2.6 People's Perception of Travel Situation

The Study has conducted a large-scale HIS (Home Interview Survey) covering about 18,000 households. In the interview, a considerable number of questions were asked to the respondent households in relation to their perception and opinion of traffic/ transport situation in Lahore. Major findings from this interview are briefly described in the following:

2.6.1 General Traffic Situation and Congestion

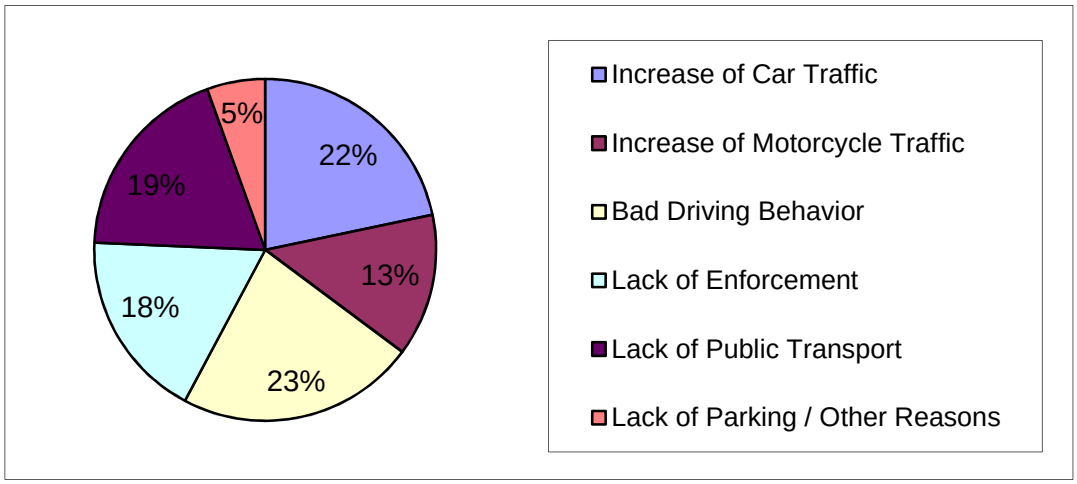
Table 2.6.1 shows the perception of Lahore citizen of the present traffic situation. It is amazing that nearly 90 % people opinion is that traffic situation is "very bad" or "bad". Figure 2.6.1 portrays the reasons why they think this situation has been brought about. There are major reasons; "Increase of Car Traffic", "Bad Driving Behaviour", "Lack of Enforcement" and "Lack of Public Transport".

Table 2.6.1 People's General Feeling on Present Traffic Situation

Opinion	Number of Samples	Percentage (%)
Very Good	24	0.1
Good	239	1.4
Average	1,865	10.5
Bad	5,489	31.0
Very Bad	10,086	57.0

Source: JICA Study Team

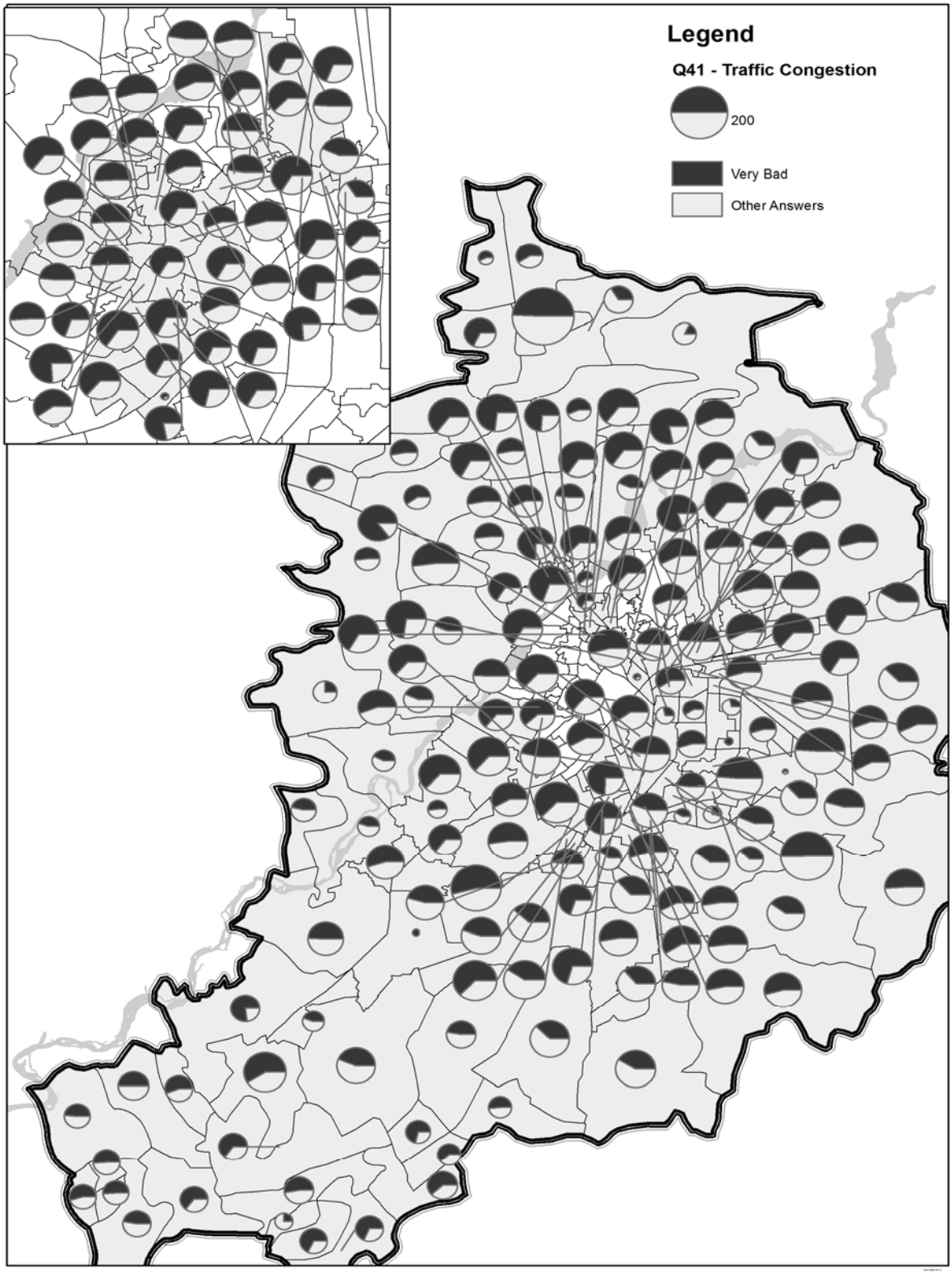
Figure 2.6.1 Stated Causes of "Very Bad" or "Bad" Traffic Situation



Source: JICA Study Team

Many people answered "Much Worse" or "Worse" of current traffic situation as compared to 5 years ago as shown in Table 2.6.2. The percentage is highest regarding congestion followed by safety. It is clear that most people are frustrated with the current traffic situation. Figure 2.6.2 illustrates the distribution of respondent households who answered "very bad regarding traffic congestion. Its percentage is high around the city center and its surrounding areas.

Figure 2.6.2 Distribution of Respondent Households who Answered "Very Bad" regarding Traffic Congestion



Source: JICA Study Team

Table 2.6.2 Percentage of People who Answered "Much Worse" or "Worse" on Current Traffic Situation as Compared to 5 Years Ago

Subject	Percentage answered "Much Worse" or "Worse"
Congestion	80.4%
Safety	76.6%
Convenience	68.6%

Source: JICA Study Team

2.6.2 Traffic Safety

In Lahore, traffic safety situation is serious. Nearly 20 % of households have experienced traffic accidents in the past 5 years as shown in Table 2.6.3.

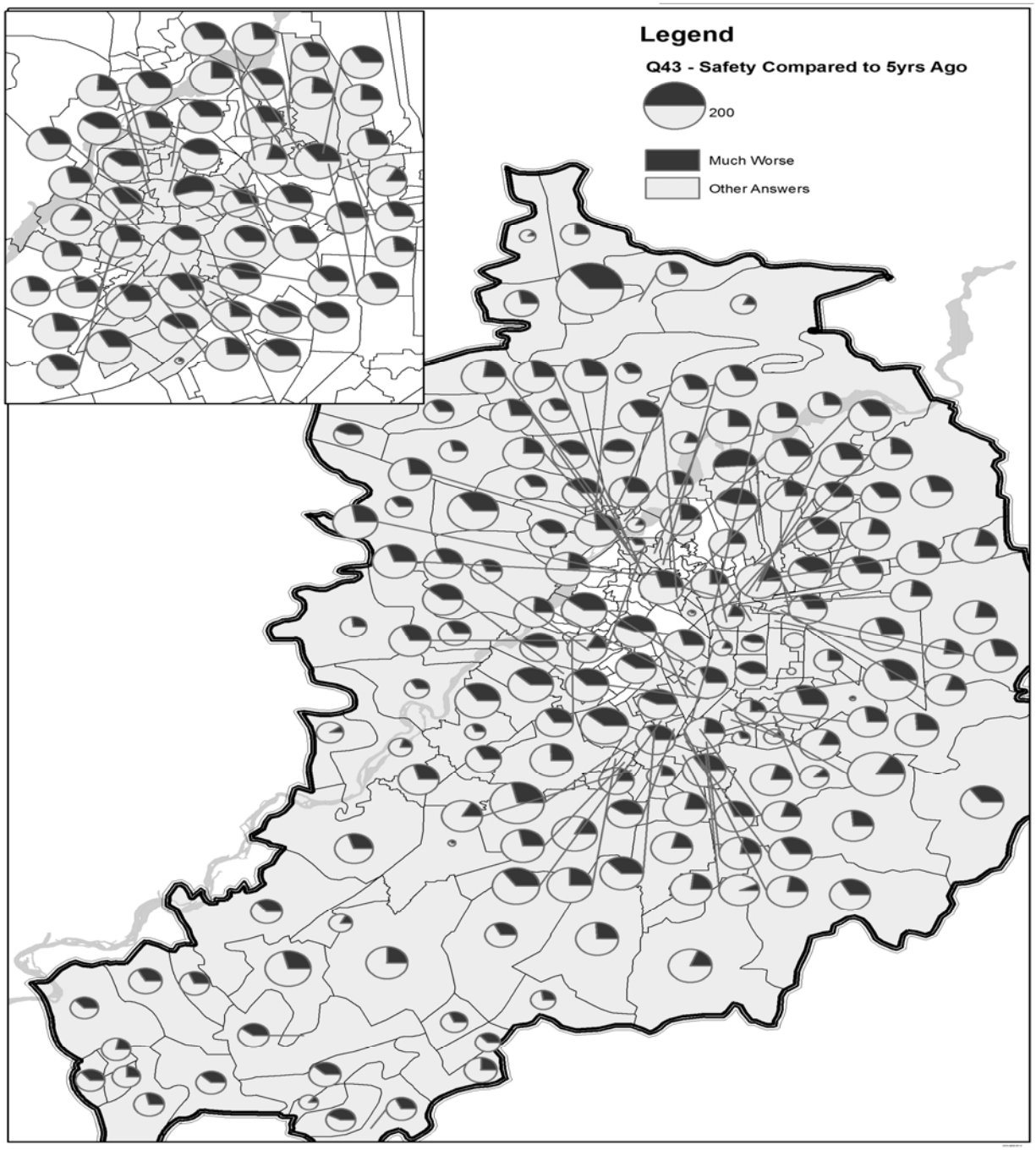
Table 2.6.3 "Have you got involved in traffic accidents in the past 5 years?"

Response	Number of Samples	Percentage
Yes	3,416	19.3%
No	14,266	80.7%
Total	**17,682**	**100.0%**

Source: JICA Study Team

Traffic safety situation in Lahore is worsening rapidly. Figure 2.6.3 shows the distribution of respondents who answered "Much Worse" of the current traffic situation as compared to 5 years ago. Its percentage tends to be higher in the city centre areas.

Figure 2.6.3 Distribution of Respondent Households who Answered Much Worse" Traffic Safety Situation as Compared to 5 Years Ago

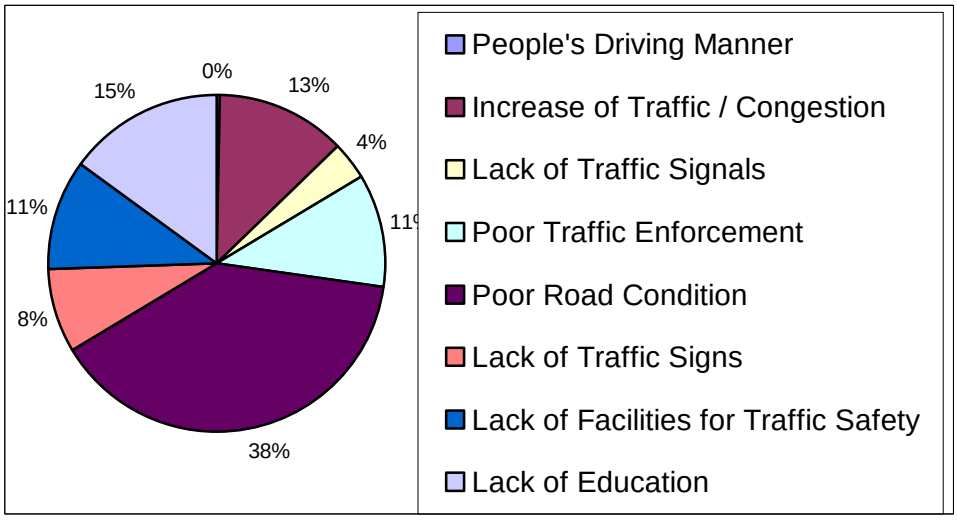


Source: JICA Study Team

Lahore citizen think that the reasons of this poor traffic safety are "Poor Road Condition", "Lack of Education", "Increase of Traffic / Congestion", "Poor Traffic Enforcement", "Lack of Facilities for Traffic Safety", and so on as presented in Figure 2.6.4. It is noted that "People's Driving Manner" is not taken seriously as traffic safety. As to the behavior of motorcyclist, people have generally negative impression such as "Very Bad" or "Bad".

Regarding traffic safety measures, majority thinks “Enhancement of People’s Awareness” and “Improvement of Road” are most necessary measures, as illustrated in Figure 2.6.5

Figure 2.6.4 People’s Opinion on Reasons of Poor Traffic Safety



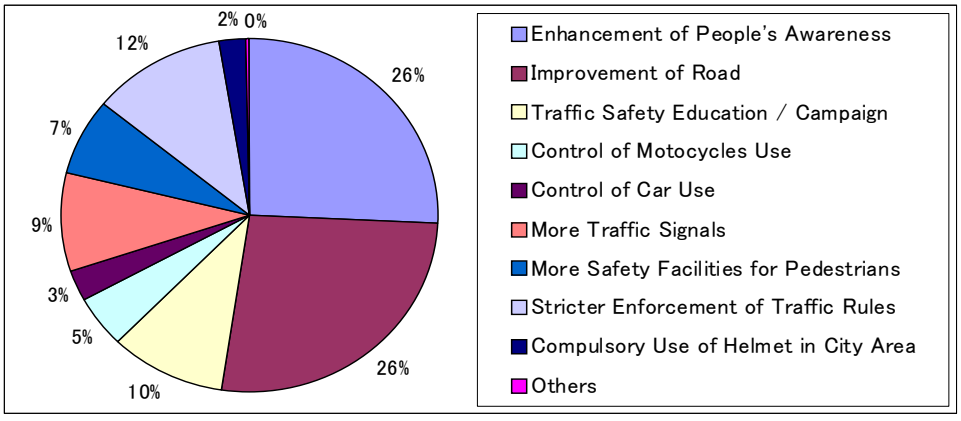
Source: JICA Study Team

Table 2.6.4 People’s Feeling on the Behavior of Motorcyclists

Response	Number of Samples	Percentage
Very Good	24	0.1%
Good	358	2.0%
Ok	3,294	18.6%
Bad	5,853	33.1%
Very Bad	8,166	46.1%
Total	**17,695**	**100.0%**

Source: JICA Study Team

Figure 2.6.5 People’s Opinion on Necessary Traffic Safety Measures



Source: JICA Study Team

2.6.3 Public Transport

Most of Lahore citizen are not using bus service regularly. Only about 14 % are the regular bus users as summarised in Tables 2.6.5 and 2.6.6. Among the reasons of not using buses, “Have own transport vehicles” was the reply of most respondents, followed by “Do not need to use buses” and “Not satisfied with bus services”. Based on people’s assessment on bus/ wagon service given in Table 2.6.7, majority of people are not satisfied on almost all aspects of the present bus/ wagon services.

