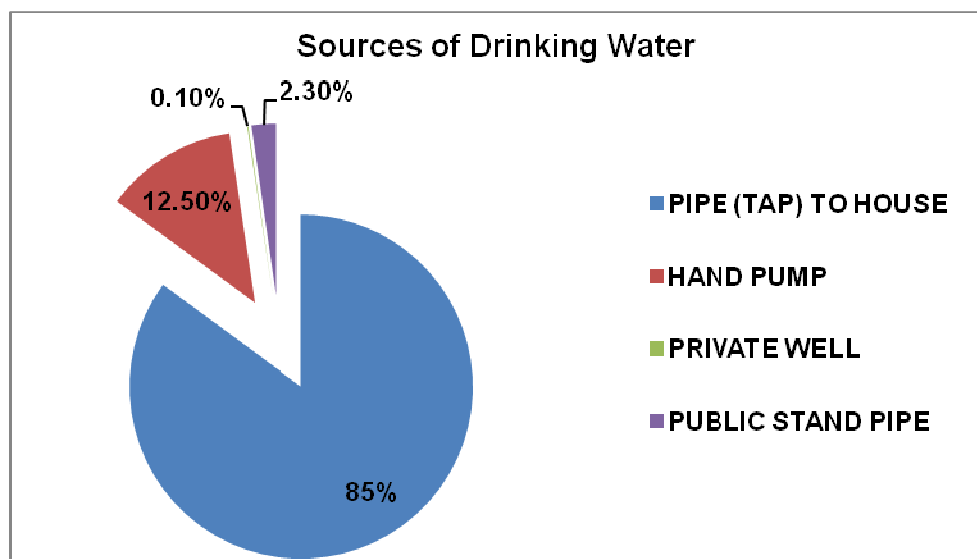
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population is supplied by the Lahore Cantonment Board and remaining 4 % population is provided by the others such as Railways Housing Societies or are reliant on own tube well or groundwater pumping (manual) system. WASA and Housing Societies base their water supply on groundwater abstraction within Lahore area. Tube-wells in various locations have been installed for pumping of groundwater, which is generally pumped directly into distribution system of WASA, while the Housing Societies have over-head tanks. Water supply system within Lahore is designed to provide water at an average rate of 363 litres per capita per day as per WASA statistics.

The Household survey of 2007-08 indicates that 85 % people were using potable (tap) water, and the rest 10% people were dependent of their personal hand pumps. These figures are not different from that of 1998, where 10 % population was using hand pumps for drinking water.

The quality of deep groundwater is potable and is adequate for direct consumption without treatment. As shown in Figure 4.1.6, 85 % people use tap water for drinking purpose from groundwater for drinking purpose in 2007-08.

Figure 4.1.6 Distribution of Household by Sources of Drinking Water in Lahore



Source: Survey by The Urban Unit, Lahore

(b) Water Supply Problems

In the Study Area water supply has fairly good situation in both quality and quantity. However, following issues are to be considered:

- a) 30 % to 40 % water is being wasted due to leakages in the system, unmetered and illegal connections, incomplete distribution system, etc.
- b) Only 70 % houses in WASA service area are provided with water connections.

The remaining houses are either without water connection or they have their own arrangements or illegal connections.

- c) There is excessive abstraction of groundwater resulting in depletion of water table at an unsustainable rate.

(ii) Sewerage and Drainage

WASA Lahore provides its sanitation services to very large portion of population, i.e., 80 % of Lahore population over 66 % of the city area. According to WASA Report 2005-06, in Lahore, there are about 405 km of sewer lines and 41km of drainage channels. These were originally designed as separate systems. However, sewer pipes are connected to drains at various points and a large amount of sewage constantly enters storm water drains at various points and is ultimately disposed into the Ravi River.

People are constantly, especially in summer months, complaining about the stench generated from wastewater and raw sewage in open channels, which are also full of sludge and garbage. Flood is attributed to the reduction of flow capacity of sanitary sewers and storm water drainage channels, which are silted up and clogged with solid waste. In addition, pumping stations do not have sufficient drainage capacity to cope with heavy rains in the monsoon season.

(a) Sewerage System

In Lahore WASA is responsible for sewerage system. In 2001 sewerage system in WASA service area catered for about 55 % of the population. The sewerage system consists of 405 km of trunk sewers and 3,205 km of lateral sewers. The sewage is pumped to the storm water cum sludge drains in various sewerage districts of WASA. These drains ultimately dispose of sewage into Ravi River. Presently no wastewater treatment services exist and the raw wastewater is directly discharged into Ravi River thus causing unhygienic condition in the river as well as for the downstream users. The situation is very critical under low flow condition in the river when sufficient dilution is not available and the river almost serves as a sludge carrier. All life form in the River is almost dead due to complete depletion of dissolved oxygen in the water.

(b) Storm Water Drainage

Lahore is comparatively a flat area with a mild slope towards south-western side. There are natural barriers like River Protection Bund along Ravi River, Railway track which divides the city into Northern and Southern parts and the Canal which runs east-west and is situated on the ridge. Therefore, the following five main natural drainage channels run on the lowest contours and finally discharge into Ravi River:

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- Upper Chotta Ravi (Northern Area)
- Lower Chotta Ravi (North Western Area)
- SukhNehr (North Eastern Area)
- Mian Mir (Central Area)
- SuttoKatla-Hudiara Drain (Southern Area)

At present urgent rehabilitation project for sewerage and drainage system is in progress in Lahore through technical cooperation with WASA by JICA. Storm water drainage has become a major environmental hazard. The situation becomes worse in the monsoon season which normally extends from July to September.

The storm water drains also function as sludge carriers. Almost all drains are flowing to their full capacity even in the dry weather and after only a light rainfall start to overflow. Encroachment along and over the drains have further deteriorated the situation. The dumping of solid waste in the drainage system is very common. Another bottle neck in the operation is the low head clearance of bridges across the drains, which reduces the waterway of the drains thus affecting their capacities.

(iii) Electricity

According to Population and Housing Census (1998), 97 % people of Lahore and 93 % people of Punjab Province had access to electricity for their common use. In Lahore area (most of the district) electricity is served to about 1.2 million consumers as of December, 2000. Out of these 75 % are residential, 22 % commercial and 3 % industrial consumers. The electricity is supplied through an interconnected 132 kV system comprised thirty-eight 132/ 11 kV grid stations. Water and Power Development Authority (WAPDA) is the agency responsible for installation, operation, maintenance, upgrading and augmentation of the electricity network. LESCO (Lahore Electric Supply Company) is responsible for its distribution, billing and control of leakage.

However, even now scheduled power stoppages are common several times a day due to system break-down and mostly shortage of supply, this causes inconvenience to living activities and are serious impediment to business activities. The existing system of power supply reveals that the network is relegating towards inefficient operational level and there is an imperative need for regular reinforcement and rehabilitation for better services.

(iv) Educational Facilities

In Punjab Province as a whole, various enrolment rates by education stages during 2007-08 were estimated as follows:

- Primary education (5-9 years) – 38.5 %
- Middle education (10-12 years) – 27.0 %
- High school education (13-14 years) – 18.8 %
- Intermediate stage education (15-16 years) – 10.8 %
- Degree level education (17-18 years) – 4.9 %

(Source: MICS Survey, Punjab, 2007-2008)

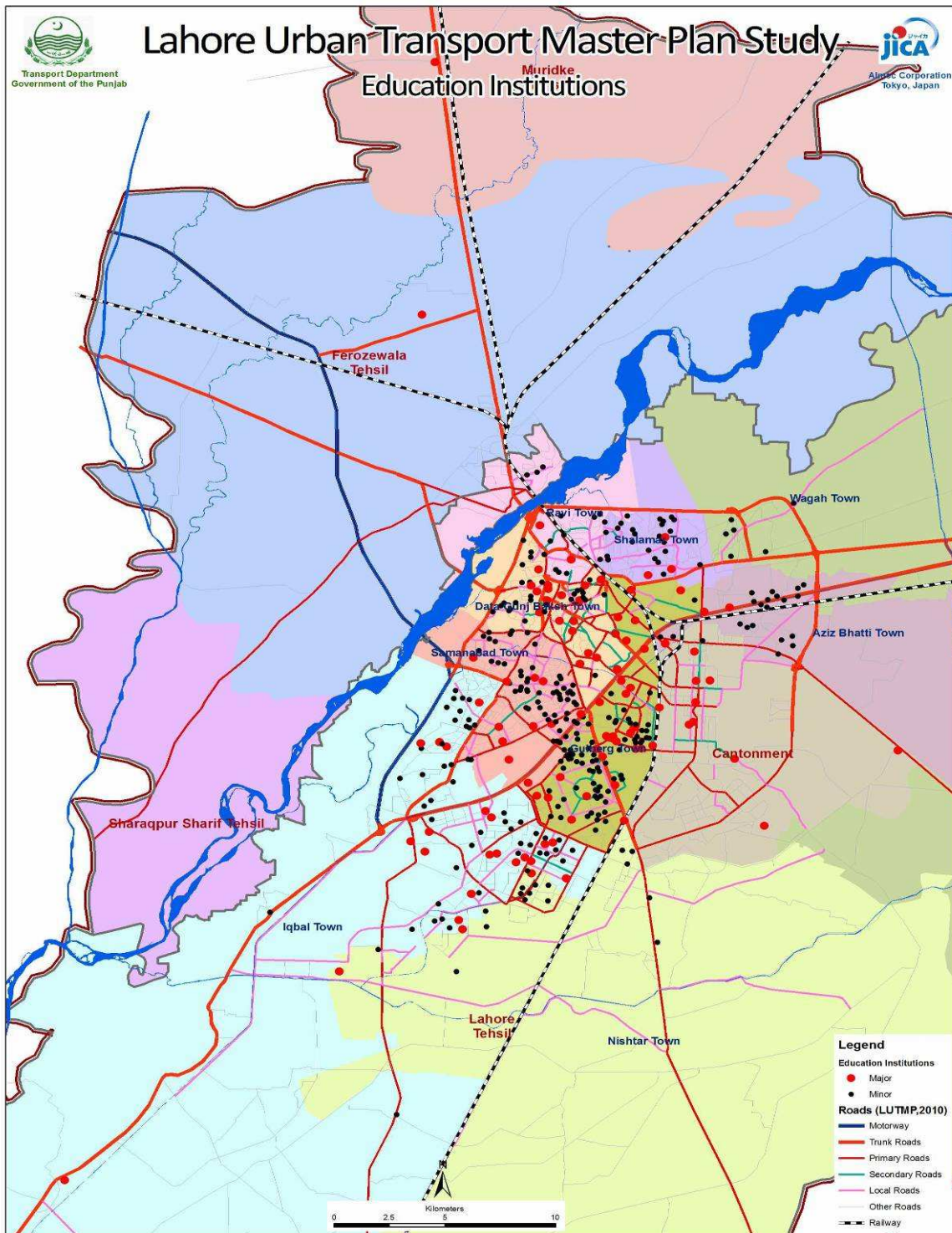
The 1998 Census indicated that the literacy rate of urban dwellers in Lahore District was about 69 % which was slightly higher than that of provincial urban average of 65 %. It is thus supposed that enrolment rates of Lahore by education stages may be higher than the above-mentioned provincial averages.

Lahore is known as an educational hub in the country. High schools and higher educational facilities are concentrated in the city and are shown in Figure 4.1.7. The number of all types of students is estimated at approximately 883 thousand. 651 thousand of which go to high schools or higher education facilities and they mostly need longer trips to the education places than primary and middle school students.

In Lahore, there are 24 universities. 11 universities are relatively new, mostly established after 1990. The largest university is University of the Punjab (30,000 students), followed by the University of Lahore (11,500 students), and University of Engineering and Technology (UET), Lahore (8,865 students).

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Figure 4.1.7 Distribution of Educational Facilities in the Study Area



Source: JICA Study Team

(v) Health**(a) Major Diseases**

Table 4.1.11 indicates that the total new case of priority diseases reported in the first quarter of year 2001, were just over 80,000 among which about 21,600 cases (27 %) were related to children under the age of 5 years. Seven of the 18 priority diseases, i.e. diarrhoea, dysentery, respiratory infections, malaria, cough, dog bite and scabies accounted for 39 % of the total new cases, during the first three months of the year 2001. In the year 2000, total new cases reported in Lahore were over 671 thousand. Among these 61 % were females and new cases less than 5 years were 20 % of the total.

Table 4.1.11 Priority Diseases in Lahore District (Jan-March, 2001)

Group		Number of Cases (Age)			%
		Under 4	5 and over	Total	
1	Diarrhea	5,926	6,111	12,037	24.6
2	Dysentery	905	1,782	2,687	59.6
3	Acute Respiratory infections	12,616	41,639	54,255	7.3
4	Fever (Clinical Malaria)	735	3,766	4,501	4.7
5	Cough more than 2 weeks	4	522	526	2.0
6	Dog bite	122	218	340	0.8
7	Scabies	1291	4,405	5,696	1.0
8	Total New cases (Priority diseases)	21,599	58,443	80,042	100.0
9	Total New cases (All diseases)	39,395	164,649	204,044	-

Source: Integrated Master Plan for Lahore-2001 (Directorate General Health Services, Punjab)

(b) Health Facilities

There are 40 hospitals distributed all over Lahore in 2001 as given in Table 4.1.12 and there are 153 dispensaries with 68 beds and 117 Maternity and Child Health Centre (MCH) in Lahore District. In addition to these, there is one Rural Health Centre with 20 beds, a civil dispensary and a MCH Centre in Sheikhpura District. According to Punjab Development Statistics 2008, 42 hospitals, 114 dispensaries, 38 BHUs, 12 SHUs and only 2 TB Clinics are operating in Lahore. These are further illustrated in Figure 4.1.8 below and their locations in the Study Area are shown in Figure 4.1.9.

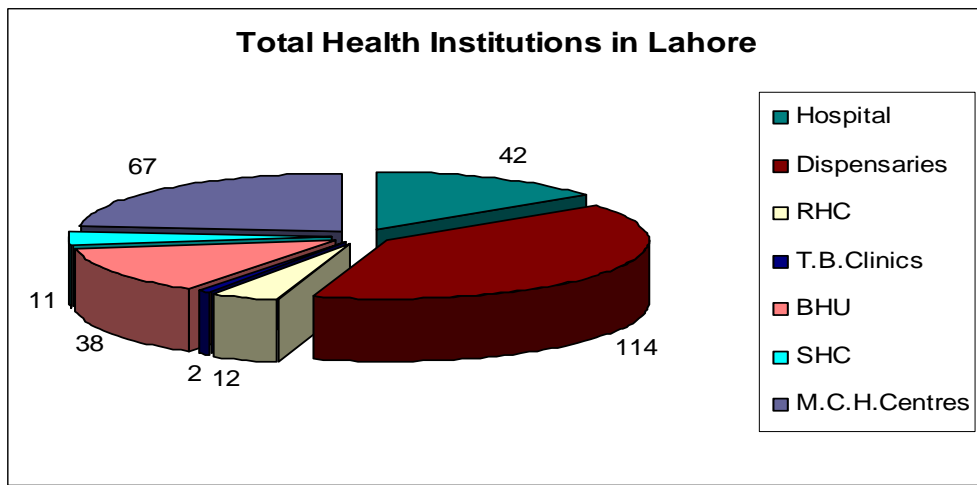
Table 4.1.12 Number of Hospitals in Lahore

Status	Hospital	Beds	Doctors/Specialists	
1	GoPb Hospitals	23	9,235	2,449
2	Federal Government, Autonomous, Semi-autonomous, Local Bodies, Army Hospitals	7	1,903	571
3	Trusts, NGOs, Waqf and other hospitals listed with DGHS	10	1,133	299
Total		40	12,271	3,319

Note: Listed with Director General of Health Services, Lahore

Source: Directorate General Health Services, Punjab

Figure 4.1.8 Health Infrastructure in Lahore



Source: Punjab Development Statistics, 2008

(c) Problems and Inadequate Facilities

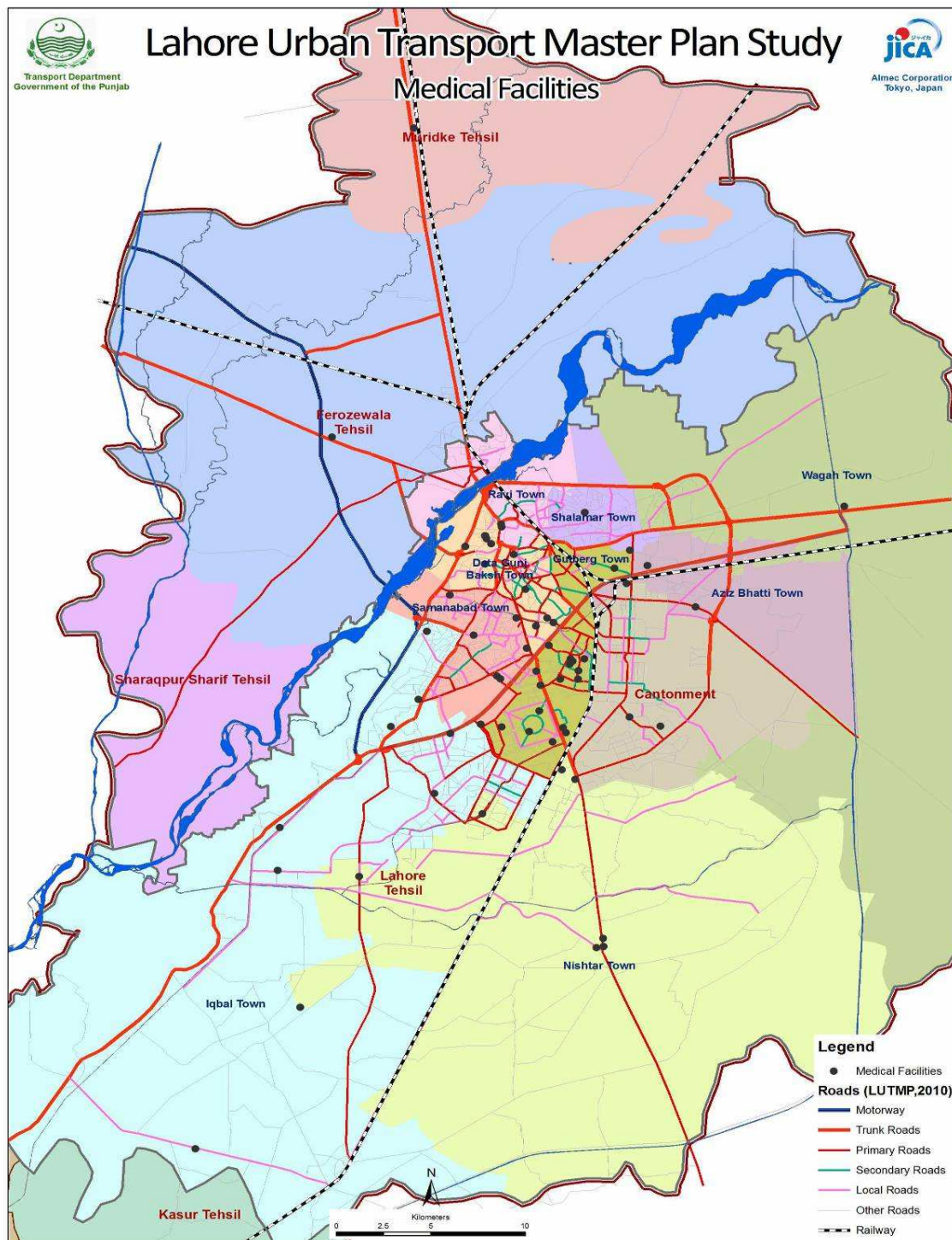
In the Study Area the problems being faced by the health sector include:

- inadequate primary health care,
- high rate of population growth,
- prevalence of communicable diseases,
- managerial deficiencies,
- inadequate funding, and
- manpower imbalances.

Thus, these lead to the following critical issues:

- a) The public sector hospitals, which serve the majority of low and middle income segments of society, are not able to cope with the continuously increasing healthcare needs of the fast growing population.
- b) There is an acute shortage of hospital beds, nurses and para-medical staff in the hospitals.
- c) Primary health care facilities (dispensaries, NCH etc.) are quite inadequate.

Figure 4.1.9 Distribution of Medical Facilities in the Study Area



Source: JICA Study Team

(vi) Recreational Facilities

Lahore provides numerous recreational and amusement facilities not only to the local population, but also caters for the needs of the adjoining areas. The facilities include cinemas, theatres, parks and open spaces, sports facilities, museums, social and sports clubs and libraries.

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(vii) Cultural, Historical and Religious Sites

In the Study Area, especially in Lahore City, various cultural, historical and religious sites can be found. Their locations are depicted in Figure 4.1.10.

(a) World Heritage Sites

Out of six World Heritage sites in Pakistan there are two World Heritage sites in the Study Area. One is the Walled City Area including Lahore Fort and Badshahi Mosque and the other is Shalamar Garden.

(b) Archaeological Sites and Monuments

There are 59 sites in Lahore District and 8 sites in Sheikhpura District as the notified archaeological sites and monuments by the Federal Government

(c) Monuments Declared as “Special Premises” By the GoPb

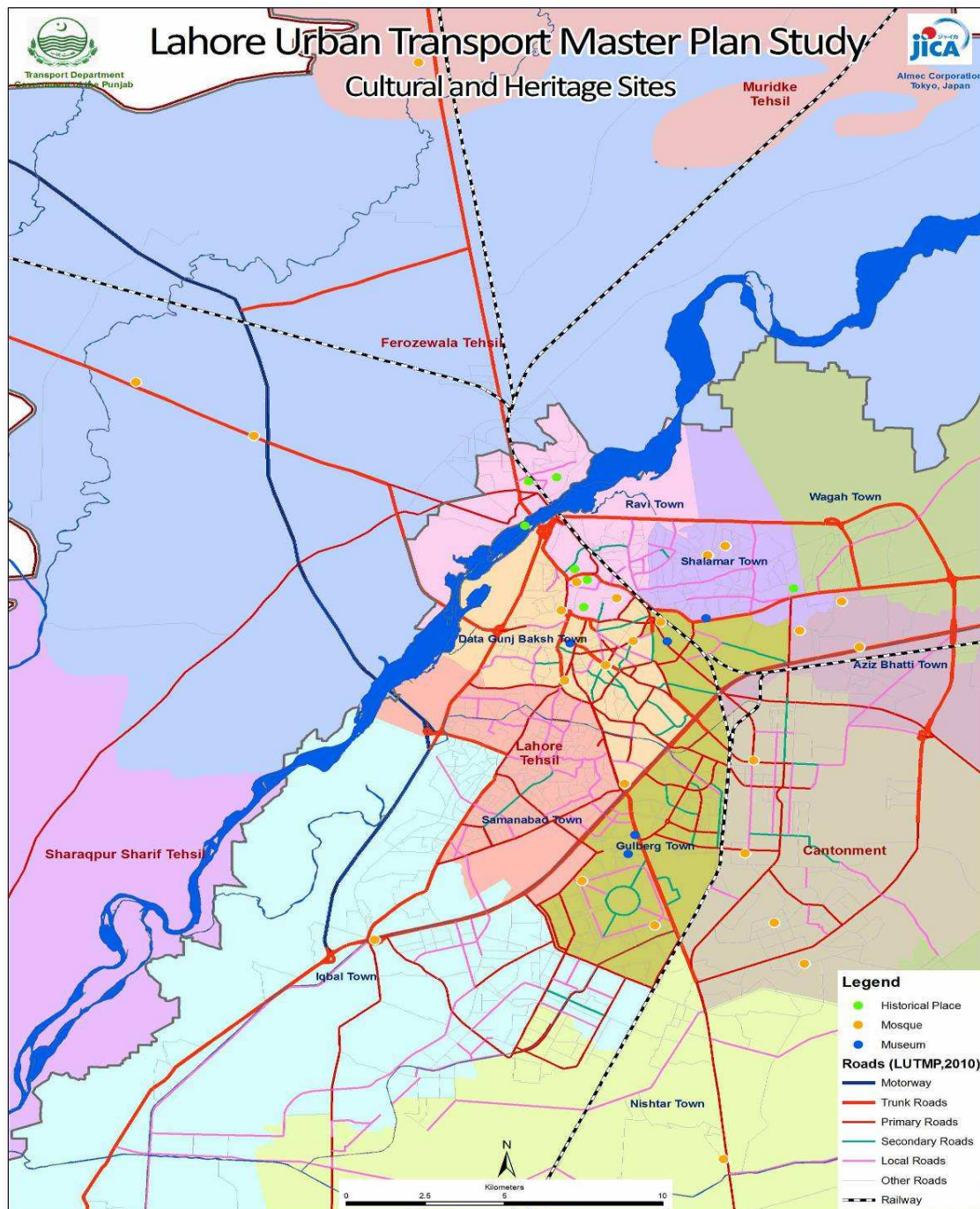
There are 109 sites in Lahore District, 3 sites in Kasur District and 2 sites in Sheikhpura District, which are declared as “special premises” in Punjab Special Premises (Preservation) Ordinance, 1985 by the GoPb.

(d) Religious Buildings in Lahore City

Lahore has a rich heritage of beautiful mosques and shrines of saints. The famous mosques in Lahore include the Badshahi Mosque, Masjid Wazir Khan, Sunehri Masjid, Masjid-e-Shohda, and Mosque of Data Darbar Complex. The maintenance and upkeep of large mosques and shrines is the responsibility of the Provincial Auqaf Department. The shrines are the core of religious gatherings and an integral part of Lahore’s cultural and historical legacy. The famous shrines of saints are those of Pir Makki, Syed Ali Hajveri (Data Ganj Bukhsh), Maadho Lai Hussain, Bibi Pak Daaman, Mian Mir Saheb and Mauj Darya. Almost all shrines include a grand mosque within their premises.

In addition, a number of Cathedrals, Convents and Churches mostly located along the major city roads are the visible and beautiful land marks of the British Colonial rule. These include Cathedral on the Mall, St. Anthony’s Church on Lawrence Road, Don Bosco and Naulakha Churches on Empress Road, and Convent of Jesus and Mary on Durand Road. Quite a few buildings/ structures such as Temples, and Gurdawaras depicting Hindu and Sikh religious faiths can be seen scattered all over the older parts of the city.

Figure 4.1.10 Cultural and Heritage Sites in the Study Areas



Source: JICA Study Team

4.1.2 Present Condition in the Study Area - Natural Environment

1) Geological Location

The Study Area is located on a flat alluvial plain along the bank of Ravi River. Lahore District lies between 31°15" and 31°42" north altitude, 74°01" and 74°39" east longitude. It is bounded on the north and west by Sheikhupura District, on the east by India (international border) and on the south by Kasur District.

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**2) Climate****(i) Climate data**

Climate data average of 30 years (1961-90) of Lahore for the recent 5 years (2006-10) is given in Table 4.1.13 and 4.1.14.

Table 4.1.13 Climate Data in Lahore Average of 1961-90

Month	Temperature (°C)		Precipitation (mm)	Relative Humidity (%)	
	Mean Monthly Max.	Mean Monthly Min.		at 8:00 a.m	at 5:00 p.m
January	19.8	5.9	23.0	83	46
February	22.0	8.9	28.6	75	41
March	27.1	14	41.2	65	37
April	33.9	19.6	19.7	49	27
May	38.6	23.7	22.4	42	22
June	40.4	27.4	36.3	50	29
July	36.1	26.9	202.1	72	54
August	35.0	26.4	163.9	77	60
September	35.0	24.4	61.1	70	49
October	32.9	18.2	12.4	66	40
November	27.4	11.6	4.2	76	47
December	21.6	6.8	13.9	84	52
Year Total	—	—	628.8	—	—

Source: Meteorological Center, Lahore

Table 4.1.14 Climate Data in Lahore Average of 2006-10

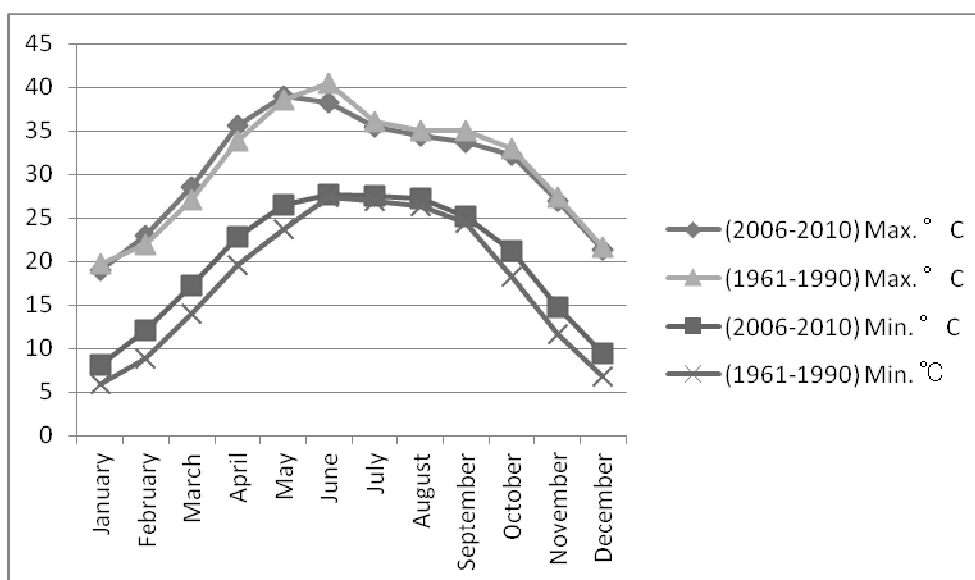
Month	Temperature (°C)		Precipitation (mm)	Relative Humidity (%)		Wind Speed (Knots)	
	Mean Monthly Max.	Mean Monthly Min.		at 8:00 a.m	at 5:00 p.m	at 8:00 a.m	at 5:00 p.m
January	19.0	8.1	12.7	81	52	0.7	2.5
February	23.0	12.1	30.6	77	48	1.1	3.2
March	28.5	17.3	33.0	68	41	1.3	3.7
April	35.6	22.8	12.1	44	23	2.3	3.9
May	39.0	26.5	18.3	43	25	2.8	3.2
June	38.3	27.7	75.6	54	36	3.0	3.2
July	35.4	27.5	156.8	75	58	2.0	2.6
August	34.5	27.2	149.2	79	65	1.5	2.3
September	33.7	25.2	72.8	76	57	1.2	2.3
October	32.3	21.1	11.0	71	43	0.5	1.8
November	27.0	14.7	4.1	78	48	0.3	0.8
December	21.4	9.4	11.4	83	52	0.3	1.0
Year Total	—	—	587.6	—	—	—	—

Source: Meteorological Centre, Lahore

(ii) Temperature

The project area experiences extremes of climate condition. The summer season starts from April and lasts till September. Hottest months are May, June and July. The monthly mean maximum and minimum temperature during these months varies between 27 °C and above 40 °C. The winter season lasts from November to March. December, January and February are the coldest months with minimum temperature reaching close to freezing point. Mean minimum and maximum temperatures for the winter period is around 6 °C to 22 °C respectively. Net temperatures data of recent 5 years (2006 -10) and earlier 30 years (1961 – 90) are given in Tables 4.1.13, 4.1.14 and illustrated in Figure 4.1.11.

Figure 4.1.11 Monthly Mean Maximum and Minimum Temperature in Lahore

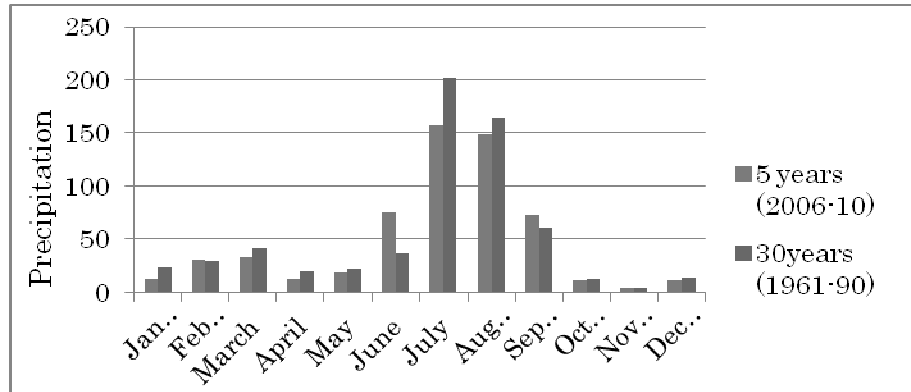


Source: JICA Study Team

(iii) Rainfall

Rainfall varies year to year and also month to month. The Study Area receives rains in all seasons. However, monsoon rain is pronounced and constitutes a definite rainy season between the months of July and September. Data of average monthly precipitation based on recent 5 years (2006-10) and 30 years (1961-90) as given in earlier tables is further compared in Figure 4.1.12. The average annual precipitation is 629 mm for the 30 years and 588 mm for the recent 5 years, respectively indicating a definite reduction in rainfall due to climatic changes, may be attributed to increased carbon emissions and global warming.