Table 2.6.5 Frequency of Bus Use

Regularity	Number of Samples	Percentage (%)
5-7 Times a Week	2,434	13.8
2-4 Times a Week	2,318	13.2
Once a Week	2,422	13.7
Rarely	6,127	34.8
Never	4,315	24.5
Total	**17,616**	**100.0**

Source: JICA Study Team

Table 2.6.6 Reasons of Not Using Bus Service

Reason	Number of Samples	Percentage (%)
Have Own Transport Vehicle	4,015	43.2
Not Satisfied with Bus Service	1,821	19.6
Don’t need to Use Bus	1,896	20.4
No Opinion	1,568	16.9
Total	**9,300**	**100.0**

Source: JICA Study Team

Table 2.6.7 People’s Assessment on Bus/Wagon Service

Reason	Percentage Answered Very Bad or Bad
Route System	67.9
Operating Hours	69.6
Frequency/ Headway	67.7
Punctuality	73.3
Bus Speed	66.2
Bus Fare	73.0
Access to Bus Stop	59.3
Bus Stop Facilities	73.1
Waiting Condition	77.9
Number of Bus Stops	65.5
On-Board Comfort	70.9
On-Board Security	72.7
Driver/ Conductor’s Attitude	68.5
Convenience of Transfer	62.2
Others	59.0

Source: JICA Study Team

Despite adverse views on the present bus/ wagon services, people generally agree to the necessity of improving public transport as shown in Table 2.6.8. For the improvement of public transport, improvement of bus services is considered most important.

Development of air conditioned buses and rail based mass transit are also considered as a necessity by the citizens of Lahore.

Table 2.6.8 People's Opinion on the Necessity of Public Transport Improvement

Response	Number of Samples	Percentage
Yes	15,925	90.5%
No	970	5.5%
Don't Know	356	2.0%
No Opinion	349	2.0%
Total	**17,600**	**100.0%**

Source: JICA Study Team

Table 2.6.9 "What types of public transport services must be improved? (Choose two)"

Mode	Number of Samples	Percentage
Taxi/ Rickshaw	3,208	10.1
Bus Services	11,447	36.1
Aircon Buses	7,056	22.2
Underground Railway	5,084	16.0
Elevated Railway	2,344	7.4
Railway	2,596	8.2
Total	**31,735**	**100.0**

Source: JICA Study Team

2.6.4 Improvement of Transport System

Table 2.6.10, presents that possible measures for transport improvements as supported by people. More than 90 % of people support "Construction/ Improvement of Roads", "Strict Traffic Control" and "Improvement of Walking Condition". "Restricting Motorcycle" seems to be the relatively unpopular response.

Table 2.6.10 People's Attitude on Transport Improvement

Transport Improvements	Percentage Answered "Strongly Support" or "Support"
Construction / Improvements of Roads	96.5
Strict Traffic Control	93.4
Restricting Motorcycle	49.0
Installation of Traffic Signals	82.6
Strict Parking Control	88.0
More Parking Facilities	89.2
Improvements of Walking Condition	91.5
Expansion of Bus Services	88.1
Introduction of Bus Lanes	87.5
Remove of Animal-driven Carts	64.8
Others	60.0

Source: JICA Study Team

Regarding public transport improvement measures, "Control of Air Pollution", "Promotion of People's Understanding of Transport Problems and Measures", "Construction of Bus Exclusive Lane / Bus-way" and "Construction of Urban Railway" have a strong support from the citizens of Lahore. "Removal of Animal-driven Carts" and "Removal of Qingqi"

also have a support to certain extent. Restrictive and economic measures on the use of private vehicles (car and motorcycle) are unpopular, as summarized in Table 2.6.11.

Table 2.6.11 People's Attitude on Public Transport Improvement Measures

Restrictive Measures	Percentage Answered "Strongly Agree" or "Agree"
Restriction of Motorcycle Use on Service Roads	48.3
Restriction of Car Use in City Area	42.2
Increase of User Charges for Car	32.5
Increase of User Charges for Motorcycle	31.1
Construction of Bus Exclusive Lane / Bus Ways	83.8
Construction of Urban Railway (Elevated)	77.4
Construction of Urban Railway (Underground)	78.2
Construction of Urban Railway (At-Grade)	76.2
Control of Air Pollution	93.2
Promotion of People's Understanding of Transport Problems and Measures	88.3
Removal of Rikshaw	51.5
Removal of Qinq Qi	61.6
Removal of Animal-driven Carts	63.8
Others	52.2

Source: JICA Study Team

2.7 Current Transport Problems and Issues

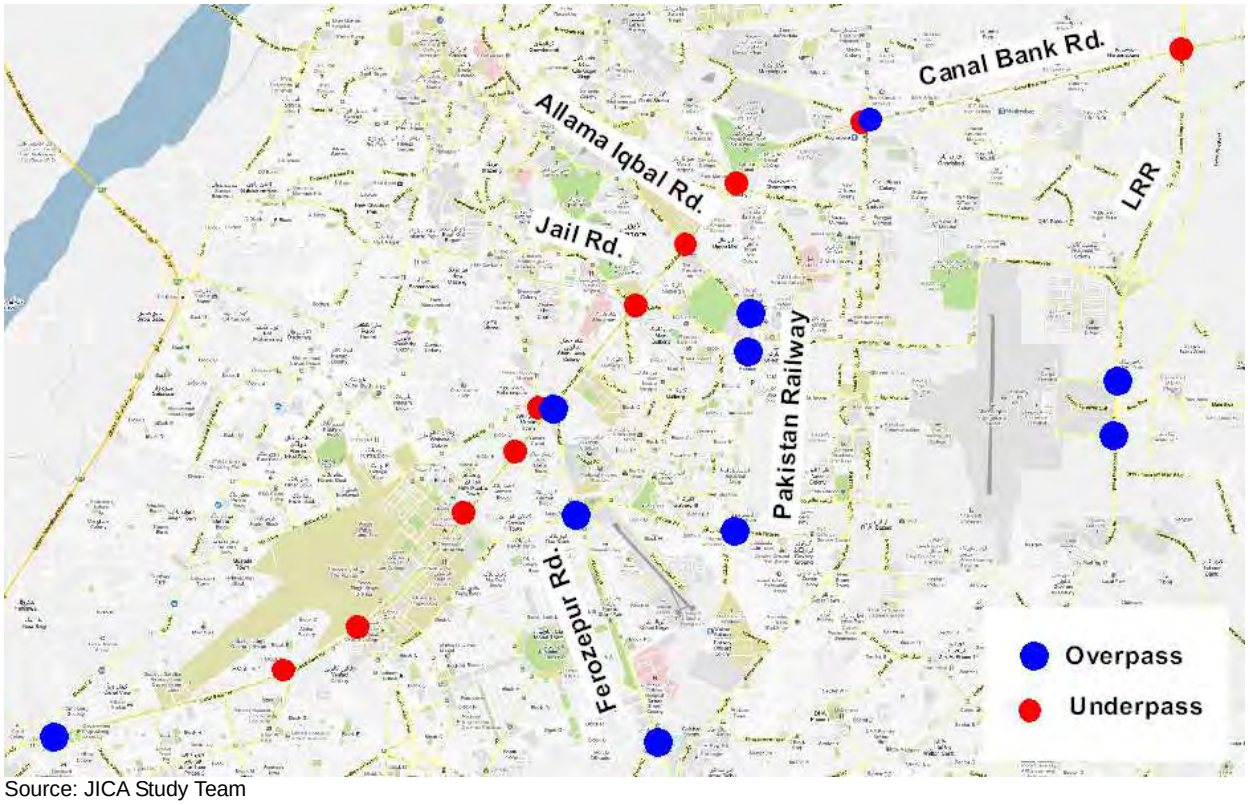
2.7.1 Road Network

Lahore is one of the most accessible cities of the Punjab Province. In addition to the historic Grand Trunk Road (G.T. Road), a motorway (M-2) was completed in 1997 from Lahore to Islamabad. The government has built underpasses to ease congestion and prevent traffic jams, and according to official figures, Lahore transportation services have improved to accommodate the growing number of visitors to the city. It is well connected by air to other countries as well as all major cities of Pakistan. Buses, trains, taxis and rickshaws are the other means of transport available in Lahore. The problems regarding road infrastructure are summarized as follows:

1) Lack of Overpasses and Underpasses

Despite these improvements, Lahore struggles for safety on its roads, which are dangerous because the number of vehicles overwhelms the road space. Massive congestion occurs every day as millions of Lahorites travel through disorganized, fast-moving traffic, and accidents are widespread. However the government is trying to improve traffic conditions by constructing flyovers, underpasses, and conducting public safety campaigns. As shown in Figure 2.7.1, the number of overpasses and underpasses are still limited, only on few roads including Canal Bank Road.

Figure 2.7.1 Location of Overpasses and Underpasses in Lahore



Source: JICA Study Team

2) Encroachment

There is no segregation between markets and roads in Lahore. All roads are market places in Lahore. LUTMP conducted RIS and recorded the extent of encroachment in terms of percentage of road area illegally occupied within the right-of-way (RoW).

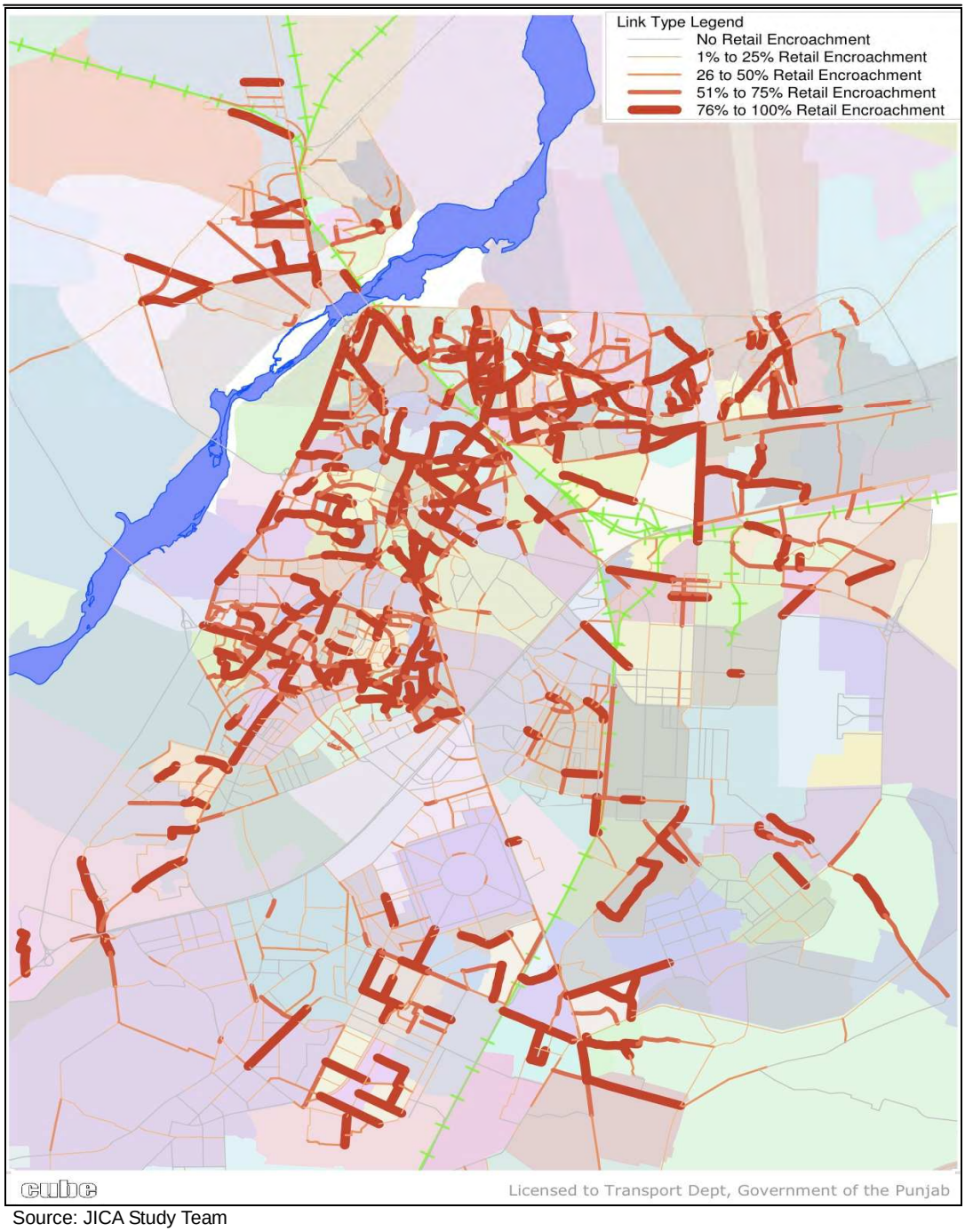
The Retail Encroachments are shown in Figure 2.7.2. The reasons will be:

- Many street vendors are working to earn their daily income.
- Parking spaces are limited or non-existent in most of commercial shops and business buildings.

Solutions to remove the encroachment will not be easy because it depends on a kind of social policy. The possible solutions will be:

- The street vendors are required to develop their economy so as to discontinue the street vending (Overall economic development is needed.).
- The shops and buildings owners have to determine to invest for their required parking spaces.