Figure 4.1.12 Mean Monthly Rainfall (mm)

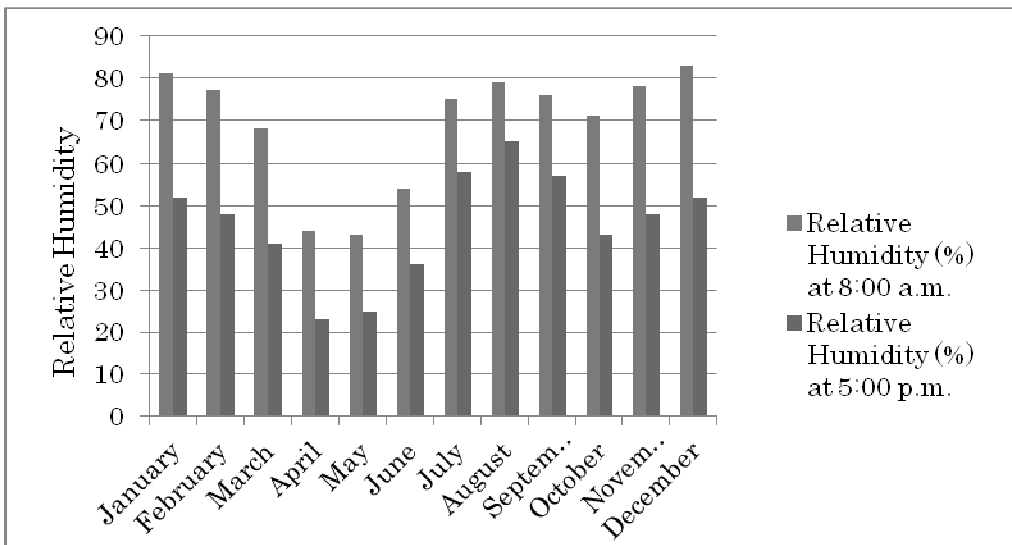


Source: JICA Study Team

(iv) Relative Humidity

Relative humidity throughout the day is higher in winter months than in summer months as compared in Figure 4.1.13. May and June are very hot and dry months during which dust storms occur occasionally.

Figure 4.1.13 Relative Humidity at 8:00 a.m. and at 5:00 p.m. (2006-2010)



Source: Meteorological Centre, Lahore

(v) Wind

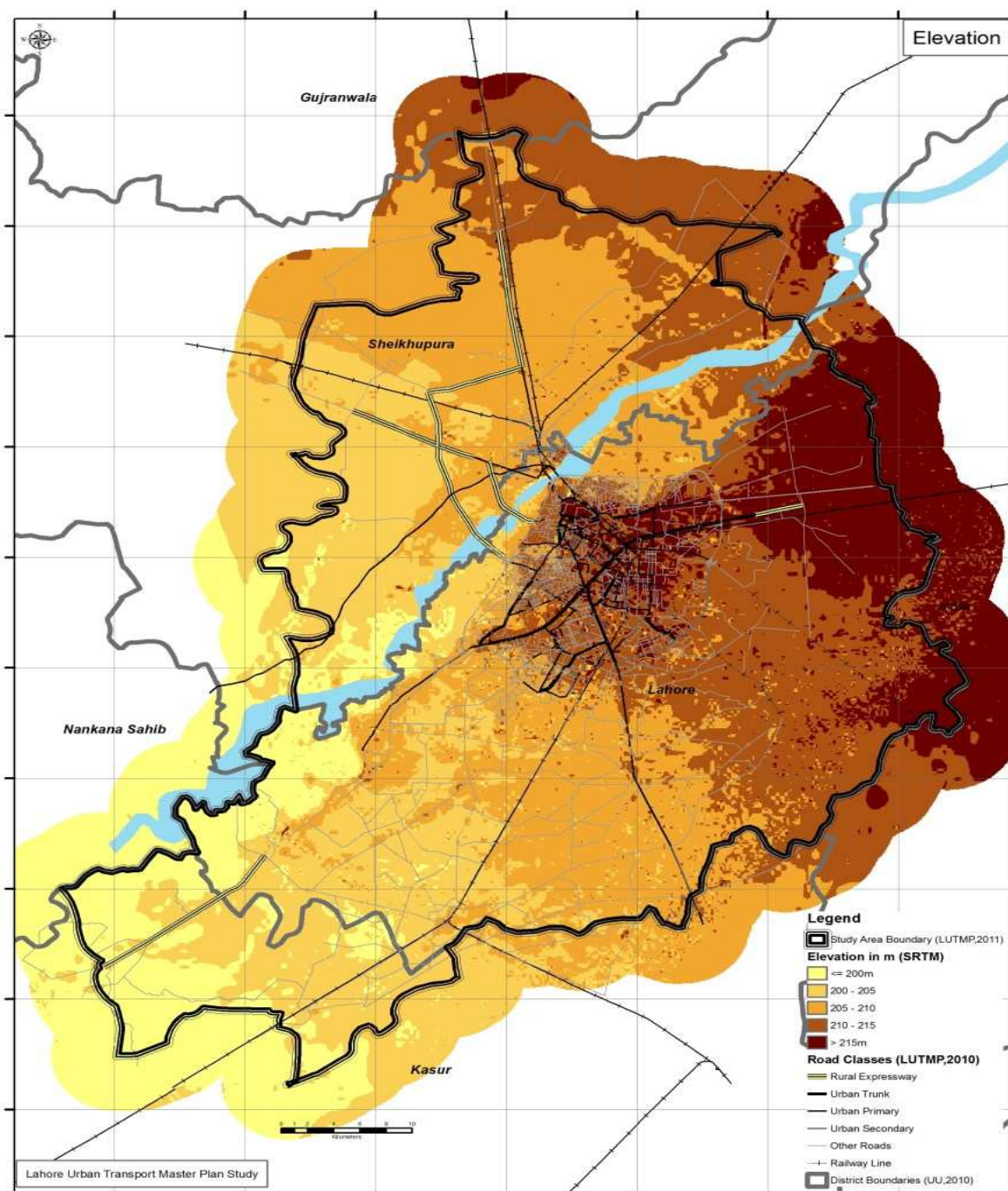
According to wind data for the year 2008, calm winds were observed 56 % of the time with wind speed of 3 m/ sec recorded 15 % of the time. The predominant wind directions are South-east and North-west with speed ranges of 3 to 6 m/ sec. In winter (November to February) the predominant directions are West and North-west, and in summer months (March to June) the predominant direction is South-east, while in Monsoon season (July to October) the predominant direction is South West.

3) Topography, Geology and Soil Conditions

General altitude of the project area is about 208 m to 213 m above sea level. The terrain

conditions are generally flat and gently sloping towards south and south-west at an average gradient of 1:3,000. This area may be divided into two parts, the low lying area along Ravi River and the comparatively upland area in the east away from Ravi River. The low lands are generally inundated by the river water during monsoon floods and heavy rain because of poor drainage conditions. The Study Area elevation is depicted in Figure 4.1.14.

4.1.14 The Study Area Land Elevation

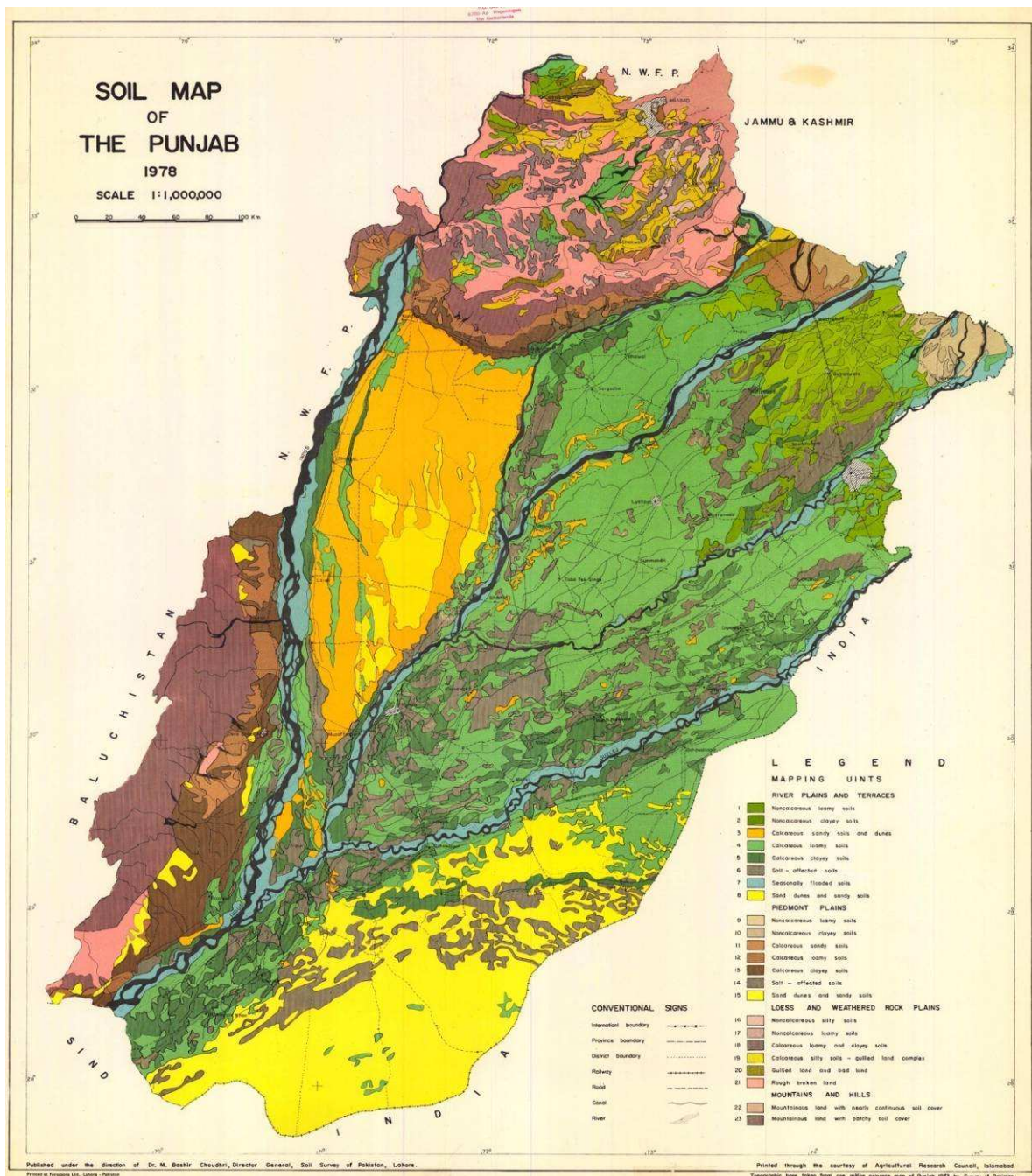


Source: LUTMP GIS Database

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

The soil of the Study Area is cohesion-less and is of alluvial type deposited by Ravi River. Various soil layers below the ground level includes: silt, silt-clay, silt-sand, poorly graded sand with silt, lean clay etc. According to the soil map of Punjab (Figure 4.1.15), seasonal flooded soil distributes along Ravi River, salt-affected soil is dominant in Sheikhupura District, and non-calcareous and calcareous loamy soil distribute in Kasur District and outside of the Lahore district area.

Figure 4.1.15 Soil Map of Punjab Province



Source: Soil Survey of Pakistan (1978)

4) Water Bodies, Groundwater and Drainage Conditions

(i) River, Canals and Drainages

Water bodies in the Study Area are Ravi River and its tributaries, canals and various drains, as shown in Figure 4.1.16. The Ravi River is a trans-boundary river flowing through North-western India and North-eastern Pakistan. It is one of the six rivers of Indus System in Punjab region. After the partition of Sub-continent in 1947, the waters of the Ravi River, along with other five rivers of the Indus System, i.e. Beas, Sutlej, Ravi, Chenab, Jhelum and Indus, divided Pakistan and India under the Indus Basin Water Treaty.

Ravi River used to be one of the main sources of fishing and recreation for Lahorites till 1960's, when the river started getting polluted due to the indiscriminate disposal of municipal as well as industrial effluents. During the dry season, this municipal and industrial discharge may exceed the river's own base flow. As the Ravi River is also one of the sources of recharge to the groundwater aquifer of Lahore, the disposal of untreated effluents including toxic substances into the river may have negative impacts on the groundwater quality of Lahore. In order to assess the pollution status water quality monitoring was started from 1988 for various effluent channels disposing of in Ravi River by Pakistan Environmental Protection Agency.

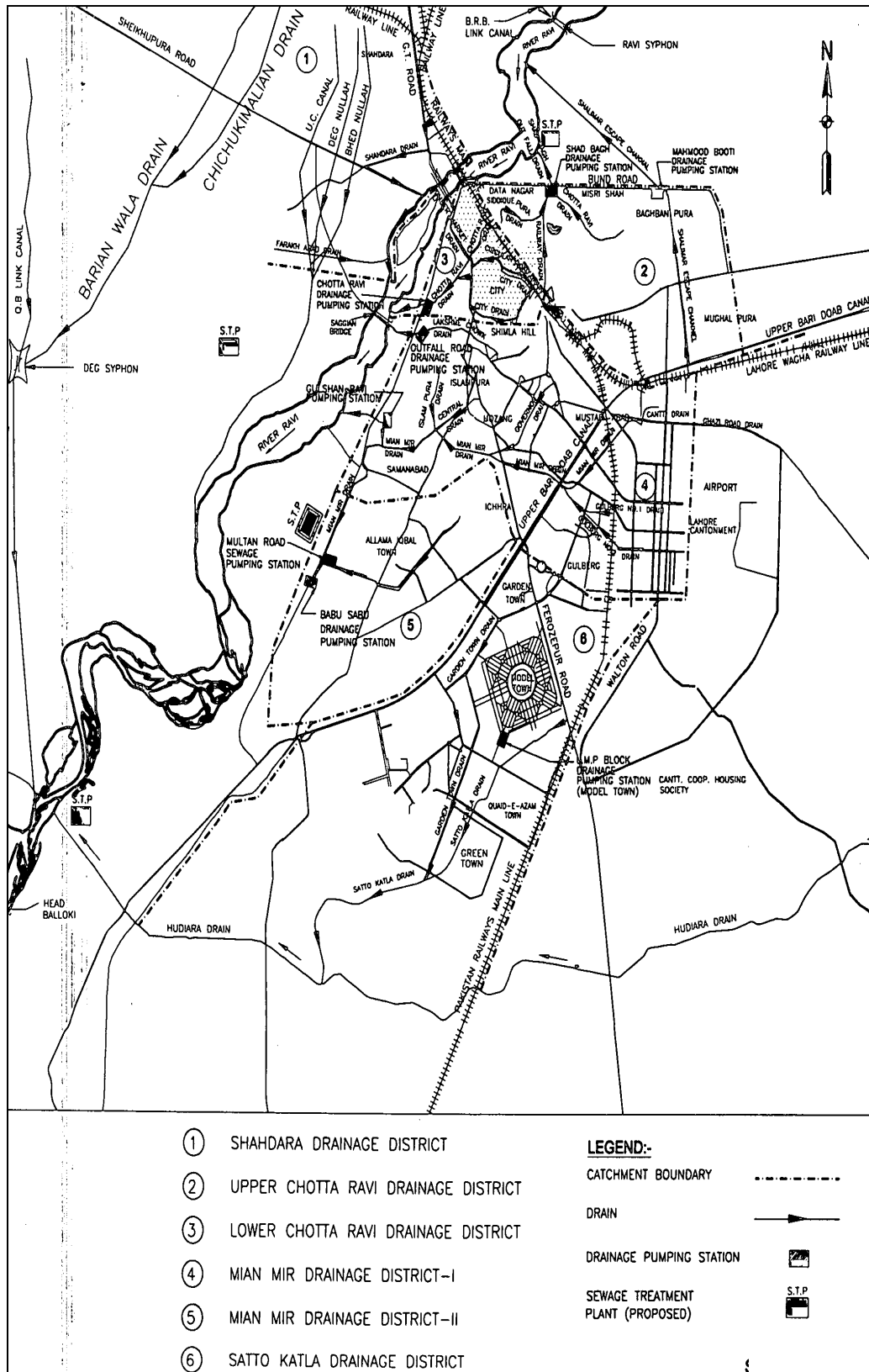
(ii) Groundwater

Project area is blessed with rather good groundwater resource in quality and quantity. Chemical quality of groundwater in the area varies with depth. However, the sweet potable water in a belt five to twenty miles wide paralleling the Ravi River. Groundwater is abstracted from aquifer by means of tube wells located throughout the area and served for drinking water for citizens.

(iii) Floods

Population growth in Lahore with its increasing economic prosperity has led to unauthorized encroachments upon the flood plains of Ravi River. In this river, low to medium floods of less intensity and frequency have created a "false sense of security" among the flood plain dwellers and residents in the adjoining neighbourhoods. The city has seen two catastrophic river floods during 1955 and 1988. The 1988 flood caused unprecedented damages to the city of Lahore and surroundings. All the flood protection facilities were damaged. Some 1,200 ha (3,000 acres) of urban settlements (Shahdara and surroundings) on the right bank got inundated, irrigation system was disrupted, communication links were interrupted and life in the city came to a stand-still for several days.

Figure 4.1.16 Ravi River and Its Tributaries, Canals and Drains



Source: Irrigation Department

(iv) Inundation

According to the Study, inundation disasters in Lahore is basically caused by internal flooding, and flooding from the Ravi River had not happened in the last 15 years, even during the recorded highest daily precipitation in 1996. The latest significant precipitation was recorded as 49.4 mm/ day at the Jail Road Monitoring Point in August, 2009. In recent years, heavy rainfall in June 2007 and in July and August 2008 caused inundation at various sites throughout Lahore for long periods.

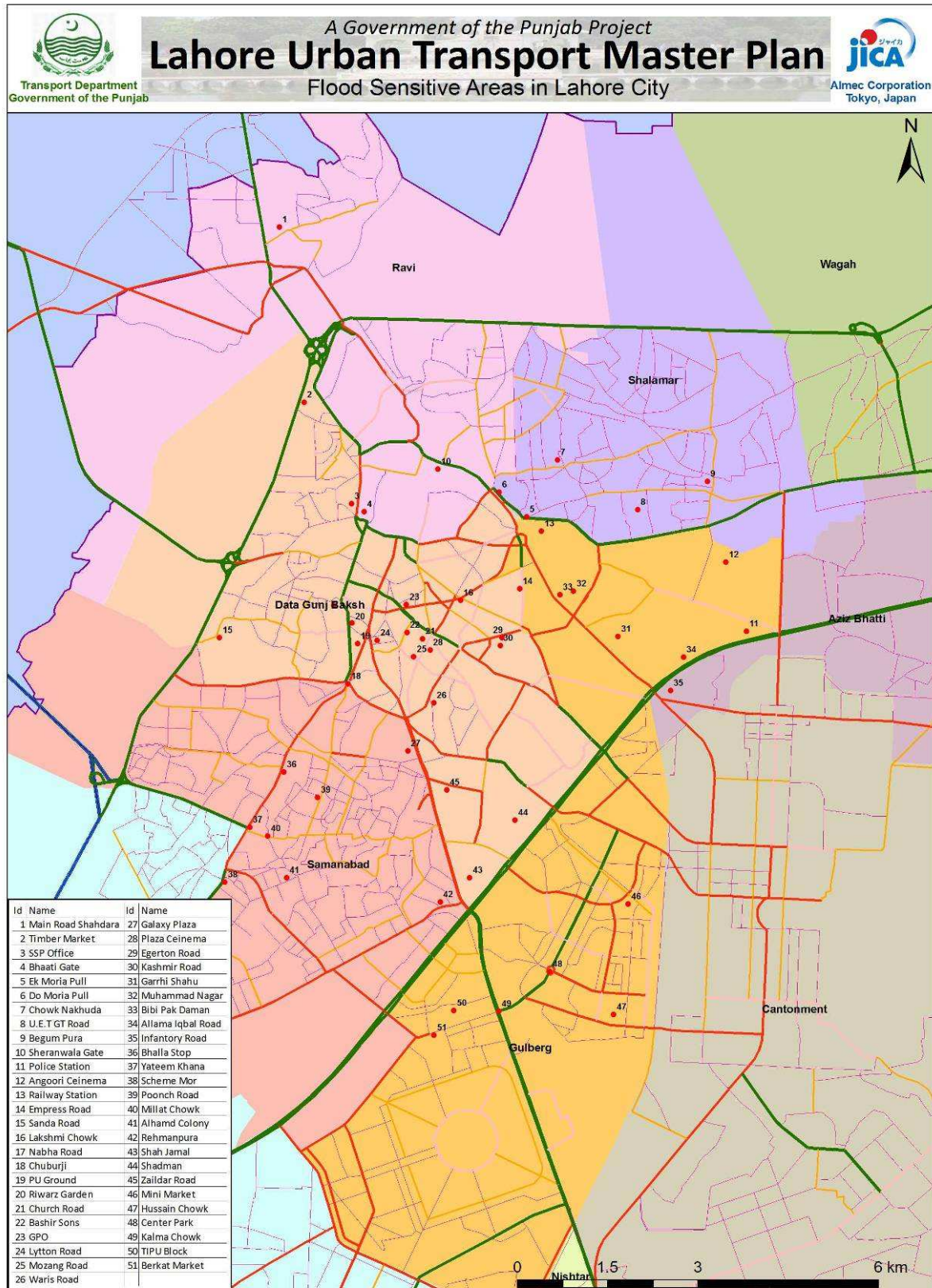
Inundation durations and depths have caused negative impacts not only to road traffic and socioeconomic conditions but also to daily living conditions and sanitation with the accumulation of a mixture of rainwater, domestic wastewater and untreated sewerage in the low-lying areas. These areas are illustrated in Figure 4.1.17. Therefore, improvement of the system together with the procurement and installation of necessary drainage equipment is urgently necessary to resolve and mitigate the negative effects of inundation.

5) Flora, Fauna and Biodiversity

(i) Flora

As climate of Lahore is semi-arid and subtropical, the vegetation of the project area falls under scrub, dry, tropical forest type as per phyto-geographical classification of the area. In addition, over the years Lahore has considerably expanded. However, the ancient monuments, old gardens, trees, graveyards and traditional bungalows having attached gardens, large expanses of lawn and old roadside trees are still found. These green areas and old indigenous trees are home to many resident bird species, as well as many summer, winter and transit migrants. Inventory data of trees and common trees in Lahore are shown in Table 4.1.15 and 4.1.16 respectively.

Figure 4.1.17 Locations Prone to Inundation in Lahore (WASA, 2011)



Source: Based on Data of Water and Sanitation Agency (WASA), Lahore

Table 4.1.15 Inventory of Trees in Lahore District

No.	Common Name	Botanical Name
1	Arjun	<i>Terminaliaarjuna</i>
2	Dhak	<i>Buteafondosa</i>
3	Mahwa	<i>Bassialatifola</i>
4	Bahara	<i>Terminaliabellerica</i>
5	Amaltas	<i>Cassia fistula</i>
6	Gul-e-nishter	<i>Erytrinasubrosa</i>
7	Barringtonia	<i>Barringtoniaacutengula</i>
8	Nim	<i>Meltaindica</i>
9	Gab	<i>Diospyrosembryopteris</i>
10	Berna	<i>Cratevareligiosa</i>
11	Khark	<i>Celtusaustralis</i>
12	Putajan	<i>Putranjivaroxburgi</i>
13	Fiddle wood/KashimirLagotis	<i>Eithrxillumrubberratum</i>
14	Gul-e-mast	<i>Daliniaindica</i>
15	Gul-e-mohr	<i>Poinciana regia</i>
16	Alstonia	<i>Alstoniascholaris</i>
17	Ashoke	<i>Saracaindica</i>
18	Sheesham	<i>Dalbergiasisso</i>
19	Alata	<i>Stercoliacolorata</i>
20	Kenair	<i>Neriumgrandiflora</i>
21	Weeping Willow	<i>Salix babylonica</i>
22	Keekar	<i>Parkinsoniaaculeata</i>
23	Nilem	<i>Jacaranda mimosfolia</i>
24	Kechnar	<i>Bauhinia purpurea</i>
25	Molsary	<i>Mimosopelengi</i>
26	Bel	<i>Aeglemarmelos</i>
27	Siris	<i>Albizialebbek</i>
28	Tun	<i>Cedrellatoona</i>
29	Jamin	<i>Eugenia jambolana</i>
30	Moor pankh	<i>Thujaorientalis</i>
31	Silkoak	<i>Grevillearobusta</i>
32	Sufeda	<i>Eucalyptus citriodora</i>
33	Peepal	<i>Ficusreligiosa</i>
34	Simbal	<i>Hiacinthusorientalis</i>
35	Berri	<i>Diospyrosmelanoxylon</i>
36	Sukh chain	<i>Pongamiagalabra</i>
37	Poplar	<i>Populus alba</i>
38	Alam	<i>Mangiferaindica</i>
39	Shehtoot	<i>Morus alba</i>

Source: Parks and Horticulture Authority (PHA), Lahore

In the Lahore city area there are a variety of trees, along the roadside, in the lawns of houses, administrative buildings and parks. Major species of common trees are listed in Table 4.1.16. In Lahore Canals provide green space of “linear urban parks” with

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

landscape symmetry and aesthetics along the bank as well as function of waterways. Regarding the vegetation along the Canal Bank from Mustafaabad Bridge to Thokar Niaz Baig dominant species are, Poplar, Weeping Willow, Mango, Eucalyptus and Jaman, and the dominant shrub species are Citrus, Kanair and Marwa according to the study by World Wide Fund (WWF) for nature in Pakistan, 2008.

Table 4.1.16 Common Trees in the City Area

No.	Common Name	Botanical Name
1	Alstonia	<i>Alstoniascholaris</i>
2	Eucalyptus	<i>Eucalyptus camaldulensis</i>
3	Jaman	<i>Syzygiumcumini</i>
4	Shisham	<i>Dalbergiasissoo</i>
5	Siris	<i>Albizzialebbek</i>
6	Bakain	<i>Meliaazedarach</i>
7	Peepal (Sacred Fig)	<i>Ficusreligiosa</i>
8	Banyan	<i>Ficusbengalensis</i>
9	Toot (Mulberry)	<i>Morus alba</i>
10	Arjan	<i>Terminaliaarjuna</i>
11	Molsary	<i>Mimusopselengi</i>
12	Bottle Palm	<i>Cocos species</i>
13	Bottle Brush	<i>Callistemon lanceolatus</i>
14	Palm	<i>Cocos species</i>

Source: Parks and Horticulture Authority, Lahore

(ii) Fauna**(a) Mammals**

Common mammals found are dogs, cats, house rats and bats. Small Indian Mongoose and Indian Palm Squirrel have also been reported.

(b) Reptiles

Snakes such as cobra, kraits etc. were common in the tract, but now cases of snake bites are very rare.

(c) Birds

Ornithologists of preceding times documented the number of bird species in Lahore. A study conducted in 1965 there were 240 bird species. However, with the unplanned growth of urbanization, number of species as well as population has reduced to 85 including the resident and migratory species. Major species are listed in Table 4.1.17. Along the above mentioned Lahore Canal 44 bird species have been identified according to the study by World Wide Fund for nature in Pakistan, 2008.

Table 4.1.17 List of Bird Species in Lahore

No.	Common Name	Zoological Name
1.	Bank Myna	<i>Acridotheresginginianus</i>
2.	Blackbird	<i>Turdusmerula</i>
3.	Black Drongo	<i>Dicrurusmacrocerus</i>
4.	Rock Pigeon	<i>Columbia livia</i>
5.	Common Babbler	<i>Turdooides caudate</i>
6.	Common Myna	<i>Acridotherestrictis</i>
7.	Garden Earbler	<i>Sylvia borin</i>
8.	Indian Robin	<i>Saxicoloides</i>
9.	White-Rowed wagtail	<i>Motacillamadraspatisensis</i>
10.	Little Green Bee-Eater	<i>Meropsorientalis</i>
11.	Asian Pied Starling	<i>Sturonus contra</i>
12.	Red-Vented Bulbul	<i>Pycnonotuscafer</i>
13.	Ring-Necked Dove	<i>Streptopeliacapicola</i>
14.	Long-Tailed Strike	<i>Laniusschach</i>
15.	Great Spotted Woodpecker	<i>Dendrocopos major</i>
16.	White/Browed Wagtail	<i>Motacillamaderaspatensis</i>
17.	Asian Koel	<i>Eudynamysscolopacea</i>
18.	Common Hawk-Cuckoo	<i>Cuculusvarius</i>
19.	Common Koel	<i>Eudynamysscolopacea</i>
20.	Pied Cuckoo	<i>Clamatorjacobinus</i>
21.	Red Turtle Dove	<i>Streptopeliatranquebarica</i>
22.	Barbarg Dove	<i>Streptopeliarisoria</i>
23.	Rose-Ring Parakeet	<i>Psittaculakrameri</i>
24.	White-Backed Vulture	<i>Gypusafricanus</i>
25.	White-Breasted Kingfisher	<i>Halcyon smynensis</i>

Source: Zoological Office, Lahore

6) Protected Areas

In Pakistan National Parks, Wildlife Sanctuaries and Game Reserves are listed as notified protected ecosystems in order to preserve, conserve and manage fauna and vegetation.

In the Punjab Province there are 60 protected ecosystem areas including:

- 2 National Parks, 37 Wildlife Sanctuaries, 20 Game Reserves and 1 Unclassified. There is no site of protected ecosystem located in the Study Area.
- In addition, there are no species reported by Forest and Wildlife Department to be under threat, which are included in the IUCN Red Data Bank for Lahore, Sheikhpura and Kasur.
- Table 4.1.18 shows endangered and prohibited species in Lahore by Forest Department.

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**Table 4.1.18 Endangered and Prohibited Species in Lahore**

No.	Endangered Species
1	<i>Dalbergiasissoo</i>
2	<i>Salvedorapersica</i>
3	<i>Ficusbengalensis</i>
4	<i>FicusReligiosa (Peepal)</i>
5	<i>Ficusenfectoria</i>
6	<i>Ficusglomerata</i>
7	<i>Albizziaprocera</i>
8	<i>Albizzialebbek</i>
9	<i>Anogeissusacuminit</i>
10	<i>Artocarpusintegrifolia</i>
11	<i>Artocarpuslakoocha</i>
12	<i>Azadirachtaindica</i>
13	<i>Bischofiajavanica</i>
14	<i>Berserserrata</i>
15	<i>Dilleniaindica</i>
16	<i>Meringa Oleifera</i>
17	<i>Prosopisspiligera</i>
18	<i>Ziziphusmauritania</i>
19	<i>Cassia Alata</i>
20	<i>Jaguiniaaristata</i>
21	<i>Tecomaundalata</i>
22	<i>Prosopisjuliflora</i>
23	<i>TamyrixArticulate</i>
24	<i>Magnolia Grandiflora</i>
25	<i>Eucalyptus Species (Molsary)</i>
26	<i>Broussonetiamalabarica</i>
27	<i>Populasnigra/Alba (Poplar)</i>
28	<i>Neriumodorum</i>
29	<i>Thevetianerfolia</i>

Source: Forest Department, Lahore

4.1.3 Environmental Pollution

Lahore, which is also called the “City of Gardens”, has gone through a rapid increase in urban population, encroachments/ unplanned growth as well as increase in vehicle traffic volumes. This caused a continuous, rapid and unchecked deterioration of its environment conditions such as air and water pollution, increase in ambient noise level, indiscriminate

disposal of untreated municipal and industrial waste and wastewater into the surface water bodies. In addition, rapid loss of green and open space led to considerable loss of gardens.

1) Air Pollution

(i) Main Sources of Air Pollution

In the Study Area air pollution has a strong impact on daily life, especially in central area of Lahore and along roadside. Motor vehicles are thought to be the major source of air pollution. However, factories and cottage industries also contribute considerably to the air pollution.