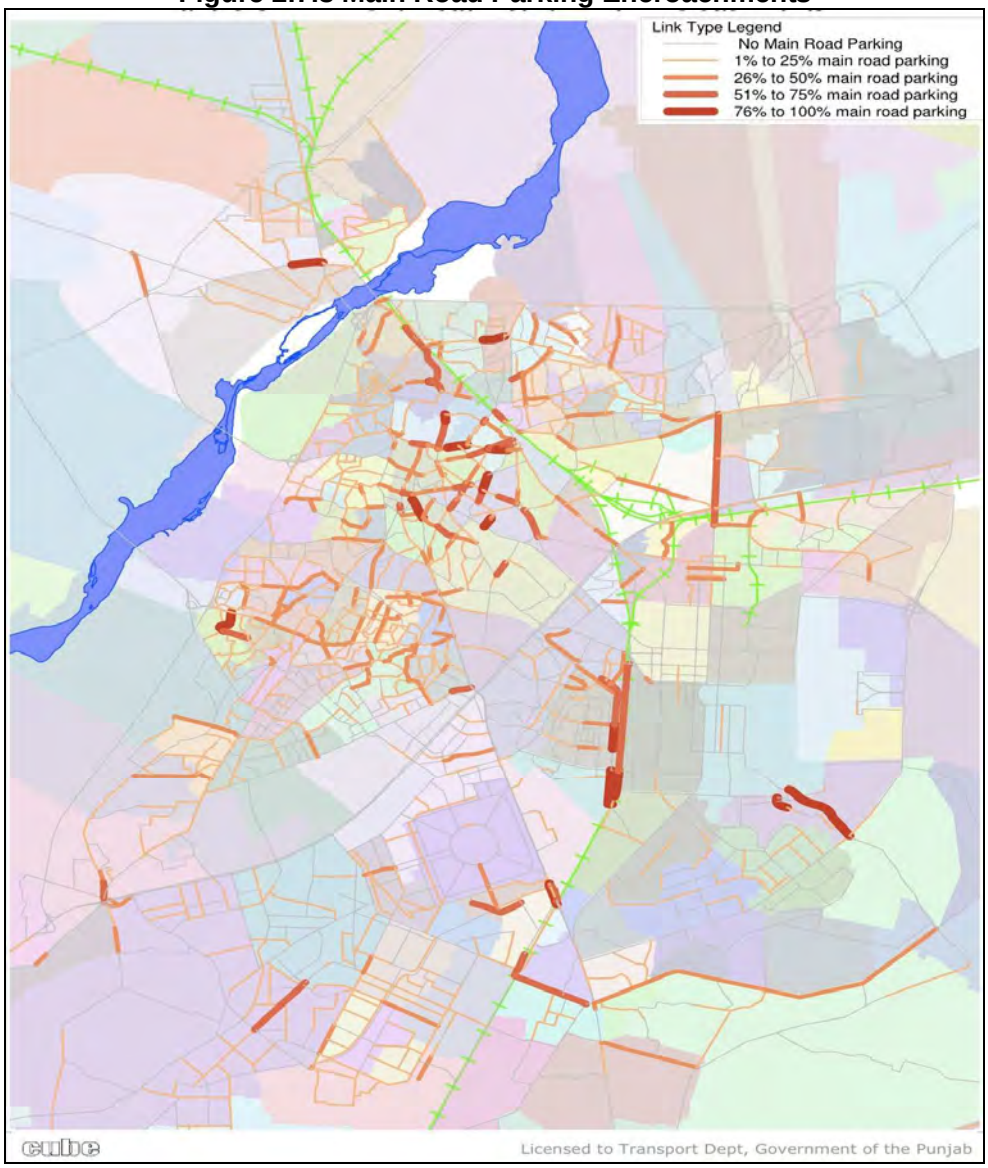
Figure 2.7.2 Retail Encroachment – Road Inventory Surveys



Source: JICA Study Team

Other forms of encroachment result from the activities outside schools, industrial facilities, hospitals and office spaces. Most of these are relatively minor, parking on main roads is significant cause of encroachments, as shown in Figure 2.7.3.

Figure 2.7.3 Main Road Parking Encroachments



Source: LUTMP Road Inventory Surveys

There is rarely parking all along the entire length of a road section. It is quite common to see parking along 25 % to 50 % of the road section, where commercial activity is prevalent.

3) Lahore Ring Road (LRR) Construction

Over quarter of the LRR is complete and eastern section is now under construction. LRR land acquisition process has been slow, however, it is anticipated that LRR Phase-I will be operational by the end of 2012. Early completion of both phases of LRR is essential to relieve the congestion in the inner city areas.

4) Lack of Ravi River Bridges

In the 1991 Master Plan prepared by Comprehensive Study on Transportation System in Lahore, JICA, three additional bridges over Ravi River were proposed. The outstanding

one is from the south end of the Canal Bank Road to the north-west over the Ravi River. For the development of the city to the west of the Ravi River, additional bridges over the Ravi River would be required.

5) Development in the South-west of Lahore

Present new housing and industrial development schemes are mostly located in the south-west quadrant of the city between Multan Road and Ferozepur Road. The development of this area was initially proposed in the 1991 Master Plan prepared by JICA Study and later confound by the 2001 Master Plan prepared by LDA. Development toward east, north and even west were not considered due to fear of flooding from Ravi River proximity to the international border with India.

For the balanced development of Lahore, all directional development should be sought including road infrastructure development for smaller sub-centres, otherwise more people will tend to travel to the city centre from a single (south-west Ferozepur Road) corridor which is not sustainable.

6) Lack of Road Classification and Inventories

At present, road classification of each road is not clear, every authority has its own definition and classification is not authorized by laws. For the long term development and smooth implementation of each road, the classification should be well planned and the road inventories should be prepared for a single classification for all the relevant agencies.

7) Vertical Clearance of Underpasses

In May 2010, several pupils sitting on the roof top of a bus were hit and killed at one of the underpasses at Canal Bank Road. Existing vertical clearances of most of underpasses varies and maximum is only 4 m, sub-standard even by American Association of State Highway and Transportation Officials (AASHTO) standard (min. 4.3 m).

2.7.2 Public Transport Development

The public transport network in Lahore is currently under-developed, fragmented, inadequately managed and highly inefficient.

1) Under-Development

It is estimated that there are 3.3 million passenger trips in the Study Area using public transport (buses, wagons and other paratransit), whereas there are only 300 to 400 buses (55 ft) are operated by 13 private companies. Evidently the public transport network is under-developed and there is a great gap between the demand and provision of an efficient and environment friendly public transport system. Despite a considerable demand and several projects (Green, Orange, Blue and Purple Mass Rapid Transit lines), there is currently no Rail-based Mass Transit (RMTS) line in Lahore.

2) Fragmentation

Historically, the provincial governments in Pakistan have owned and operated intercity and urban public transport services. However, over the years, the government, according to the guidelines of the World Bank, advocated to encourage the private sector in operating public transport. The decline of state-owned public transport services created a vacuum that was filled by private operators in accordance with these guidelines. Initially, the market was opened to private operators in parallel with public-owned public transport. However, the availability of public transport has not grown at the same rate as the population. Therefore, a large number of small private operators were permitted to fulfil this gap in a fragmented way. As a result, a chaotic mass of individually-owned small vehicles (Wagon, Qingqi, Rickshaw etc.) operate in Lahore, competing for road space.

3) Inadequate Management

Public transport organizations have a long history of deficiency in professional, administrative, and financial capacity to manage public transport service planning. In the absence of human resources, coordination, research, and financial capacity of public transport institutions in Punjab, public transport has now become fully the prerogative of the private sector as described in the previous paragraph. The incomplete routes, high fares, fewer-than-needed buses, gender discrimination, and even absence of buses in some places are common in the urban areas. Whole public transport is grossly mismanaged with least objective of service provision, limited and inadequate condition of the public transport facilities (including buses, bus terminals and bus stops) and chaotic use of road space (leap frogging by Wagons) due to absence of proper government regulations and enforcement. Public transport operation should be improved by extending franchised bus operations on all major corridors and restricting small vehicles operations on feeder routes. It will require emphasis on high-capacity buses (50+ seats) rather than a multitude of small vehicles.

Transport related functions (transport planning, engineering and maintenance, and licensing, registration, regulation and operation of public transport routes) were not concentrated into one single and efficient authority: TEPA has no longer any involvement, and licenses are issued without assistance of any origin-destination data or transport planning processes. LTC is established to regulate public transport operations, it is anticipated to improve, albeit, the program has been limited over the last three years since its operation.

Actually there are currently many public transport vehicles operating without valid license and or even registration. About 25 % of mini-buses operate without any valid documents. It has also been reported that many wagons are operating without any registration, and

that many do not follow the authorized route. Buses also suffer because of undue competition with paratransit; there are wagons and coasters which provide licensed services to neighbouring towns and, although they are not allowed to serve intra-urban passengers, these compete illegally with bus routes by picking-up and dropping-off passengers within Lahore district area.

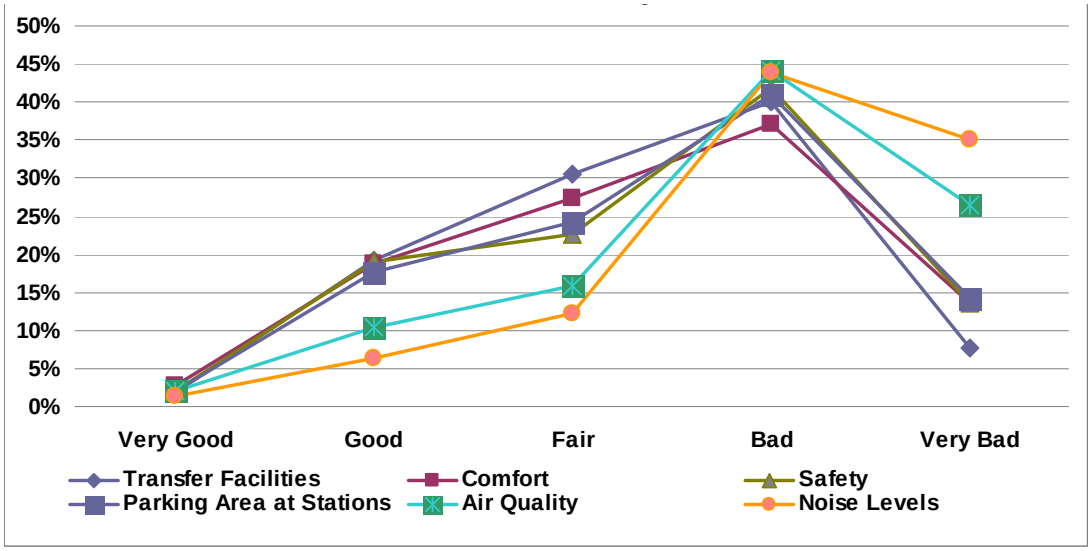
In addition to unlicensed mini-bus and wagon services, there is increasing phenomenon of Qingqis and Rickshaws. About 5,000 route permits have been issued to Qingqis, but it is estimated that as many as 40,000 are currently operating in Lahore, many along primary and secondary roads which are also served by licensed bus services. In parallel, the presence of more than 80,000 rickshaws not only causes congestion but serious threat to efficiency and service quality.

4) Performance

Due to rapid motorization increase in traffic volume over the last two decades, the road network has many congested sections along arterial roads, which increases travel delays and reduces bus travel speeds, implying a less competitive public transport network, especially in the CBD where commercial and trading activities are concentrated.

Current public transport services are suffering greatly due to irregularity. On certain routes waiting times for the passengers are too long, whereas on certain routes buses wait for the passengers to be filled. Such a situation prevails because of the fact that routing and licensing is not based on passenger demand analysis but based on convenience of operators and the regulator. Efficiency is acceptable on certain routes but reliability is poor, there being no scheduling at all. Quality of public transport services, as reported by users is illustrated in Figure 2.7.4.

Figure 2.7.4 User Assessment of Public Transport Facilities



Source: JICA Study Team

2.7.3 Traffic Management

Mainly due to institutional issues, traffic management is highly inefficient and ineffective in Lahore. Main aspects are: traffic laws, management of the public spaces, management of the physical infrastructure, traffic control, also management of the drivers, provision of pedestrian facilities and safety of all road users.

1) Traffic Laws

In general, traffic related regulations are insufficient, ineffective and obsolete; moreover, enforcement of rules is quite weak. This generally implies a chaotic and an in-disciplined traffic on roads, and therefore results in high rate of accident and even loss of life, injuries and damages to the properties. This chaotic situation is exacerbated by the diversity of the traffic in Lahore. The traffic laws are not though applied on pedestrians, cyclists, animal-drawn carts and hand-pushed carts, 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 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.

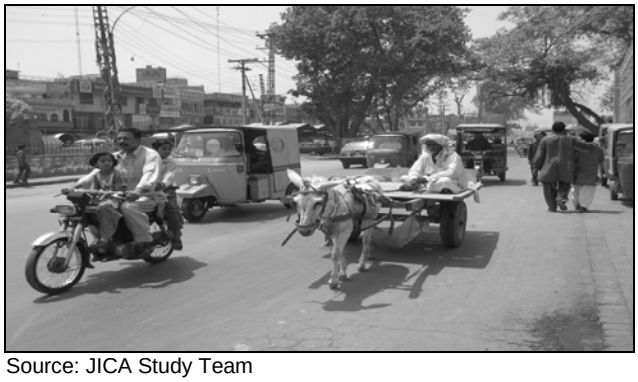
2) Management of Public Spaces

Management of the public spaces in Lahore is poor, resulting in disorderly traffic mixed with various modes, many encroachments and illegal parking, and few facilities for pedestrians and cyclists.

As illustrated by the following Figure 2.7.5, Lahore is characterized by a disorderly traffic mix with pedestrians, animal-drawn carts, hand-pushed carts (fruit sellers, hawkers),

bicycles, motorbikes, rickshaws, Qingqis, cars, vans, mini-buses, inter-city coaches, trucks etc. The animal driven vehicles and the other slow-moving non-motorized vehicles need to be eliminated from using the main road and separated from general traffic. These slow modes of traffic cause blocking back in traffic resulting in congestion, queues and even severe traffic accidents. It is observed that such animal driven/ hand carts and slow modes are frequently parked on footpaths, as a result the pedestrian walk in the main carriageway, are major problem and reasons for pedestrian accidents.

Figure 2.7.5 Disorderly Traffic Mixed in Lahore



Source: JICA Study Team

Wide spread, encroachments of roadside, both permanent and temporary, reveal a lack of parking policy in Lahore. Parking blocks sidewalks in many locations and inhibit both pedestrian and vehicular flows. For instance, large Solid Waste Containers are placed on main roads (as service roads are full with the parked vehicles). These 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 use higher speed lane which make travelling difficult and increase the risk of accidents as well as traffic congestion. There is a strip commercial development along most of the transportation corridors without proper offsets, set-backs, on and off-street parking and access management as per the bye-laws; causing severe encroachments and traffic congestion issues. Moreover, traffic police does not have the adequate authority/ capacity or even interest 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, garbage and hawkers forcing pedestrian to walk on the street and therefore affecting traffic safety.

3) Management of the Physical Infrastructure

Management of the physical infrastructure particularly concerns 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 to the maintenance of existing infrastructure. Roads are completely dilapidated condition resulting in frequent pavement failures and require full rehabilitation. Road maintenance is generally ignored till reconstruction becomes due. 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, as shown in Figure 2.7.6.

Figure 2.7.6 Flood in Lahore

Source: JICA Study Team

4) Traffic Control

Traffic control devices include traffic signs, signals, road marking and other devices (cameras) are used and are key elements for managing traffic flow. There is no standard practice of using uniform traffic control devices in the Punjab. The only Manual for Uniform Traffic Control Devices available is the National Transport Research Centre (NTRC) Manual for Signs, Signals ad Markings (1989), which has never been updated. 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) are inoperative and signage is almost non-existent. 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 functioning. In recent years, some signals have been installed and managed by other agencies, such as the GoPb, C&W, the NHA (on National Route N-5) and The Cantonment Board, about 50 signal installations in the Defence Housing Areas. Similarly, traffic signs and road markings are placed and maintained by TEPA, CDGL and Parks and Horticultural Authority (PHA), and also by other agencies and even private sector with advertisement. For the sake of efficiency, uniformity and economy, it would be desirable to concentrate these functions in a city-wide single traffic agency.

5) 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. Commuters and transporter have generally no traffic sense resulting in a chaotic 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 two or more passengers, often without helmet for both driver and passengers. The general situation causes a fatal failure to follow traffic rules, which in turns leads to a worsening of congestion level and contribute to road accidents.

2.7.4 Institutional Set-up

In LUTMP Phase-I, institutional issues of transport sector administration in Lahore were reviewed through perusal of past studies and interviews of relevant organizations. As a result, following was understood as the key current institutional problems. However, there are still quotations pointed out in some reports or hearsays mentioned in some interviews.

1) Many Responsible Agencies and Duplication of Roles

There are at least 17 departments or agencies of the national, provincial and city district Governments that play important role in the management of roads, public space and transport services. In addition to these, there are nine TMAs. Among these, some roles are assigned to plural organizations and as a result, such roles are prone to be neglected. The matter is now further worsened by creation of government owned public companies for public transport and waste management without clear delineation of power.

2) Insufficiently Trained Traffic Police

Traffic police is mainly responsible for traffic control and management, while capacity building of traffic police has been neglected. In the past 20 years, information technology in traffic management has been significantly advanced and training of traffic police has failed to catch up with these advances.

Along with increase of traffic volume, roles of traffic police has been widened and complicated, while training of traffic police is not adequate, this has resulted in low efficiency in traffic control and road space management. As a result, people have not respect of traffic police and their role in traffic management.

3) Shortage of Planning Expertise

The TD of the GoPb does not have any agency specialized in transport planning and as result, has no trained staff or planning expertise. By this, every action and projects tend to have a nature of a patchwork, which will impair investment efficiency. With this background, the Transport Department has decided to establish the Transport Planning Unit (TPU).

4) Outdated Transport-related Rules and Regulations

The transport sector in Pakistan is regulated through the federal and provincial enactments which are (a) The Provincial Motor Vehicle Ordinance (MVO), 1965 (b) The provincial Motor Vehicle Rules, 1969 (c) The Motor Vehicle Act, 1939 (d) The Fatal Accidents Act, 1855 and (e) The National Highway Safety Acts.

Most of these well out dated and losing their proper workability to the 21st Century transportation phenomena. These require review and amendment. For example, the MVO 1965 provides the mechanism, licensing and regulation of motor vehicles in particular and for control of traffic but it does not cover all the aspects of the Road Traffic Control, Regulation and the Public Space Management. It has provisions for the construction, equipment and maintenance of motor vehicles but has not been updated for a very long time.

The section 67 of the MVO, 1965 provides another aspect relating to accidents of motor vehicles and causalities which specify the responsibility for compensation. However, the principles relating to award of compensation in motor accident cases and the provisions relating to insurance in the MVO, 1965 are extremely vague, uncertain and complicated.

5) Incomplete Implementation of Rules and Regulations

The MVO, 1965 is a consolidated and comprehensive law with various amendments over the years. Despite the exhaustive nature of the ordinance and the matters contained therein, the issue of effective enforcement is lacking, resulting in deterioration of traffic conditions and motor vehicle affairs in general.

The criteria for granting various licenses like driving licenses, stage carriage licenses and private/ public carrier licenses are contained in the ordinance but not followed by proper enforcement. The discretion available to the traffic police officers and cumbersome penal ticketing system in case of traffic rules violations have contributed towards corrupt practices and deterioration of traffic system.

As for another example, the National Highway Safety Ordinance (NHSO), 2000 has provision for “No Fault Accident Compensation” by a registered insurance company, but the rules have not yet been framed to implement this provision. An urgent need is pointed out in Pakistan to introduce new concepts within the MVO, 1965, commensurate for the compensation for no fault liability.

Section 76 of the MVO, 1965 authorizes the Government to prescribe conditions for the issue of permits to heavy transport vehicles. In reality, however, an offender driving an over-loaded heavy vehicle is only asked to reduce the weight at the close-by storage point, which is rarely exercised, resulting in the common and widespread road surface rutting.

Volume-I – Chapter-3

URBAN DEVELOPMENT CONTEXT

FINAL REPORT

3. URBAN DEVELOPMENT CONTEXT

3.1 Alternative Urban Development Scenarios

3.1.1 Assessment of Past Urban Development in Lahore

1) Urban Area Formation in the Past

The origin of Lahore's urban development is the Walled City. During British colonial era, urban facilities including residence, parks and universities were constructed in the south of the Walled City surrounding administrative centres. At present, a number of administrative facilities such as provincial parliament, governor's official residence and government officer's residences are concentrated in this area together with the Jinnah Park, the University of Punjab, other colleges and many business/ commercial buildings. This area boasts of its beautiful urbanization with low-coverage buildings, characterized by wide streets and parks/ gardens covered by tall trees.

The Canal also has a salient influence on the formation of Lahore's urban area. The Canal Bank road runs in the east to south-west direction, and contributes largely to the special urban scenery of Lahore having the canal in the center of the road. The canal has its source in Larger BRB Canal upstream and supplies irrigation water to Lahore and agricultural areas in Lahore and the south-west green belt.

In the north-east of this built-up area, the Lahore station is located. The railway is basically for intercity long distance travel connecting Lahore with Rawalpindi and Peshawar in the north and Karachi in the south. The agglomeration of iron/ steel industries located in the north-east of the railway (about 150 ha) is considered to have been once developed due to the proximity to the railway. Although it has little relation with the railway transportation at present yet its production and sales functions still remain in the same area. The road traffic generated from these industries, coupled with intra-city bus terminal traffic on the opposite side of the railway, creates serious traffic congestion between the Walled City and the Lahore Station.

Lahore's population was about 2.5 million in 1960, which is less than third of the present. As population increased with economic growth, urbanization went southward and eastward. Eastward urbanization was led by the military as Cantonment, and southward expansion was based on road and road transport. There is no evidence that railway played any role in leading urbanization.

In the later decade of the Last Century (1980-1990), urban development pattern was gradual outward expansion of the existing built-up areas. Motorcycles and auto-rickshaws, which became popular, then, may have assisted this development. In the meantime, a huge academic town of universities and colleges of about 10km^2 was developed at the

south-western end of the urban area. This academic town, however, is in the midst of residential area at present.

Urban development pattern changed in 1990's due to rapid motorization, commercial, industrial and residential development occurred along arterial roads showing ribbon development pattern along radial roads. In one word, the pattern changed from concentric-contiguous pattern to starfish pattern. This pattern, however, is changing again. The concentric-contiguous pattern is appearing again due to the following reasons:

- New road development has become difficult (except for northern half of the LRR).
- Insufficient capacity of radial arterial roads has become a restriction for large-scale urban development between radial corridors.
- Development permission system has started functioning (LDA was established in 1975 and legal system has been provided).

The concentric-contiguous pattern is seen mainly in the south and in the east. In Cantonment, well-organized residential area (DHA) was developed by the military, and the eastern section of the LRR further enforced this development. In the south, development permissions were given to vast areas such as Engineering Town and Chung. However, these areas are not necessarily built-up yet, and agricultural land and other open space still remain in the midst of residential areas.

In the north of the Ravi River, ribbon-type development is still seen particularly along the G.T. Road and Sheikhupura Road. Industrial, commercial and residential development of this area is mainly due to the improvement of access condition by the Motorway.

The population of the Study Area is 9,928 thousand (8,652 thousand for Lahore District and 7,571 thousand for built-up area of Lahore) as of 2010. Population density exceeds 1,700 /ha in some zones of the Walled City. However, it is sometimes below 50/ha in the residential areas that are not fully built-up. In the remaining vacant parts of these inefficient areas, high-rise buildings of up to 15 stories are often built. But the location is not well-planned in general. In addition, LDA promotes many housing schemes, mostly in the suburbs in the east and south.

- LDA Regular Schemes: 52
- Private Housing Schemes approved by LDA: 215

With regards to industrial estates, there are two salient industrial estates: one in the south nears the border with Kasur District (Sundar Industrial Estate) and the other in the north along Lahore-Sheikhupura Road. The former depends on a narrow 2-lane local road and the later on a 6-lane National Highway. There is also industrial ribbon belt along G.T.

Road (National Highway N-5) between Lahore and Muridke in the Study Area.

2) Assessment and Identified Problems

(i) Densely Built-up Area in the North

In the north of Lahore, there are extremely high-density built-up areas such as the Walled City. The most salient advantage of this area is that a wide variety of functions exist in proximity and the area does not generate many long-distance trips as compared to the dense accumulation of population and urban functions. The close community incubates local/ family industries and vitalizes people's life. The disadvantage of the area is obsolete residences with extreme high population density and poor sanitary condition due to dust, sewerage and uncollected garbage. The advantage and disadvantage are in a trade-off relation.

A large problem exists with the agglomeration of iron/ steel industries, which produces traffic congestion as mentioned earlier. Its production efficiency is deteriorated due to its dependency on road transport, and with limited access to main roads.

Congestion on the secondary and local roads of this area is serious due to mixed traffic of car, bus, truck, auto-rickshaw, Qingqi, and animal-drawn carts and had drawn carts mostly for movement of goods.

(ii) Government Building Area and Its Environs

This area consists of government buildings, offices, hotels, high-grade residences and so on, and its environment such as greeneries, parks, gardens, historic buildings and wide-carriageway roads needs to be inherited. This area is the actual CBD of Lahore. The coverage of most buildings is low and high-rise buildings are few (mostly 3-5 stories, 10 stories at most). The space in this area for future possible development and enhancement is sufficient because limited elevation of buildings in harmony with the existing environment may suffice for immediate future needs.

The only problem of this area is that it is located in far north of Lahore, and it creates large travel needs to/ from the southern and eastern residential areas. If urbanization proceeds further to the south without strong public transport, there is a strong possibility that the CBD functions would get paralyzed in the not too distant future.

(iii) Existing Built-up Residential Areas

This area consists mainly of residential areas constructed before 1990. With moderate population density and reasonable road network, people's life is comfortable and convenient in general. This situation, however, is changing.

First, 3-7 story buildings are constructed along arterial roads. However, the location

seems to be selected randomly without any city plan. Usually, this type of building is admitted in limited areas to form urban functions in an orderly manner. Another problem is related to the fact that the construction period seems very long. Due to this inefficient investment (e.g. interest during construction), building construction does not contribute much to the urban economy as seen in other cities of the world.

Second, there are many unused land spaces that seem to be increasing recently. Large-scale disorderly development in the suburbs, results in deterioration of existing urban area, and this again increases unused land spaces. This vicious cycle should be checked early on. Such development cycle was also observed in the early redevelopment years of Japan after the World War II.

Third, conversion from residence to commercial building is often seen in high-grade residential areas. This increases convenience of the area, while this tends to aggravate the living environment. It may be necessary to restrict this conversion. In addition, GoPb has development rules established in 2009 which can deal with this situation.

In summary, this area is changing rapidly. Major effort should be made to create good urban environment in this area.

(iv) University Area

As mentioned earlier, an academic town is located in the midst of residential area in the south-west of Lahore. Its population density ranges 50-100 /ha (partially over 200 /ha) showing that many staff and students stay in residences and dormitories on campus. Travel demand to/ from outside is relatively small.

For instance, Zone 57 (Sikandar Block) is mostly university campus. This zone has incoming 5,757 trips on commuting purpose, of which 2,723 trips or 47 % are intra-zonal. Nearly half of the university staff lives on the campus. Number of “to-school” trips is 11,252, of which 4,405 or 39 % are intra-zonal. About 40 % of the students live on campus.

The problem of this area is that the area hinders the north-south traffic flow due to the lack of through road from this 4-5 km wide area. In addition to the above, there are other universities, colleges, etc in the CBD or in the suburbs. Those in the suburbs have been developed recently, such as the Institute of Technology located 10 km north of the Ravi River and two universities located in the west of Nishtar Town and recently opened Lahore School of Economics and University of South Asia on Burki Road in the east of Lahore.

(v) Expansion of Urban Area toward the East and South

The expansion of urban areas toward east and south has created a number of problems

due to vast and low-density development:

- Poor community formation with weak internal relationship;
- Inconvenient access to urban facilities;
- Dependency on cars for commuting with large load on arterial roads.

The largest problem is lack of coordination between urban development projects and arterial road development that support daily traffic needs of the residents. LDA acknowledges this problem focusing on "increasing distances from city center, deficiency in social and physical infrastructure, environmental degradation".

It is essential for sound urban development to pursue maturation of urban area by filling scattered unused open space and development of trunk transport system. As for unused open space, it is recommended to classify it into the area to be urbanized or the area to be conserved as green spaces.

(vi) Ribbon Development in the North

With regard to the ribbon development along arterial roads seen in the north, some problems are identified:

- Difficulty of land use at the back of ribbon development;
- Low efficiency of the thinly developed area;
- Degraded function of the arterial road.

Due to the reasons above, UK prohibited ribbon-type development by law in 1935[1]. Owing to this restriction, many British cities including London are generally compact and efficient. In Japan, however, because ribbon-type development was admitted, suburban land use became inefficient and functions of arterial roads were degraded. Disorderly development in the suburbs damages city efficiency as a whole.

In the north, planned development should be pursued taking advantage of the following favourable condition:

- Proximity to the center of Lahore;
- High mobility due to the Motorway and wide-carriageway arterial roads;
- Vast open space usable for various projects of urban development.

Without planned development, ribbon-type development will further proceed and 'concentric-contiguous' development will become unfeasible.

[1] Restriction of Ribbon Development Act

(vii) Industrial Zones

Industrial development in Lahore has continued depending on existing arterial roads. This was favourable to strengthen the basis of Lahore's economy.

In the south, most industries are located in the shape of ribbon developments except for some estates, and its production environment is not generally good in terms of transportation of materials/ industrial products and workers. Immediate countermeasures are required to prevent exodus of factories.

The developing industrial area in the north of Ravi River also has the problem of ribbon-type development although the function of intercity arterial roads is much stronger than in the south. Development of industrial estates is required. According to Sheikhupura Tehsil, 723 factories were established by 2000 in that Tehsil, and the reason of location was the existence of intercity roads for 307 factories or 42.5 % of the total. In addition, the factories are rice mills, iron steel re-rolling mills, tanneries, flour mills and so on. Most of the factories are small except for sugar mills, polyester processing and fertilizer production. Although no data is available after 2000, recent industrial developments can be observed in this area.