Ambient air pollutants may be divided into two types, gases and the suspended particulates. Among these gaseous pollutants Sulphur dioxide (SO₂), Nitrogen Oxides (NO₂ and NO), Carbon Oxides (CO₂ and CO), Ozone (O₃) are the main pollutants as indicators for the ambient air quality. For suspended particles Suspended Particulate Matter Size (PM₁₀ – 10 microns) and (PM_{2.5} – 2.5 microns) and amount are the indicators for the quality.

Particulate matters are most common pollutants in dry semiarid zones, industrial and heavy traffic areas. These particulate matters consist of a mixture of primary particles resulting from incomplete combustion of fossil fuels and secondary particles resulting from chemical reactions of some pollutants in the atmosphere. Those produced from combustion, especially diesel fuel combustion such as diesel powered vehicles and thermal electric power stations.

These particles have negative impacts on human health as they cause dangerous respiratory diseases. Their impacts depend on the size of these particles. If they are less than 10 microns (PM₁₀) in size these will be more harmful because these are inhaled easily. In addition, particles less than 2.5 micron (PM_{2.5}) are considered to be the most dangerous because breathing defence organs cannot prevent them from reaching deep into lungs and interact with blood stream and other organs of the body.

(ii) Existing Air Pollution Level in Lahore

In Lahore vehicle population has shown a considerable increase over the recent years. Experts consider that 60-70 % cause of urban air quality deterioration is due to road traffic. Table 4.1.19 shows results of air quality monitoring conducted in 2004 by the Punjab Environmental Protection Department. During the monitoring alarming level of suspended particulate matter was found as detailed in Table 4.1.19.

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Table 4.1.19 Results of Air Quality Monitoring in Lahore Area (2004)

Air pollutant	Unit	WHO Standards	Monitoring Station				
			Azadi Junction	Qurtaba Junction	Chauburji Junction	Chairing Cross	
1	SO ₂	ppb	50	29	47	23	41
2	NO _x	ppb	—	167	192	195	321
3	NO ₂	ppb	107	89	67	71	71
4	CO	ppm	0.9	0.3	0.3	3.1	7.3
6	PM ₁₀	µg/m ³	150	882	640	534	963
7	PM _{2.5}	µg/m ³	-	-	-	-	-

Source: Punjab Environmental Protection Department

In 2007, Pakistan EPA, in cooperation with JICA, mentioned air quality data in Pakistan and assessed the ambient air quality in Islamabad, Karachi, Lahore, Quetta and Peshawar. Air quality sampling was conducted using fixed stations that measured daily mean concentrations of air pollutants in May and September 2007. The concentrations of PM_{2.5} were found to have greatly exceeded the WHO guideline values in most of the cities. The ambient concentrations of SO₂, NO_x (NO, NO₂) and Carbon monoxide (CO) were, on average, found to be within the limits of the WHO guidelines. Table 4.1.20 shows the daily mean values of PM_{2.5}, SO₂, CO, NO_x in Lahore in 2007.

According to the Punjab EPD reports that air pollution problems in Lahore are linked with the road traffic in the city and high concentration in a few areas due to which the entire city population suffers. In addition, the permissible level of dust particulate matters less than 2.5 microns (PM_{2.5}) and PM₁₀ has crossed the safe limits in many areas of the city due to mobile and stationary combustion sources and commercial activities in the city. Even in the isolated areas dust particulates PM_{2.5} value has reached 80 µg/m³ in the non-rainy seasons against the permissible 25 µg/m³ for 24 hour mean.

Exposure to very high levels of SO₂ can be threatening and is considered immediately dangerous to life and health.

Table 4.1.20 Data of Ambient Air Quality Daily Mean Values in 2007

Measuring Station	Date of Measurement	NO	NO ₂	Methane*	Non-Methane Hydrocarbon	CO	SO ₂	PM _{2.5}
		µg/m ³	µg/m ³	ppb	ppb	ppm	µg/m ³	µg/m ³
Lahore Fixed Station 1	9-May-2007	48.8	83.6	2519.3	1138.4	1.9	41.6	91.8
	20-Sep-2007	6.8	50.4	1732.3	461.0	0.9	46.5	85.5
Lahore Fixed Station 2	9-May-2007	6.9	33.7	1833.8	317.3	0.6	21.5	57.5
	20-Sep-2007	5.0	35.3	3453.1	358.2	1.1	21.4	99.6
Draft PAAQS	-	40	40	-	-	5	80	15

Source: Pakistan EPA in Cooperation with JICA (2007)

*Note: No Methane Standard Exist in Pakistan Ambient Air Quality Standards

(iii) Recent Data of Air Quality Monitoring in Lahore

In Lahore there are three air quality monitoring stations donated by JICA:

1. Commercial site: Town Hall Station is at the Mall Road near Punjab University, an institutional zone.
2. Residential site: Quaid-e-Azam Station is in Township about 3km from Quaid-e-Azam Industrial estate.
3. Mobile Station: Loaded in a truck usually placed at the EPA office near Qaddafi Stadium, which is a recreational area. The mobile unit is also placed at locations like Lower Mall, Gulberg and Township in Lahore.

Table 4.1.21 shows air quality data at Town Hall in 2010. Annual trend shows that ambient air quality deteriorated throughout the year which is detailed below: and further comparisons are illustrated in Figures 4.1.18 to 4.1.20.

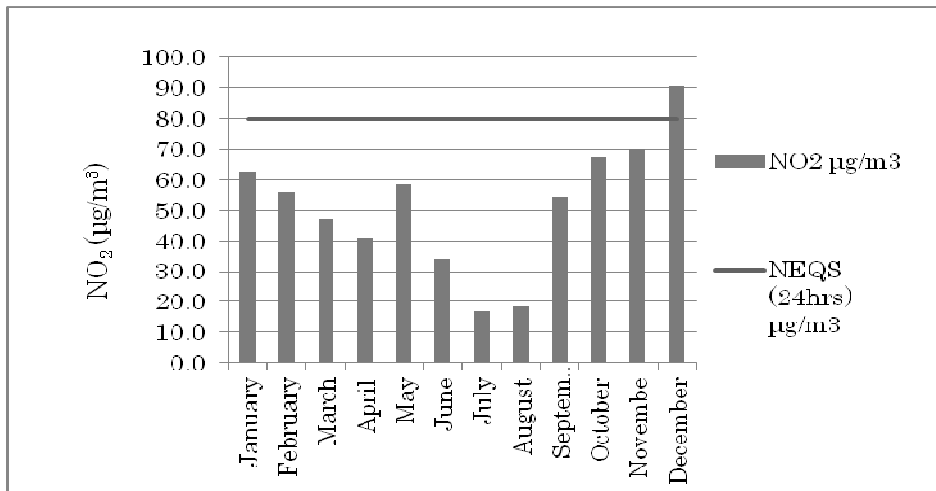
- Inhalable particle (PM_{2.5}) was found to be almost five times higher than National Environmental Quality Standard (NEQS).
- Level of oxides of nitrogen in air was found to be twice the permissible level of National Environmental Quality Standard.

Table 4.1.21 Result of Air Quality Monitoring at Town Hall in 2010

Month (2010)	NO	NO ₂	NO _x	CO	SO ₂	O ₃	PM _{2.5}
	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
January	96.9	62.5	159.4	3.2	(-)	23.9	253.9
February	54.7	56.0	110.7	1.6	34.9	30.6	122.2
March	48.2	47.4	95.6	1.4	46.9	38.9	116.6
April	72.5	40.7	113.2	2.2	51.3	40.4	116.2
May	16.9	58.3	75.2	1.2	32.0	62.9	90.9
June	0.8	34.0	34.8	0.7	22.8	101.4	72.6
July	0.6	16.9	17.5	0.6	12.2	77.8	50.8
August	0.7	18.4	19.0	0.7	10.4	59.5	56.8
September	45.3	54.3	99.5	1.1	14.1	68.8	69.8
October	53.3	67.5	120.7	1.7	26.6	85.5	116.1
November	78.3	70.3	148.5	6.4	44.1	62.4	173.9
December	85.9	90.6	176.5	7.3	49.9	(-)	190.7
Annual Average	46.1	51.4	97.5	2.3	31.4	59.3	119.2
NEQS Standard (Annual Average)	40	40	n/a	5	80	130	15

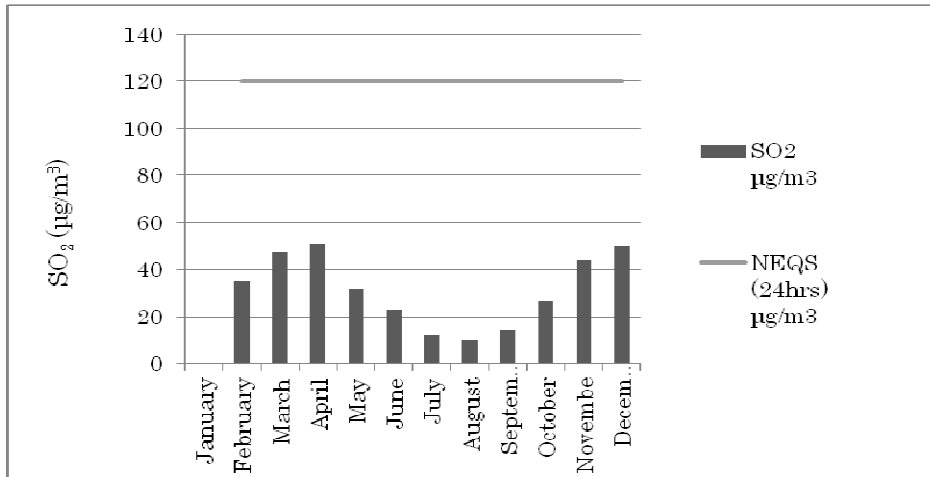
Source: Punjab Environmental Protection Department

Figure 4.1.18 Ambient NO₂ Level at Town Hall Monitoring Station in Lahore (2010)



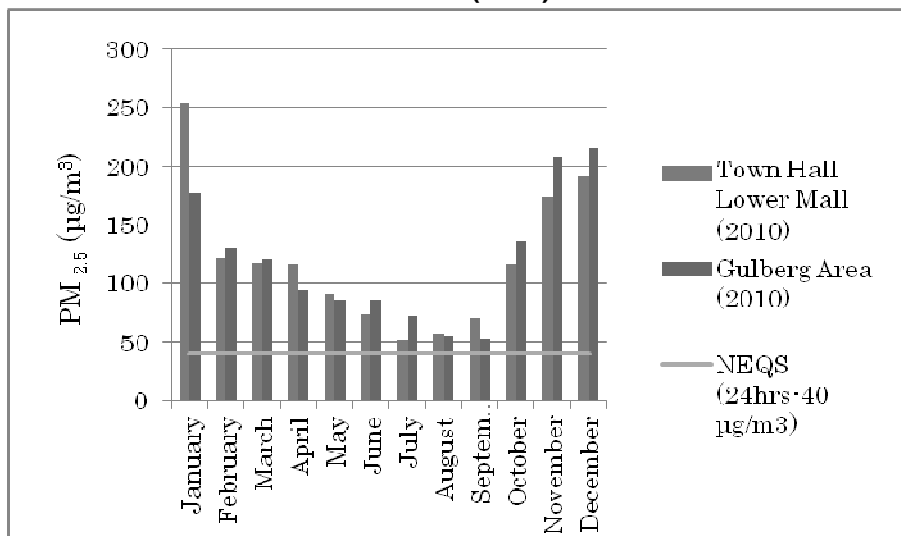
Source: Punjab Environmental Protection Department

Figure 4.1.19 Ambient SO₂ Level at Town Hall Monitoring Station in Lahore (2010)



Source: Punjab Environmental Protection Department

Figure 4.1.20 Ambient PM_{2.5} Level at Town Hall and at Gulberg Monitoring Stations in Lahore (2010)



Source: Punjab Environmental protection Department

(iv) Daily-Base Air Quality as Indicated by Air Quality Index (AQI)

In Pakistan Air Quality Index (AQI) is defined as indicator of daily-base air quality. The value of AQI indicates extent of air pollution. The value from 0 to 25 is considered as “pollution free (good)”, 26 to 50 as “moderate pollution”, 51 to 100 as “unhealthy”, 101 to 200 as “severe pollution” and greater than 200 as “hazardous”. Daily-base AQI for Islamabad, the capital city is reported on a website of Pakistan Environmental Protection Agency (<http://www.pakepa.org/aqi/>).

In Lahore, the data of 29th March, 2010 at Town Hall area shows the that PM_{2.5} concentration was 105 ug/m³ against the NAAQS of 40 ug/m³, NO₂ concentration was found to be 101.6 ug/m³ against the standard of 80 ug/m³, and SO₂, O₃ and CO concentration were 60 g/m³, 152 ug/m³ and 1.51 mg/m³ respectively. The calculated AQI was 111 which mean that air quality was unhealthy on that day.

(v) Result of Roadside Monitoring

Although the contribution of vehicle traffic to air pollution is widely recognized, relatively few studies have been conducted in Pakistan to estimate the levels of pollutants due to vehicle exhaust emissions. Data shown in Table 4.1.22, indicate the levels of roadside exhaust emissions.

Table 4.1.22 Air Pollutant Concentration at 23 Road Crossings in Lahore

No.	Site	PM _{2.5} or PM ₁₀ (ug/m ³ /hr)	Vehicle Exhaust Emission (ppm)		
			CO	SO ₂	NO ₂
	Reference Values (NEQS)	5	25.8	5	25
1	Chauburji	2.76	5	20	0.10
2	Chowk Yaadgar	2.36	8	16	0.08
3	Chungi Amer Sidhu	2.72	6	11	0.15
4	Club Chowk	1.80	5	11	n/a
5	Ghazi Chowk	1.68	6	20	0.13
6	General Bus Stand	3.10	5	17	0.13
7	Kalma Chowk	8.17	5	20	n/a
8	Kanchee Crossing	5.04	8	18	n/a
9	Lahore Hotel Chowk	7.60	7	17	0.17
10	Lakshmi Chowk	1.11	7	12	0.20
11	Liberty Market	2.21	6	12	0.15
12	Lahori Gate	3.42	9	20	0.17
13	Mochi Gate	4.53	5	10	0.10
14	Moon Market Chowk	1.33	9	13	0.18
15	Muslim Town Chowk	1.43	7	15	0.15

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No.	Site	PM _{2.5} or PM ₁₀ (µg/m ³ /hr)	Vehicle Exhaust Emission (ppm)		
			CO	SO ₂	NO ₂
16	Naulakha Chowk	4.52	10	20	0.25
17	Qurtaba Chowk	1.51	7	18	0.20
18	Railway Station	2.89	8	20	0.18
19	Regal Chowk	1.38	9	18	0.20
20	Samanabad Morr	1.93	10	20	0.18
21	Scheme Morr	2.38	11	18	0.22
22	Shadman Chowk	1.04	7	18	0.15
23	Yateem Khana Chowk	3.61	9	15	0.17

Source: Faculty of Environment and Public Health, Institute of Public Health, Lahore

2) Water Pollution**(i) Pollution in Ravi River**

Presently no wastewater treatment services exist and the raw sewerage and wastewater is directly discharged into Ravi River, causing unhygienic condition in the river and for the downstream users. The situation is very critical under low flow condition in the river when sufficient dilution is not available and the river almost serves as a sludge carrier. Thus, Ravi River receives almost all the untreated municipal and industrial wastes from the Study Area. The industrial and workshop discharge and household sewage go to Ravi River without any treatment. Thus, its potential value as a recreational water body and breeding place for fish and aquatic life is seriously threatened and almost non-existent due to negligible amount of dissolved oxygen in the water. The sewerage network and facilities are not formally established in the area, even in the Lahore City.

(ii) Water Quality Monitoring of Ravi River

Water quality of Ravi River, canals and drains is monitored by Irrigation Department of the GoPb. As a part of integrated water resources management surface water quality monitoring for drinking water was conducted at two rivers and 18 selected canals by Directorate of Land Reclamation Punjab. Among them results for Ravi River indicate following features as shown in Table 4.1.23.

- Physio-chemical parameters are within permissible limits except turbidity in June 2008;
- Trace Metals/ elements are also within permissible limits – except Ferrous and Lead as found in the sample of June 2008;
- Contaminants – such as nitrates are also within permissible limits;
- Coli forms are reported in the water in both the monitoring runs– indicating microbial contamination – rendering water totally unfit for drinking;

- Biological contamination such as BOD and COD render water unfit for drinking and other purposes, Organic pollutants were not recorded at this site.

Table 4.1.23 Water Quality of Ravi River at Baloki Head Works

No	Parameter	Unit	Reference Value	Sampling Date	
				Sep-07	Jun-08
Physico-Chemical Parameters					
1	pH	(-)	6 - 9	7.81	8.02
2	EC	dS/m	1.5	0.48	0.379
3	Hardness	mg/l	500	190	140
4	Turbidity	mg/l	< 5	< 5	165
5	TDS – Total Dissolved Solids	mg/l	308	308?	281
Trace Metals/ Elements					
6	Cu – Copper	mg/l	2	0.18	Nil
7	Zn – Zinc	mg/l	5	0.1	0.06
8	Cr – Chromium	mg/l	0.05	0.03	Nil
9	Cd – Cadmium	mg/l	0.003	nil	Nil
10	Fe – Iron	mg/l	0.3	0.04	0.44
11	Mn – Manganese	mg/l	0.5	0.1	0.29
12	Pb – Lead	mg/l	0.01	(-)	0.17
13	As – Arsenic	mg/l	0.01	(-)	Nil
14	B – Boron	mg/l	0.3	(-)	0.01
Contaminants					
15	NO ₃ – Nitrogen Trioxide	mg/l	50	0.02	(-)
16	S – Sulphate	mg/l	(-)	Nil	Nil
17	F – Fluoride	mg/l	1.5	0.6	Nil
18	CN – Cyanide	mg/l	0.07	None	(-)
Coli forms					
19	Coli forms (<i>E. Coli</i>)	-	Nil	Yes	yes
Biological					
20	BOD – Biological Oxygen Demand	mg/l	0	10.2	16.4
21	COD – Chemical Oxygen Demand	mg/l	0	22.6	(-)
22	DO – Dissolved Oxygen	mg/l	7	4.2	6.18
Organic Pollutants					
23	Oil and Grease	n/ a	n/ a	Not Record	
24	Phenolic Compounds	n/ a	n/ a	Not Record	
25	Anionic Detergents	n/ a	n/ a	Not Record	
26	Residual Pesticides	n/ a	n/ a	Not Record	

Source: Monitoring of Surface Water Quality for Drinking Purposes – 2009 (Directorate of Land Reclamation Punjab, Canal Bank Road Mughalpura, Lahore)

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**(iii) Canal Water Quality**

CBD Canal water quality was sampled near Muslim Town in Lahore for an EIA study. The results are given below in Table 4.1.24.

Table 4.1.24 Results of Canal Water Quality in Lahore

No.	Parameter	Unit	Result	NEQS
1	Temperature	°C	18.0	<= 40
2	pH	(-)	7.4	6-9
3	BOD	mg/l	10.0	80.0
4	COD	mg/l	26.0	150.0
5	TSS	mg/l	161.0	200.0
6	Odour	(-)	Odourless	N/A
7	Conductivity	uS	282.00	N/A
8	Turbidity	NTU	108.0	N/A
9	NO ₃ (Nitrogen Tri-oxide)	mg/l	4.4	N/A
10	Chlorine (Cl)	mg/l	6.7	1,000
11	Fluoride (F)	mg/l	0.12	10.0
12	Sodium (Na)	mg/l	4.7	200.0

Note1: Sampling point is near Muslim Town on 2011.3.15

Source: EIA Report (2011.3) - EIA of Construction of Flyover at Kalma Chowk, Lahore

(iv) Groundwater Quality

According to Groundwater Monitoring Report (2009), there are 55 monitoring points in Lahore District and continuous data for the period 2003-08 was available for only 9 points. Data show that the water quality, at least from salinity point of view and is fresh to marginal and has not shown any considerable change in the last 6 years. Results from a recent, (15th March 2011) test are given in Table 4.1.25. It indicates that water quality is getting worst and many parameter values exceed both the WHO and NEQS recommend maximum permissible values.

Table 4.1.25 Data of Groundwater Quality in Lahore

No.	Parameter	Date (15-Mar-2011)			
		Unit	Result	WHO Guidelines	NEQS
1	Temperature	°C	26.0	<= 40	(-)
2	pH	(-)	7.3	6.5-8.5	6.5-8.5
3	TDS – Total Dissolved Solids	mg/l	1144.0	1000.0	< 1000
4	Cl – Chlorine	mg/l	61.6	250.0	< 250
5	Hardness	mg/l	274.7	500.0	< 500
6	NO ₃ – Nitrogen Trioxide	mg/l	2.69	50.0	<=50
7	Na – Sodium	mg/l	236	200.0	n/ a
8	F – Fluoride	mg/l	0.65	1.5	<=1.5
9	As – Arsenic	mg/l	< 0.01	0.01	<=0.05
10	Pb – Lead	mg/l	< 0.01	0.01	<=0.05
11	Hg – Mercury	mg/l	< 0.001	0.001	<=0.001
12	Fe – Iron	mg/l	0.8	0.3	(-)
13	Total Colony Count	cfu/ml	Too numerous to count	< 500	(-)
14	Total Coliforms	No./ml	64.0	0/100ml	0/100ml
15	Faecal Coliforms (<i>E. Coli</i>)	No./ml	18.0	0/100ml	0/100ml

Note1: Sampling point is near the construction camp site at Kalma Chowk on 15-Mar-2011

Source: EIA Report (2011.3) - EIA of Construction of Flyover at Kalma Chowk, Lahore

3) Solid Waste

Solid waste generated includes residential (household), commercial, industrial, hospital, animals and other sources.

(i) Data from Integrated Master Plan for Lahore-2021

Solid waste management study for Lahore carried out in 1997, it was estimated that only 70 % of approximately 3,000 tons of solid waste generated every day (approximately 0.55 kg/ person/ day) was being collected and disposed of by the civic authorities. The uncollected 30 % solid waste found its way into open spaces or vacant plots, sewage system, manholes and storm water channels. The 71 major hospitals and clinics also generate 13.8 tons of solid waste including toxic medical waste. Its disposal process is also not clear.

According to a recent report, it is estimated that 5,000 tons of household waste is generated everyday out of which 70 % is disposed properly and remaining is left to spread in the low lying area, open spaces and along the drains and into the wastewater drains. The waste collection services are labour-intensive, i.e. 7,897 workers to serve the

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

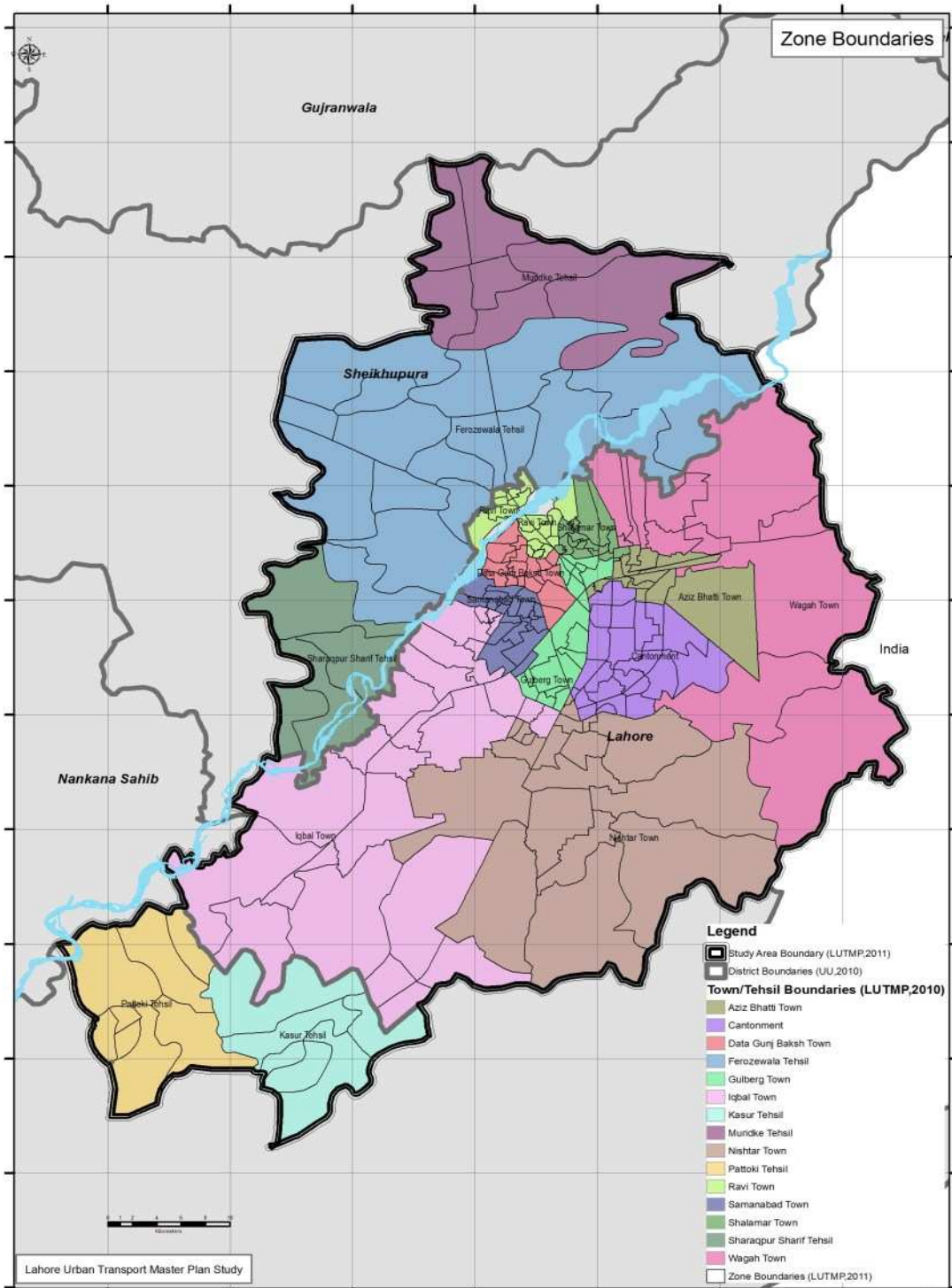
vast area of Lahore and thus the division of worker per thousand population is 1:21.

Solid waste is collected from the communal bins placed at various locations in the city and transported to open dumping sites. Among the disposal sites four are existing and two are proposed. Both public and private sectors are involved in managing solid waste. In public sector the City District Government and Lahore Cantonment Board are responsible for collection and disposal. In the private sector, Model Town Society and Lahore Cantonment Cooperative Housing Society are responsible for the collection and disposal from their respective areas. In addition, some NGOs are also involved in the collection of solid waste. However, their activities are generally limited only to collection of solid waste in some parts of the city.

(ii) Data of City District Government, Lahore (CDGL)

Estimated population of Lahore District in 2008 was about 8.65 million with total number of housing units about 1.5 million. For the collection and disposal of solid waste city has been divided into nine towns as shown in Figure 4.1.21 and Table 4.1.26. Waste generation per capita per day is estimated to be 0.65 kg and the total waste is about 5,700 tons/ day. The GDGL solid waste lifting capacity and management is about 4,500 tons/ day (about 78 % of generated waste) and the remaining 1,200 tons/ day waste spreads in the low lying areas, open spaces and along the drains and into the wastewater drains, and finally flows into Ravi River. As a whole the existing solid waste management system is not effective, is getting worst and has many problems to be solved.

Figure 4.1.21 Administrative Zone Map for the Collection of Solid Waste



Source: JICA Study Team

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**Table 4.1.26 Estimated Solid Waste Generation in CDGL – 2010**

No.	Town	Population (,000)	Waste Generated (ton/day)*
1	Ravi	1,007	722
2	Shalimar	854	612
3	Wagha	656	470
4	Aziz Bhatti	667	478
5	Data Ganj Buksh	970	695
6	Samanabad	984	705
7	Gulberg	778	557
8	Allama Iqbal	960	688
9	Nishter	945	677
Total		7,821	5,604

Source: JICA Study Team

Note: * Assumed that waste generation per capita per day is 0.65kg.

4) Noise Pollution

In general there are two types of sources of noise generation. One is stationary sources such as factory machinery, construction work, loud speakers, audio entertainment systems etc. The other is mobile sources due to transportation such as road traffic, railway and aircraft. However, in the city area noise pollution due to road traffic by various types of vehicles is the most dominant and displeasing for human life. In Lahore, there is no ambient noise monitoring system established. However, some data on noise levels is found in EIA reports of road development projects.

(i) Road Traffic Noise

Noise levels at 18 busy places with high traffic volumes in Lahore were measured for a road traffic noise study in 2004 during peak working hours of the day as given in Table 4.1.27. It was found that the daytime average noise level has crossed the permissible limit of 85 dB (A) at 90 % of the busy points in the city. In the study maximum average noise level recorded was 104 dB(A), which was considered to be due to vehicular traffic especially Rickshaws and Qingqis with ineffective silencers and frequent use of the pressure horns by buses, wagons and other vehicles.

Table 4.1.27 Road Traffic Noise Level at Busy Traffic Locations in Lahore

No.	Site/ Location	Predominant Land Use	Density of Traffic	Observed Noise Level dB(A)		
				L _{eq}	Observed	
Reference Value				85	L_{max}	L_{min}
1	Kalma Chowk	Commercial	Heavy	90	100	78
2	PCSIR Main Gate	Main Road	Heavy	87	96	80
3	Muslim Town	Commercial/ Residential	Heavy	91	103	79
4	Shah Jamal	Commercial/ Residential	Heavy	88	98	77
5	Ichhra	Main Road	Heavy	89	102	75
6	Shama	Commercial	Heavy	88	99	76
7	Mozang	Commercial	Heavy	92	104	82
8	Chauburji	Main Road	Heavy	87	101	75
9	Secretariat	Main Road	Heavy	96	101	75
10	Old Anarkali	Commercial/ Residential	Light	92	94	73
11	Mayo Hospital	Commercial	Light	87	99	75
12	Lahori Gate	Commercial	Heavy	83	97	73
13	Delhi Gate	Commercial	Heavy	84	99	72
14	Yaadgar Chowk	Commercial	Heavy	88	102	78
15	New Anarkali	Commercial	Heavy	89	100	77
16	Neela Gumbad	Commercial	Heavy	86	98	78
17	Akbari Mandi	Commercial	Light	98	100	79
18	Crown Adda	Commercial	Heavy	99	104	78

Data Source: Pakistan Council for Scientific and Industrial Research Labs (PCSIR), 2004

(ii) Ambient Noise Level at Sensitive Receptor Sites

The ambient outdoor and indoor noise level, measured at nine sensitive receptors is compared in Table 4.1.28.

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Table 4.1.28 Ambient Noise Level Monitoring at Sensitive Receptors

No.	Description	Observed Noise Level dB(A)		
		Leq	Lmax	Lmin
1	Lahore American School, Upper Mall (Outside)	70.3	94.1	61.7
	Lahore American School, Upper Mall (Inside)	64.0	82.4	57.1
2	The Lahore Lyceum Main Branch (Outside)	69.9	85.0	60.3
	The Lahore Lyceum Main Branch (Inside)	65.6	80.1	59.3
3	FC College, Lahore (Outside)	71.3	87.1	63.8
	FC College, Lahore (Inside)	61.5	80.0	56.5
4	University of Central Punjab (Outside)	72.2	86.9	63.5
	University of Central Punjab (Inside)	65.5	80.7	59.3
5	Allama Iqbal Medical College (Outside)	70.8	89.3	61.8
	Allama Iqbal Medical College (Inside)	60.3	76.9	50.6
6	Doctor's Hospital (Outside)	74.9	90.9	62.8
	Doctor's Hospital (Inside)	69.2	85.2	60.7
7	University of Punjab (Outside)	72.9	87.0	61.7
	University of Punjab (Inside)	60.8	72.4	55.4
8	Punjab College of Commerce Campus (Outside)	77.0	87.0	66.7
	Punjab College of Commerce Campus (Inside)	70.0	80.0	62.5
9	Atchison College (Outside)	73.5	80.8	65.6

Source: EIA Study of Canal Bank Road, Lahore, 2006

5) Soil Contamination

At present no relevant data is available.

6) Sediment Contamination

At present no relevant data is available.