(viii) Overall Urban Structure

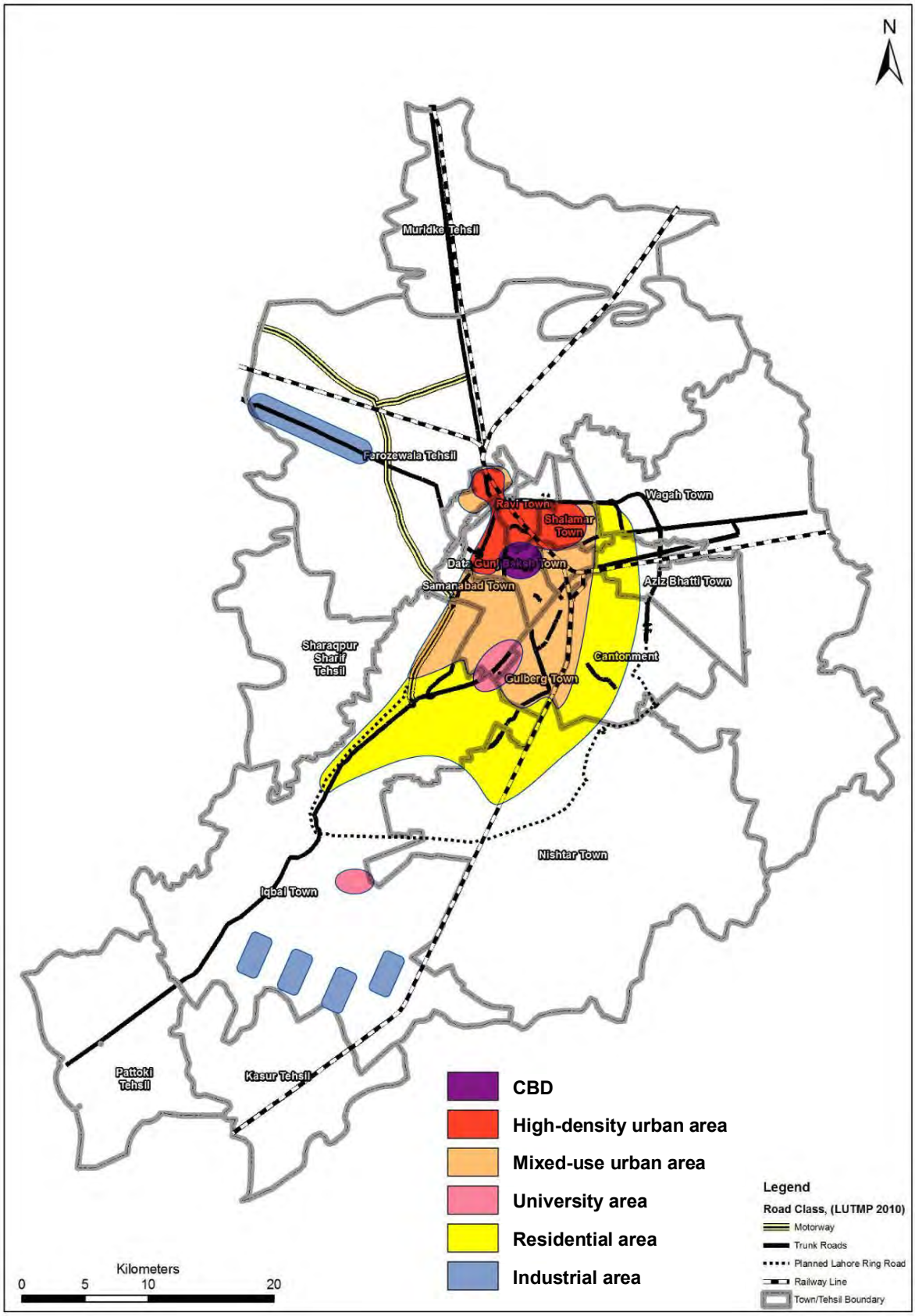
As stated earlier, the CBD of Lahore is located in the north due to historical reasons and urbanization spreads toward the south and the east. Due to poorly developed public transport depending on a small number of buses, long-distance travel becomes more and more uncomfortable, inconvenient and extremely difficult affecting economic performance of Lahore.

The residential area spreading to the south and the east seems to have been developed in a planned manner. However, developed areas are actually distributed widely like islands in the sea with numerous vacant land plots. The overall population density of these residential areas is very low. This incurs the issues of low efficiency of urban infrastructure and the difficulty of public transport development.

Outside Lahore District, there are some urban clusters in Sheikhupura and Kasur District such as Muridke, Raiwind area and Pattoki Tehsil areas. However, the interrelation of these urban clusters with urban activities of Lahore is very weak, presumably due to historical reason and the lack of high-mobility transport system.

The present urban structure is schematically illustrated in Figure 3.1.1.

Figure 3.1.1 Present Urban Structure



Source: JICA Study Team

3.1.2 Alternative Urban Development Scenarios

In order to solve the urban problems mentioned above and to promote future development, medium- to long-term urban development scenarios should be formulated. Three scenarios have been developed;

Scenario1: assumes past natural tendency will continue without any political intervention from the Government except for some ongoing projects such as LRR.

Scenario 2: assumes compact development with improvement of living environment and mobility by development/ enhancement of public transport.

Scenario 3: assumes dispersed multi-core development by fostering suburban cities and urban areas by restricting urban expansion of Lahore.

In order to determine the land use pattern for each scenario above, the result of land development suitability analysis was taken into account. The analysis are based on three factors; proximity to major roads, accessibility to city center and net population density. Natural conditions were not considered due to the similarity over the entire Study Area. This is presented in Figure 3.1.2, with its criteria shown in Table 3.1.1.

Table 3.1.1 Criteria for Land Development Suitability Analysis

Factor	Weight (%)	Grade				
		5 (Good)	4	3	2	1 (Bad)
Proximity to major roads	25	<500m from trunk roads	<500m from primary roads	500-1000m from trunk roads	500-1000m from primary roads or <500m from secondary roads	500-1000m from secondary roads
Access time to city center	25	- 15 mins.	15-30 mins.	30-45 mins	45-60 mins	60 mins. or more
Net population density	50	< 50/ ha	50-100/ ha	100-150/ ha	150-250/ ha	250/ha or more

Source: JICA Study Team

1) Scenario 1 (Zero Option – Trend)

This scenario assumes that the past tendency of urbanization will continue in the future. Although there is a risk that this Scenario will further amplify the current urban problems such as: inefficiency of urban infrastructure and worsening of traffic congestion, public investment by the Government would be limited.

(i) Densely Built-up Area in the North

Population of this area will not increase much. Actually the population of the Walled City has been stagnant already according to the "Sustainable Development of Walled City Lahore Project". As people's income increases, residents of this area will move out gradually looking for better living environment.

(ii) Government Building Area and Its Environs

The needs for public facility and office spaces will increase according to the population growth. Thus the floor area of this zone will increase accordingly. Although existing greenery and open space will decrease slightly, its environmental impact will be minimal considering strict land use restriction and its abundance.

(iii) Existing Built-up Residential Area

Although strong political intervention is not considered, vacant land space will be gradually filled by buildings as a natural tendency. Moderate land use control based on existing laws is assumed in this scenario.

(iv) University Area

No change is assumed in this scenario.

(v) Expansion of Urban Area toward the East and South

Population of LDA project areas and development permitted areas will reach its target by 2030 as planned. The rest of increased population is assumed to be distributed in newly developed areas to the east of LRR, in the south of Defense Road, around Ravi Town and so on. Moderate land use control based on existing laws is assumed in this scenario as well.

(vi) Ribbon Development in the North

Ribbon development will further expand along arterial roads.

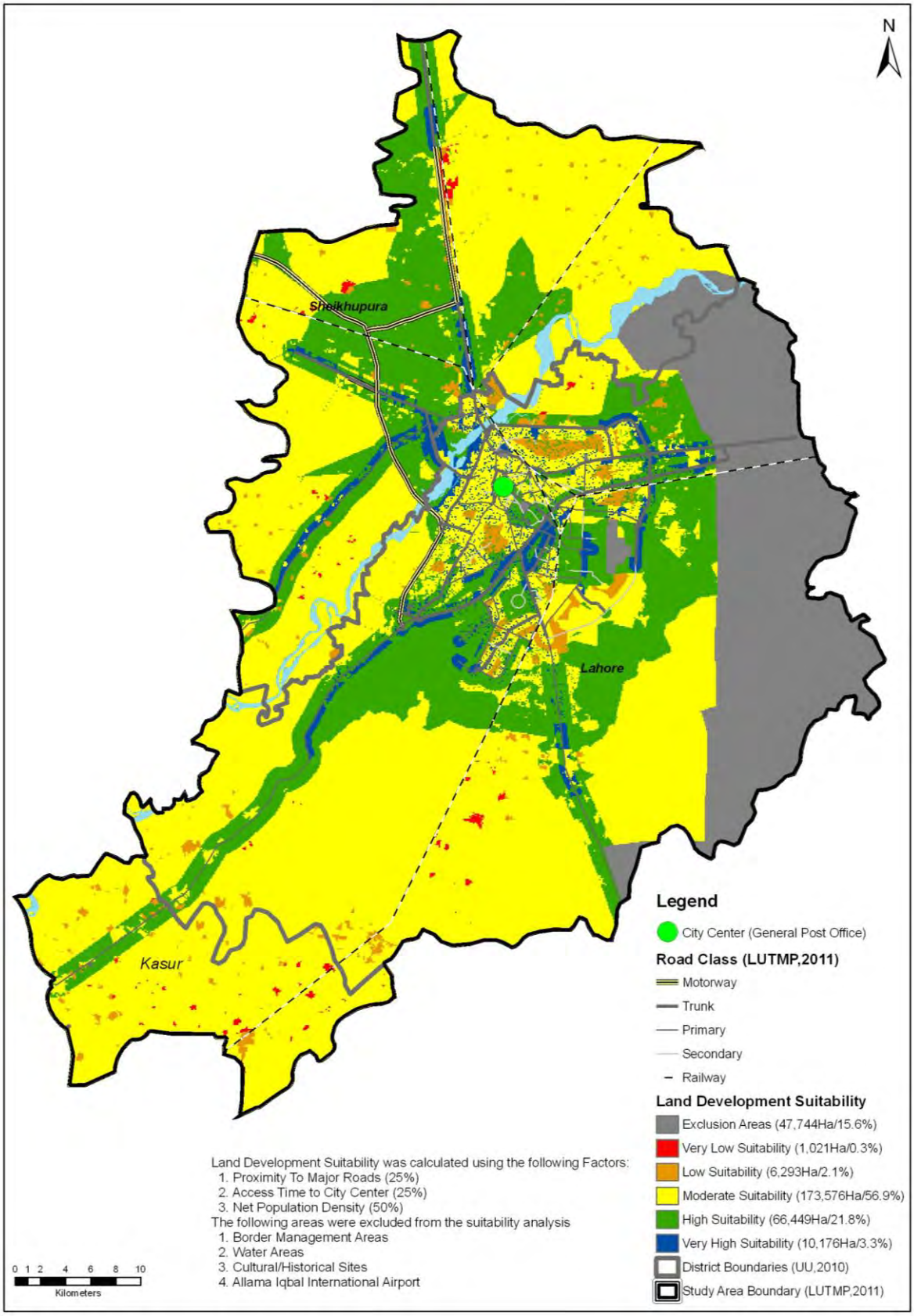
(vii) Industrial Zones

Considering the existing road network, industrial development will not precede much in the south. In the north, however, it will expand taking advantage of the favourable road condition.

(viii) Overall Urban Structure

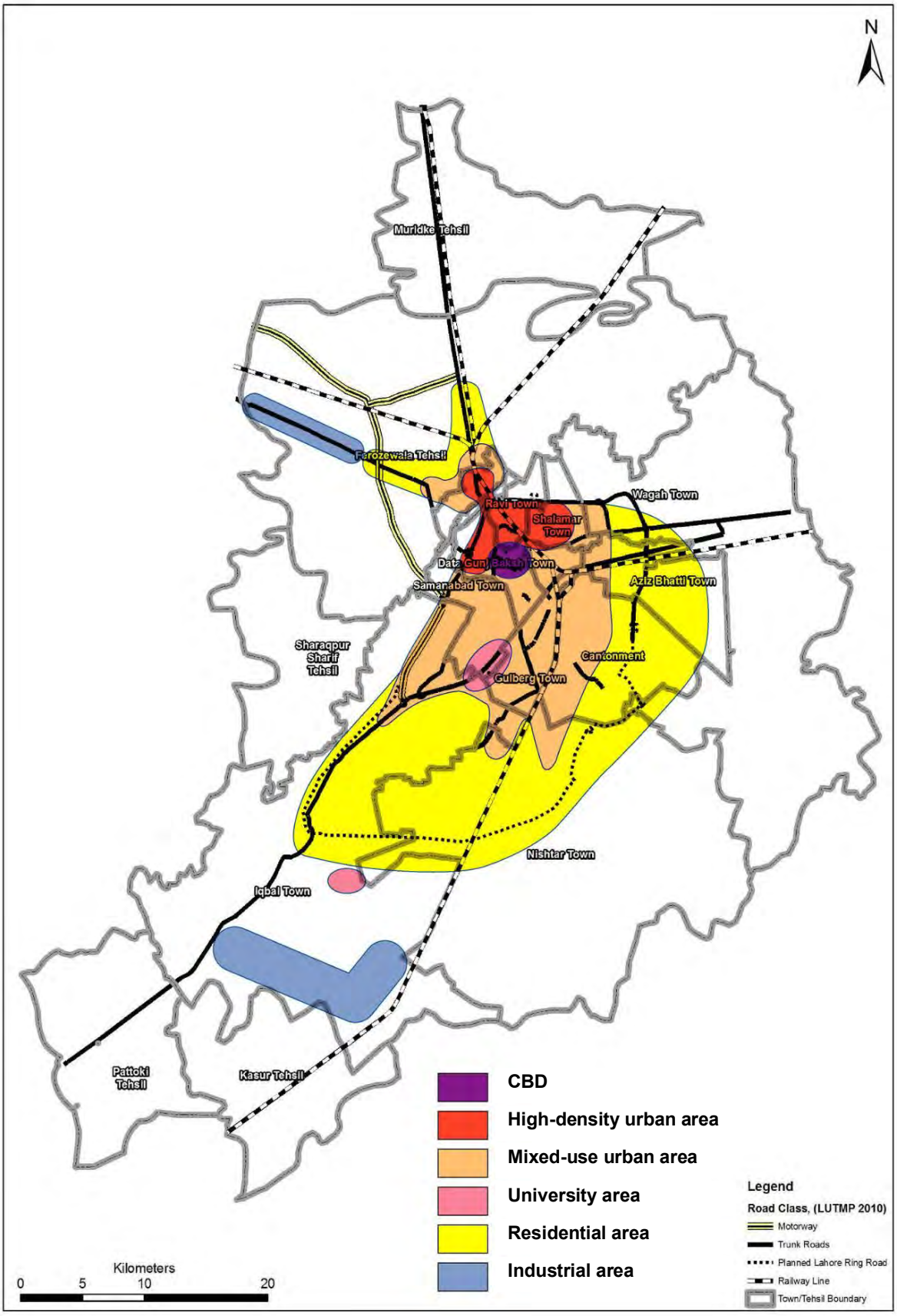
In this scenario, urban structure will be the same as at present as a whole. Urban area will expand mainly to the east and south. It is a car-oriented society. The resultant scenario (Zero Option – Trend) is depicted in Figure 3.1.3.

Figure 3.1.2 Result of Land Development Suitability Analysis



Source: JICA Study Team

Figure 3.1.3 Urban Development Scenario 1 (Zero Option – Trend)



Source: JICA Study Team

2) Scenario 2 (Compact Development)

This scenario intends a compact urbanization led by public transport development. This scenario is friendly to people's travel, living environment and natural environment. Many of the current urban problems will be alleviated although sizeable public investment and administrative capacity of the government are required.

(i) Densely Built-up Area in the North

This scenario assumes a salient urban development project. The existing agglomeration of iron/ steel industries will be relocated to suburbs and integrated development of this area including the retaining of the bus terminal and railway station will be carried out using this space. This intends to alleviate the problems of high density and traffic congestion in the area. The development is of multi-purpose mainly of residential but including business/ commercial functions. The environment of the Walled City may be improved in relation to this project. Using the impact of this key project, similar projects can be carried out one after another.