7) Ground Subsidence

In general ground subsidence is often observed in case of a large scale groundwater abstraction. However, there is no indication of ground subsidence due to groundwater abstraction in Lahore.

4.2 Summary of Current Policy, Legal and Institutional Framework

4.2.1 Policy Framework

The paramount document for environmental legislation and policy is the Constitution of Islamic Republic of Pakistan, 1973. It safeguards the fundamental rights as to life and health of a citizen. The reference to the environment finds mention in the concurrent list, Item 24 of the Constitution. It provides environment, pollution and ecology, as a concurrent subject that can be legislated by both the Federal Government and the Provinces.

1) National Environmental Policy, 2005

Government of Pakistan launched its National Environmental Policy, in March, 2005 which provides an overarching framework for addressing the environmental issues. Section 5 of the policy commits for integrating environment into development planning as instrument for achieving the objectives of National Environmental Policy. It further states in clause (b) of Subsection 5.1 that EIA related provisions of Environmental Protection Act of 1997 will be diligently enforced for all development projects.

It also provides broad guidelines to the Federal Government, Provincial Governments, Federally Administrative Territories and Local Governments to address their environmental concerns and to ensure effective management of their environmental resources.

2) Other National Policies

The major national policies of Pakistan are listed in Table 4.2.1.

Table 4.2.1 National Policies in Pakistan

No.	National Policy	Year
1	National Conservation Strategy	1992
2	The 8th Five Year Plan (1993-1998)	1993
3	National Forest Policy	2000
4	National Water Policy	2002
5	Education Policy	2001
6	Population Policy	2002
7	National policy for Development and Empowerment of Women	2002
8	National Resettlement Policy	2002
9	Policy for Power Generation Projects	2003
10	National Environment Policy	2005
11	National Sanitation Policy	2006
12	National Drinking Water Policy (Draft)	2007
13	Clean Development Mechanism (CDM) National Operation Strategy	2006
14	National Transport Policy (2005-2015)	2005

Source: Website of Pakistan Environmental Protection Agency

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4.2.2 Legal Framework

1) Laws and Legislations Relevant to Environmental Protection

Major Laws and legislations relevant to environment in Pakistan are outlined in Table 4.2.2. Government of Pakistan has promulgated laws/ acts, regulations and standards for protection, conservation, rehabilitation and improvement of the environment. In addition to Laws and Acts, procedures governing development projects have also been developed for environmental impact assessment.

Table 4.2.2 Major Laws and Legislations Relevant to Environment in Pakistan

Purpose Sector	Legislation
Environmental Protection	The Pakistan Penal Code (1880)
	Pakistan Environmental Protection Ordinance, NO.XXVUU of 1997
	Pakistan Environmental Protection Act,1997
Land Use and Land Acquisition	The Land Improvement Loan Act, 1883
	Land Acquisition Act, 1894
	The Punjab Development of Damaged Areas Act, 1962
	The Punjab Soil Reclamation Act, 1952
	The West Pakistan Agricultural Pests Ordinance, 1959 and Rules, 1960.
	The Punjab Development Cities Act, 1976
	Lahore Development Authority Act, 1975
Lahore Development Authority Land Use (Classification, Reclassification and Redevelopment) Rules, 2009	
Water Quality and Wastewater, and Water Resources	The Pakistan Penal Code,1860
	The Canal and Drainage Act, 1873
	The Factories Act, 1934
	On-Farm Water Management and Water User's Associations Ordinance, 1981
	Indus River Apportionment Accord, 1991
Statutory Notification S. R. R 742, 1993	
Air Quality	The Pakistan Penal Code, 1860
	The Factories Act, 1934
	The Motor Vehicles Ordinance, 1965 and Rules, 1969
	The Balochistan, NWFP, Punjab and Sindh Local Government Ordinance(s), 1979/80
	Statutory Notification S. R. R 742, 1993
Statutory Notification S. R. R 1023, 1995	
Noise	The West Pakistan Regulation and Control of Loud-Speakers and Sound Amplifiers Ordinance, 1965
	The Motor Vehicle Ordinance, 1965 and Rules, 1969
Toxic and Hazardous Substances	The Pakistan Penal Code, 1860
	The Explosives Act, 1884
	The Factories Act, 1934
	The Agricultural Pesticides Ordinance, 1971 and Rules, 1973
Solid Wastes	The Factories Act, 1934
	The Balochistan, NWFP, Punjab and Sindh Local Government Ordinance(s), 1979/80
	Pakistan Environmental Protection Ordinance, NO.XXVUU of 1997
Marine and Fisheries	The West Pakistan Fisheries Ordinance, 1961
	Balochistan Sea-Fisheries Ordinance,1970 and Rules, 1973

Purpose Sector	Legislation
Marine and Fisheries	The NWFP Fisheries Rules, 1976
	Territorial Waters and Maritime Zones Act, 1976
Forest Conservation	The Punjab Forest (Sale of Timber) Act, 1913
	The Forest Act, 1927
	The NWFP Hazara Forest Act, 1936
	The West Pakistan Firewood and Charcoal (Restrictions) Act, 1964
	The Punjab Plantation and Maintenance of Trees Act, 1974
	The Cutting Trees (Prohibition) Act, 1975
	The NWFP Management Of Protected Forests Rules, 1975
	The Balochistan, NWFP, Punjab and Sindh Local Government Ordinance(s), 1979/80
	The NWFP (Conservation and Exploitation of Certain Forests in Hazara Division) Ordinance, 1980
	The NWFP Forest Development Corporation Ordinance, 1960
Parks and Wildlife Conservation and Protection	The West Pakistan Ordinance, 1959
	The Kohat Marsazi Control Act, 1954
	The Sindh Wildlife Protection Ordinance, 1972 and Rules, 1972
	The Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974 and Rules, 1974
	The Balochistan Wildlife Protection Act, 1974 and Rules, 1975
	The NWFP Wildlife (Protection, Preservation, Conservation and Management) Act, 1975 and Rules, 1976
	The Pakistan Plant Quarantine Act, 1976
	Islamabad Wildlife (Protection, Preservation, Conservation and Management) Ordinance, 1979/80
	The Balochistan, NWFP, Punjab and Sindh Local Government Ordinance, 1979/80
Export and Control Order, 1982	
Mineral Development	The Regulation of Mines and Oil-Fields and Mineral Development (Government Control) Act, 1946
Transport Development	The Provincial Motor Vehicles Ordinance, 1965
	The Provincial Motor Vehicles Rules, 1969
	The Motor Vehicles Act, 1939
	The Fatal Accidents Act, 1855
	The National Highway Safety Ordinance, 2000
Cultural Development	The Antique Act, 1975
	The Punjab Special Premises (Preservation) Ordinance, 1985
Livestock	West Pakistan Goats (Restriction) Ordinance, 1959
	West Pakistan Punjab Animal Slaughter Control Act, 1963
	The Grazing of Cattle in the Protected Forests (Range Lands) Rules, 1978
	Pakistan Animal Quarantine (Import and Export of Animals and Animal Products) Ordinance, 1979/80
	The Balochistan, NWFP, Punjab and Sindh Local government Ordinance(s), 1979/80
Public Health and Safety	The Pakistan Penal Code, 1860
	The Boilers Act, 1923
	The Public Health (Emergency Provisions) Ordinance, 1944
	The West Pakistan Factories Canteen Rules, 1959
	The Balochistan, NWFP, Punjab and Sindh Local government Ordinance(s), 1979/80
	The Western Pakistan Epidemic Diseases Act, 1979/80

Source: Pakistan Environmental Protection Agency, 1997 and JICA Study Team

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2) Federal Laws

(i) Pakistan Environmental Protection Act, 1997

The Act was enacted in December 06, 1997 by repealing the Pakistan Environmental Protection Ordinance, 1983. It provides the framework for implementation of PNCS, 1992 establishment of provincial sustainable development funds, protection and conservation of species, conservation of renewable resources, and establishment of Environmental Tribunals, appointment of Environmental Magistrates, Initial Environmental Examination (IEE), and Environmental Impact Assessment (EIA). According to Pakistan Environmental Protection Agency, some portions of Pakistan Environmental Protection Act, 1997 have been proposed to be updated but they were not officially approved. Therefore, the 1997 legislation is effective at present.

(ii) Cutting of Trees (Prohibition) Act, 1975

This Act prohibits cutting or chopping of trees without permission of the Forest Department.

(iii) The Antiquities Act, 1975

Archaeological sites and monuments are specifically protected by this Act.

(iv) Land Acquisition Act, 1894

The Land Acquisition Act (1894) deals with the acquisition of private properties for public purposes including large development projects like major roads terminals, stations etc. There are 55 sections in this Act mainly dealing with area notifications, surveys, acquisition, compensation, apportionment awards, disputes resolution, penalties and exemptions.

(v) Canal and Drainage Act, 1873

This Act entails provisions for the prevention of pollution of natural or man-made water bodies.

(vi) Pakistan Penal Code, 1860

This Act defines the penalties for violations concerning pollution of air, water bodies and land.

(vii) Explosives Act, 1884

Under the Explosives Act, 1884, the project contractors are bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes.

(viii) Highways Safety Ordinance, 2000

This ordinance includes provisions for the licensing and registration of vehicles and construction equipment; maintenance of road vehicles; traffic control devices, offences, penalties and procedures; and the establishment of a police force for motorways and national highways charged with regulating and controlling traffic on roads, and keeping roads and highways clear of encroachments.

(ix) Occupational Health

Construction and operational activities could affect the occupational health of workers. Quantitative national standards with respect to the above aspect are yet to be developed in Pakistan. However, guidance in qualitative terms can be obtained from the Labour Laws (Amended) Ordinance, 1972.

3) Provincial Laws

(i) Punjab Wildlife Act, 1974

This Act defines rules and regulations for the protection, preservation, conservation and management of wildlife in the Province of the Punjab.

(ii) The Punjab Plantation and Maintenance of Tress Act, 1974

This Act defines rules and regulations for plantation and maintenance of trees in the Province of the Punjab.

(iii) The Punjab Soil Reclamation Act, 1952

This Act defines rules and regulations for the speedy reclamation and improvement of the areas damaged by salinity and water logging (for preventing further damage and for maximizing agricultural production).

(iv) Punjab Local Government Ordinance, 2001

Environmental protection is devolved subject under Punjab Local Government Ordinance (LGO), 2001. Notwithstanding any specific provisions, every local government may perform functions conferred by or under the Punjab Local Government Ordinance, 2001 and in performance of such functions may exercise such powers, which are necessary and appropriate. Until different provisions, rules, regulations or byelaws are made, the local governments may exercise such powers as are specified in the Sixth Schedule of Punjab LGO, 2001.

(v) Lahore Development Authority Act, 1975

Lahore Development Authority (LDA) is responsible for new planned development in Lahore. The body acts as regulatory body of permissions which are required for new

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housing projects, private houses and commercial development in the city areas. LDA was established under the LDA Act, 1975 duly approved by Punjab Legislative Assembly.

(vi) Lahore Land Use (Classification, Reclassification and Redevelopment) Rules, 2009

The GoPb enacted new land use rules in 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 be comply with land use classification and sub-classification of the Rules.

(a) New Classification of Land Use in Lahore

In the Lahore Development Authority (LDA) Land Use (Classification, Reclassification and Redevelopment) Rules, 2009 land in the controlled area should be classified into following 6 areas: a) Residential, b) Commercial (including institutional), c) Industrial, d) Per-urban, f) Agricultural, f) Notified.

(b) Sub-classification of land use

The land classified as above are further sub-classified according to the characteristics of the land such as planned, existing notification or established built-up area, size of plots, right of way of roads, corridors, and land use availability (permitted, permissible or prohibited).

4.2.3 Environmental Standards

The Pakistan Environmental Protection Council first approved these standards in 1993. These were later revised in 1995 and 2000 as National Environment Quality Standards (NEQS). Subject to the provisions of the PEPA, 1997 and the rules and regulations made there under, no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards or, where applicable, the established standards.

The National Environmental Quality Standards (NEQS), 2000 specify the following standards:

- Maximum allowable concentration of pollutants in municipal and liquid industrial effluents discharged into inland waters, sewage treatment facilities, and the sea (three separate sets of numbers).
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources.

- Maximum allowable concentration of pollutants (2 parameters) in gaseous exhaust and noise emission from vehicles.

Revised/ new National Environmental Quality Standards for ambient air, drinking water and ambient noise were proposed by Pakistan Environmental Protection Agency and published in the Gazette of Pakistan, Extra, 26th November, 2010. These NEQs were approved by Pakistan Environmental Protection Council and are now effective.

4.2.4 EIA Regulations

1) Review of IEE/ EIA Regulations, 2000

In 1997, the National Assembly passed the 1997 Pakistan Environmental Protection Act (EPA), which subsumed the 1983 Ordinance. This act requires IEEs and EIAs for all developmental projects. Environmental impact assessment of all development projects whether public or private is a legal requirement under section 12 of PEPA 1997, which became operational in 2001. Project categories, which require an IEE, are listed in Schedule 1 as given in Table 4.2.3. The projects for which an EIA is required are in Schedule 2, and listed in Table 4.2.4. The Pakistan EPA (Review of IEE and EIA) Regulations, 2000 (The 2000 Regulations) prepared under PEPA 1997 define the procedures for IEEs and EIAs, and give legal status to the Pakistan Environmental Assessment Procedures, prepared by the Federal EPA in 1997.

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**Table 4.2.3 List of Projects Requiring an IEE**

Sector	Project Description
A. Agriculture, Livestock and Fisheries	1. Poultry, livestock, stud and fish farms with total cost more than PKR 10 million
	2. Projects involving repacking, formulation or warehousing of agricultural products
B. Energy	1. Hydroelectric power generation less than 50 MW
	2. Thermal power generation less than 200 KW
	3. Transmission lines of less than 11 KV, and large distribution projects
	4. Oil and gas transmission systems
	5. Oil and gas extraction projects including exploration, production, gathering systems, separation and storage
	6. Waste – to - energy generation projects
C. Manufacturing and Processing	1. Ceramics and glass units with total cost more than PKR 50 million
	2. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost less than PKR 100 million
	3. Man-made fibers and resin projects with total cost less than PKR 100 million
	4. Manufacturing apparel, including dyeing and printing, with total cost more than PKR 25 million
	5. Wood products with total cost more than PKR 25million
D. Mining and Mineral Processing	1. Commercial extraction of sand, gravel, limestone, clay, sulphur and other minerals not included in Schedule II with total cost less than PKR 100 million
	2. Crushing, grinding and separation processes
	3. Smelting plants with total cost less than PKR 50 million
E. Transport	1. Federal or Provincial highways (except maintenance, rebuilding or reconstruction of existing metaled roads) with total cost less than PKR 50 million
	2. Ports and harbor development for ships less than 500 gross tons
F. Water Management, Dams, Irrigation and Flood Protections	1. Dams and reservoirs with storage volume less than 50 million cubic meters of surface area less than 8 square kilometers
	2. Irrigation and drainage projects serving less than 15,000 hectares
	3. Small-scale irrigation systems with total cost less than PKR 50 million
G. Water supply and Treatment	Water supply schemes and treatment plants with total cost less than PKR 25 million
H. Waste Disposal	Waste disposal facilities for domestic or industrial wastes, with annual capacity less than 10,000 cubic meters
I. Urban Development and Tourism	1. Housing schemes
	2. Public facilities with significant off-site impacts (e.g., hospital wastes)
	3. Urban development projects
J. Other Projects	Any other projects for which filing of an IEE is required by the Federal Agency under sub-section (2) of Regulation 5

Source: Schedule I of Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000

Table 4.2.4 List of Projects Requiring an EIA

Sector	Project Description
A. Energy	1. Hydroelectric power generation over 50 MW
	2. Thermal power generation over 200MW
	3. Transmission lines (11 KV and above) and grid stations
	4. Nuclear power plants
	5. Petroleum refineries
B. Manufacturing and Processing	1. Cement plants
	2. Chemical projects
	3. Fertilizer plants
	4. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost of PKR 100 million and above.
	5. Industrial estates (including export processing zones)
	6. Man-made fibers and resin projects with total cost of PKR 100 million and above
	7. Pesticides (manufacture or formulation)
	8. Petrochemicals complex
	9. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, textiles (except apparel), printing and publishing, paints and dyes, oils and fats and vegetable ghee projects, with total cost more than PKR 10 million
	10. Tanning and leather finishing projects
C. Mining and Mineral Processing	1. Mining and processing of coal, gold, copper, sulphur and precious stones
	2. Mining and processing of major non-ferrous metals, iron and steel rolling
	3. Smelting plants with total cost of PKR 50 million and above
D. Transport	1. Airports
	2. Federal or Provincial highways or major roads (except maintenance, rebuilding or reconstruction of existing roads) with total cost of PKR 50 million and above
	3. Ports and harbour development for ships of 500 gross tons and above
	4. Railway works
E. Water Management, Dams, Irrigation and Flood Protection	1. Dams and reservoirs with storage volume of 50 million cubic meters (50 M m ³) and above or surface area of 8 square kilometres (8 km ²) and above
	2. Irrigation and drainage projects serving 15,000 hectares and above
F. Water Supply and Treatment	Water supply schemes and treatment plants with total cost of PKR 25 million and above
G. Waste Disposal	1. Waste disposal and/or storage of hazardous or toxic wastes (including landfill sites, incineration of hospital waste)
	2. Waste disposal facilities for domestic or industrial wastes, with annual capacity of more than 10,000 cubic meters (10,000m ³)
H. Urban Development and	1. Land use studies and urban plans (large cities)
	2. Large-scale tourism development projects with total cost more than PKR 50

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Sector	Project Description
Tourism	million
I. Environmentally Sensitive Areas	All projects situated in environmentally sensitive areas
J. Other Projects	1. Any other projects for which filing of an EIA is required by the Federal Agency under sub-section (2) of Regulation 5
	2. Any other projects likely to cause an adverse environmental effect

Source: Schedule II of Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000

2) EIA Guidelines

Pak-EPA has also published environmental assessment procedures and guidelines in October, 1997. These contain the following sets of information relevant to the proposed project as given in Table 4.2.4.

- Guidelines for Policy and Procedures for Filing, Review and Approval of Environmental Assessment Reports – It describes environmental policy and administrative procedures to be followed for filing of an environmental assessment reports by the proponents and its review and approval by the concerned Environmental Protection Agency/ Department.
- Guidelines for the Preparation and Review of Environmental Reports – These guidelines are developed to facilitate both the proponents and decision makers to prepare reports (inclusive of all the information contained therein) and carry out their review so as to take informed decisions.
- Guidelines for Public Consultation – These guidelines deal with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures that their concerns are incorporated in any impact assessment study.
- Detailed Sectorial Guidelines – These guidelines embody issues impacts commonly arisen in projects, the mitigations to reduce/ eliminate these impacts and the need for environmental management plan and monitoring plan to protect the environment. These guidelines include major roads, major thermal power stations, major chemical and manufacturing plants, water supply projects, industrial estates, new township development, sewerage schemes, irrigation and drainage, oil and gas exploration etc.
- Guidelines for sensitive and critical areas – These guidelines deal with environmental considerations which should be fully taken into account for the development in sensitive and critical areas in relation both to the natural

environment and cultural aspects.

Table 4.2.6 provides a comprehensive checklist to be followed when planning and proposing a road project as an initial fatal flew analysis due to its environmental impact.

Table 4.2.5 Major Guidelines Relevant to EIA Procedures

Guidelines for EIA Study, Reports and Approval	
1	EIA Guidelines and Overview
2	EIA Graphics Overview
3	Front Sheet
4	Policies and Procedures for Review and Approval
5	Guidelines for Preparation and Review of Environmental Report
6	Guidelines for Public Consultation
7	Guidelines for Sensitive and Critical Areas
8	Pakistan Environmental Legislation and National Environmental Quality Standards
9	Sectorial Guidelines for Environmental Reports, Major Thermal Power Stations
10	Sectorial Guidelines for Environmental Reports, Major Chemical and Manufacturing Plants
11	Sectorial Guidelines for Environmental Reports, Housing States and New Town Development
12	Sectorial Guidelines for Environmental Reports, Industrial States
13	Sectorial Guidelines for Environmental Reports, Major Roads Guidelines
14	Sectorial Guidelines for Environmental Reports, Major Thermal Power Stations
15	Sectorial Guidelines for Environmental Reports, Sewage Schemes
16	Sectorial Guidelines for Environmental Reports, Oil and Gas Exploration and Production

Source: Website of Pakistan Environmental Protection Agency (<http://www.environment.gov.pk/info.htm>)

Table 4.2.6 Checklist of Items and Matters to Be Considered in Initial Site Assessment for Road Development Project

Check Item	Items/ Matters to be Considered
1. Operational Requirements	1) If there is a new road reserve, is the corridor location consistent with any strategic transport plan for the area?
	2) Does the site or corridor provide sufficient land area for present and future requirements?
	3) Is the site efficient in relation to extractive material and other building material sources?
2. Water Issues	1) Are there any site constraints so that on-site water management is difficult?
	2) Are there risks of surface water pollution because of the proximity or pathways to water bodies or wetlands.
	3) Are there risks of groundwater problems because of shallow or rising groundwater tables, or proximity to groundwater recharge areas, or areas with high vulnerability to pollution?
	4) Is the site susceptible to flooding?
3. Flora and Fauna Issues	1) Can clearing of native vegetation be avoided?
	2) Can clearing of vegetation of high significance be avoided e.g. vegetation

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Check Item	Items/ Matters to be Considered
3. Flora and Fauna Issues	used for visual screening, riparian vegetation, vegetation used as corridors for the movement of fauna?
	3) Are threatened flora and fauna species, populations and ecological communities or their habitats likely to be affected?
	4) Can areas of native forest be avoided?
4. Geological or Soils Issues	1) Are the local topographic characteristics likely to result in design and management difficulties or the inefficient use of natural resources?
	2) Are there any geological characteristics which will cause difficulties in managing impacts (subsidence, slippage, seismic)?
	3) Is the soil highly erodible? identify any management problems.
	4) Is there any existing soil problems e.g. contamination of soil, acid sulphate or saline soils?
5. Transport issues	1) Does the proposal in this location enhance the efficiency of the transport network including public transport?
	2) Can the standard and capacity of the surrounding road network accommodate traffic likely to be generated directly or indirectly by the proposal?
	3) If inadequacies exist, can the road network or traffic management be changed to minimize any impacts, particularly on residential areas?
6. Community Issues (Land Use, Severance, Pollution, Cultural Property etc.)	1) is the proposal likely compatible with surrounding existing or proposed land uses, any sites of outstanding natural, environmental, agricultural or mineral value?
	2) Does the corridor route avoid necessary dislocation of existing roads, and other infrastructure or utility networks? Can dislocation of residential areas be avoided, particularly severance of communities with strong community identity? Can dislocation of the operation of agriculture, forestry, commercial or industrial activities be avoided?
	3) Is there likely to be a problem with air or water quality, or noise levels due to the proximity and nature of nearby land uses? Is the proposal likely to pose health risks?
	4) Is the proposal likely to affect heritage values or sites of significance?
	5) Is the site highly visible? Can significant visual impacts be avoided?
7. Cumulative Issues	Is the proposal at the proposed location, in concert with other recent and planned road network improvements likely to cause cumulative problems, or contribute to existing problems (air, noise, congestion, economic hardship, social issues and inappropriate land use)?

Source: Pakistan Environmental Protection Agency (1997) Sectorial Guidelines for Environmental Reports, Major Roads Guideline

3) Procedure for Environment Approval

According to the Regulation, 2000 general procedure for Environment Approval is as illustrated in Figure 4.2.1.

(i) Project Requiring an IEE

Proponent of a project cannot proceed unless the agency has filed an Initial

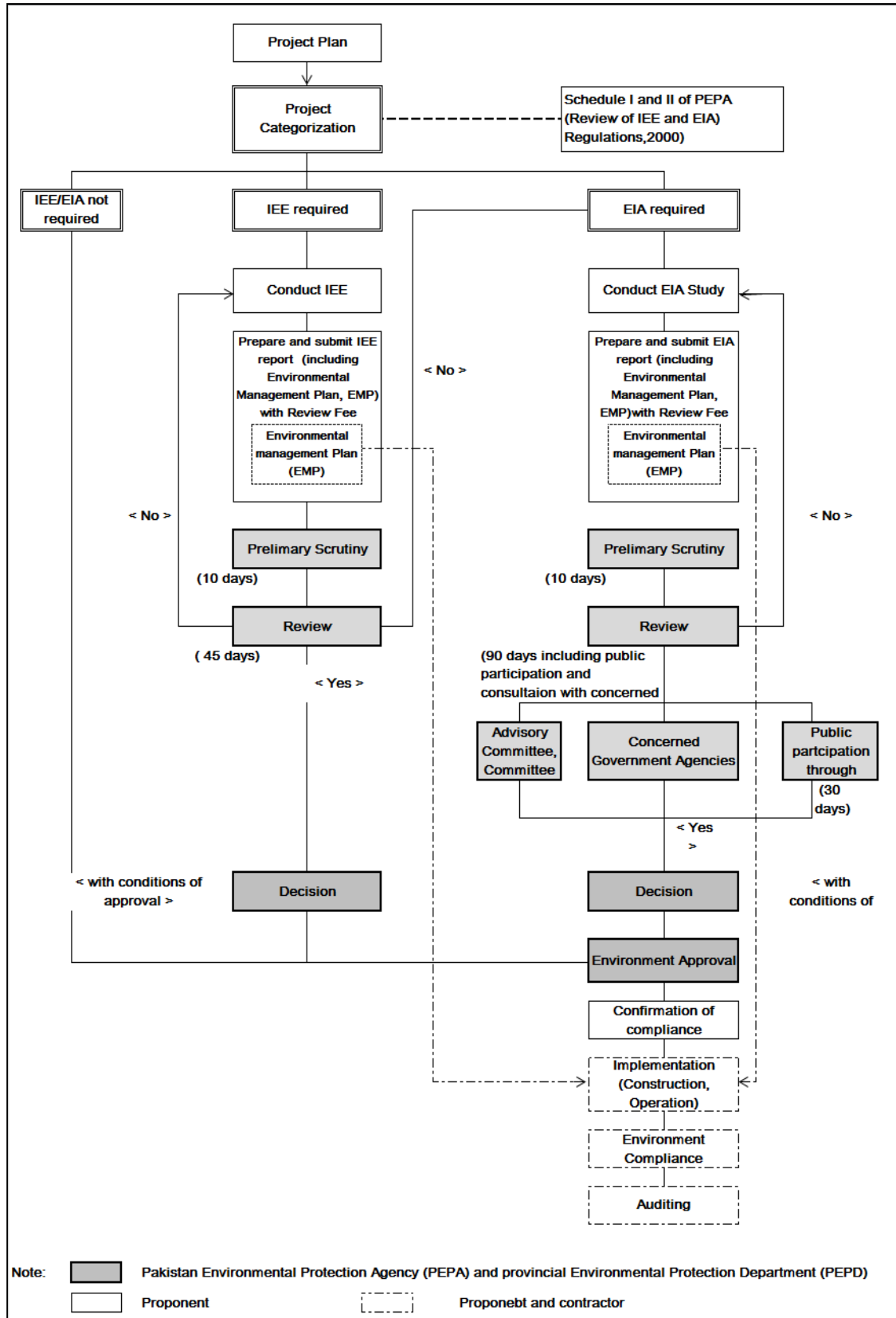
Environmental Examination (IEE) with the Federal Agency and received approval. After filing the IEE, the Federal Agency must respond within 10 working days and state if the submission is acceptable or not, or if an EIA is required. If acceptable, the agency is required to review the IEE and approve, within 45 days.

(ii) Project Requiring an EIA

No proponent of a project which is likely to cause adverse environmental effects can proceed unless an EIA has been approved by the Federal Agency. If an EIA is required

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Figure 4.2.1 Procedure of Environment Approval in Pakistan



Source: JICA Study Team

The Agency must review the EIA and give approval subject to conditions, within 90 days, require that the EIA be re-submitted after any stipulated modifications, or reject the project. Every review of an EIA must be carried out with public participation but no information will be disclosed during the public participation if it is commercially confidential, unless such disclosure is in the public interest.

(iii) Approval of IEE/ EIA

The Federal Agency must communicate its approval or otherwise within four months from the date the IEE or EIA is first filed. If the submission is complete and complies with procedure, but no response is given, then the IEE or EIA shall be deemed approved. The Federal Government can, at its discretion, extend the four months period if justified due to the nature of the project.

The Federal Agency must maintain separate registers for IEEs and EIAs projects, which contain brief particulars of each project and a summary of decisions taken. These registers are to be open to the public. The IEE and EIA submission and approvals procedure is shown above in figure 4.2.1.

(iv) Environmental Monitoring and Audit

The project proponent will be responsible for ensuring implementation of those environmental mitigation measures which are recommended in the IEE or EIA. The corresponding Environmental Management Plan (EMP) should be prepared during the planning phase of the respective IEE/ EIA. The EMP should include specific mitigation measures, environmental monitoring requirements, institutional arrangements and its corresponding budget.

The EMP is a crucial document that should be prepared during planning phase. After its approval by the EPA, the EMP is to be taken into consideration when defining the contractual obligation to be imposed on the contractor. The implementation of the EMP while performing the corresponding construction works is the responsibility of the contractor. The contractor is responsible for environmental monitoring and reporting activities. The project proponent must ensure that the performance of the contractor is in accordance with EMP. The contractor should submit annually a report on the EMP implementation.

4.2.5 Land Acquisition and Resettlement Issues

1) Definition of Land Acquisition and Resettlement

One of major social issues generated by development is land acquisition and resettlement. Land may be acquired to secure necessary space for various development

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activities for the public purpose by the government and related organizations. Generally land acquisition contains not only land itself but also assets. On the other hand, international donors such as World Bank, Asian Development Bank and JICA have different definition discussed in this section.

2) Land Acquisition According to Land Acquisition Act, 1894

In Pakistan, a number of laws give and protect the proprietary rights. The Land Acquisition Act, 1894 (LAA) has been the most commonly used law for acquisition of land and other properties for development projects. Process and timeframe for land acquisition is outlined in Table 4.2.7. The process is initiated by a preliminary notice under Section 4 of LAA served by the District Land Acquisition Collector (LAC) expressing the desire to "enter upon" broadly identified private lands for surveying and soil-testing for the specified public purpose. Then under Section 5, marking and measurement of the land is performed and assessments made of compensation. The final declaration for possession is issued under Section 17 of the Act, having issued the award compensation for individual owners.

Under this Act, only legal owners and tenants officially registered with the Land Revenue Department or possessing formal lease agreements, are considered "eligible" for land compensation. Following the Act (Section 5), cash compensation is assessed on the basis of three – five years average registered market rate, and is paid to the landowners for their land being acquired. Land acquisition is to be completed in total 52 weeks (about one year).

Table 4.2.7 General Process and Time Frame for Land Acquisition in Pakistan

Step	Land Acquisition Process	Responsible Organization	Timeline (General)
1	Land acquisition proposal to Revenue Department; project description, location, extent of land to be acquired	Pak-EPA	Week 1-2
2	Publication of Notice expressing the intent to acquire the land under Section 4	Revenue Department (each District)	Week 3-4
3	Field survey, inventory of assets under Section 5	Revenue Department (each District)	Week 5-20
4	Declaration for possession under Section 6	Revenue Department (each District)	Week 21-22
5	Compensation assessment and award preparation	Revenue Department (each District)	Week 23-24
6	Dispute/Objections (Grievance Redress)	Aggrieved parties	Week 25-26
7	Possession of land, marking, clearance	Revenue Department (each District)	Week 23-52
8	Disbursement of compensation	Revenue Department (each District)	Week 23-52

Note 1: Land acquisition according to Land Acquisition Act, 1894

Note 2: Land acquisition to be completed in total 52 weeks (about 1 year)

Source: JICA (2006): PTPS Report

Although it comprises 55 Sections pertaining to area notification and surveys, acquisition, compensation and appointment, awards and disputes resolution, penalties and exemptions and lays down detailed procedures for the acquisition of private properties for public purposes and their compensation. The LAA or any other law of the land, does not cover resettlement and rehabilitation of persons in a manner perceived today.

In the absence of a resettlement policy, for development purposes and for those which are adversely affected, the LAA 1894 has been the '*de facto*' policy governing resettlement, and compensation to the project affected persons. Its provisions do not take into account the changed social, cultural, economic and environmental situations in which these operate. From operational point of view, the LAA is a provincial law, and each province has its own version and interpretation of this law, mostly procedural in nature. These differences lead to different dispensations in compensation and resettlement packages for the PAPs.