(j) Government Building Area and Its Environs

This scenario assumes integrated urban development in some obsolete areas to enhance the CBD functions. Conservation of the present scenery and environment should be pursued, too.

(k) Existing Built-up Residential Area

The three problems of this area will be tackled by designating specific areas or streets for high-rise buildings and by stringent application of LDA's land use rules to deal with unused land space remaining in the area and land use conversion. In some cases, relaxation of the rules may be necessary.

(ii) University Area

As for existing universities located in urbanized area, no action is assumed in this scenario. The new academic town planned in Ferozewala Tehsil, where the University of Engineering and Technology of Lahore has already located some of its faculties, should be expanded by inviting high-grade education facilities, research organizations and related business establishments. It is important to relate this academic town with the adjacent industrial estate mentioned later so that this academic town becomes one of the leading areas for high technology in the Punjab and Pakistan.

(iii) Expansion of Urban Area toward East and South

Population of LDA project areas and development permitted areas will reach its target by 2030 as planned. The rest of increased population is assumed to be distributed in areas

to be developed near the railway stations and other public transport nodes to be proposed in this master plan.

(iv) Ribbon Development in the North

This scenario assumes concentric-contiguous development of this area consisting of industrial estates and an academic town mentioned above. Ribbon-type development should be suppressed to enhance land use efficiency of this area. The industrial estates are considered to become the relocation site of iron/ steel industries located in the north of Lahore station at present. Residential development is also done in this area to absorb the increasing of population.

(v) Industrial Zones

Development of industrial estates is assumed in this scenario in the north in connection with the proposed academic town. In the south, improvement of access and arterial roads should be carried out to strengthen the functions of the existing industries. The road improvement includes some circumferential roads and Thokar Niaz Beg Canal Road.

(vi) Overall Urban Structure

As this scenario assumes urban Rail-based Mass Transit System (RMTS) to be the trunk public transport system of Lahore, dense urbanization will occur along these RMTS routes. Urban RMTS facilitates people's movement in the city as well as conservation of suburban greenery and agriculture. RMTS usually reduces traffic congestion on roads. The combination of industrial estates and academic town proposed in Ferozewala Tehsil has a possibility to lead high-tech industrial development of not only Punjab but entire Pakistan. As a whole, this scenario aims to vitalize various urban functions by combining them closely with each other using improved mobility and enhanced land use efficiency. The envisioned urban structure is shown in Figure 3.1.4.

3) Scenario 3 (Dispersed Multi-Core Development)

The core idea of this scenario is to increase absorptive capacity of Lahore for rapidly growing population by developing suburban cities. Thus this scenario assumes less population increase in the built-up areas of Lahore. Suburban development is proposed in this scenario at Muridke, Raiwind area, and Pattoki Tehsil areas. Each of these areas will be a sub-center of the metropolis of Lahore with its own CBD and surrounding residential areas.

(i) Densely Built-up Area in the North

Same as Scenario 2.

(ii) Government Building Area and Its Environs

Same as Scenario 2.

(iii) Existing Built-up Residential Area

Same as Scenario 2.

(iv) University Area

Same as Scenario 2.

(v) Expansion of Urban Area toward East and South

Population of LDA project areas and development permitted areas will reach its target by 2030 as planned. However, this scenario assumes no more development permitted in Lahore except for the proposed academic town located in Ferozewala Tehsil. All the rest of increased population is assumed to be accommodated in Muridke, Raiwind area and Pattoki Tehsil areas. These three areas have their own accumulation of business/ commercial facilities. Enhancement of CBD functions will be pursued coupled with residential development in the surrounding areas.

(vi) Ribbon Development in the North

Same as Scenario 2.

(vii) Industrial Zones

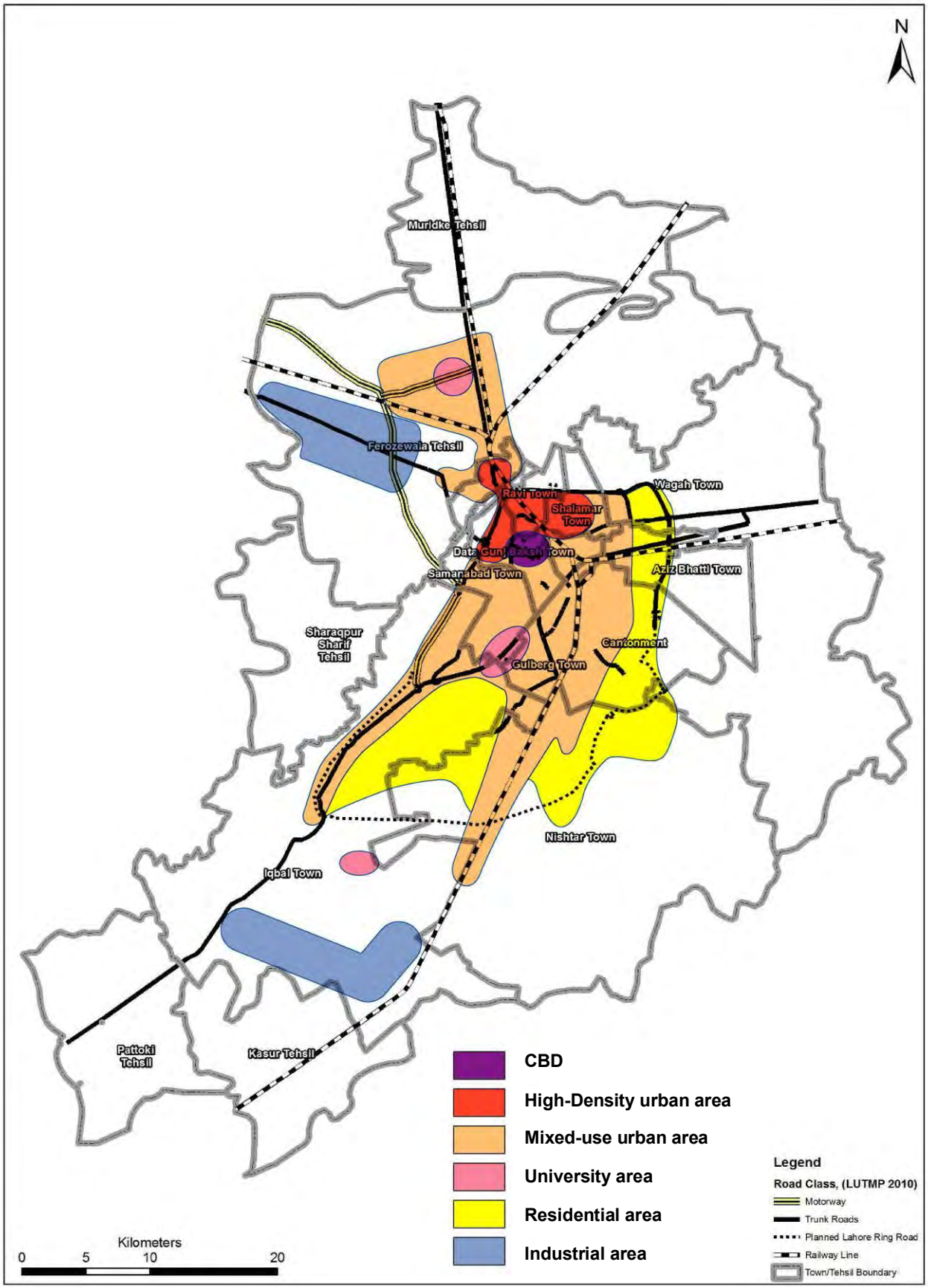
Same as Scenario 2.

(viii) Overall Urban Structure

The existing built-up areas in Lahore will mature with fewer vacant spaces/ plots, industrial estates are located in the south and north, and there will be an academic town in the north. To be more important, three cities will appear in the suburbs of Lahore with urban functions and 300-500 thousand population. In the long run, high-speed, high capacity transport system connecting Lahore and these sub-centers will be required.

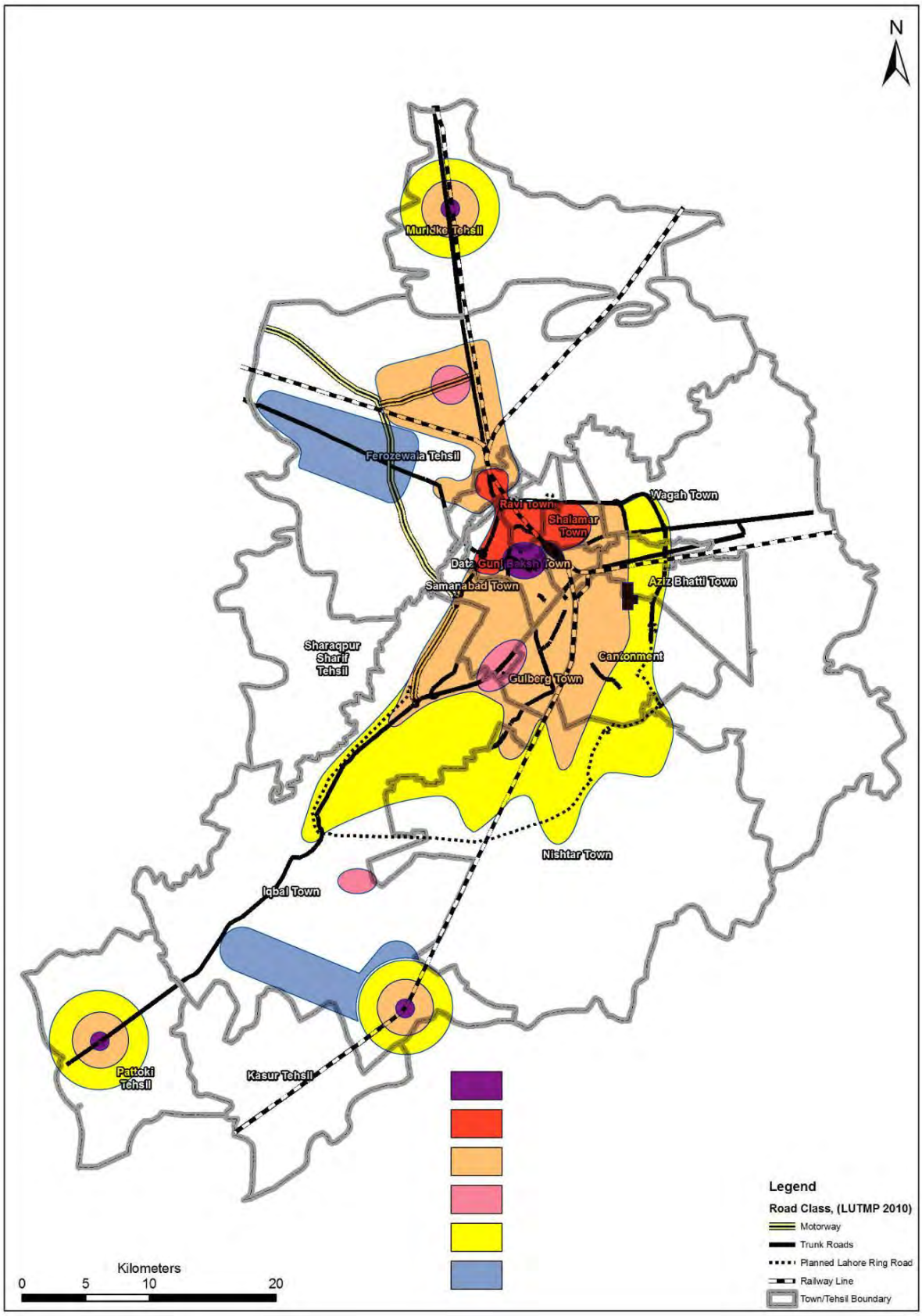
In Tokyo, Japan, there is a conceptual plan called “Core Cities Linkage Plan”. The intention of this plan is to transplant part of CBD functions of Tokyo to medium to large cities located at 30-50 km distance from Tokyo. The objective of this plan is to alleviate the negative impacts of high density and to prevent disorderly urbanization. At present these core cities perform the central functions significantly. This concept is illustrated in Figure 3.1.5.

Figure 3.1.4 Urban Development Scenario 2 (Compact Development)



Source: JICA Study Team

Figure 3.1.5 Urban Development Scenario 3 (Dispersed Multi-Core Development)



Source: JICA Study Team

3.1.3 Assessment of Alternative Scenarios

1) Assessment by Scenario

The three scenarios described above are compared and an assessment is presented in Table 3.1.2.

Table 3.1.2 Assessment of Alternative Scenarios

Component	Scenario 1 (Trend)	Scenario 2 (Compact Development)	Scenario 3 (Multi-Core Dev.)
Transport Convenience	Chronic traffic congestion near the city center will become more serious (Grid-lock) due to expansion of urbanization.	Development of public transport enhances mobility of people and reduces traffic congestion on roads	Due to increase of sub-urban traffic, development of sub-urban public transport will become necessary.
Living Environment	Difficult to provide favorable living environment for many people due to continued over-saturation of the built-up area in the north and insufficient mobility in the expanded residential area.	Gradual enhancement of living environment can be expected in the built-up area in the north and high mobility due to public transport development in expanded urban area can be expected.	Gradual enhancement of living environment can be expected in the built-up area in the north and urban expansion in the area of poor mobility will be restricted. Living environment in Lahore will be much improved as a whole and that of suburban cities could be favorable, depending on city planning.
Impact on Natural Environment	Due to lack of planning, disorderly land use will continue and conservation of greenery and agricultural land will become difficult.	Owing to planned urbanization control, conservation of greenery and agricultural land can be done in an orderly manner.	In terms of conservation of greenery and agricultural land, this scenario is the best for Lahore. However, the situation may become worse in suburban areas.
Reality	Most realistic because public investment is minimal and government intervention is also the least; only with 2009 land use rules of LDA.	Though there are difficult targets of development of competitive public transport system and planned urban development, many cities in the world have overcome these issues. It is feasible if institutional and financial problems could be resolved.	Development of suburban cities needs tremendous efforts by the government. If this is not prepared in a timely manner, the situation will become the same as Scenario 1 (Zero Option - Trend).
Others	-	-	If suburban cities are developed, high-speed rail transport system will be needed to connect these cities with Lahore.

Source: JICA Study Team

2) Conclusion

Scenario 2 and 3 are both excellent for a city with a population over 10 million in terms of mobility, living environment and conservation of greeneries and agricultural land. From the viewpoint of reality, Scenario 1 *(Zero Option - Trend)* is the easiest way. However, Scenario 2 and 3 are also realistic only if strong *'political will'* and leadership are guaranteed in planning and funding. Scenario 3, however, may be slightly weak in flexibility because the timing of project implementation must be consistent with population increase and high-speed transport system will be required in the long run to support the intended structure of the metropolis.

In contrast, Scenario 2 has a flexibility to shift from Scenario 1 to Scenario 2 depending on the timing of public transport development. In this sense it may be called Scenario 2a (between Scenario 1 and 2).

3.1.4 Existing Land Use Rules of the Punjab and Its Use

1) Existing Land Use Rules of the Punjab

The GoPb enacted new land use rules on the 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. There are 6 land use classes, as follows:

1. Residential,
2. Commercial (including institutional),
3. Industrial,
4. Peri-urban,
5. Agricultural, and
6. Notified Areas. (e.g. specially designated development area)

For each of these classes, maximum height, coverage, floor to area ratio, etc. are determined by size of the plot. Orderly development is thus ensured in the controlled area. This specification is done by plot, and it is easy to understand for both government and private developers since subdivision of a plot is prohibited by law (Subdivision Ordinance). However, this detailed specification requires a long time for the government to prepare and the consistency of these specifications with macroscopic land use plans is not necessarily guaranteed. In addition, land use conversion from one class to the other is allowed by paying the land use conversion tax if the conversion is deemed appropriate judging from the environment nearby. LDA applies these rules mainly to the areas where land use is changing rapidly or new development is foreseen because of the huge time and cost required for land use classification of entire Lahore. In reality, built-up areas like

Walled City and rural villages are excluded from application of these rules.