To achieve long term social benefits of development projects, the people must be consulted, compensated for their losses, and assisted in rebuilding their lost assets and livelihoods to enjoy at least the same standard of living as they had before the project. In addition, very often affected people are poor and vulnerable and therefore unable to either stand up to political or government pressure or to absorb adverse impacts on their lives. Mere payment of cash compensation under the LAA is not enough to restore livelihood and living standards, caused by involuntary resettlement issues.

In 2002 National Resettlement Policy (Draft) was formulated not only to cover the Project Affected Persons (PAPs) under the existing system, but also to ensure an equitable and uniform treatment of resettlement issues all over Pakistan. The Policy is supplemented with Guidelines for planning and implementation of resettlement and project Implementation and Resettlement of Affected Persons Ordinance was planned for enactment by the provincial and local government. However, the Ordinance is not yet enacted.

4.2.6 Donor's Environmental Impact Assessment Procedures and Guidelines

All the development projects, which are funded by the donor agencies, have to abide by the guidelines stipulated by the respective donor agency for the Environmental Impact Assessment purpose.

1) World Bank (WB)

In 1998, the World Bank grouped ten of its key environmental and social policies into a set of "safeguard policies" which together are designed to provide maximum protection to the environment and vulnerable population from negative effects of the Bank financed

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

operations. The World Bank Safeguard Policies establish mandatory standards and procedures that the borrower and the Bank must follow in preparing and implementing the Bank financed projects.

(i) Operational Policy 4th January, 1999: Environmental Assessment

This is the umbrella policy through which potential social and environmental impacts are identified and the mitigation measures are proposed. The assessment process determines whether other safeguard policies apply. This policy provides the World Bank to screen projects in order to identify potential impacts early in the project cycle and categorize projects according to the level of environmental impacts. The categories trigger varying requirements regarding pre-project studies, participation, and information disclosure. The borrower is required to conduct assessment and avoid or minimize the identified impacts of the project and also to examine the project alternatives. The borrower is required to assess not only impacts on immediate project area, but project's "area of influence" (e.g., access roads, power lines, pipelines) as well as unplanned developments (spontaneous settlements, logging, etc.) induced by the project.

(ii) Operational Policy 4th December, 2001: Involuntary Resettlement

This policy establishes standards and procedures for projects that displace people from their homes or cause economic displacement due to loss of land, buildings, or sources of income. The policy insists that involuntary resettlement must be minimized, if not avoided. The displaced persons must be assisted as a minimum in restoring their former living standards, income earning capacity, and production levels. Though not required, the policy speaks of improving living standards of resettled persons. It also provides that the resettlement activities should be conceived and executed as sustainable development programs. The policy applies when a WB financed project causes the loss of land (including buildings), assets, or sources of income. The policy also applies when a project restricts access to parks and protected areas.

2) Asian Development Bank (ADB)

Policy of ADB for Environmental Impact Assessment involves its "safeguard policy" and it is basically the same as that of World Bank. ADB's safeguard policy framework consists of three operational policies on the environment: Indigenous Peoples, and involuntary resettlement. These are accompanied by *Operations Manual* sections on Environmental Considerations in ADB Operations; Involuntary Resettlement; and Indigenous Peoples. *ADB's Handbook on Resettlement and Environmental Assessment Guidelines* (2003) provide information on good practice approaches to implementing safeguards. In addition to the three safeguard policies, several sector policies have environmental safeguard

elements, for example, those pertaining to water, energy, and forestry.

3) JICA Guidelines for Environmental and Social Considerations (2010)

In JICA Guidelines (Phrase 7 of Appendix 1. Environmental and Social Considerations Required for Intended Projects) regarding involuntary resettlement, required environmental and social considerations are mentioned as follows:

- Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the affected people.
- People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible. Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover for land and property), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.
- Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.
- For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.

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4.2.7 Difference in EIA Policy of Pakistan and Donors

There are some gaps/ differences between EIA policy of Pakistan and donor agencies. Major gaps are found in involuntary resettlement policy as shown in Tables 4.2.8 and 4.2.9. Subsequently, adverse impacts expected by involuntary resettlement such as generation of PAPs are not formally taken into consideration for categorization of project. Therefore, if number of PAPs are expected more than 200 due to the project (According to World Bank and ADB safeguard policy, it is classified as Category A project). It is not clear whether EIA is truly required or not.

However, Pakistan Government already drafted National Resettlement Policy and Resettlement Ordinance, 2003. The draft policy is consistent with the requirements of the World Bank's OP 4.12 on involuntary resettlement. Unfortunately, this policy has yet to be approved and notified by the government.

Table 4.2.8 Entitlement Matrix Proposed by Resettlement Ordinance, 2003 (Draft)

Item	Type of Losses	Entitlement
1	Partial loss of agricultural land, crops and trees by owners and (sharecrop/ lease) tenants	Cash compensation based on current market replacement value plus 15 % Compulsory Acquisition Surcharge (CAS)
		Cash compensation for loss of crops/trees at the market value
		Compensation to tenants at mature crop value crop-share
		Encroachers/squatters are not eligible for compensation for land on Road Right-of-Way but eligible for cash compensation for loss of assets
2	Total/ major loss of agricultural land by owners/ tenants	Financial assistance (grant/loan) and/or job opportunities as the project for an immediate restoration of livelihood. (In addition to the cash compensation paid under Item No.1)
3	Loss of commercial/ other structures/ installations by owners (SBEs, tube-wells, livestock-sheds etc.)	Compensation for loss at full replacement cost on current value/ prices.
		All salvageable materials will be allowed for rebuilding purposes
		Shops/Small Business Enterprise (SBE) owners once paid due compensation will not be allowed to re-establish within the active ROW of the project roads
		Compensation for all other immovable assets on replacement value, plus installation costs (salvageable materials allowed)
		Where necessary, adequate transportation and labour cost will be paid, especially to the most vulnerable persons (poor/women)
4	Loss of business premise by renters/ tenants	One-time cash assistance equivalent to 2 months' rent to the renters for alternative premises for re-establishing of businesses
		If necessary, adequate transportation and labour costs will be paid

Item	Type of Losses	Entitlement
5	Income assistance for loss of business by shops/ SBE owners/ tenants	One-time assistance, a lump sum grants; based on the nature of business and type and size of losses, the following range will apply: (i) small business up to PKR 2,000; (ii) medium business up to PKR 3,500; and (iii) large business up to PKR 10,000.
6	Loss of wages by SBE employees	Wages for 30 to 60 days at local wage rate (or latest wages)
		Family workers in SBEs will not be paid any compensation; they are already covered by income assistance under No.5.
		Special assistance to vulnerable persons, like , the poor, disabled and women-headed household - one-time lump sum grant of PKR 1,000.
7	Loss of cultural/ community structures/ installations	Cash compensation at replacement value to patrons/user group leaders for rehabilitation/rebuilding of the affected part/ whole, including construction/installation costs (salvageable material will be allowed for free for residue in reconstruction/restoration)
		If not feasible, then the project will be rebuild/restore from its own project cost

Source: Pakistan Environment Protection Agency

Table 4.2.9 Comparison of Land Acquisition Policies between Pakistan and International Donors including WB, ADB and JICA

#	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 deduced 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.

Note:* World Bank, Asian Development Bank and JICA

Source: National Transmission and Dispatch Company (NTDC), Government of Pakistan (2007.11) Pakistan - Power Transmission Enhancement Program MFF Tranche 2.

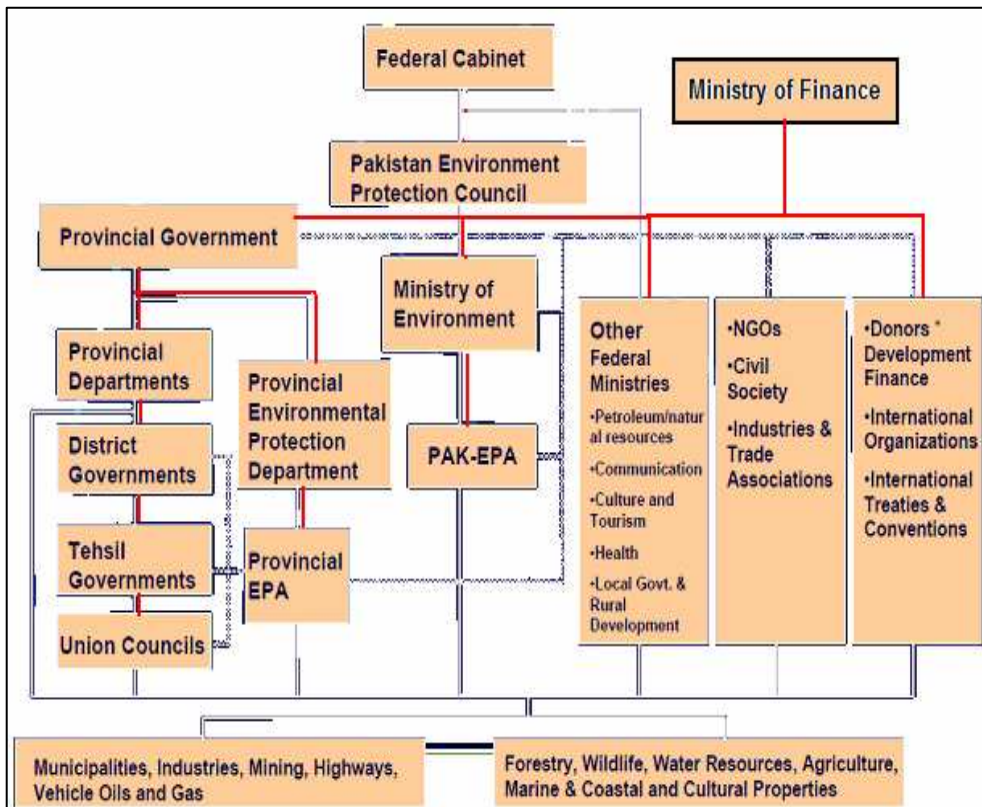
4.2.8 Institutional Framework

1) Pakistan Environmental Protection Council

The Pakistan Environmental Protection Council (PEPC) is the apex institute for environment in Pakistan. The main function of the PEPC is to develop policies and strategies for the enhancement of environment. The PEPC is supported by the Ministry of Environment and Pakistan Environmental Protection Agency. The Planning Commission of Pakistan and provincial planning and development departments have also established environmental sections. These sections are responsible of environmental policy development, identification and development of environmental projects for the five-year plans and annual plans at the federal and provincial levels. To implement Pakistan protection Act 1997 and other regulations, all provincial governments have established Environmental Protection Agencies (EPAs).

Under the framework of the PEPA 1997 and the instruction of Supreme Court of Pakistan, Provincial High Courts have established Environmental Tribunals. Any person in the individual capacity can approach environmental tribunal to register the case against polluters. Figure 4.2.2 shows the organization structure of environmental institutes in Pakistan.

Figure 4.2.2 Relation of Relevant Organizations in Environmental Management



Note: Red lines – flow of resources, Black line – flow of information and decision making processes
 Source: PEPA (2009.6): Institutional Analysis of Air Quality management in Urban Pakistan (Draft Report)

4.2.9 Federal Agencies

The Federal Government established the Pakistan Environmental Protection Agency (PEPA) in 1987 to administer the Act, its rules and regulations. PEPA has among its duties:

- Ensure enforcement of the National Environmental Quality Standards; Establish standards for the quality of the ambient air, water and land.
- It may allow different standards for discharge or emission from different sources, and for different areas, but where standards are less stringent than the National Environmental Quality Standards; prior approval of the Council is required.
- PEPA is staffed with 46 regular staff of which 11 are officers and 35 are ancillary staff. It has a Central Laboratory for Environmental Analysis (CLEAN), and a Green Library, which is also a resource center for the Ministry of Environment. In accordance with section 26 (1) of the 1997 Act, the Federal Government has delegated the powers and functions of the Federal EPA to the Provincial Governments, which have set up provincial EPAs. Provincial EPAs can now implement environmental regulations, monitor compliance, inspect environmental performance and take action against violators.

4.2.10 Provincial Agencies

(1) Punjab Environmental Protection Department (PEPD)

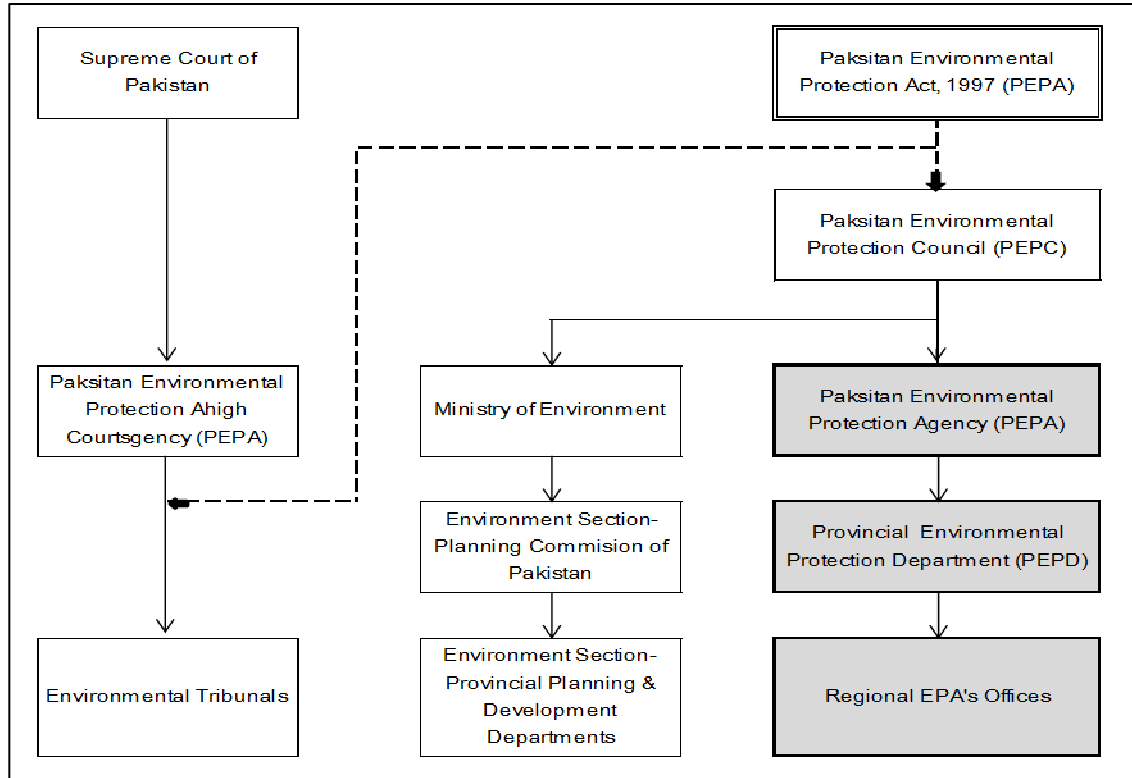
The GoPb has an independent Environment Protection Department headed by a Secretary. The PEPD had offices in the districts, which are headed by Assistant Directors. Under the Punjab Local Government Ordinance, 2001 the PEPD has been devolved, and the officers reassigned at district level. PEPD has 30 officers and 133 ancillary staff, and a laboratory staffed with 5 officers, which generates revenue for the PEPD. The institutional relation slips between various government organizations relevant to environmental protection in Pakistan is illustrated in Figure 4.2.3 and duties, responsibilities as mandated are given in Table 4.2.10.

CHAPTER 4 – ENVIRONMENTAL AND SOCIAL CONSIDERATIONS**Table 4.2.10 Responsibilities of Environmental Protection Enforcing Agencies**

Organization	Mandate
Ministry of Environment	<ul style="list-style-type: none"> • Development of Environmental Policy, Drafting and notifying rules and regulations • Focal point for National Policy, plans and programs regarding environmental planning, pollution and ecology, including physical planning and human settlements. • Coordination with other countries and international organizations in the fields of Environment, physical planning and Human Settlements. • Administrative control of Pak EPA, Pak Forest Institute, etc. • Responsible for coordination of implementation of National Conservation Strategy
Pak-EPA and Provincial EPAs	<ul style="list-style-type: none"> • Regulation of hazardous substances/wastes; • EIA review and introduction of public participation; • Formulation of ambient air standards; • Implementation of national environmental policies; • Establishment of network of environmental laboratories, • Render advice and assistance in environmental matters, • Measures to prevent accidents and disasters causing pollution, • Promote public education and awareness, • Undertake inquiries and investigations into environmental issues., and • Other potential tasks are associated with preparation and processing of legal cases for Environmental Tribunals.
Ministry of Water and Power	Power production to be attuned to safeguarding the environment including air quality
Ministry of Industries	Controlling and correcting industrial discharge of residues and wastes, handling of toxic chemicals, etc. Environmental protection should be one of the key criteria in the selection and development of technology".
Ministry of Transport and Communication	Initiate achievable and phased program for automotive emissions controls by asking local automotive manufacturing industry (Cars, Trucks and Tractors) to comply with EURO Standards for new models.
City Government	<ul style="list-style-type: none"> • Proper solid waste management system right from collection of solid waste up to its proper disposal; • Measures to prevent accidents and disasters causing pollution, and • Promote public education and awareness

Source: Compiled from Institutional Analysis of Air Quality Management in Urban Pakistan by PEPA, (Draft Report – June, 2009)

Figure 4.2.3 Institutional Relationship of Organizations Relevant Environmental Protection in Pakistan



Source: JICA Study Team

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4.3 Preparation of SEA Procedures

4.3.1 Strategic Environmental Assessment and Planning Process

1) Need and Definition of SEA

The need to address the environmental impact of policy, and plans, and programs is widely acknowledged. Regional and national plans are subject to environmental assessment procedures to identify, at a strategic level, potential environmental impacts likely to arise during implementation of the policy or plan. This level of environmental assessment is often referred to as Strategic Environmental Assessment (SEA). In other word, SEA is a system of incorporating environmental considerations into policies and plans.

In this regards, SEA term of “environment” is used as a wider meaning of description which covers not only natural and social conditions but also economic, and financial engineering (technological) aspects. Currently, SEA is widely accepted in many countries as a tool to integrate environmental and social considerations into a decision-making process. It is generally understood as a process for assessing the environmental impacts caused by a policy, plan and program. SEA should be recognized as a supportive method to conduct appropriate decision-making from the point of view of the environment and sustainable development.

An increasing number of countries and international organizations including World Bank, ADB and JICA have introduced SEA system. However, there are differences in the scope, comprehensiveness, duration in relation to policies, plans and programs. There is no single approach to SEA that can be applied to all cases and no internationally accepted definition of SEA. More importantly the decision making context at the strategic level is different at national versus regional level, at policy versus plan/ program level, etc. SEA should be arranged reflecting differences in each situation of proposed policy, plan and program. The whole SEA process is intended to act as a support to planners and decision-makers, providing them with relevant environmental information on the positive and negative implications of policy, plans and programs.

SEA is a macro-planning tool that identifies the opportunities and constraints that the environment provides for the development process, while EIA focuses on identifying and containing the adverse impacts of the development process on the environment at the micro level. Hence, EIA and SEA are complementary planning tools that enable us to effectively mainstream environmental and social considerations in the development process.

2) SEA Definition According to JICA Guidelines

In JICA Guidelines for Environmental and Social Considerations (Amended April 2010), following definition and explanation are given:

- 1.3 Definitions 7. A “strategic environmental assessment” is an assessment that is implemented at the policy, planning, and program levels, but not at project-level EIA.
- 1.4 Basic Principles Regarding Environmental and Social Considerations. As one of seven principles to be very important, “measures for environmental and social considerations must be implemented from an early stage to a monitoring stage”.

JICA applies a Strategic Environmental Assessment when conducting Master Plan Studies and encourages project proponents to ensure environmental and social considerations from an early stage to the monitoring stage. However, there is no further detailed description of SEA in the JICA Guidelines.

3) Role of SEA and Plans for Administrative Decision Level

As mentioned above, SEA can also be applied to formulation of policies, plans and programs at a higher administrative level. Contents and evaluation factors for SEA are somewhat changed depending on the targeted levels of policies, plans and programs such as administrative, spatial and/ or sectarian level. In view of SEA for necessary environmental and social considerations relation of policies and plans with environmental and social considerations are shown in Table 4.3.1.

Table 4.3.1 Development Plan and Strategic Environmental Assessment

No.	Development Plan (Master Plan etc.)		Necessary Environmental and Social Considerations	
	Policy, Strategy, Plan, Project	Example of Development Plan	Examples of SEA/EIA	Tentative Evaluation Factors
1	National Level	National policy/strategy for sector and regional development	National Environmental Policy (NEP)	(1) The Constitution, (2) National Environment Policy, 2005, (3) National Transport Policy
2	Regional (Provincial/District Level)	Regional (Provincial/District) level policy/ strategy for development	(1) SEA-Policy level-1, (2) SEA-sector level	(1) NEP, (2) Regional/Governorate Environmental Management Plan (EMP), (3) Pollution loads (NOx, PM, CO ₂), (4) Energy consumption, (5) Consistency with land use and land regulation

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No.	Development Plan (Master Plan etc.)		Necessary Environmental and Social Considerations	
	Policy, Strategy, Plan, Project	Example of Development Plan	Examples of SEA/EIA	Tentative Evaluation Factors
3	Specific Sector Level	Transport sector (mode and type) development master plan (mode: road, railway, inland waterway, etc., type: passenger, freight)	(1) SEA-policy level-1, (2) SEA-sector level (Transport sector)	(1) NEP, (2) Regional/ Governorate Environmental Management Plan (EMP), (3) Pollution loads (NO _x , PM, CO ₂), (4) Energy consumption, (5) Consistency with land use and land regulation
4	Selection of Routes/ Areas	Candidate routes and/or areas (sites) for the project	(1) SEA-project level, (2) SEA-sector level	Alternative analysis based on identification of envisioned impacts on natural (including pollution) and social environment (wider range)
5	Implementation of Specific Development Project	Specific project with determined route or site	(1) EIA-specific project, (2) IEE-environmental scoping	(1) Full EIA study or partial EIA study, (2) EIA Form A or B.

Source: JICA Study Team

4.3.2 SEA in Master Plan Study**(1) Basic Approach**

In conducting an environmental evaluation of the Master Plan, a SEA will be applied as a systematic process for comprehensively evaluating, at the earliest appropriate stage in the planning process. Several alternative options for the overall transport development project, thereby ensuring a full integration of the relevant environmental and social considerations as well as economic, engineering and financial aspects of the proposed Master Plan.

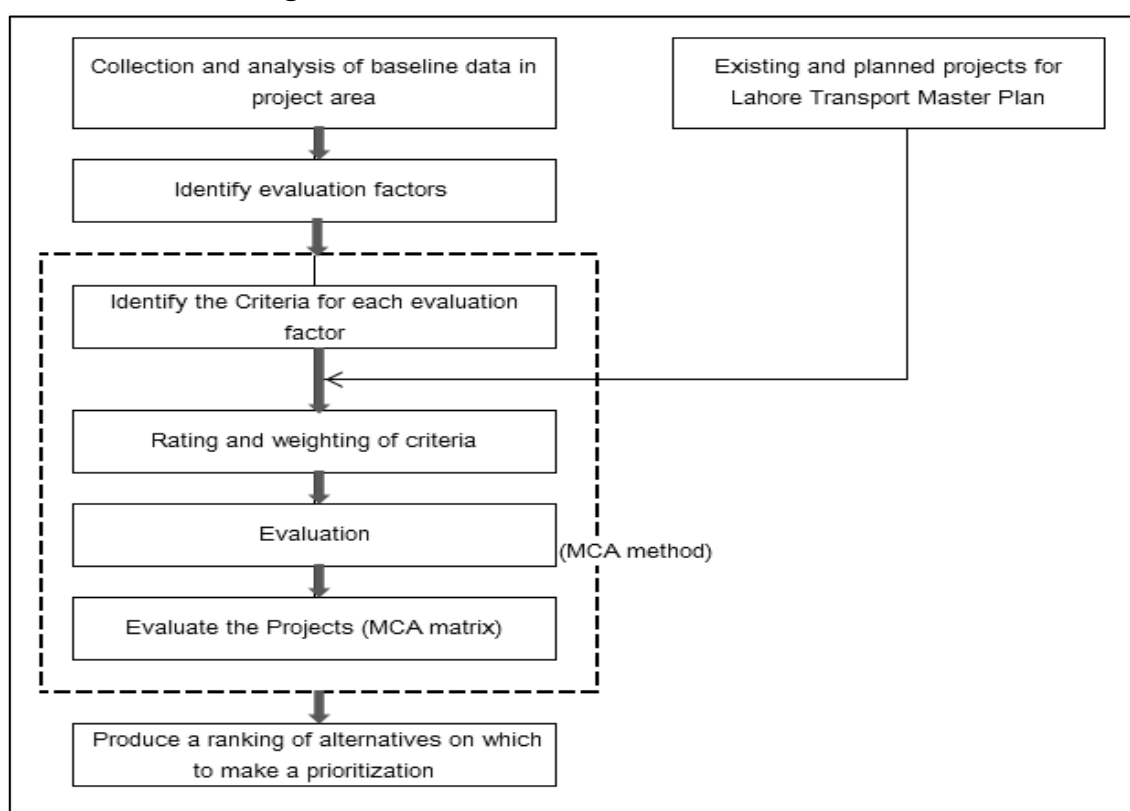
In accordance with the SEA concept, environmental considerations are sufficiently incorporated into the Master Plan. While a project-level environmental impact assessment (EIA) will be implemented after specifying the detailed transport development projects such as road and railway construction along designated route alignment in the Master Plan, the SEA introduces early and strategic environmental considerations before the details of plans of route alignments and their specifications are decided. In other words, the SEA method allows the planner to focus on the environmental affects for the optimum formulation of the Master Plan before specific transport development projects are finalized. Thus, in comparison with a project-level EIA,

the SEA can take into account a broader range of alternative plans and projects and mitigation measures in the procedures of formulating the Master Plan.

2) Procedure of SEA

The main objective of the SEA method is to conduct a comprehensive impact assessment of the Master Plan by using a SEA methodology. It does not only deal with the negative impacts of the engineering, economic, financial, environmental and social aspects of the Master Plan but also the positive ones. The typical SEA process begins with screening and scoping, and ends up with mitigation measures. Procedure of SEA in a Master Plan is shown in Figure 4.3.1.

Figure 4.3.1 Procedure of SEA in Master Plan



Source: JICA Study Team

(i) Collection of Baseline Data and Information

The collection of the baseline information was carried out to establish benchmarks for natural environmental parameters and their attributes, including the socio-economic conditions in the affected areas. This includes a description of the physical, biological, and socio-economic environments with reference to project location and the proposed activities in the Lahore Urban Transport Master Plan.

(ii) Identification of Evaluation Factors

The details of the tentative primary evaluation items (i.e. engineering items), secondary

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items (i.e. economic and financial items), and tertiary items (i.e. environmental and social considerations items) are described. Evaluation items will be utilized for both impact assessment and the comparison of alternatives.

(iii) Evaluation of Rating and Impact Assessment

Rating and evaluation of expected impact are designed to identify and assess the potential environmental impacts of proposed alternatives, thereby assisting in the design of appropriate mitigation measures. Impact assessment will be implemented among several alternatives. The results of the impact assessment will be streamlined in the impact assessment matrix.

(iv) Multi-Criteria Analysis (MCA)

The scope of the SEA is not limited to environmental affects alone. The method provides a number of potential links with the socio-economic assessment, recognizing the idea of the SEA's inter-relationships with socio-economic issues or sustainability concerns. The so-called Multi-Criteria Analysis (MCA), which is a useful evaluation method that judges priorities under different development alternatives, is being employed as a key methodology for the overall SEA assessment.¹

Since a wide range of positive effects and negative impacts are included in the evaluation criteria in the MCA, the methodology allows evaluators to utilize more practical evaluation procedures. The MCA provides a comprehensive evaluation matrix with different weights for each evaluation item, thereby aiding in the selection of alternatives. More concretely, the MCA will be conducted through the following steps:

- a) Selection and rating of evaluation items,
- b) Fixing evaluation indices and rating evaluation scores,
- c) Calculating total weighted evaluation scores,
- d) Formulation of an MCA Matrix.
- e) Recommendations for mitigation measures; and
- f) Information dissemination for mitigation measures,

The above all are elaborated as under:

(a) Selection and Rating of Evaluation Items

The selected evaluation items will be streamlined in the form of a 3 to 5 level evaluation system composed of the following:

¹In this Study results of MCA for candidate projects of LUTMP are separately described in Volume I Chapter 7.

- a) Engineering items related to project conditions,
- b) Economic and financial evaluation items related to project benefits and efficiency;
and
- c) Environmental and social condition items related to project effects and impacts.

(b) Fixing Evaluation Indices and Rating Evaluation Scores

A wide range of indicators explaining the quantitative and qualitative evaluations on the proposed alternatives will be employed. Although it is desirable that evaluation indicators are quantifiable, indicators based on narrative descriptions of the evaluation items are likewise acceptable whenever difficulties in quantifying indicators arose. In order to obtain clear-cut evaluation results for selecting optimum alternatives, all the evaluation items will be rated through the use of a 3 to 5 grade scoring system.

(c) Calculation of Total Weighted Evaluation Score

To reflect the significance of the evaluations, the weight of each evaluation item is assumed, and the total weighted evaluation score will be calculated taking these weights into account. A five-grade evaluation score will be applied for the evaluation.

(d) Formulation of MCA Matrix

To summarize the results of the evaluation, an MCA matrix, which includes the weights and the scores of each evaluation item, will be prepared. The alternatives will be prioritized in accordance with the total evaluation score in the MCA matrix.

(e) Recommendation for Mitigation Measures

As a preventive tool on a wide range of impacts on the natural environment, mitigation measures will be formulated and incorporated into the SEA process in order to ensure that the environmental deterioration resulting from the Master Plan will be minimized. In accordance with the identified and assessed impacts, a comprehensive mitigation measures will be prepared in a concrete manner.

(f) Information Dissemination and Public Participation

The JICA Guidelines on Environmental Considerations stipulates that in the environmental and social aspects in master planning, a series of stakeholder meetings will be conducted at key stages of the study, i.e. during the preparation of the draft of the scoping items, during the formulation of a rough outline of environmental and social considerations, and during the preparation of the draft final report.

As an integral part of the SEA process, a series of stakeholder meetings will be held involving the representatives of various stakeholders in order to disseminate relevant

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information on the proposed Master Plan, as well as eliciting responses on possible positive and negative impacts as perceived by the stakeholders. Results will be shared in the SEA process. The main objectives of the public consultation activities for the SEA process are:

- Enhance transparency in decision-making through the provision of information which will allow for the early identification and mitigation of impacts.
- Promote a more comprehensive understanding of the baseline environmental information. Provide stakeholders with relevant information on potential environmental effects at an early stage of the SEA process in order to avoid unnecessary controversies and delays in the decision-making process at latter stages due to public opposition arising from lack of understanding.

Volume-II – Chapter-5

**CONDUCT OF CAPACITY
DEVELOPMENT FOR TPU**

FINAL REPORT

CHAPTER 5 – CONDUCT OF CAPACITY DEVELOPMENT FOR TPU

5. CONDUCT OF CAPACITY DEVELOPMENT FOR TPU

5.1 Overall Progress

5.1.1 Program of Capacity Development

TPU had been established in 2010 before the start of the Study. However, no staff was recruited for the first one year, mainly due to financial reasons and difficulty to find qualified persons by the offered conditions. Because of this reason, capacity development program had been suspended during the phase-I of LUTMP (April 2010 – March 2011), even though the capacity development was deemed as an important objectives of the Study.

In April of 2011 when the Phase II of LUMTP started, the Transport Department employed five personnel of TPU, who were all assisting and supportive staff (Assistant Grade) and in July and August additional seven staff including senior researchers were recruited. Soon after the JICA Study Team arrived for the Phase-II of the project, the capacity development program was started for them, through lectures, exercise and On-the Job-Training (OJT).

1) Participants of the Lecture

The first lecture was given on 18th April 2011 at the TPU meeting room. The technical staff of TPU reached eleven by August 2011. At the early stage of the program, Transport Department invited persons who wanted to learn transport planning from transport-related departments and agencies and universities, to the LTUMP lectures. Table 5.1.1 lists the participants who attended the lectures at the capacity development programme.