Although this system has a significant effect to improve the quality of urban areas, there still remain some problems. Private developers tend to select arbitrarily development areas for their convenience, and thus these are inefficient, and in many cases the agricultural land remains in between developed areas (e.g. in the southern developing areas of Lahore). LDA recognizes this problem and is seeking for measures for solution. Another big issue is how to keep consistency between detailed land use classification and the overall urban structure of Lahore. Strong political will may be needed to realize an ideal land use for the entire metropolis.

2) Application of Present Land Use Rules toward Realization of the Scenario

As described above, GoPb has a strong power through LDA to realize planned land use. In this section, how to use the present land use rules to attain the goals of Scenario 2 is briefly discussed.

The basic assumption here is the future development of urban RMTS. Around planned RMTS stations, development areas (assuming 800 m to 1000 m radius, 200ha and fifty thousand population) should be determined first, and the mode of development (LDA direct or through private developers) should be selected depending on the land use condition such as the size of commercial area, type of public facilities to be developed, size of parks/ greeneries, and open spaces.

Next step is the implementation of the development around RMTS stations. LDA has enough capacity of these types development although their experience is based on Radial or Trunk roads (e.g. development along Thokar Niaz Baig; Canal Bank Road). In this scenario, the road is replaced by RMTS. If LDA does not implement the project directly, private developer should be selected on a competitive basis based on land use requirement and other condition. This procedure is allowed by the 2009 land use rules.

There is an important point in the RMTS-based development. While financial viability of the project is not affected by the timing of implementation in the case of road-based development, the synchronization of the timing of urban development and station development is a critical factor to determine the financial (and also economic) viability of the entire project in the case of RMTS-based development.

Korea amended the city planning law and its related rules and regulations in 2000-2003, where the right of cancellation of development permit was given to local government when private developer could not observe the planned timing of development. This system may be added to the 2009 land use rules of Lahore, and would be an essential pre-requisite for Scenario 2 and 2a.

3) Proposal for a Development Benefit Recovery System

The development around RMTS stations produces a huge benefit for urban developers. After developing a RMTS station, land price of the surrounding area naturally increases many fold due to improved mobility, and the benefit becomes huge as a whole. Theoretically, therefore, developers should pay a part of the benefit to the RMTS operator. If this system is introduced, it can be a part of the funds required for the RMTS development.

This system has been implemented in many cities of the world. For instance, subway line No.1 in Osaka, Japan was subsidized in 1930's by a new tax imposed on land owners around stations (within 800 m radius) who were potential beneficiaries of the subway. This tax was collected as a surcharge to the property tax.

3.1.5 Projects Assumed by Scenario

In order to materialize the three urban development scenarios shown above, a series of urban development projects need to be implemented. Some projects are common among the scenarios while others are unique to the scenario.

1) Proposed Urban Development Projects

Table 3.1.3 shows the proposed urban development projects needed for each scenario.

Table 3.1.3 Proposed Urban Development Projects

Project	Scenario
Utilization of open space in built-up areas	1, 2, 3
Control of expanding urban area	1, 2
Environment improvement in northern densely built-up area	2, 3
Maturing of CBD	2, 3
Development of academic town	2, 3
Development of industrial estates	2, 3
Fostering suburban cities	3

Source: JICA Study Team

2) Project Description

(i) Utilization of Open Space in Built-up Areas

This is materialized only when "carrot and stick" strategy is applied to land developers or land owners. As to "stick", the 2009 land use rules should be strictly applied in the controlled areas and need to be strengthened, for example, by imposing "non-utilization surcharge" on unused land plots in the classified area.

As to "carrot", subdivision of land plot and high-rise buildings may be admitted under certain condition, and a part of taxes may be exempted for a certain period when land is used properly. For this purpose, the Subdivision Ordinance may be deregulated for large land plots above a certain size if environmental degradation is not incurred.

(ii) Control of Expanding Urban Area

The principle of this project is the stringent application of the 2009 land use rules. In *Scenario 1*, development will proceed along arterial roads, and development permit should be given to developers so that remaining unused land area becomes minimal. In *Scenario 2*, the most important is the political intervention to guide urban development to RMTS station areas. Plans and concepts should be informed to the public, and the role of LDA is quite significant as planner, developer and controller.

(iii) Environment Improvement in Northern Densely Built-up Area

The 150ha land produced by the relocation of the existing iron/ steel industries to the suburbs is the key element of this project. In close coordination with the adjacent bus terminal and railway station, the environment of the area will be largely improved by an integrated multi-purpose development. The image of the central redevelopment building is as follows:

- First floor – Integrated transport terminal including Pakistan Railway, city bus and feeder transport. Shopping mall, office, park and road space.
- Second floor – Artificial ground covering Lahore Station of Pakistan Railway. Business and commercial facilities. Pedestrian deck. Equipment room to support the complex building.
- Third floor and above – Residence in principle.
- The overall scale could be:
  - Developed area : 300 ha;
  - Floor area : 2,000 ha (1,500 ha residence);
  - Population : 150 thousand (with population density at 500/ha); and
  - No. of workers : 50 thousand

The residence here absorbs residents from the nearby area, and other environment improvement projects will be promoted one after another in the adjacent area.

(iv) Maturation of CBD

The present CBD takes advantage of well developed social infrastructure including roads and parks/ gardens. However, as population and economy grow, the function of this CBD needs to be upgraded. For this purpose, a large-scale development project will be necessary.

For this project, a comprehensive plan needs to be formulated including future number of

workers, necessary floor space, building location, height of building, transport access, pedestrian movement and conservation of greenery/ parks. For areas of government buildings, the project should be implemented by LDA, while other areas can be developed by private developers under control of LDA.

The present CBD of Lahore consists of the four zones shown in Table 3.1.4 and the density of workers, particularly of tertiary sector (service and commercial), is quite high compared to the zones nearby.

Table 3.1.4 Workers Density in the Four Zones of CBD, 2010

Zone No.	Area Name	No. of Workers in Daytime ('000)	Area (ha)	Density (/ha)
27	Anarkali	79	206	384
30	Qila Gujjar Singh	88	243	361
32	Mozang	37	145	256
33	Jinnah Hall	41	161	252
Total		**244**	**755**	**324**

Source: JICA Study Team

As seen in the table above, the density of daytime workers is not high as a CBD. For instance, the same figure in Tokyo, Japan is 1,000-3,000 as of 2010. Although the situation of Tokyo is not necessarily favorable, the room for future development is very large in Lahore.

The present CBD of Lahore should remain as the CBD in the future too, because of the well developed infrastructure and the abundant room for future upgrading. The current workers density could be easily raised to 500/ha without any negative impact on environment. For this upgrading project, high-rise building may be allowed in some specific areas or streets.

(v) Development of Academic Town

The academic town proposed in the north of Ravi River is expected to be one of the high-tech centers of Pakistan. The proposed site has favorable conditions such as well developed road infrastructure, existence of The University of Engineering and Technology, proximity to railway and industrial estates proposed nearby.

The overall scale of this project could be:

- Development area: 1,500 – 2,000 ha;
- Campus area: 1,000 – 1,400 ha;
- No. of universities/ high-grade education organizations: 3 – 4;
- No. of research organizations: 30 – 50;
- Population: 100 – 150 thousand;
- No. of workers: 60 – 80 thousand; and
- No. of students: 60 – 80 thousand.

(vi) Development of Industrial Estates

In the south-west of the academic town mentioned above, industrial estates will be developed. The ribbon development along Lahore-Sheikhupura Road should be absorbed. This is the relocation site of the existing industries located in Lahore. Modern high-tech industries should be invited too to promote synergy with the proposed academic town. The overall scale of this project could be:

- Development area : 500 – 800 ha;
- Floor area : 400 – 600 ha;
- No. of enterprises : about 2,000; and
- No. of workers: about 50 thousand.

(vii) Fostering Suburban Cities

This project, inherent to Scenario 3 only, intends to foster, Muridke, Raiwind area, and Pattoki Tehsil areas, as suburban cities. The other aspect of this project is the stringent restriction of urban area expansion in Lahore.

In this project, the role of District Government becomes essential. The experience of LDA should be transferred to local government agencies in the field of planning, design, contract preparation, implementation, control and monitoring.

3.2 Socio-Economic Framework

3.2.1 Population

1) Past Trends in Population Growth

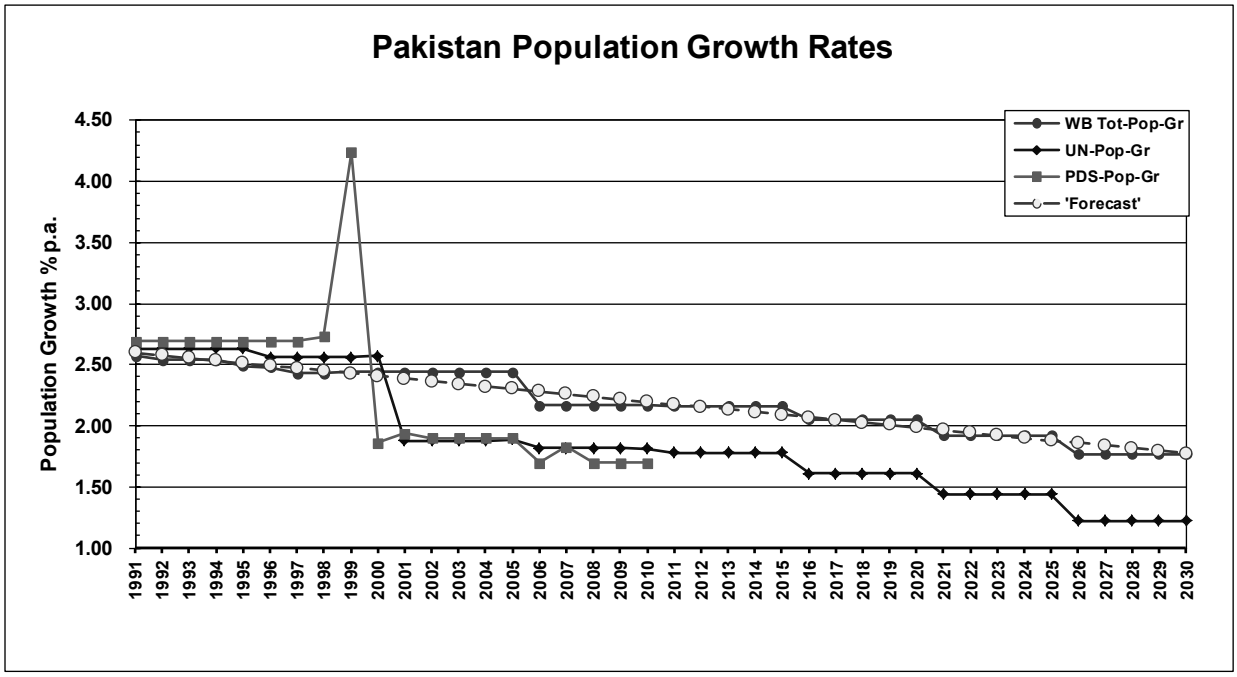
Table 3.2.1 shows the past population trends for Pakistan, the Punjab, Lahore Division and the Study Area. The latest census was conducted in 1998, and the 2010 figures have been estimated by the Study Team after consulting various government agencies. Past population trends and forecast for future years by various agencies and JICA Study Team are shown in Figure 3.2.1.

Table 3.2.1 Past Population Trends of Pakistan, the Punjab, Lahore Division and the Study Area

Area Description	Area (km^2)	Census Population ('000)					Annual Growth Rate (%)				
		1961[1]	1972[1]	1981[1]	1998[1]	2010[1]	1951-1961	1961-1972	1972-1981	1981-1998	1998-1910
Pakistan	796,096	42,880	65,309	84,254	132,352	168,258	2.43	3.90	2.87	2.69	2.02
The Punjab	205,345	25,464	37,607	47,292	73,621	93,682	2.17	3.61	2.58	2.64	2.03
Lahore Division	11,729	3,560	5,431	7,183	12,016	15,784	2.36	3.91	3.16	3.07	2.30
Lahore District	1,772	1,626	2,588	3,545	6,319	8,650	3.66	4.32	3.56	3.46	2.65
Kasur District	3,995	854[2]	1,186[2]	1,528[2]	2,376	3,016	1.16	3.03	2.86	2.63	2.01
Sheikhupura District	3,242	656[3]	1,028[3]	1,338[3]	2,276[3]	2,888	1.61	4.17	2.97	3.17	2.00
The Study Area	**3,044**	**N/A**	**N/A**	**N/A**	**7,307**	**9,928**	**N/A**	**N/A**	**N/A**	**N/A**	**2.59**

Note 1: Census Year; Note 2: Lahore divided in to Lahore District and Kasur District; Note 3: Sheikhupura divided in to Sheikhupura District and Nankana Sahib District in 2005.
Source: Punjab Development Statistics, 2010

Figure 3.2.1 Past Population Trends of Pakistan and Future Forecast by Various Agencies



Source: WB, UN and PDS 2010

2) Population Projections

Due to lack of detailed demographic data, macroscopic approach has been taken. The procedure of projection is as follows:

Step-1: Set future population growth rates for Pakistan:

2010 – 2015: 2.13 % p.a.
2015 – 2020: 2.03 % p.a.
2020 – 2025: 1.92 % p.a.
2025 – 2030: 1.82 % p.a.

The above growth rates are the same as the projection of the United Nations (UN) Census Bureau, and also consistent with the recent Planning Commission's paper "Pakistan: Framework for Economic Growth". These rates are higher than the targets of the Mid-Term Development Framework 2005 – 10 (MTDF) which states 2010 population growth rate at 1.63 %. Pakistan Transport Plan Study (PTPS, 2006 JICA), following the MTDF approach, also used these low growth rates of 1.63 % for 2010 and 1.08 % for 2020. Considering the recent trends, however, these low growth rate projections have proven to be unrealistic.

Step-2: Set future population share of the Punjab to Pakistan, and the Study Area to the Punjab:

These shares can be calculated as shown in Table 3.2.2. The share of the Punjab has been gradually diminishing, while the share of Lahore Division and the Study Area is on the increasing trend. Note that the share of the Study Area can be calculated only for 1998 and 2010 due to the change of administrative boundaries of Districts, Tehsils and Lahore Towns. Kasur District was separated out of Lahore District in 1976 and Sheikhupura District was split in to Sheikhupura and Nankana Sahib District in 2005.

In addition, Lahore district Tehsils/ Towns have been created and merged in to number of towns. Therefore at time it is almost impossible to do a direct area based comparison.