Table 5.1.1 Participants of the Capacity Development Programme

No.	Name	Position
1	Mr. Tayyab Farid	DS(Planning), Transport Department
2	Mr. Arif Nazir	Quality Manager, TPU
3	Mr. Hamid Khan	Senior Traffic Engineer, TPU
4	Ms. Sadaf Saeed	Urban Planner, TPU
5	Mr. Luqman Haider	GIS and Computing, TPU
6	Ms. Maryam Nawaz	Research Assistant, TPU
7	Mr. Muhammad Waqar Aslam	Research Assistant, TPU
8	Ms. Sara Ambreen	Research Assistant (GIS), TPU
9	Mr. Faisal Hassan	Assistant Demand Modeler, TPU
10	Mr. Muhammad Asif	Data Analyst, TPU
11	Mr. Asif Javed	Research Analyst, TPU
12	Mr. Muhammad Usman Malik	Research Analyst, TPU
13	Mr. Azhar Ali	Research Analyst (GIS), TPU
14	Ms. Sara Khan	Manager Planning, LTC

No.	Name	Position
15	Mr. Mohammad Imran	Deputy Manager Planning, LTC
16	Ms. Azmat Naz	Deputy Director(Tech), EPA
17	Mr. Mohsin Raza	Lecturer Transport Engineering, UET Lahore
18	Ms. Izza Anwar Minhas	Lecturer Transport Engineering, UET Lahore
19	Mr. Wajidullah	Student: City and Regional Planning UET Lahore
20	Mr. Aqeel Younis	Assistant Transport Planner, JICA Study Team
21	Mr. Taimoor UI Haq	Assistant Transport Planner, JICA Study Team
22	Mr. Nisar Ahmad Sheikh	Assistant Transport Planner, JICA Study Team
23	Mr. Muhammad Usman Akram	Assistant Transport Planner, JICA Study Team
24	Mr. Kazim Khan	Research Associate , The Urban Unit
25	Mr. Abid Ali Chohan	Student (Environmental Sciences), LSE
26	Ms. Isbah Hameed	Student (Environmental Sciences), LSE
27	Ms. Sidrah Inayat Khan	Student (Environmental Sciences), LSE
28	Mr. Jarjaish Hussain	Intern (GIS)

Source: JICA Study Team

As the results of “open door” arrangement, the attendants have widely varied occupations and their experiences and knowledge of transportation planning were also variable. To know the knowledge level, every new attendant to the lecture was requested to fill a questionnaire shown in Figure 5.1.1. This form requests the attendant to describe briefly his/ her working or studying experience in the field of transport planning and to mark on “A”, “B” or “C” according to the level of knowledge of the ten selected technical terms, which are arranged in the ascending order of higher specialty. This is not for examination purpose but to set the level of lecture. Therefore, he/ she is requested to declare the result of self-assessment on each technical term.

Table 5.1.2 shows the result of the declaration individually but anonymously (The order of Table 5.1.1 is randomly shuffled in Table 5.1.2). Out of 22 persons, a few knows 7-8 words well. On the contrary, five persons know almost no words. In average, “A” was marked on 3.7 words, “B” on 2.9 words and “C” on 3.4 words.

On the first hour words which are relatively easy, 56% of participants marked “A” and on the next three words, 38 % marked “A”. On the last three words, relatively difficult words, only 11 % marked “A”, 37 % put “B” and 52 % put “C”.

Considering the original purpose of the LUTMP capacity development programme, technology transfer should focus on training of TPU staff. However, their absorptive capacity seems not at all higher than other attendants’. Therefore, level of the lectures can be duly set focusing upon the average of the attendants.

CHAPTER 5 – CONDUCT OF CAPACITY DEVELOPMENT FOR TPU**Table 5.1.2 Survey Results of Knowledge on Transport Planning**

No.	Attendant	Knowledge									
		1	2	3	4	5	6	7	8	9	10
1	Mr. A	A	B	B	A	C	A	B	B	C	A
2	Mr. B	A	A	A	A	A	A	A	B	C	A
3	Mr. C	C	C	C	C	C	C	C	B	C	C
4	Ms. D	A	A	A	A	A	C	B	B	C	C
5	Ms. E	A	A	A	A	A	B	A	B	B	A
6	Ms. F	A	A	A	A	A	A	A	-	-	A
7	Mr. G	C	B	B	B	C	C	C	C	C	B
8	Ms. H	A	A	C	B	B	B	B	B	C	C
9	Mr. I	A	A	A	A	B	B	B	B	B	A
10	Ms. J	A	A	A	A	A	B	A	B	B	B
11	Mr. K	A	A	B	A	A	B	B	C	C	C
12	Mr. L	A	A	B	B	A	B	B	B	B	B
13	Mr. M	A	A	A	A	A	B	A	B	B	B
14	Mr. N	B	A	A	A	A	A	B	C	C	B
15	Mr. O	A	A	A	A	A	A	A	B	C	A
16	Mr. P	A	A	-	-	A	A	A	B	B	A
17	Mr. Q	B	A	B	B	C	C	B	C	C	C
18	Ms. R	C	B	C	B	C	C	C	C	C	C
19	Ms. S	C	B	C	B	C	C	C	C	C	C
20	Mr. T	C	C	C	C	B	C	C	C	C	C
21	Mr. U	C	C	C	B	C	C	B	C	C	C

Note: Order is not same as the order of Table 5.1.1. Same staff was not given the test

Source: JICA Study Team

Figure 5.1.1 Questionnaire to the Lecture Attendants

Questionnaire to Attendants to Lesson 1 of LUTMP Course 1 (2011/04/18)

Name: _____ Position: _____

1. Describe briefly your experiences of working or studying in the transport planning fields.

2. Show your knowledge on the technical terms below by marking X on a box, where

A: Know well.

B: Don't know but have ever heard.

C: Never know and have n

Origin-Destination (OD) Matrix or OD Table A B C

(1) Channelization of Carriageway A B C

(2) Coordinated Signal Control A B C

(3) Light Rail Transit (LRT) A B C

(4) Cordon Line Survey A B C

(5) Internal Rate of Return (IRR) A B C

(6) Congestion Tax A B C

(7) Economic Cost and Shadow Price Rate A B C

(8) User Optimum Equilibrium Assignment A B C

(9) Exclusive HOV Lane A B C

Source: JICA Study Team

2) Lectures and Exercises

Lectures were scheduled twice a week on Tuesday and Friday at 10:00 to 12:00 in the morning in the TPU meeting room. A lecture included an exercise which took 10 to 20 minutes. In the course of the Study, about 50 lectures were planned and these were classified into five courses according to the subjects as outlined in Table 5.1.3. In the original program, these courses were planned to be delivered concurrently with the activities of the Study. In reality, however, the Study has preceded the course programme, and lectures were delivered in more compact schedule than the Study.

Table 5.1.3 Overall Schedule of LUMTP Training Course

Course	Main Subject	Period
1	Transport Surveys and Database Development	Apr – May-11
2	Demand Structure Analysis	May – Jun-11
3	Model Building and Transport Demand Forecast	Jun – Aug-11
4	Transport Network and Project Evaluation	Sep – Oct-11
5	Project Prioritization and Formulation of Implementation Program	Oct – Nov-11

Source: JICA Study Team

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Table 5.1.4 gives the schedule of individual lecture, with course number and main contents. By August 5, 2011, actual lectures have been held exactly following the schedule and 24 lessons have been completed.

Both TPU staff and visiting attendants have been very earnest to learn and come to lecturers to ask questions whatever they did not understand well, even after class. Observing their performance of doing exercise, they seemed to understand lecturer’s explanation well. Most of them, however, are not good at mathematics.

Unfortunately, core staff of TPU has not been recruited yet and they joined in class later. Consequently, the contents of lectures from 1st to 24th were kept at basic and preparatory level. After the rest of TPU staff joins in, lectures advanced to essential components of planning technologies.

The counterpart team consisting of TPU researchers was assigned a planning project of public transport improvement at Gujarat City in the Punjab Province and all the TPU staff visited the city for one week from 25 to 29 July 2011. During this period, the lectures were suspended; instead, consultative advices were given on the surveys for the public transport improvement project. And one lesson out of the three lost sessions was recovered on 4th August. The other two lessons were carried over to September after EID Holidays. On 5th August 2011, a small test was given.

After one month of break, lectures restarted at the end of June. The first four lessons after restarting had been spent for training of GIS, which is a powerful tool, also useful in transportation planning. Every transport planner should understand what GIS can do for transport planning, even though he/ she could not operate the GIS by him/ her-self. Lectures entered the Course 3 (Transport Demand Forecast) after the GIS.

Table 5.1.4 Schedule of Lectures

No.	Schedule			Lecturers	Course	Subject and Contents
	Month	Date	Day			
1	Apr	18	Mon	Wakui	1	Introduction/ Technical Terms
2	Apr	22	Fri	Wakui/ Horie	1	Home Interview Survey (HIS)
3	Apr	26	Tue	Wakui/ Horie	1& 2	Home Interview Survey (HIS), OD Table
4	Apr	29	Fri	Wakui/ Horie	1& 2	Cordon and Screen Survey
5	May	3	Tue	Wakui	1& 2	Other Transport/ Traffic Surveys, Network Composition and Road Capacity
6	May	6	Fri	Prof. K. K. Mumtaz	Special	Future Urban Structure of Lahore City
7	May	10	Tue	Wakui	1 & 2	Route Search Algorithm (Moore and Dijkstra), Road Network and Transit Network
8	May	13	Fri	Wakui	2	Structure of Master File, Analysis of Transport Demand(1) What we can do using the PT Master File?
9	May	17	Tue	Wakui	2	Structure of Master File, Analysis of Transport Demand(2) Trip Rate, OD table, Trip Chain, Intermodal Point

No.	Schedule			Lecturers	Course	Subject and Contents
	Month	Date	Day			
10	May	27	Fri	Horie	2	Exercise of Present Transport Demand Analysis (1)
11	May	31	Tue	Horie	2	Exercise of Present Transport Demand Analysis (2)
12	June	3	Fri	Horie	2	Exercise of Present Transport Demand Analysis (3)
13	June	7	Tue	Obrien	2 & 3	Network of LUTMP and Structure of LUTMP Network
14	June	28	Tue	Joel CRUZ	2 & 3	GIS(1) Basic Concept of GIS, Database and GIS
15	July	1	Fri	Joel CRUZ	2 & 3	GIS(2) Thematic Map of GIS and Transport Plan
16	July	5	Tue	Joel/ Sara	2 & 3	GIS(3) (Exercise)
17	July	8	Fri	Sara Ambreen	2 & 3	GIS (4) (Exercise)
18	July	11	Mon	Wakui	3	Preparation for model building (Basic knowledge of Statistics)
19	July	15	Fri	Wakui	3	Regression analysis of non-linear equation Model Building (1) Trip Production
20	July	19	Tue	Wakui	3	Model Building (2) Trip Generation and Attraction Model Usage of Adjustment Factor
21	Aug	2	Tue	Wakui	3	Model Building (3) Trip Distribution Model Value of Time
22	Aug	4	Thu	Wakui	3	Model Building (4) Present Pattern Method Iteration Techniques, Opportunity Model
23	Aug	5	Fri	Wakui	3	Model Building (5) Modal Split Model Logit model and its application
24	Sep	6	Tue	Wakui	4	Do Nothing Analysis and Network Evaluation Techniques Overall Evaluation and Corridor Analysis
25	Sep	9	Fri	Wakui	4	Traffic Assignment Method (1) and Incremental and Equilibrium Assignment
26	Sep	13	Tue	Wakui/ Nishikatsu	4	Traffic Assignment Method (2) and Network Improvement
27	Sep	16	Fri	Wakui/ Horie	3&4	Exercise of Network Simulation(1)
28	Sep	30	Fri	Wakui/ Horie	4	Transport Planning and Project Formulation(1) Traffic Management
29	Oct	1	Sat	Wakui/ Horie	4	Transport Planning and Project Formulation(2) Traffic Management
30	Oct	3	Mon	Mazhar Iqbal	4	LRMTS Network Development and Implementation
31	Oct	4	Tue	Takagi	4	Transport Planning and Project Formulation(4) Traffic Management
32	Oct	6	Thu	Horie	4	Transport Planning and Project Formulation Public Transport Development
33	Oct	7	Fri	Horie	4	Transport Planning and Project Formulation Public Transport Development
34	Nov	4	Fri	Wakui	5	Project Evaluation and Prioritization (2); Estimation of Economic Benefit
35	Nov	21	Mon	Wakui	5	Project Evaluation and Prioritization (3) Multi-Criteria Analysis
36	Nov	22	Tue	Wakui	5	Formulation of Implementation Plan (IP)
37	Nov	23	Wed	Wakui	5	Financing Plan and Private Sector Participation (1) Schemes of Private Sector Participation
38	Nov	24	Thu	Wakui	5	Financing Plan and Private Sector Participation (2) Success and Failure of PSP/ PPP Projects
39	Nov	25	Fri	Wakui	Overall	Summary Lecture/ Examination.
40	Nov	28	Tue	Wakui	Overall	Tea Party/ Free Discussion/ Award of Certificate

Source: JICA Study Team

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3) On the Job Training

Planning technologies were transferred to trainees through rotation of lecture, exercise and on-the-job training (OJT). Among three, OJT was the most important one and then maximum time should have been allocated to OJT. This means, the staff of TPU had to work together with the JICA Study Team as counterparts, in order to elaborate and be involved in the Lahore Urban Transport Master Plan.

However, then capacity of TPU was not adequate enough to function to compose a task force with the Study Team and then, a full-scale OJT could not be accomplished, except supportive work in the field of GIS and land use study. In addition, some analysis of cordon survey data surrounding the old wall city, designated as a world heritage sites, was analysed by the TPU Staff.

5.2 Contents of Lectures

In the period of 26th April to 28th November, 2011, forty (40) lessons were conducted in total. The main topics of each lesson are outlined below. Slides and the handouts used in lectures and exercises are provided in other reports of this study.

5.2.1 Lesson 1 (18 April 2011) by Tetsuo Wakui

The first lecture was given by Tetsuo Wakui, member of JICA Study Team in charge of capacity development. As this is the first time, everybody was requested to make a self-introduction and fill a questionnaire shown in Figure 5.1.1.

The followings were explained in the first lecture:

- Basic policy of LUTMP training programme;
- Procedure for Developing Transport Master Plan;
- Training Schedule;
- Explanation of Selected Technical Terms;
- Calculation of Trip Production Rates;
- How to make traffic Zones (Division of an area, Zone boundary); and
- Exercise: Calculate various trip rates under given conditions.

5.2.2 Lesson 2 (22 April 2011) by Tetsuo Wakui/ Tetsuo Horie

Before stating new topics, about ten minutes are spent for reviewing the previous lesson.

Main topics of the second lecture are as follows:

- Four step approach for transport demand analysis;
- Points for Zoning and Examples of Zone System;
- Sample Rate and Confidence Limit;

- Contents of HIS of Person Trips;
- Exercise: Calculate Necessary Sampling Rate under given conditions; and
- Home Work: To Fill the HIS Questionnaire Form.

Figure 5.2.1 View of LUTMP Lecture (26th April)



Source: JICA Study Team

5.2.3 Lesson 3 (26 April 2011) by Tetsuo Wakui/ Tetsuo Horie

Before starting new topics, discussion was held on the homework and review of the previous lesson was made. Main topics of the third lecture are as follows:

- Implementation method of HIS;
- Procedure of Compilation of Trip Master File;
- Structure of O/D Table;
- How to integrate zones in O/D Table;
- Method of Cordon Survey;
- Method of Screenline Survey;
- How to use the result of Cordon Survey; and
- How to use the result of Screenline Survey.

5.2.4 Lesson 4 (29 April 2011) by Tetsuo Wakui/ Tetsuo Horie

Before stating new topics, about twenty minutes are spent for reviewing the previous lesson. Main topics of the fourth lecture are as follows:

- Auxiliary Surveys to HIS of Person Trip Surveys;
- Structure of HIS Database;
- Node and Link Expression of Transport Network;
- General Outline of JICA STRADA;
- Structure of JICA STRADA;
- Main Modules of JICA STRADA;
- Exercise: To draw cordon surrounding Lahore City and make a location plan of survey stations; and

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- Exercise: Installation of JICA STRADA.

5.2.5 Lesson 5 (3 May 2011) by Tetsuo Wakui

Before stating new topics, about twenty minutes are spent for reviewing the previous lesson. Main topics of the fifth lecture are as follows:

- Auxiliary Surveys to HIS of Person Trip Surveys;
- Travel Speed Survey;
- Parking Survey;
- Traffic Count Survey;
- Bus Occupancy Survey;
- Road Inventory Survey;
- Basic Knowledge of Transport Network in Computer modeling;
- Travel Speed and Road Capacity; and
- Passenger Car Equivalent Units.

5.2.6 Lesson 6 (6 May 2011) by Prof Kamil Khan Mumtaz

The JICA Study Team invited Professor Kamil Khan Mumtaz of Lahore School of Economics (LSE) and requested him to give a lecture to the attendants of the LUTMP training course. He gave willing consent and gave a lecture under the title of “Retrospect and Prospect of Lahore Urban Transport Master Plan”. Figure 5.2.2 is a handout describing the topics of his lecture prepared by him.

Figure 5.2.2 Topics of Special Lecture by Prof. Kamil Khan Mumtaz

<i>May 5, 2011</i>	
<p style="text-align: center;">Lecture by Prof. Kamil Khan Mumtaz, Lahore School of Economics</p> <ol style="list-style-type: none"> 1. Man and Environment <ol style="list-style-type: none"> (1) Science, economy, settlement patterns (2) "Development" and sustainability 2. Traditional Urban Planning <ol style="list-style-type: none"> (1) Ideal City <ul style="list-style-type: none"> ▪ Mohenjo-Daro, Harappa ▪ Axial ▪ Bhambore, Mansura, Baghdad ▪ Gujrat, Fatehpur Sikri, Satghara 3. Master Plan 1966 <ul style="list-style-type: none"> ▪ Twentieth Century Planning <ol style="list-style-type: none"> a. "Road map" and zoning plan <ul style="list-style-type: none"> ▪ Mechanized circulation ▪ Segregation ▪ High tech ▪ Low density ▪ High rise 	<ol style="list-style-type: none"> 4. LUDS 1980 <ol style="list-style-type: none"> (1) Donor driven agendas <ul style="list-style-type: none"> ▪ Development Aid ▪ Sites and Services ▪ Basic Needs; ▪ Poverty Alleviation: sustainable development of the Walled City Project ▪ Sustainable Development (2) Structural Plan <ul style="list-style-type: none"> ▪ Objectives, policies, strategies ▪ Action plan 5. Vision 2020, 2000 <ul style="list-style-type: none"> ▪ Incremental development 6. Post Modern <ol style="list-style-type: none"> (1) Project replaces strategic planning <ul style="list-style-type: none"> ▪ Opportunism, instant gratification ▪ World Class Cities ▪ New Murree, Gwadar, Karachi Waterfront Development Project ▪ Canal Road Widening ▪ Kalma Chowk 7. Need of the Hour <ul style="list-style-type: none"> ▪ Sustainable economy <ul style="list-style-type: none"> ▪ Global Crisis ▪ Conservation of our humanity and our Environment

Source: Prof. Kamil Khan Mumtaz

5.2.7 Lesson 7 (10 May 2011) by Tetsuo Wakui

Main Topics of this lecture are as follows:

- PCU Factors and Vehicle Occupancy;
- Algorithm of Minimum Path Search
- What are the difficulties of traffic assignment procedures
- Method and procedure of traffic assignment
- Exercise: Minimum Route Search manually

5.2.8 Lesson 8 (13 May 2011) by Tetsuo Wakui

Main Topics of the lecture are as follows:

- Traffic Assignment and Transit Assignment
- Daily Fluctuation of Traffic and Peak-hour Ratio/ Factors;
- Information Retrieval from LUTMP Master File; and
- Exercise: To Design a multi-dimension table based on LUTMP Master File.

5.2.9 Lesson 9 (17 May 2011) by Tetsuo Wakui

Main Topics of the lecture are as follows:

- Format of three options of LUTMP Master File;
- Quick review of demand analysis in the LUTMP Interim Report-I; and
- Explanation of LUTMP Training Programme from now on.

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5.2.10 Lesson 10 (27 May 2011) by Tetsuo Horie

This lesson was given by Tetsuo Horie, member of JICA Study Team. He explained the structure of the LUTMP database and gave an exercise to make a two-dimensional table, using a part of the database.

5.2.11 Lesson 11 (31 May 2011) by Tetsuo Horie

This lesson is a continuation of the last lesson. Explanation was given on how to expand the sample data and how to tabulate a two-dimensional matrix, using MS-Excel commands of "COUNTIFS" and "SUMIF". An exercise was given to four groups comprised of attendants.

5.2.12 Lesson 12 (3 June 2011) by Tetsuo Horie

This is also a continuation of the last lesson. That is an explanation and exercise on data processing using the LUTMP database. As an example of three dimensional tabulation, an O/D tables by trip purpose was made using "COUNTIF". After developing the O/D tables, an exercise was done to draw a desire line chart using the O/D tables.

In addition, a second small exercise was given to attendants, concerning data processing and tabulation. In this case, the test was announced in advance.

5.2.13 Lesson 13 (7 June 2011) by David O'Brien

These two lessons given by David O'Brien, member of JICA Study Team were concerning Lahore transport network developed and used by LUTMP. Lectures were given on how to develop and how to use the network.

- The Basic Components of a Travel Demand Model Network
 - a. What are networks made of?
 - i. Nodes, Centroids, Links Centroid Connectors
 - b. Building a Network
 - i. Data Preparation
 - ii. Example
- How a Network is Used
 - a. Path Building Examples for Time and Distance
 - b. Generalized Costs Theory and Examples
 - c. Vehicle Operating Costs (Not something I planned, but we talked about it in response to questions.)
- Building the Lahore UTMP Network
 - a. Where the information comes from
 - b. Putting it all together

- c. Iterative checking process.

5.2.14 Lesson 14 to 17 (28 June to 8 July of 2011) by Joel Cruz and Sara Ambreen

Four lessons from 15 to 18 were introductory lectures and exercises in GIS, which are frequently used for analysis and presentation in transport planning. Lectures were given by Joel Cruz with active assistance of TPU Staff: Ms. Sara Ambreen. Lectures focused on the function and structure of GIS software and how to prepare thematic maps.

5.2.15 Lesson 18 (11 July 2011) by Tetsuo Wakui

Following a quick review of the course one and two given for new participants, basic knowledge and skills of statistics were explained as an introduction to modeling.

- Regression analysis
- Least square error method
- Correlation coefficient
- Estimation of correlation coefficient parameters using excel

5.2.16 Lesson 19 (15 July 2011) by Tetsuo Wakui

After reviewing the regression analysis techniques, trip production as a control total was explained.

- Linear equation and non-linear equation
- Logistic equation
- Transformation to linear equation
- Multiple regression and multi collinearity
- Exercise of regression analysis
- Trip production rate
- Relationship of trip rate to car ownership and household income

5.2.17 Lesson 20 (19 July 2011) by Tetsuo Wakui

Lecture and exercise on regression analysis of logistic equation were given and trip generation and attraction models were explained. As analytical techniques, usage of dummy variables and adjustment factors were also explained.

- How to use dummy variables
- Exercise of fitting of logistic curve
- Application of linear models to trip generation attraction
- Explanatory variables of trip generation and attraction models
- Tentative LUTMP trip generation and attraction models
- How to use adjustment factors

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5.2.18 Lesson 21 (2 August 2011) by Tetsuo Wakui

After reviewing the last lesson, value of time and Trip Distribution models were explained. An exercise was conducted on calculation of depreciation both by linear and compound method.

- Value of time in monetary terms
- Value of time of vehicle
- Value of time of trip makers
- Trip Distribution
- Gravity model and its variations
- Problems of Gravity Model

5.2.19 Lesson 22 (4 August 2011) by Tetsuo Wakui

Additional explanation of gravity model was described. And then, internal trip models, iteration techniques, present pattern method and intervening opportunity models were explained. An exercise was done on parameter estimation of a gravity model.

- Internal trip Model
- Adjustment to G & A (Iterative techniques)
- Present Pattern Method
- Intervening Opportunity Model
- Exercise of developing a gravity model

5.2.20 Lesson 23 (5 August 2011) by Tetsuo Wakui

Logit model and its application example were explained as a modal split model.

- Variation of modal split models
- Logit model
- Estimation of Logit model
- Application of Logit model

5.2.21 Lesson 24 (6 September 2011) by Tetsuo Wakui

At the end of Program 2 of “Transport Demand Forecast”, the case of LUTMP was explained, including socio-economic framework, trip generation and attraction, trip distribution, modal split and assigned future demand on the present transport net. In the latter half of the lesson, two exercises were done: one is to draw a desire line chart and the other is to draw a schematic map showing traffic generation and attraction for a model city.

Figure 5.2.3 View of LUTMP Lecture and Second Test (5th August)



Source: JICA Study Team

5.2.22 Lesson 25 (9 September 2011) by Frits Olyslager

Frits Olyslager, a JICA Study Team member in charge of bus transportation planning gave a lecture on general bus planning, by presenting advanced bus services in the world, inclusive of the Bus rapid Transit (BRT) system. He also proposed the proceeds pooling system for Lahore.

5.2.23 Lesson 26 (13 September 2011) by Tetsuo Wakui and Yoshiaki Nishikatsu

The JICA-Mission headed by Mr. Kawahara visited and attended this lesson. In the first half of the lesson, an overall review of the past 25 lessons, by checking the participants' understandings on the selected important points. In the latter half, Yoshiaki Nishikatsu, a JICA Study Team member in charge of road planning gave a lecture on road planning in general. Also, he explained the planning issues and directions of road planning for Lahore.

5.2.24 Lesson 27 (16 September 2011) by Tetsuo Wakui and Tetsuo Horie

The method of transport network development was lectured including network simulation cases of "Do nothing" case, "Do something" case and "Do maximum" case, which were usually undertaken in a transport master plan study. Network simulation exercises were scheduled in the latter half of the lesson. However, most of the exercised were carried over to the next lessons due to the time limitation.

5.2.25 Lesson 28 (30 September 2011) by Tetsuo Wakui and Tetsuo Horie

The TPU staff came back from Gujranwala and they were to start a financial analysis on the bus business of the Study City. Therefore, how to make a financial analysis was lectured by changing schedule. It was originally scheduled in November. The lecture covered the followings:

- Definition of Financial Analysis and Economic Analysis
- Evaluation Indicators

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- Nominal (Current Price) and Real (Fixed Price) Terms
- Cash Flow of a Project
- Discount Rate
- Calculation of Net Present Value and B/C Ratio
- Estimation of IRR
- Single Year Evaluation

5.2.26 Lesson 29 (1 October 2011) by Tetsuo Wakui and Tetsuo Horie

Traffic assignment method was re-lectured by explanation of the Wardrop's principles and Input/ Output for the JICA STRADA assignment modules. During intermission, Horie explained how to clean PC computers from virus, characteristics of anti-virus software. In the last half of the lesson, exercise of traffic assignment was conducted through a network simulation of "Do-Nothing case", and network improvement by road widening and new road construction. This exercise is a continuation of the exercise of 27th lesson on 13 September.

5.2.27 Lesson 30 (3 October 2011) by Mazhar Iqbal

Mazhar Iqbal, the deputy leader of LUTMP in charge of public transport planning gave a lecture on the Study of Lahore Mass Transit System (LMTS), conducted in 2005-08, covering the LMTS network configuration consisted of four lines, demand forecast, cost estimates, evaluation results, and project status and implementation.

5.2.28 Lesson 31 (4 October 2011) by Michimasa Takagi

Mr. M. Takagi, a Study Team member in charge of traffic management planning gave a lecture on traffic signalization plan in general. At the end of the lecture, an exercise was given to determine the split time under the given conditions of phases and in-flow traffic volumes of each leg and signal phases.

5.2.29 Lesson 32 and 33 (6 and 7 October 2011) by Tetsuo Horie

An exercise of network simulation was given as a continuation of the previous exercise, which included tasks of:

- (1) To develop a simulation network, by using GIS Converter
- (2) To conduct a transit assignment, by using a model city prepared in the JICA STRADA.

5.2.30 Lesson 34 (4 November 2011) by Tetsuo Wakui

A lecture was given on the transport demand management (TDM), covering its historical background, classification and examples of TDM implementation in the world. A

homework was given to collect through internet at least one interest TDM example undertaken in some city in the world. The homework shall be reported on 15th of November.

5.2.31 Lesson 35 (21 November 2011) by Tetsuo Wakui

Before entering to the main topic of this lesson, presentations of homework (examples of TDM measures implemented in the world) was made by two participants. This is the first lesson of the economic evaluation. After explanation on economic cost, an exercise was given to convert financial cost to economic cost.

5.2.32 Lesson 36 (22 November 2011) by Tetsuo Wakui

As the second lesson of economic evaluation of a transportation project, the lecture focused on how to define and estimate economic benefit of a project. Another way of demand forecast of a project was explained by using diverted, converted, induced and developed demand, and relationship of those demand and four step approach. Consumer's surplus, VOC and TTC were also explained.

5.2.33 Lesson 37 (23 November 2011) by Tetsuo Wakui

After making an explanation on the exercise in the previous lesson, continuation of the economic analysis was lectured focusing economic benefit estimation. After finishing the explanation on economic analysis, lecture was given on the structure of the basic three accounting books and how to calculate IRR using these books. Finally, IRRs from other viewpoints than a project were explained, that is, the Equity IRR and Financier's IRR.

5.2.34 Lesson 38 (24 November 2011) by Tetsuo Wakui

In this lesson, the Multi-Criteria Analysis (MCA) and Public and Private Partnership (PPP) were lectured, explaining the following topics:

MCA

- Procedure of MCA
- Scoring to criteria
- Variations of MCA
- Criteria used in LUTMP
- Exercise of MCA

PPP

- Modality of PPP
- Transport Sector PPP in the World
- PFI Projects in the World

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- Role Division for the Public and the Private
- Case Study In Manila of the Philippines
- Main Issues of PPP Scheme
- Fare Setting
- Risk Allocations

5.2.35 Lesson 39 (25 November 2011) by Tetsuo Wakui

As this is the second last lesson, an overall review was given from the course 1 to 5, by asking a question to all the attendants one by one, concerning important technical terms, demand forecast steps and models, zoning and network formulation techniques, road capacities, project evaluation method, and important conditions for success of PPP project.

5.2.36 Lesson 40 (28 November 2011) by Tetsuo Wakui

As this was the final lesson, a test covering the course 1 to 5 was given as shown in Figure 5.3.1. The resultant records were quite satisfactory and the capacity development was regarded successfully achieved.

5.3 Understanding of Lectures

5.3.1 Test at the End of Course 2

At the end of Course 2 of the programme, a small surprise test was given to the attendants, in order to know to what extent they understood the contents of the lectures. There are five questions in the test paper as shown in Figure 5.3.1. These aim at testing the following knowledge.

- **Q1:** Four Steps of Transport Demand Analysis Procedure
- **Q2:** Definition and volume of Road Capacity
- **Q3:** Important matter of Zoning
- **Q4:** Structure of OD Table
- **Q5:** Purpose of Screen Line Survey and Cordon Line Survey

The test was conducted after the lecture on 17th May 2011, by giving time of 20 minutes. Thirteen attendants took the test. The result is shown in Table 5.3.1. The average point is 74.3, which is passable but rather lower than expected. One reason may be that some attendants entered class only recently and did not participate in the early lessons. Actually, two persons attended only two or three lessons.

If observing the average points (in percentage to the full point) by question, Q1, Q2 (1), Q2 (2) and Q5 are comparatively well understood, at the average point of 85 %, 85 %, 77 % and 79 %, respectively. On the contrary, Q2 (3), Q3 and Q4 are poorly understood at 54 %, 62 % and 69 %.

The small test revealed that even very basic knowledge are not necessarily well understood and then repetitive explanation should be given in easier way to understand. In addition, some orientation will be needed to midway attendants by making quick review of lessons prior to their participation.

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Figure 5.3.1 Test after Course 1 and 2

The First Small Test at the end of Course 1 and 2 (17 May 2011)

Name: _____

Position: _____

1. Four Step Method for Transport Demand Forecast

Show the Four Step Method in order by connecting adjacent squares of correct terms with lines, in the same way as an Exempl example.

Step 0:		<input type="checkbox"/>	—	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	Trip
Production	From where to where?	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
Step 1:	Traffic Assignment	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	By which
transport mode?		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
Step 2:	Modal Split							
Step 3:	Trip Distribution							
Step 4:	Trip Generation/ Attraction							

Via which route?
How many trips zone-wise?
How many trips in total?

2. Road Capacity

(1) Based on the definition of three highway capacities of a link, arrange them in descending order (largest at first and smallest at last) by filling the boxes with A, B or C.

A: Practical Capacity > >
 B: Basic Capacity
 C: Possible Capacity

(2) What is an average possible capacity of a lane in a multi-lane road in an urban area?
 _____ PCU/Lane/Hour

(3) Convert an hourly road capacity into a daily capacity.
 6,000 PCU/Hour = _____ PCU/Day

Assume the followings:

- A) One day = 24 hours.
- B) Daytime and Nighttime traffic ratio= 80: 20
- C) Peak-hour ratio = 10%
- D) Heavier direction traffic ratio = 1.55

3. Zoning

Explain the most important consideration for zoning. (Mention only one.)

4. OD Table

What are the following A – G of an OD Matrix called in technical terms for transport planning?

Select the correct ones among choices of a-m and fill the boxes with a-m.

		Origin/ Destination Matrix		Sum	Answers	
1	Study Area	A	B	E	A	— <input style="width: 40px; height: 20px;" type="text"/>
n n+1		C	D		B	— <input style="width: 40px; height: 20px;" type="text"/>
External Zones		C	D		C	— <input style="width: 40px; height: 20px;" type="text"/>
N					D	— <input style="width: 40px; height: 20px;" type="text"/>
Sum		F		G	E	— <input style="width: 40px; height: 20px;" type="text"/>
					F	— <input style="width: 40px; height: 20px;" type="text"/>
					G	— <input style="width: 40px; height: 20px;" type="text"/>

Choices

- (a) Out-going External Trips
- (b) Linked Trips
- (c) Inter-modal Trips
- (d) Non-home based Trips
- (e) Internal Trips
- (f) Triangle Trips
- (g) Produced Trips

- (h) Unlinked Trips
- (i) Through-Trips (External-External Trips)
- (j) Attracted Trips
- (k) Home-based Trips
- (l) In-coming External Trips
- (m) Generated Trips

5. Cordon and Screenline Surveys

State briefly on main purposes of Cordon and Screenline Surveys as auxiliary surveys to support HIS Person Trip Survey.

Cordon Line Survey: _____

Screen-Line Survey: _____

Source: JICA Study Team

CHAPTER 5 – CONDUCT OF CAPACITY DEVELOPMENT FOR TPU**Table 5.3.1 Results of Test at the End of Course 1 and 2**

Question	1	2(1)	2(2)	2(3)	3	4	5	Total
Full Point	24	6	5	5	10	35	15	100
Examinee								
A	18	6	5	5	10	35	15	94
B	12	6	5	5	5	10	8	51
C	18	6	5	5	8	35	12	89
D	24	6	5	5	7	35	15	97
E	24	6	0	0	10	10	15	65
F	24	2	5	0	10	35	10	86
G	24	6	5	0	5	15	15	70
H	24	6	5	5	5	35	15	95
I	12	6	5	0	10	30	15	78
J	24	2	5	5	3	15	15	69
K	24	6	5	5	5	35	5	85
L	24	2	0	0	3	10	15	54
M	12	6	0	0	0	15	0	33
Average	20.3	5.1	3.8	2.7	6.2	24.2	11.9	74.3

Source: JICA Study Team

5.3.2 Test at the End of Course 3

A small test was given to the participants in order to check their understandings. The test included four questions concerning four step approach of demand forecast, calculation of depreciation, linearity of generation and attraction model, characteristics of logistic equation and present pattern, as shown in Figure 5.3.2.

Figure 5.3.2 Test at the End of Course 3

The Second Small Test at the end of Course 3

5August, 2011

Name: _____

Position: _____

1. Four Step Method for Transport Demand Forecast

State the four steps for transport demand forecast Method in order with very brief explanation of job contents or output of each step.

(Name of Step) (Job Contents or Output of the Step)

Step 0 (example): Trip Production: Total trips generated in the study area

Step 1: _____

Step 2: _____

Step 3: _____

Step 4: _____

2. Depreciation

1) How much is the annual depreciation amount under the following conditions?

- Initial value: PKR150,000
 - Scrap Value: 10.0%
 - Durable Period (Life): 15 years
 - Depreciation Method: Straight Line Depreciation
- Annual Depreciation Amount PKR _____

2) What is the annual depreciation rate under the following conditions?

- Initial value: PKR 10,000
 - Scrap Value: 5.0% of the initial value
 - Durable Period (Life): 8 years
 - Depreciation Method: Compound Depreciation
- Annual Depreciation Rate _____%

E) **Trip Generation and Attraction Model:** State the reason why a linear model is usually used for the trip generation and attraction model.

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3. Logistic Model

Select correct statements about the logistic equation below, using ✓.

$$y = \frac{N}{1 + e^{-ax}}$$

- The logistic curve is symmetric to the central point (0, N/2).
- y can take any value even larger than N, if x is enough large.
- y cannot exceed N. Then, N is called “capacity”.
- Growth rate of y becomes the maximum when x is zero.
- The logistic equation cannot be transformed to linear equation.
- Population of a specific area can be shown using the logistic curve.
- The differential of dy/ dx is proportional to y(N-y).
- If x is negative, y is also negative.

4. Present Pattern Method

(1) For what purpose is the Present Pattern Method used? Select the correct one with ✓.

- To estimate the parameters of trip generation and attraction models.
- To estimate future OD trips using present OD table and future generated and attracted trips
- To estimate total trip production
- To make a regression analysis in order to build a logistic model

(2) State one advantage and two disadvantages to use the present pattern method.

Advantage: _____

Disadvantages:

(1) _____

(2) _____

Source: JICA Study Team

The result of the test is shown in Table 5.3.2. All the participants of perfect attendance were marked high scores. Most attendants were judged to understand the lessons well.

Table 5.3.2 Results of Test at the End of Course 3

No.	Question # ⇒	1	2	3	4	5-1	5-2	5-3	Total
	Examinee / Full Point	20.0	20.0	20.0	20.0	5.0	5.0	10.0	100.0
1	A	20.0	20.0	20.0	17.5	5.0	5.0	10.0	97.5
2	B	20.0	20.0	20.0	15.0	5.0	5.0	10.0	95.0
3	C	20.0	20.0	20.0	15.0	5.0	5.0	10.0	95.0
4	D	20.0	20.0	20.0	15.0	5.0	5.0	10.0	95.0
5	E	20.0	20.0	20.0	12.5	5.0	5.0	10.0	92.5
6	F	20.0	20.0	20.0	10.0	5.0	3.0	10.0	88.0
7	G	20.0	20.0	20.0	15.0	5.0	3.0	5.0	88.0
8	H	20.0	20.0	10.0	17.5	5.0	5.0	10.0	87.5
9	I	20.0	20.0	0.0	17.5	5.0	3.0	5.0	70.5
10	J	20.0	10.0	5.0	15.0	5.0	3.0	10.0	68.0

Source: JICA Study Team

5.3.3 Final Test

On the final day of lectures, a small test was given to the participants. The five questions shown in Figure 5.3.3 given in the following two pages covered not only the course 5 of project evaluation, but overall courses 1 to 5 and focused on the most important issues which were repeatedly explained and reminded. Moreover, in the second last lesson, overall review was given, touching most part of the test questions. Consequently, the results were much improved comparing the previous two tests, are given in Table 5.3.3. Although there are reasons of the good results, the essences of transport planning technology were seemingly well understood by most of participants.

Table 5.3.3 Results of the Final Test

No.	Question # ⇒	1	2	3	4	5	Total
	Full Point ⇒	20.0	30.0	15.0	15.0	20.0	100.0
1	A	20.0	30.0	15.0	15.0	20.0	100.0
2	F	20.0	30.0	15.0	15.0	18.0	98.0
3	B	20.0	27.0	15.0	15.0	20.0	97.0
4	G	20.0	27.0	15.0	15.0	20.0	97.0
5	H	20.0	30.0	12.0	15.0	20.0	97.0
6	I	20.0	27.0	15.0	15.0	20.0	97.0
7	J	20.0	27.0	15.0	15.0	20.0	97.0
8	K	20.0	27.0	15.0	15.0	20.0	97.0
9	M	20.0	27.0	15.0	15.0	20.0	97.0
10	C	18.0	30.0	15.0	13.0	20.0	96.0
11	L	20.0	26.0	15.0	15.0	20.0	96.0
12	E	14.0	27.0	15.0	15.0	20.0	91.0
13	D	9.0	21.0	15.0	13.0	16.0	74.0

Source: JICA Study Team

Figure 5.3.3 The Final Test

The Final Test at the end of Capacity Building Program

28 November, 2011

Name: _____

Position: _____

1. Put the most suitable technical terms in each box.

- (1) What comparison is made to estimate economic benefits of a project?
_____ and _____ comparison
- (2) What is the most popular model for the trip distribution step? _____ model
- (3) What is the most popular model for the modal split step? _____ model
- (4) For conversion of financial cost to economic cost, physical contingency is not excluded and then, what contingency is excluded? _____ contingency
- (5) A network for transport demand assignment is composed of:
_____ and _____
- (6) A conversion rate "SER" represents: _____
- (7) A conversion rate "SWR" represents: _____
- (8) An important attitude to identify and select economic benefits of a project is to exclude a doubtful one, that is, _____ -ism.
- (9) There are two representative road network patterns: one is "radial and circular" pattern and the other is _____ pattern.
- (10) All types of vehicles are converted into the unit of _____ when loading on a network.

2. State briefly the answer of each question.

- (1) What is the most important condition to success in a PPP project?

- (2) What are the differences between the financial evaluation and the economic evaluation?

- (3) State about "discount rate" (=rate of capital opportunity cost).

- (4) What are the three basic accounting books? List-up only the names.
a) _____ b) _____ c) _____
- (5) State the definition of "internal rate of return" (IRR).

3. TDM

Assuming that Lahore had a fine rail transit network for urban transport but people preferred using cars and most roads were congested while the rail transit lines had not enough demand. Under such a situation, recommend three TDM measures in order to shift the demand from private car use to rail transit use.

- (1) _____

- (2) _____

- (3) _____

4. Calculation

(1) Depreciation

Calculate the annual depreciation rate of ten years compound depreciation at the scrap value (salvage value) of 20%. R= _____%

(2) Net Present Value

Calculate the net present value (NPV) in the right Table, assuming the discount rate at 12%.

Year	Cost	Benefit	Discounted at 12%	
			Cost	Benefit
2012	150	-		
2013	10	180		
2014	10	200		

(3) Installment

Calculate the one-time payment amount of fixed amount installment of Rp 250,000 at 10 times installment and interest rate of 12% per annum. Rp _____ / time

Formula: $X = i (1.0 + i)^n / ((1.0 + i)^n - 1.0) A$

5. Select Correct Statement (Put ? in a box)

- (1) Logistic curve is transformable into a log-linear equation.
- (2) The double-entry bookkeeping is the mainstream in accounting even now.
- (3) Trip generation model cannot be a linear equation.
- (4) In most case, economic cost of a project is less than financial cost of the same project.
- (5) Induced and developed trips are additionally estimated in the 4 step approach.
- (6) P/L statement states the assets of an entity at the end of its fiscal year.
- (7) The PCU of an animal driven cart is smaller than 1.0
- (8) In “do-nothing” analysis, present network is assumed also for the future.
- (9) “Linked” trip is counted by mode.
- (10) An OD matrix represents distributed trips.

Extra Question

Describe the most impressive matter explained in the course of Lessons which may be kept in your mind for a long time. If there is none, describe “none”.

Volume-II – Chapter-6

LUTMP DATABASE

FINAL REPORT

6. LUTMP DATABASE

LUTMP database has been broadly categorized in to two types; Transport Database, and GIS Database. Transport database includes transport/ traffic surveys. GIS is mainly the processed data related road network, administrative, social, land use, infrastructure, transportation facilities in GIS Arc-View Map environment.

6.1 Transport Database

6.1.1 Introduction

Eleven different types of transport/ traffic surveys have been conducted. These were designed according to data requirement for urban transport planning, and scope of the Study. All types of surveys are described briefly in chapter “Conduct of Transport/ Traffic Surveys” (Volume-II Chapter 1). In addition to these surveys, relevant data was collected from government agencies/ departments related to socio-economic, public transport, administrative, and existing road network and facilities.

Nine surveys have been conducted in LUTMP Phase-I, and two supplementary surveys in Phase-II of the Study. All survey data had been used at different stages of the Study.

Development of comprehensive transport/ traffic surveys database for master planning is essential for its future use in transport planning, strategy development project evaluations, and follow-up feasibility studies by other departments and agencies. LUTMP database has been developed based on the following guidelines:

- It should have clear and simple file structure for user’s ease and understanding;
- It should be transferable from one computer storage media to another through CD-ROM, or external hard drives;
- It should have readable file format which can be ease and understanding accessed/ processed through database, GIS, traffic engineering and transport modeling and planning tools;

6.1.2 Data Classification

Transport/ traffic surveys database is classified according to their use and objective in the Study. Database consists of results of field surveys and other data from like population and administrative boundaries from other sources. Transport database is classified in to six categories as listed below in Table 6.1.1.

Table 6.1.1 Transport Database Classification

Data Category	Source
1 Socio-Economic Data	
a) Population by Age b) Employment by Workplace c) Workers by Residence d) School Attendance e) Income Level f) Vehicle Ownership	Household Interview Survey
2 Transport Demand	
a) Internal O/D Trip Matrices b) External O/D Trip Matrices	Household Interview Survey Cordon Interview Survey
3 Transport Model Calibration	
a) Screenlines Counts and Occupancy b) Traffic Counts	Canal and Rail Screenlines Survey Traffic Count Survey
4 Road Network	
a) Road Network Inventory b) Junctions Characteristics	Road Network Inventory Survey and Junctions Survey
5 Public Transport	
a) Public Transport User Interview b) Bus Occupancy c) Willingness to Pay for Improvements	Public Transport User Interviews Bus Occupancy Survey Willingness to Pay Survey
6 Traffic Management	
a) Parking b) Travel Speed c) Road Junctions Designs and Traffic Signal Operation	Parking Survey Travel Speed Survey Road Junctions and Traffic Signal Survey
OTHER DEPARTMENTS/ AGENCIES	
Population by Union Council Level	Punjab Bureau of Statistics (PDS)
Public Transport Existing HOV and LOV Routes	Lahore Transport Company
Railway Passengers by Station	Pakistan Railway

Source: JICA Study Team

6.1.3 Data Types

The data can be categorized in to three types based on its processing status; primary, secondary and tertiary.

1) Primary Database

It is unprocessed but cleaned data obtained from direct field surveys in standard format without any analysis or computations prepared in LUTMP Phase-I.

This data is held as the base data, and will be useful for the user; if they need raw data for their own specific purpose.

2) Secondary and Territory Database

It is processed data; or analysis of the base data by different transport and traffic field experts according to their own specific requirement to understand the existing situation. Many summary tables, graphs, origin-destination (O/D) trip tables by purpose, mode,

time, or activity are proposed. Most importantly this is used to prepare a base for base transport model using the current socio-economic information, O/D trip tables and other surveys for calibration. This data can be used as simple facts without any specific purpose or requirement.

It is the forecast data for future years such as socio-economic framework, road network operational condition, project specific forecasts like BRT or MRT patronage lines. This will be completed at the end of LUTMP Phase-II. This data is scenario specific, and forecast is based on assumptions taken for each scenario. Three alternative urban development scenarios have been considered during the Study, and scenario-II; compact concentric fashion development has been adopted for the master plan development based on its more compatibility and ease of implementation in local condition. This data is not simple facts; so require complete comprehension of socio-economic framework, transport planning and demand modeling before using this for some specific purposes. Detail of primary and secondary data type is given in Table 6.1.2, followed by tertiary data type in Table 6.1.3.

Table 6.1.2: Primary and Secondary Transport Database – LUTMP Phase-I

Data Class	Primary Data (Original Data)	Secondary Data (Processed Data)
Socio-Economic	a) HIS Master File b) Zone System	a) Population by Age b) Employment by Workplace c) Workers by Residence d) School Attendance e) Income Level f) Vehicle Ownership
Transport Demand	a) HIS Master File b) Cordon Survey Master File	a) O/D Matrices
Transport Model Calibration	a) Rail and Canal Screenlines b) Traffic Counts	a) Traffic counts and vehicle occupancy by each crossing b) PCUs summary by each site
Road Network	a) Road Network Inventory b) Junctions Characteristics	a) Road network existing condition analysis through RoW, road width, land use, parking, encroachment b) Overall junction existing condition
Public Transport	a) Public Transport User Interview b) Bus Occupancy c) Willingness to Pay for Improvements	a) Public transport user data summaries and O/D Matrices b) Average occupancy computation by each route c) Value of time
Traffic Management	a) Parking b) Travel Speed c) Road Junction Design and Traffic Signal Operation	a) Parking accumulation and turnover b) Average journey time by each route and delay type analysis c) Junction design and phasing drawing of surveyed junction

Source: JICA Study Team

Table 6.1.3 Tertiary Transport Database – LUTMP Phase-II

Data Class	All Scenarios (2020 and 2030)
Socio-Economic	<ul style="list-style-type: none"> a) Population b) Employment c) Students d) Income e) GDP f) Vehicle Ownership
Transport Demand	a) O/D Matrices by Mode
Road Network	<ul style="list-style-type: none"> a) Road Network Capacity b) Network Demand for Proposed Road Network
Public Transport (PT)	<ul style="list-style-type: none"> a) PT Demand for existing Bus Routes b) PT Demand for proposed public transport improvement projects: BUS, BRT and MRT

Source: JICA Study Team

6.2 GIS Database

6.2.1 Overview and Purpose of GIS Database Development

Geographical Information System (GIS) database is developed using Arc-View environment. This is used to perform geographical analysis based on spatial distribution of socio-economic, other information to see their impact by area type like district, town, union council and traffic zone.

GIS database was developed to understand current conditions of the Study Area covering Lahore and parts of Sheikhpura and Kasur districts, at town and union council levels. The database covers, in varying levels of detail, the administrative, natural, social, land use, infrastructure, public facilities and transport conditions in the Study Area.

6.2.2 LUTMP GIS Database Development

1) Collection of Existing Data

Basic information regarding the administrative boundaries, other information related to socio-economic, land use and road infrastructure were collected from various Punjab Government agencies/ departments. All districts including Lahore, Sheikhpura and Kasur were found to lack GIS system for their administrative and land use control. However, The Urban Unit, GoPb provided GIS based administrative boundaries for Lahore District.

Road network of NESPAK for Lahore Ring Road Study and LRMTS Studies data were considered. Both studies did not cover whole of the Study Area and were specific to their own projects. LRMTS study road network was selected to form base for the Road Network Inventory Survey. Data collected was in digital and hardcopy formats. This data was integrated into the GIS database. Characteristics of the collected data are described below;

(i) Formats

File formats encountered in data collection include

- Microsoft Excel (*.xls)
- Microsoft Office Documents (*.doc)
- Maps (*.jpg, *.pdf)
- AutoCAD (.dwg)
- ESRI Shape files (.shp)
- MapInfo tab files (.dbf)

(ii) Problems Encountered

During assessment and processing of collected data, several problems were encountered; like map data lacked standard coordinate system.

2) LUTMP GIS Data Generated

The JICA Study Team generated a lot of new information regarding the Study Area. The following describes some of the Study developed geographic data attributes.

(i) Satellite Image Map (2010)

Pan-sharpened Advanced Land Observation Satellite (ALOS) imagery at 2.5 m resolution taken from the period March to May, 2010 for the Study Area. This imagery (on loan from JICA) was used to update the various map layers used in the Study such as the road network, built up areas and land use related information. Figure 6.2.1 shows a portion of the pan-sharpened satellite imagery.

Figure 6.2.1 Pan-sharpened ALOS Imagery



Source: JICA Study Team

(ii) Land Use Map (2011)

An updated land use map of the Study Area was prepared by the JICA Study Team. The information used to create the land use map came from the following sources:

a) Lahore District Land Use

- LDA, 2001, Land Use Map

- Partial information from The Urban Unit, 2010
- 2010 and 2006 satellite imagery
- Field surveys conducted in selected areas

b) Sheikhpura and Kasur Land Use

- 2010 satellite imagery
- Inputs from Sheikhpura District, Kasur and Pattoki Tehsil planners
- Field surveys conducted in selected areas

Finalized land use map of the Study Area is depicted in Figure 6.2.2.

3) Data Integration

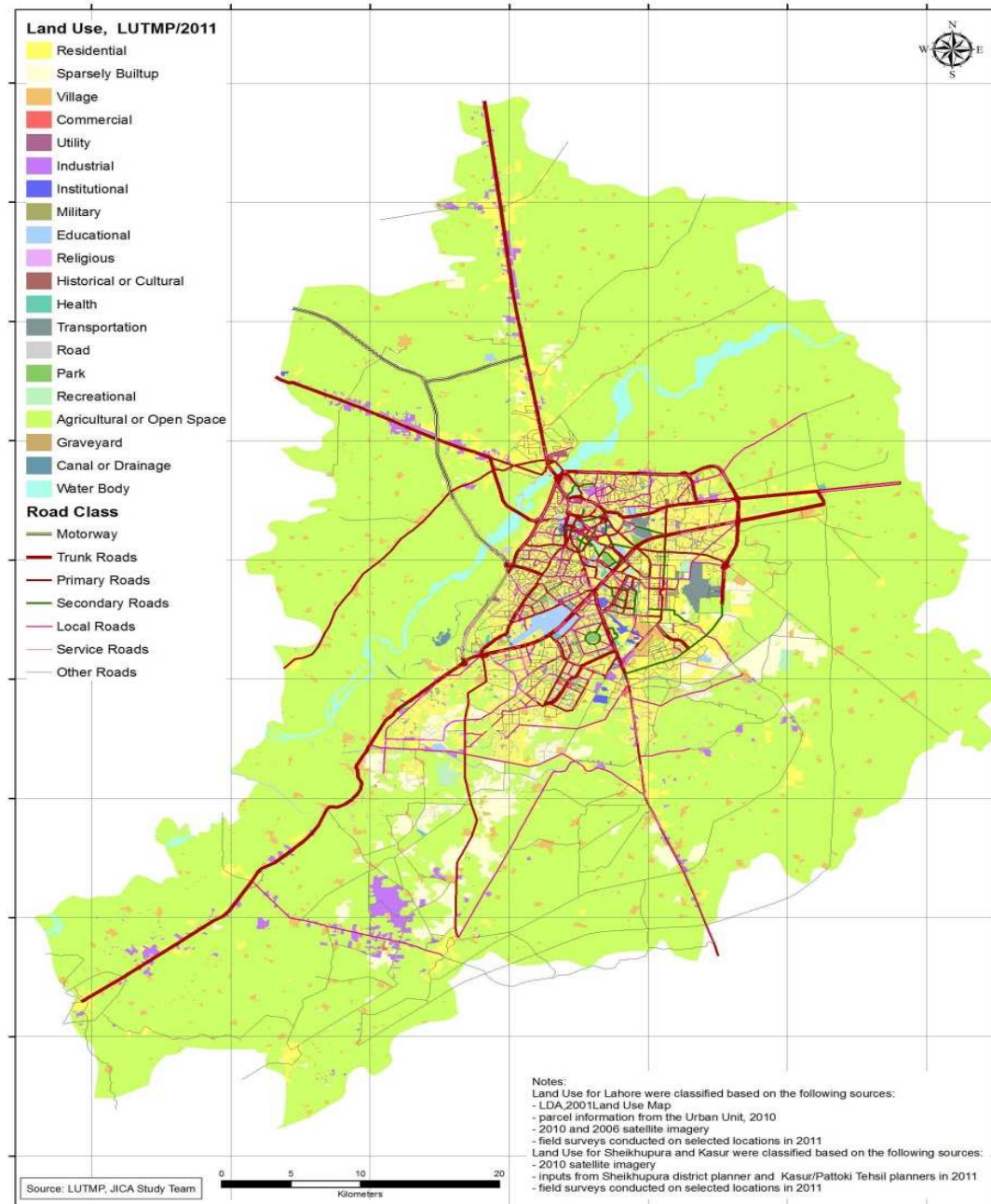
Existing and newly created data was integrated to develop LUTMP GIS database. Data integration consisted of converting hardcopy data to digital form and processing all digital data to conform to standards adopted in the Study. The following are standards adopted in the GIS database.

- The GIS data format is ESRI Shape file format.
- The coordinate system is UTM Zone 43 N.

6.2.3 Current Status

LUTMP GIS Database is finalized, and details are given in Table 6.2.1 with classes of data created during the course of the Study.

Figure 6.2.2 Land Use Map of the Study Area, 2011



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Table 6.2.1 LUTMP GIS Database

Folder	Shapefile	Description	Coverage	Feature Type	Compilation Scale	Year	Source
T:\10_Databases\10_GIS\00_Administrative							
	A_India_UTM43.shp	India Border Area	India	Polygon	1:50,000	2010	JST
	A_SA_Background_LUTMP2011_UTM43.shp	Area	SA		approx 1:50,000	2011	JST
	A_SA_District_LUTMPAug2011_UTM43.shp	Study Area District	SA	Polygon	approx 1:50,000	2011	UU/JST
	A_SA_StudyAreaBoundary_LUTMP2011_UTM43.shp	Study Area Boundary	SA	Polygon	approx 1:50,000	2011	LUTMP
	A_SA_Tehsil_LUTMPAug2011_UTM43.shp	Study Area Tehsil	SA	Polygon	approx 1:50,000	2011	UU/JST
	A_SA_TownTehsil_LUTMPAug2011_UTM43.shp	Study Area Town/Tehsil	SA	Polygon	approx 1:50,000	2011	UU/JST
	A_SA_UnionCouncil_LUTMPAug2011_UTM43.shp	Study Area Union Councils	SA	Polygon	approx 1:50,000	2011	UU/JST
	A_SA_ZoneFilled_HIS_LUTMPAug2011_UTM43.shp	Zoning System	SA	Polygon	approx 1:50,000	2011	JST
	A_SA_ZoneSecnd_LUTMP092011_UTM43.shp	Zone Index	SA	Polygon	approx 1:50,000	2011	JST
T:\10_Databases\10_GIS\10_NaturalConditions							
	N_SA_WaterBodies_LUTMPAug2011_UTM43.shp	Water Bodies (River, Canal, Drainages)	SA	Polygon	approx 1:10,000	2011	JST
T:\10_Databases\10_GIS\20_Transportation							
	T_LAH_Airports_UU2010_UTM43.shp	Airport Location	Lahore	Point	1: 10,000	2010	JST
	T_LAH_BusRoutes_UU2010_UTM43.shp	Bus Routes	Lahore	Line	1: 10,000	2010	UU
	T_LAH_BusTerminals_UU2010_UTM43.shp	Bus Terminals	Lahore	Point	1: 10,000	2010	JST
	T_LAH_BusTerminal_SPG_Zone_2011_UTM43.shp	Terminal	Lahore	Polygon	1: 10,000	2011	JST
	T_LAH_RailwayStation_SPG_Zone_2011_UTM43.shp	Station	Lahore	Polygon	1: 10,000	2011	JST
	T_LAH_TruckTerminal_SPG_Zone_2011_UTM43.shp	Terminal	Lahore	Polygon	1: 10,000	2011	JST
	T_SA_CordonPoints_LUTMPAug2011_UTM43.shp	Control Points	SA	Point	1: 10,000	2011	JST
	T_SA_RailwayLine_LUTMPAug2011_UTM43.shp	Railway Line	SA	Line	1: 10,000	2011	JST
	T_SA_AccidentData_LUTMP20092011UTM43.shp	Road Accident	SA	Line	1:10,000	2011	JST
	T_LHR_CDGLPrkngStandLUTMP2011_UTM43	City District Govt. Lahore	Lahore	Point	1:10,000	2011	JST
	T_LHR_TrafficSignal_TEPA2010_UTM43	Traffic Signal	Lahore	Point	1:10,000	2011	TEPA
	T_SA_RailwayStation_LUTMP2010_UTM43.shp	Railway Station	SA	Point	1: 10,000	2010	JST
	T_SA_Screenline_PointsLUTMPAug2011_UTM43.shp	Screen line	SA	Point	1: 10,000	2011	JST
T:\10_Databases\10_GIS\30_RoadNetwork							
	R_LHR_BottleneckJuncSurvey_LUTMP2011_UTM43.shp	Bottleneck Junction Survey	Central Lahore	Polygon	1:10,000	2011	JST
	R_LHR_BottleneckJuncSurvey_LUTMP2011_UTM43_line.shp	Bottleneck Junction Survey	Central Lahore	Line	1:10,000	2011	JST
	R_SA_AccessTimesALL_LUTMP2011_UTM43.shp	Access Analysis from City Center	SA	Polygon	1:10,000	2011	JST
	R_SA_JunctionSurvey_LUTMP2011_UTM43.shp	Junction Survey	SA	Point	1:10,000	2011	JST
	R_SA_RoadNetCube_LUTMPAug2011_UTM43.shp	Road Network	SA	Line	1:10,000	2011	JST
T:\10_Databases\10_GIS\40_Infrastructure							
	I_SA_DrainageOpen_Topo50k1994_UTM43.shp	Open Drainage	Lahore	Line	1:10,000	1994	UU
	I_SA_CanalDrain_LUTMPAug2011_UTM43	Canal/Drain	Lahore	Line	1:10,000	2011	JST
T:\10_Databases\10_GIS\50_Landmarks							
	LC_LA_Centers_LUTMP2011_UTM43.shp	(General Post Office)	Lahore	Point	1:10,000	2011	JST
	LC_LA_HistoricalSites_LUTMP2010_UTM43.shp	Historical Sites	Lahore	Polygon	1:10,000	2010	JST
	LC_LA_TouristLandmarks_UU2010_UTM43.shp	Tourist Landmark	Lahore	Point	1:10,000	2010	UU/JST
T:\10_Databases\10_GIS\60_LandConditions							
	LC_SA_BorderMgmtAreas2010_LUTMP2010_UTM43.shp	Border Management Area	SA	Polygon	1:100,000	2010	JST
	LC_SA_LandUse_LUTMPAug2011_UTM43.shp	Landuse for Study Area	SA	Polygon	1:10,000	2011	JST
	LC_SA_NetPopDensity1998_LUTMP2010_UTM43.shp	Net Population Density	SA	Polygon	1:10,000	2010	JST
	LC_SA_NetPopDensity2010_LUTMP2010_UTM43.shp	Net Population Density	SA	Polygon	1:10,000	2010	JST
T:\10_Databases\10_GIS\80_Environment							
	E_LA_Educational_LUTMPAug2011_UTM43.shp	Educational	Lahore	Point	1:10,000	2011	JST
	E_LA_MajorLandmarks_LUTMPAug2011_UTM43.shp	Major Landmark	Lahore	Point	1:10,000	2011	JST
	E_LA_SolidWasteContainer_UU2010_UTM43.shp	Solid Waste Container	Lahore	Point	1:10,000	2010	UU
T:\10_Databases\10_GIS\90_Others							
	O_SA_GPSTracks20110423_LUTMP2011_UTM43N.shp	GPS Tracks	SA	Line		2011	JST
	O_SA_GPSWaypoints20110423_LUTMP2011_UTM43N.shp	GPS waypoints	SA	Point		2011	JST
T:\10_Databases\10_GIS\91_Planning							
	P_SA_UDS_1_LUTMP2011_UTM43.shp	Option Trend	SA	Polygon	1:10,000	2011	JST
	P_SA_UDS2_LUTMP2011_UTM43.shp	Compact Development	SA	Polygon	1:10,000	2011	JST
	P_SA_UDS_3_LUTMP2011_UTM43.shp	Despersed Multicore Development	SA	Polygon	1:10,000	2011	JST
	P_SA_SuitabilityAnalyses_LUTMP2011_UTM43.img	Results of Suitability Analyses	SA	Raster		2011	JST
	P_LHR_TrafficManagementPlanLUTMP2011_UTM43	Traffic Management Plan	SA	Polygon	1:10,000	2011	JST

Source: JICA Study Team

Volume-II – Annex-I
TRAFFIC ZONE SYSTEM

FINAL REPORT

ANNEX 1 – Traffic Zone System

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
1	617	Int	Lahore	City	Ravi	1	617	Begum Kot	1
2	83	Int	Lahore	City	Ravi	2	83	Kot Mohibbu	2
3	76	Int	Lahore	City	Ravi	3	76	Aziz Colony	3
4	42	Int	Lahore	City	Ravi	4	42	Faisal Park	4
5	65	Int	Lahore	City	Ravi	5	86	Qaiser Town - East	5-E
6	20	Int	Lahore	City	Ravi			Qaiser Town - West	5-W
7	201	Int	Lahore	City	Ravi	6	201	Dhair	6
8	183	Int	Lahore	City	Ravi	7	222	Shahdara - East	7-E
9	40	Int	Lahore	City	Ravi			Shahdara - West	7-W
10	256	Int	Lahore	City	Ravi	8	256	Jia Musa	8
11	153	Int	Lahore	City	Ravi	9	153	Qila Lakshman Singh	9
12	137	Int	Lahore	City	Ravi	fxdccvf	137	Fruit Mandi	10
13	317	Int	Lahore	City	Ravi	11	317	Siddiquepura	11
14	137	Int	Lahore	City	Ravi	12	137	Bangali Bagh	12
15	172	Int	Lahore	City	Ravi	13	172	Siddiqia Colony	13
16	510	Int	Lahore	City	Ravi	14	510	Bhamman	14
17	75	Int	Lahore	City	Ravi	26	75	Farooq Ganj	26
18	53	Int	Lahore	City	Ravi	27	53	Dehli Gate	27
19	76	Int	Lahore	City	Ravi	28	76	Rang Mahal	28
20	44	Int	Lahore	City	Ravi	29	44	Androon Bhaati Gate	29
21	92	Int	Lahore	City	Ravi	30	92	Androon Texali Gate	30
22	271	Int	Lahore	City	DataGB	67	271	Kasurpura	67
23	82	Int	Lahore	City	DataGB	68	82	Ameenpura	68
24	299	Int	Lahore	City	DataGB	69	299	Kareem Park	69
25	68	Int	Lahore	City	DataGB	70	68	Ganj Kalan	70
26	129	Int	Lahore	City	DataGB	71	129	Bilal Gunj	71
27	206	Int	Lahore	City	DataGB	72	206	Anarkali	72
28	89	Int	Lahore	City	DataGB	73	89	Gawalmandi	73
29	102	Int	Lahore	City	DataGB	74	102	Sarai Sultan	74
30	243	Int	Lahore	City	DataGB	77	243	Qila Gujjar Singh	77
31	528	Int	Lahore	City	DataGB	78	528	Race Course	78
32	145	Int	Lahore	City	DataGB	79	145	Mozang	79
33	161	Int	Lahore	City	DataGB	80	161	Jinnah Hall	80
34	53	Int	Lahore	City	DataGB	81	53	Riwaz Garden	81
35	29	Int	Lahore	City	DataGB	82	29	Islampura	82
36	191	Int	Lahore	City	DataGB	83	191	Chohan Park	83
37	182	Int	Lahore	City	DataGB	85	182	Sanda Kalan	85
38	82	Int	Lahore	City	DataGB	86	82	Sanda Khurd	86
39	230	Int	Lahore	City	DataGB	94	230	Shadman	94
40	493	Int	Lahore	City	Samanabad	84	493	Abu Bakar Siddique Colony	84
41	169	Int	Lahore	City	Samanabad	87	169	Sham Nagar	87
42	63	Int	Lahore	City	Samanabad	88	63	Gulgasht Colony	88
43	128	Int	Lahore	City	Samanabad	89	128	Gulshan-e-Ravi	89

The Project for Lahore Urban Transport Master Plan in the Islamic Republic of Pakistan
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ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
44	219	Int	Lahore	City	Samanabad	90	219	Babu Sabu	90
45	71	Int	Lahore	City	Samanabad	91	71	Rizwan Park	91
46	67	Int	Lahore	City	Samanabad	92	67	Sodiwal	92
47	162	Int	Lahore	City	Samanabad	93	162	Bahawalpur House	93
48	79	Int	Lahore	City	Samanabad	100	79	Ichhra	100
49	36	Int	Lahore	City	Samanabad	101	36	New Samanabad	101
50	61	Int	Lahore	City	Samanabad	102	61	Shah Kamal	102
51	103	Int	Lahore	City	Samanabad	103	103	Pakki Thatti	103
52	230	Int	Lahore	City	Samanabad	104	230	Kashmir Block	104
53	123	Int	Lahore	City	Samanabad	105	123	Nawan Kot	105
54	159	Int	Lahore	City	Samanabad	106	159	Samanabad	106
55	128	Int	Lahore	City	Samanabad	107	128	Rehman Pura	107
56	216	Int	Lahore	City	Samanabad	108	216	Gulshan-e-Iqbal	108
57	551	Int	Lahore	City	Samanabad	109	551	Sikandar Block	109
58	514	Int	Lahore	City	Samanabad	115	694	Muslim Town - North	115-N
59	180	Int	Lahore	City	Samanabad			Muslim Town - South	115-S
60	60	Int	Lahore	City	Shalamar	15	60	Bhaghatpura	15
61	801	Int	Lahore	City	Shalamar	16	801	Gujjarpura	16
62	68	Int	Lahore	City	Shalamar	17	68	Rehmatpura	17
63	35	Int	Lahore	City	Shalamar	18	35	Begumpura	18
64	127	Int	Lahore	City	Shalamar	19	127	Chah Miran	19
65	43	Int	Lahore	City	Shalamar	20	43	Bilal Park	20
66	58	Int	Lahore	City	Shalamar	21	58	Makhanpura	21
67	84	Int	Lahore	City	Shalamar	22	84	Kot Khawaja Saeed	22
68	138	Int	Lahore	City	Shalamar	23	138	Shad Bagh	23
69	121	Int	Lahore	City	Shalamar	24	121	Wassanpura	24
70	52	Int	Lahore	City	Shalamar	25	52	Faiz Bagh	25
71	69	Int	Lahore	City	Shalamar	33	69	Crown Park	33
72	56	Int	Lahore	City	Shalamar	34	56	Madhu Lal Hussain	34
73	478	Int	Lahore	City	Shalamar	35	478	Muhammad Colony	35
74	132	Int	Lahore	City	Shalamar	36	132	Baghbanpura	36
75	106	Int	Lahore	City	Shalamar	46	106	Angori Bagh	46
76	14	Int	Lahore	City	Shalamar	47	14	Mujahidabad	47
77	203	Int	Lahore	City	Gulberg	31	278	Railway Colony - East	31-E
78	75	Int	Lahore	City	Gulberg			Railway Colony - West	31-W
79	379	Int	Lahore	City	Gulberg	32	379	Daras Barey Mian	32
80	120	Int	Lahore	City	Gulberg	75	120	Bibi Pak Daman	75
81	44	Int	Lahore	City	Gulberg	76	115	Garrhi Shahu - East	76-E
82	71	Int	Lahore	City	Gulberg			Garrhi Shahu - West	76-W
83	674	Int	Lahore	City	Gulberg	95	674	Al-Hamra	95
84	190	Int	Lahore	City	Gulberg	96	291	Zaman Park	96-N
85	101	Int	Lahore	City	Gulberg			Zaman Park	96-S
86	359	Int	Lahore	City	Gulberg	97	359	Gulberg	97

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ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
87	191	Int	Lahore	City	Gulberg	98	191	Mecca Colony	98
88	326	Int	Lahore	City	Gulberg	99	326	Naseerabad	99
89	418	Int	Lahore	City	Gulberg	126	418	Garden Town	126
90	621	Int	Lahore	City	Gulberg	127	621	Model Town	127
91	216	Int	Lahore	City	Gulberg	128	216	Faisal Town	128
92	95	Int	Lahore	City	Gulberg	129	95	Liaqatabad	129
93	166	Int	Lahore	City	Gulberg	130	166	Kot Lakhpat	130
94	131	Int	Lahore	City	Gulberg	131	131	Pindi Rajputan	131
95	311	Int	Lahore	City	AzizB	41	606	Harbanspura - North	41-N
96	296	Int	Lahore	City	AzizB			Harbanspura - South	41-S
97	144	Int	Lahore	City	AzizB	43	144	Rashidpura	43
98	286	Int	Lahore	City	AzizB	44	286	Fateh Garh	44
99	140	Int	Lahore	City	AzizB	45	140	Nabipura	45
100	126	Int	Lahore	City	AzizB	48	126	Mughalpura	48
101	69	Int	Lahore	City	AzizB	54	69	Mian Meer	54
102	89	Int	Lahore	City	AzizB	55	89	Mustafabad	55
103	73	Int	Lahore	City	AzizB	56	73	Ghaziabad	56
104	212	Int	Lahore	City	AzizB	57	212	Taj Bagh	57
105	113	Int	Lahore	City	AzizB	58	113	Tajpura	58
106	100	Int	Lahore	City	AzizB	59	100	Al-Faisal Town	59
107	428	Int	Lahore	City	AzizB	60	428	Guldasht Colony	60
108	4,519	Int	Lahore	City	AzizB	61	4,519	Bhangali	61
109	1,583	Int	Lahore	City	Wagah	37	1,583	Muslimabad	37
110	84	Int	Lahore	City	Wagah	38	84	Sultan Mehmood	38
111	869	Int	Lahore	City	Wagah	39	869	Shadipura	39
112	798	Int	Lahore	City	Wagah	40	798	Salamatpura	40
113	386	Int	Lahore	City	Wagah	42	386	Daroghawala	42
114	1,680	Int	Lahore	City	Wagah	49	1,680	Lakhodher	49
115	9,966	Int	Lahore	City	Wagah	50	9,966	Bhaseen	50
116	1,294	Int	Lahore	City	Wagah	51	1,294	Dogra Kalan	51
117	604	Int	Lahore	City	Wagah	52	604	Manawan	52
118	9,533	Int	Lahore	City	Wagah	53	9,533	Minhala	53
119	5,955	Int	Lahore	City	Wagah	62	5,955	Barki	62
120	11,254	Int	Lahore	City	Wagah	65	11,254	Hadiara	65
121	4,014	Int	Lahore	City	Nishter	63	4,014	Kamahan	63
122	7,363	Int	Lahore	City	Nishter	64	7,363	Hair	64
123	8,939	Int	Lahore	City	Nishter	66	8,939	Dhaloke	66
124	43	Int	Lahore	City	Nishter	134	43	Bostan Colony	134
125	163	Int	Lahore	City	Nishter	135	163	Ismail Nagar	135
126	99	Int	Lahore	City	Nishter	136	99	Sittara Colony	136
127	251	Int	Lahore	City	Nishter	137	251	Farid Colony	137
128	83	Int	Lahore	City	Nishter	138	83	Keer Kalan	138
129	113	Int	Lahore	City	Nishter	139	113	Green Town	139
130	137	Int	Lahore	City	Nishter	140	137	Maryam Colony	140
131	842	Int	Lahore	City	Nishter	141	842	Attari Saroba	141
132	1,649	Int	Lahore	City	Nishter	142	1,649	Dullo Khurd Kalan	142

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ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
133	569	Int	Lahore	City	Nishter	143	1,239	Chandrai - East	143-E
134	670	Int	Lahore	City	Nishter			Chandrai - West	143-W
135	6,310	Int	Lahore	City	Nishter	144	6,310	Halloke	144
136	2,825	Int	Lahore	City	Nishter	145	2,825	Gajju Matta	145
137	1,741	Int	Lahore	City	Nishter	146	1,741	Kahna Nau	146
138	5,953	Int	Lahore	City	Nishter	147	5,953	Jia Bagga	147
139	7,961	Int	Lahore	City	Nishter	150	7,961	Pandoki	150
140	170	Int	Lahore	City	Iqbal	110	170	Awan Town	110
141	100	Int	Lahore	City	Iqbal	111	100	Saidpur	111
142	1,444	Int	Lahore	City	Iqbal	112	1,444	Sabzazar	112
143	79	Int	Lahore	City	Iqbal	113	79	Dholanwal	113
144	124	Int	Lahore	City	Iqbal	114	124	Bakar Mandi	114
145	891	Int	Lahore	City	Iqbal	116	891	Johar Town	116
146	1,524	Int	Lahore	City	Iqbal	117	1,524	Hanjarwal	117
147	1,438	Int	Lahore	City	Iqbal	118	1,438	Niaz Beg	118
148	1,790	Int	Lahore	City	Iqbal	119	2,537	Shahpur - North	119-N
149	747	Int	Lahore	City	Iqbal			Shahpur - South	119-S
150	3,427	Int	Lahore	City	Iqbal	120	3,427	Ali Razabad	120
151	877	Int	Lahore	City	Iqbal	121	1,899	Chung - North	121-N
152	1,012	Int	Lahore	City	Iqbal			Chung - South	121-S
153	5,799	Int	Lahore	City	Iqbal	122	9,129	Maraka - North	122-N
154	3,330	Int	Lahore	City	Iqbal			Maraka - South	122-S
155	984	Int	Lahore	City	Iqbal	123	7,266	Shamke Bhattian - North	123-N
156	6,282	Int	Lahore	City	Iqbal			Shamke Bhattian - South	123-S
157	7,456	Int	Lahore	City	Iqbal	124	7,456	Sultanke	124
158	3,387	Int	Lahore	City	Iqbal	125	3,387	Manna	125
159	299	Int	Lahore	City	Iqbal	132	299	Township	132
160	410	Int	Lahore	City	Iqbal	133	410	Township-II	133
161	2,328	Int	Lahore	City	Iqbal	148	8,459	Pajian - East	148-E
162	6,131	Int	Lahore	City	Iqbal			Pajian - West	148-W
163	932	Int	Lahore	City	Iqbal	149	1,999	Raiwind - East	149-E
164	1,068	Int	Lahore	City	Iqbal			Raiwind - West	149-W
165	531	Int	Lahore	Cantt	Cantt	152A	531	Cantt Airport	152A
166	309	Int	Lahore	Cantt	Cantt	152B	309	Cantt Askari Housing	152B
167	413	Int	Lahore	Cantt	Cantt	152C	413	Cantt Aziz Bhatti	152C
168	172	Int	Lahore	Cantt	Cantt	152D	172	Cantt Basti Chiragh Shah	152D
169	326	Int	Lahore	Cantt	Cantt	152E	326	Cantt CMA Colony	152E
170	786	Int	Lahore	Cantt	Cantt	152F	786	Cantt Chung Khurd	152F
171	192	Int	Lahore	Cantt	Cantt	152G	192	Cantt DH01a	152G
172	277	Int	Lahore	Cantt	Cantt	152H	277	Cantt DH01b	152H
173	373	Int	Lahore	Cantt	Cantt	152I	373	Cantt DH03	152I
174	243	Int	Lahore	Cantt	Cantt	152J	243	Cantt DH04	152J
175	434	Int	Lahore	Cantt	Cantt	152K	434	Cantt DH05	152K

FINAL REPORT: VOLUME II of II
ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
176	1,523	Int	Lahore	Cantt	Cantt	152L	1,523	Cantt DH08	152L
177	272	Int	Lahore	Cantt	Cantt	152M	272	Cantt Dher Pindi	152M
178	157	Int	Lahore	Cantt	Cantt	152N	157	Cantt Gulshan1	152N
179	162	Int	Lahore	Cantt	Cantt	152O	162	Cantt Gulshan2	152O
180	45	Int	Lahore	Cantt	Cantt	152P	45	Cantt Gulshan3	152P
181	672	Int	Lahore	Cantt	Cantt	152Q	672	Cantt Iqbal Camp	152Q
182	521	Int	Lahore	Cantt	Cantt	152R	521	Cantt Madina	152R
183	259	Int	Lahore	Cantt	Cantt	152S	259	Cantt Mian Mir	152S
184	102	Int	Lahore	Cantt	Cantt	152T	102	Cantt New Nishtar	152T
185	436	Int	Lahore	Cantt	Cantt	152U	436	Cantt Nishat Colony	152U
186	969	Int	Lahore	Cantt	Cantt	152V	969	Cantt Park View	152V
187	301	Int	Lahore	Cantt	Cantt	152W	301	Cantt Pir Colony	152W
188	302	Int	Lahore	Cantt	Cantt	152X	302	Cantt Raza Colony	152X
189	9,961	Int	Sheikhupura	Ferozewala	Ferozewala	SF22	9,961	Luban wala	SF22
190	4,287	Int	Sheikhupura	Ferozewala	Ferozewala	SF23	4,278	Chak 44	SF23
191	6,939	Int	Sheikhupura	Ferozewala	Ferozewala	SF24	6,939	Bharth	SF24
192	2,489	Int	Sheikhupura	Ferozewala	Ferozewala	SF26	2,489	Shekhan	SF26
193	1,559	Int	Sheikhupura	Ferozewala	Ferozewala	SF27-29	3,334	Ferozewala - East	SF27X-E
194	1,775	Int	Sheikhupura	Ferozewala	Ferozewala			Ferozewala - West	SF27X-W
195	1,801	Int	Sheikhupura	Ferozewala	Ferozewala	SF30-31	1,801	Wandala Dial Shah	SF30X
196	1,443	Int	Sheikhupura	Ferozewala	Ferozewala	SF32	1,443	Dacca	SF32
197	5,151	Int	Sheikhupura	Ferozewala	Ferozewala	SF33	5,151	Faizpur Khurd	SF33
198	1,902	Int	Sheikhupura	Ferozewala	Ferozewala	SF34-36	1,902	Kot Abdul Malik	SF34X
199	4,948	Int	Sheikhupura	Ferozewala	Ferozewala	SF37	4,948	Momanpur	SF37
200	3,707	Int	Sheikhupura	Ferozewala	Ferozewala	SF38	3,707	Mandhiali	SF38
201	1,353	Int	Sheikhupura	Ferozewala	Ferozewala	SF39	1,353	Kot Pindi Dass	SF39
202	6,002	Int	Sheikhupura	Ferozewala	Ferozewala	SF40	6,002	Qila Sattar Shah	SF40
203	1,164	Int	Sheikhupura	Ferozewala	Ferozewala	SF41	1,164	Khanpur	SF41
204	3,106	Int	Sheikhupura	Ferozewala	Ferozewala	SF42	3,106	Burj Attari	SF42
205	7,851	Int	Sheikhupura	Muridke	Muridke	SM11	7,851	Dharor Muslim	SM11
206	2,957	Int	Sheikhupura	Muridke	Muridke	SM12	5,510	Nangal Gahdan - East	SM12-E
207	2,554	Int	Sheikhupura	Muridke	Muridke			Nangal Gahdan - West	SM12-W
208	4,847	Int	Sheikhupura	Muridke	Muridke	SM13	4,847	Nangal Kaswala	SM13
209	1,493	Int	Sheikhupura	Muridke	Muridke	SM15-20	1,493	Muridke	SM15X
210	2,679	Int	Sheikhupura	Muridke	Muridke	SM21	2,679	Noon	SM21
211	3,798	Int	Sheikhupura	Sharaqpur	Sharaqpur	SS43	3,798	Sahjewal	SS43
212	3,251	Int	Sheikhupura	Sharaqpur	Sharaqpur	SS44	3,251	Mandian wala	SS44
213	5,199	Int	Sheikhupura	Sharaqpur	Sharaqpur	SS45	5,199	Dhamke	SS45
214	1,742	Int	Sheikhupura	Sharaqpur	Sharaqpur	SS49	1,742	Sharaqpur	SS49
215	590	Int	Kasur	Kasur	Kasur	KK1	590	Kot Radha Kishen 1	KK14
216	1,402	Int	Kasur	Kasur	Kasur	KK2	1,402	Kot Radha Kishen 2	KK15
217	3,548	Int	Kasur	Kasur	Kasur	KK30	3,548	Zafarke	KK30
218	2,067	Int	Kasur	Kasur	Kasur	KK33	2,067	Babilana Otari	KK33

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ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
219	2,290	Int	Kasur	Kasur	Kasur	KK37	2,290	Chak 55	KK37
220	5,130	Int	Kasur	Kasur	Kasur	KK38	5,130	Mudke Dhariwal	KK38
221	793	Int	Kasur	Patoki	Patoki	KP24	793	Phool Nagar 1	KP24
222	348	Int	Kasur	Patoki	Patoki	KP25	348	Phool Nagar 2	KP25
223	446	Int	Kasur	Patoki	Patoki	KP26	446	Phool Nagar 3	KP26
224	3,062	Int	Kasur	Patoki	Patoki	KP80	3,062	Ghumankey	KP80
225	4,138	Int	Kasur	Patoki	Patoki	KP82	4,138	Lambey Jagheer	KP82
226	3,105	Int	Kasur	Patoki	Patoki	KP83	3,105	Chak 6 Dina Nath	KP83
227	1,297	Int	Kasur	Patoki	Patoki	KP84	1,297	Nathey Kalsey	KP84
228	3,302	Int	Kasur	Patoki	Patoki	KP85	3,032	Baghiana Kalan	KP85
229	-	SPG	Lahore	Special Gen.	Air	152A	-	Airport - Passenger ONLY	152A
230	-	SPG	Lahore	Lahore	Ravi Town	9	-	Qila Lakshman Singh	9
231	-	SPG	Lahore	Lahore	Samanabad	92	-	Sodiwal	92
232	-	SPG	Lahore	Lahore	Gulberg	31-W	-	Railway Colony	31-W
233	-	SPG	Lahore	Lahore	DataGB	71	-	Bilal Gunj	71
234	-	SPG	Lahore	Lahore	Ravi Town	2	-	Kot Mohibbu	2
235	-	SPG	Lahore	Cantt	Cantt	152Q	-	Cantt Iqbal Camp	152Q
236	-	SPG	Lahore	Lahore	Iqbal	119W	-	Shahpur	119W
237	-	SPG	Lahore	Lahore	Gulberg	95	-	Al-Hamra	95
238	-	SPG	Lahore	Lahore	Samanabad	91	-	Riawan Park	91
239	-	SPG	Lahore	Lahore	Gulberg	97	-	Gulberg	97
240	-	SPG	Lahore	Lahore	Nishter	141	-	Attari Saroba	141
241	-	SPG	Lahore	Lahore	Ravi	7-W	-	Shahdara	7-W
242	-	SPG	Lahore	Lahore	Wagah	40	-	Salamatpura	40
243	-	SPG	Lahore	Lahore	Iqbal	120	-	Ali Razabad	120
244	-	SPG	Lahore	Lahore	Bus	145	-	Gajju Matta	145
245	-	SPG	Lahore	Lahore	Ravi	2	-	Kot Mohibbu	2
246	-	SPG	Lahore	Lahore	Iqbal	119	-	Shahpur	119
247	-	SPG	Lahore	Lahore	Nishter	-	-	-	-
248	-	SPG	Lahore	Lahore	Gulberg	31	-	Railway Colony	31
249	-	SPG	Lahore	Lahore	Ravi Town	9	-	Qila Lakshman Singh	9
250	-	SPG	Sheikhupura	Ferozewala	Ferozewala	SF27-29	-	Ferozewala	SF27X-W
251	-	SPG	Sheikhupura	Ferozewala	Ferozewala	SF40	-	-	SF40
252	-	SPG	Sheikhupura	Muridke	Muridke	SM15-20	-	Muridke	SM15X
253	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
254	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
255	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
256	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
257	-	SPG	Lahore	Cantt	Cantt	152E	-	Cant CMA Colony	152E
258	-	SPG	Lahore	Cantt	Cantt	152X	-	Cant Raza Colony	152X
259	-	SPG	Lahore	Lahore	Nishter	135	-	Ismail Nagar	135
260	-	SPG	Lahore	Lahore	Nishter	142	-	Dullo Khurd Kalan	142
261	-	SPG	Lahore	Lahore	Iqbal	148E	-	Pajian	148E
262	-	SPG	Kasur	Kasur	Kasur	-	-	-	-

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ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
263	-	SPG	Sheikhupura	Ferozewala	Ferozewala	SF27-29	-	Ferozewala	SF27X-W
264	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
265	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
266	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
267	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
268	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
269	-	SPG	Lahore	Lahore	AzizB	-	-	Mustafabad	55
270	-	SPG	Lahore	Lahore	Wagah	-	-	Minhala	53
271	-	SPG	Lahore	Lahore	Wagah	-	-	Minhala	53
272	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
273	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
274	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
275	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
276	-	SPG	Lahore	Special Gen.	Railway	-	-	-	-
277	-	SPG	Lahore	Lahore	AzizB	55	-	Mustafabad	55
278	-	SPG	Lahore	Lahore	Iqbal	118	-	Niaz Beg	118
279	-	SPG	Lahore	Lahore	Ravi	10	-	Fruit Mandi	10
280	-	SPG	Lahore	Lahore	Ravi	28	-	Rang Mahal	28
281	-	SPG	Lahore	Lahore	Ravi	28 & 30	-	Rang Mahal-Andron Taxali Gate	28X
282	-	SPG	Lahore	Lahore	Iqbal	114	-	Bakar Mandi	114
283	-	SPG	Lahore	Lahore	Wagah	40 & 42	-	Salamatpura-Shadipura	40X
284	-	SPG	Sheikhupura	Ferozewala	Ferozewala	26	-	Shekhan	26
285	-	SPG	Lahore	Lahore	Iqbal	119	-	Shahpur	119
286	-	SPG	Lahore	Lahore	Iqbal	135	-	Ismail Nagar	135
287	-	SPG	Lahore	Special Gen.	Truck Terminal	-	-	-	-
288	-	SPG	Lahore	Special Gen.	Truck Terminal	-	-	-	-
289	-	SPG	Lahore	Special Gen.	Truck Terminal	-	-	-	-
290	-	SPG	Lahore	Special Gen.	Truck Terminal	-	-	-	-
291	-	Ext	Sheikhupura	Ferozewala	Ferozewala	-	-	Remainder of Tehsil Ferozewala	-
292	-	Ext	Sheikhupura	Muridke	Muridke	-	-	Remainder of Tehsil Muridke West of GT Road Cordon Point	-
293	-	Ext	Sheikhupura	Muridke	Muridke	-	-	Remainder of Tehsil Muridke East of GT Road Cordon Point	-
294	-	Ext	Sheikhupura	Muridke	Muridke	-	-	Remainder of Tehsil Muridke South-East of GT Road Cordon Point	-
295	-	Ext	Narowal	<i>District</i>	-	-	-	-	-
296	-	Ext	Sheikhupura	Sharaqpur	Sharaqpur	-	-	Remainder of Sharaqpur	-
297	-	Ext	Sheikhupura	Sheikhupura	Sheikhupura	-	-	Whole Tehsil & City of Sheikhupura	-

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ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
298	-	Ext	Nankana Sahib	District	-	-	-	-	-
299	-	Ext	Kasur	Kasur	Kasur	-	-	Kasur Tehsil UC's surrounding Cordon Site-5 & Kasur City	-
300	-	Ext	Kasur	Chunia	Chunia	-	-	Tehsil Chunia Surrounding Cordon Point 5	-
301	-	Ext	Kasur	Kasur	Kasur	-	-	Kasur Tehsil UC's surrounding Cordon Site-6	-
302	-	Ext	Kasur	Kasur	Kasur	-	-	Kasur Tehsil UC's surrounding Cordon Site-8	-
303	-	Ext	Kasur	Chunia	Chunia	-	-	Tehsil Chunia Surrounding Cordon Point 5	-
304	-	Ext	Kasur	Patoki	Patoki	-	-	-	-
305	-	Ext	Gujranwala	Kamoke	-	-	-	-	-
306	-	Ext	Gujranwala	Nowshera Virkan	-	-	-	-	-
307	-	Ext	Gujranwala	Gujranwala	City	-	-	-	-
308	-	Ext	Gujranwala	Wazirabad	-	-	-	-	-
309	-	Ext	Sialkot	District	-	-	-	-	-
310	-	Ext	Gujrat	District	-	-	-	-	-
311	-	Ext	Jhelum	District	-	-	-	-	-
	-	Ext	Mirpur Has	District	-	-	-	-	-
312	-	Ext	Hafizabad	District	-	-	-	-	-
	-	Ext	Mandi Baha-ud-Din	District	-	-	-	-	-
	-	Ext	Ralwalpindi	District	-	-	-	-	-
	-	Ext	Attock	District	-	-	-	-	-
	-	Ext	Islamabad	District	-	-	-	-	-
	-	Ext	Rest of Azad Kashmir	District	-	-	-	-	-
	-	Ext	FATA		-	-	-	-	-
313	-	Ext	Chakwal	District	-	-	-	-	-
	-	Ext	Layyah	District	-	-	-	-	-
	-	Ext	Faisalabad	District	-	-	-	-	-
	-	Ext	Jhang	District	-	-	-	-	-
	-	Ext	Chiniot	District	-	-	-	-	-
	-	Ext	Toba Tek Singh	District	-	-	-	-	-
	-	Ext	Sargodha	District	-	-	-	-	-
	-	Ext	Bhakkar	District	-	-	-	-	-
	-	Ext	Khushab	District	-	-	-	-	-
314	-	Ext	Mianwali	District	-	-	-	-	-
	-	Ext	Bahawalpur	District	-	-	-	-	-
	-	Ext	Bahawalnagar	District	-	-	-	-	-

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ANNEX 1 – TRAFFIC ZONE SYSTEM

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC	
314	-	Ext	R.Y. Khan	District	-	-	-	-	-	
	-	Ext	D.G. Khan	District	-	-	-	-	-	
	-	Ext	Muzaffargarh	District	-	-	-	-	-	
	-	Ext	Rajanpur	District	-	-	-	-	-	
	-	Ext	Multan	District	-	-	-	-	-	
	-	Ext	Khanewal	District	-	-	-	-	-	
	-	Ext	Lodhran	District	-	-	-	-	-	
	-	Ext	Vehari	District	-	-	-	-	-	
	-	Ext	Sahiwal	District	-	-	-	-	-	
	-	Ext	Okara	District	-	-	-	-	-	
	-	Ext	Pakpattan	District	-	-	-	-	-	
	-	Ext	Kasur	Patoki	-	-	-	-	Dholan Chak No.27	-
	-				-	-	-	Bhopay Wall	-	
	-				-	-	-	Awan Chak 39	-	
	-				-	-	-	Hanjarai Kalan	-	
	-				-	-	-	Halla	-	
	-				-	-	-	Alpa Kalan	-	
	-				-	-	-	Sheikhum	-	
	-				-	-	-	Padhana Chak No. 45	-	
	-				-	-	-	Jamber Khurd	-	
	-				-	-	-	Bharwal Kalan	-	
	-				-	-	-	Kot Sardar Kahan Singh	-	
	-				-	-	-	Sarai Noshera Rural	-	
	-				-	-	-	Khankay Mor	-	
	-				-	-	-	Gulzar Jageer	-	
	-				-	-	-	Chak No. 66 Dina Nath	-	
	-				-	-	-	Nathay Khalsa	-	
	-				-	-	-	Wan Radha Ram	-	
	-				-	-	-	Bhadian Chak No. 35	-	
	-				-	-	-	Wan Adhan	-	
-	-				-	-	Ghumankay	-		
-	-	-	-	Kanween	-					
-	-	-	-	Bhagiana Kalan	-					
-	-	-	-	Phulyani	-					
-	-	-	-	Chak No.7	-					
-	Ext	Kasur	Chunian	-	-	-	-	Chak No.13	-	
315	-	Ext	KPK	Province	-	-	-	-	-	
	-	Ext	Gilgit Baltistan	Province	-	-	-	-	-	
316	-	Ext	Sindh	Province	-	-	-	-	-	
317	-	Ext	Balochistan	Province	-	-	-	-	-	
318	-	Ext	India	Special Generator	Road	-	-	India	-	

Zone	Zone Area (ha)	Int/Ext	District	Tehsil	Town	UC No.	UC Area	Name	Split-UC
319	-	Ext	Afghanistan	<i>Special Generator</i>	Road	-	-	Afghanistan	-
320	-	Ext	Rest of the World	<i>Special Generator</i>	Air	152A	-	Rest of the World	152A
401	-	Bin	Lahore	Lahore	-	-	-	-	-
402	-	Bin	Lahore	Cantt	-	-	-	-	-
420	-	Bin	Lahore	Lahore	Gulberg	-	-	-	76E-76W
421	-	Bin	Lahore	Lahore	Gulberg	-	-	-	96E-96W