Table 3.2.2 Relation of Population between Pakistan, the Punjab, Lahore Division and the Study Area

Description	1961	1972	1981	1998	2010
Share (%) of Punjab to Pakistan	59.4	57.6	56.1	55.6	54.0
Share (%) of Lahore Division to Punjab	14.0	14.4	15.2	16.3	16.8
Share (%) of the Study Area to Punjab	N/A	N/A	N/A	9.9	10.6

Source: Punjab Development Statistics

Assuming the same tendency between 1998 and 2010 continues in the future until 2030, these shares can be calculated as follows:

2030 Share (%) of the Punjab to Pakistan: 51.3 %

2030 Share of Lahore Division to the Punjab: 17.9 %

2030 Share of the Study Area to the Punjab: 11.7 %

Step-3: Calculate Future Population:

The results of projected population for Pakistan, Punjab and the Study Area is presented in Table 3.2.3 and annual growth rate comparison for future years forecast is shown in Figure 3.2.2.

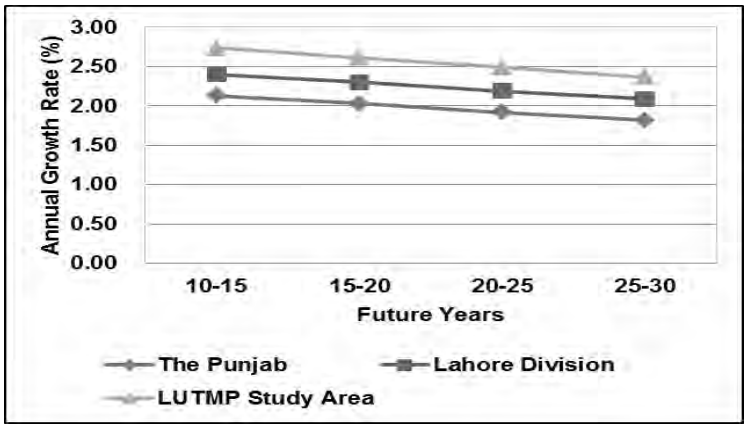
The 2030 population of Pakistan was projected at 256.4 million. This is considerably higher than the PTPS 2030 projection at 216.2 million. However, the UN Census Bureau projected 2025 population at 245.1 million is considerably on the high side. Regarding Lahore Metropolitan Area (LMA), "Integrated Master Plan for Lahore 2021" by LDA projected population at 10.5 and 14.1 million for 2011 and 2021, respectively. Although comparison cannot be made exactly due to the difference in the Study Areas, this estimate seems to be considerably higher than the current projection. In addition, the 1991 JICA, Comprehensive Study on Transportation System in Lahore projected 2010 LMA population at 10.4 to 11.0 million. This is comparable to the LDA study forecasts.

Table 3.2.3 Population Forecasts

Province / Division / District	Estimated Population ('000)					Annual Growth Rate (%)			
	2010	2015	2020	2025	2030	10-15	15-20	20-25	25-30
Pakistan	168,258	186,957	206,720	227,342	248,797	2.13	2.03	1.92	1.82
The Punjab	93,682	104,093	115,097	126,578	138,524	2.13	2.03	1.92	1.82
Lahore Division	15,784	17,772	19,913	22,191	24,609	2.40	2.30	2.19	2.09
The Study Area	**9,928**	**11,362**	**12,925**	**14,615**	**16,429**	**2.74**	**2.61**	**2.49**	**2.37**

Source: JICA Study Team

Figure 3.2.2 Annual Growth Rate Comparison for Future Year Forecast



Source: JICA Study Team

3) Population Breakdown to the Study Area Zones

(i) General

The projected 2030 population is distributed to traffic zones according to the

methodology explained hereafter. After zonal breakdown, the difference is adjusted by distributing the projected total to zones in proportion to the calculated figures as a result of the zonal breakdown. 2020 population by zone was estimated by interpolation, and the values by zone were adjusted to the projected total. The zonal breakdown methodology is different by scenario.

(ii) Methodology of Population Breakdown to Study Area Zones

1. Ravi, Data Gunj Baksh, Samanabad and Shalamar Towns

The methodology is common for all scenarios. The density of these towns is extremely high and needs to be reduced by political intervention. According to the "Sustainable Development of Walled City Lahore Project", there are already some zones where population has started to decrease. It is a common phenomenon in many cities of the world that the population of high-density areas has decreased and living environment has been improved. Therefore population of these areas will certainly continue to decrease for some time to come. However, political intervention is desirable rather than wait-and-see attitude of natural change, for the betterment of the living environment.

The upper limit of population density for a low to medium height building areas population density is set at 500 /ha, and 1,000 /ha in the case of super high-rise building areas. In Lahore, super high-rise building is not admitted and excellent city scenery with open skyline has been traditionally maintained. This tradition should be observed in the future. It is assumed that population density of zones with more than 500 /ha be lowered to 500 /ha while population density of other zones remain unchanged.

2. Gulberg Town

This area boasts of its excellent environment with large residences, wide streets and parks/ greeneries. For scattered open spaces including under-used facilities of Pakistan Railway (PR), redevelopment projects should be promoted as proposed in the previous chapter.

In Scenario 2 and 3, the population of zones 77 (Railway Colony) and 79 (Daras Barey Mian) that include PR facilities is assumed to be 150 thousand. In other zones, it is assumed that population will increase by 5 % (open space 1 % and its redeveloped population density at 5 times of the present).

3. Aziz Bhatti Town

The western part of this area has been densely built-up, and the same assumption is introduced as 1 above (Ravi and other towns). For other zones, Scenario 1 assumes that urbanization spreads beyond LRR while Scenario 2 and 3 controls urbanization within LRR. Upper limit of population density is set at 100 /ha. For zones already built up, the

present population is maintained.

4. Wahgah Town

Present population density of this area is about 15 /ha showing low level of urbanization. This is due to the government restriction on development for the defense reasons and lack of arterial roads to Lahore city centre.

Similarly to Aziz Bhatti Town, Scenario 1 assumes that urbanization spreads beyond LRR while Scenario 2 and 3 controls urbanization within LRR. Upper limit of population density of newly developed areas is assumed at 100 /ha in all the scenarios.

5. Nishtar Town

This area remains under-developed with a population density of 19 /ha although a part of northern area shows considerable urbanization. The area to the west of railway has been developed mainly by private developers with relatively high standards although numerous unused land plots are common. In the eastern area, Ferozepur Road has led urbanization towards the south.

Scenario 1 assumes the following:

a. Population density of densely inhabited areas of more than 1,000 /ha located in the north of this area be lowered to 500 /ha similarly to the northern densely built-up area.

b. Population density of areas with a population density of 200-500 /ha should be raised to 500 /ha.

c. Population density of areas with a population density of less than 200 /ha be raised to 200 /ha.

d. Population density of suburban areas with a population density of 10-60 /ha at present is raised to 100 /ha on average.

e. Other agricultural areas will remain as is.

Scenario 2 has the same assumption for densely inhabited area of more than 1,000 /ha located in the north of this area (as above). Along the railway, new development areas will have a population density at 200 /ha. For other areas urbanization is controlled within the planned areas at average population density of 100 /ha.

Scenario 3 has the same assumption for densely inhabited areas of more than 1,000 /ha located in the north of this area (as above). Urbanization is controlled within the planned areas at average population density at 100 /ha. Planned development along the railway is not assumed unlike Scenario 2.

6. Iqbal Town

This area has been partially urbanized along Multan Road with a population density over 600 /ha. As a whole, however, urbanization level is low with an average population density of 18 /ha. In this area, there are a number of urban development projects are planned and prepared, and it is assumed that these projects will be implemented.

Population density of over-saturated areas will be lowered to 500 /ha at the highest. This assumption is common for all scenarios.

Scenario 1 assumes conventional road-based urban development taking advantage of LRR and other roads. This scenario assumes urbanization beyond LRR. Westward development is not taken into account due to the risk of flooding of the Ravi. Assumed population density is 100 /ha.

Scenario 2 assumes planned dense development around the stations of the proposed RMTS to be developed in the long run. Planned population density is 200 /ha. Suburban development is limited within the planned/ on-going projects. Its population density is set at 100 /ha.

Scenario 3 assumes that suburban development be restricted within the planned/ ongoing projects. Its population density is set at 100 /ha.

7. Cantonment

This area is characterized by high-quality residences. In the west of the airport, the residential area is already matured while future development is foreseen in the east. Unlike Gulberg, unused land plots are limited.

Scenario 1 assumes that population density of already built up zones remain basically as it is except for immature zones with a population density of less than 200 /ha that will be raised to 200 /ha. For eastern zones, maximum population density is set at 100 /ha.

Scenarios 2 and 3 assume the same as Scenario 1. However, outside LRR, urbanization is not considered and population will remain unchanged.

8. Tehsil Ferozewala Areas

This area has a large potential for future development due to the proximity to Lahore CBD.

Scenario 1 assumes conventional ribbon development toward the north and north-west along arterial roads. Population density is assumed at 200 /ha for the area near Ravi Town and 100 /ha for other areas.

Scenario 2 and 3 assume planned development of the area taking advantage of the high potential. The key project is the development of an academic town mentioned in the

previous chapter. Population density is set at 100 /ha in the academic town, 200 /ha in the surrounding residential area and 100 /ha for the high-quality residential area further outside of the academic town.

9. Muridike, Pattoki and Kasur North (Raiwind)

These areas have been conventional rural villages without salient urban development.

In Scenario 1 and 2, no major change is foreseen.

Scenario 3 intends to utilize the potential of Lahore's urbanization for developing these areas as suburban cities by providing urban functions in the built-up areas and by supplying residences in the surrounding area. The total population of this area should be 500-600 thousand with a population density of 200 /ha near the city center and 100 /ha in the adjacent area.

10. Sharaqpur

In this area, population will not change much due to the absence of urban development projects.

(iii) Results of Forecast Population Distribution

The resultant distributed forecast population by Towns and Tehsil is given in Table 3.2.4 and detailed in Figure 3.2.3 and 3.2.4. It is noted that population decrease is assumed in Ravi, Data Gunj Baksh, Samanabad and Shalamar towns while significant increases are forecast for Nishtar and Iqbal Towns, Cantonment and Ferozewala under all scenarios. Large increase in population is assumed for Muridike, Raiwind and Pattoki as assumed under Scenario 3.

The results might be considered as too drastic from practical point of view of Lahore residents. However, political intervention, if applied properly, could have strong influence. This is the reason why master planning is important. Of course there must be a strong will of residents to guide Lahore to the desirable direction they choose whether Scenario 1, 2, 3, or another scenario as combination of the proposed scenarios.

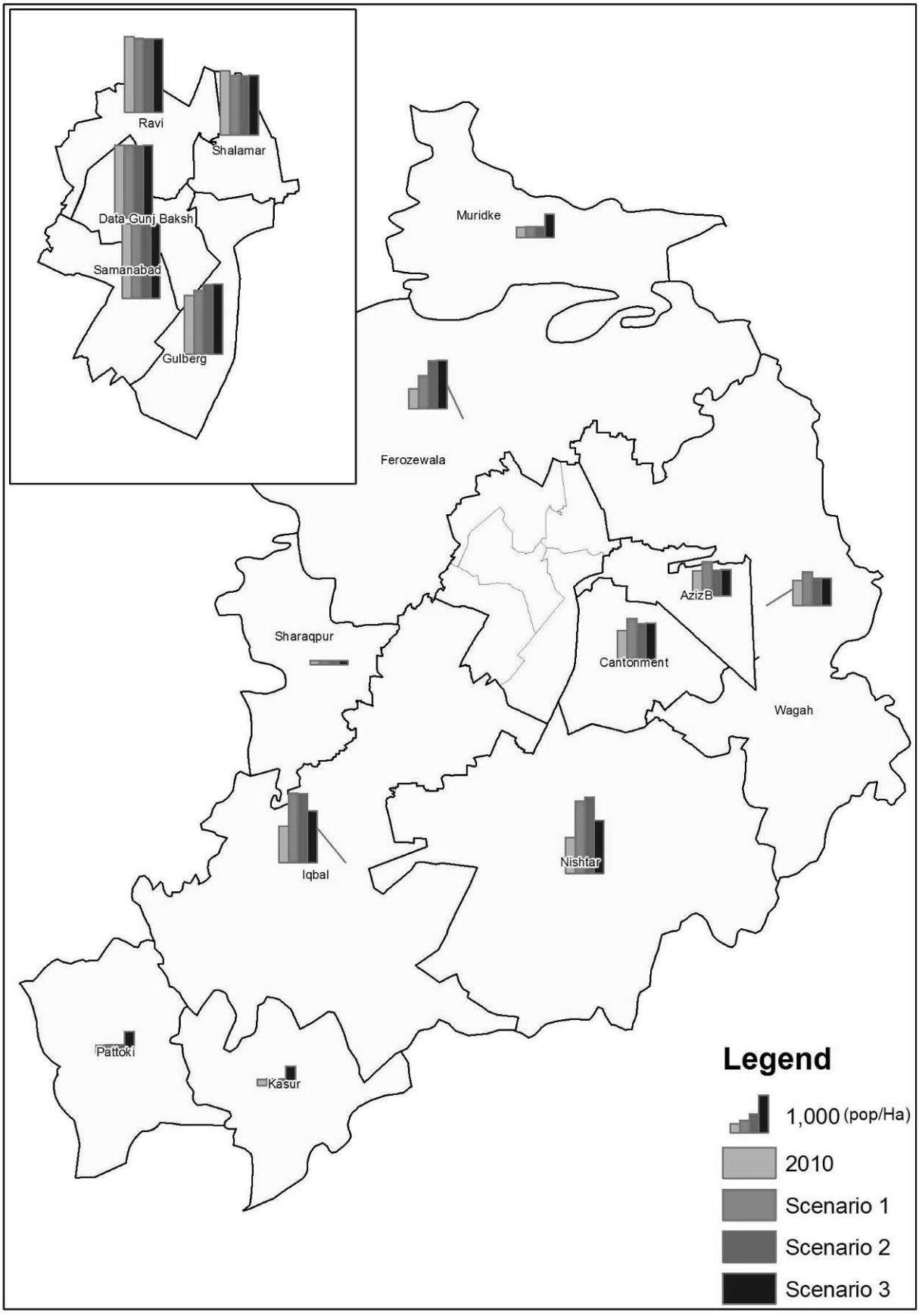
In addition, the total population of the Study Area is controlled to be the same under all three scenarios to facilitate an easy and direct comparison.

Table 3.2.4 Summary of Forecast Population ('000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	1007	978	971	976	949	938	947
2	Data Gunj Baksh	970	968	961	966	970	958	967
3	Samanabad	984	990	983	988	1002	990	999
4	Shalamar	854	790	784	788	720	711	717
5	Gulberg	778	850	926	931	937	1102	1112
6	AzizB	667	901	686	690	1175	714	721
7	Wagah	656	881	713	717	1145	784	792
8	Nishter	945	1906	2007	1399	3017	3226	1927
9	Iqbal	960	1840	1824	1366	2857	2818	1838
10	Cantt	831	1149	1018	1024	1521	1240	1251
11	Ferozewala	534	883	1268	1275	1288	2110	2130
12	Muridke	266	284	282	609	305	302	1005
13	Sharaqpur	101	108	107	107	116	114	115
14	Kasur	168	179	177	520	192	190	927
15	Patoki	207	221	219	568	238	235	983
1-10	**Lahore**	**8653**	**11252**	**10873**	**9846**	**14291**	**13479**	**11270**
11-13	**Sheikhupura**	**901**	**1274**	**1656**	**1992**	**1708**	**2526**	**3250**
14-15	**Kasur**	**375**	**399**	**397**	**1088**	**430**	**424**	**1910**
1-15	**The Study Area**	**9928**	**12925**	**12925**	**12925**	**16429**	**16429**	**16429**

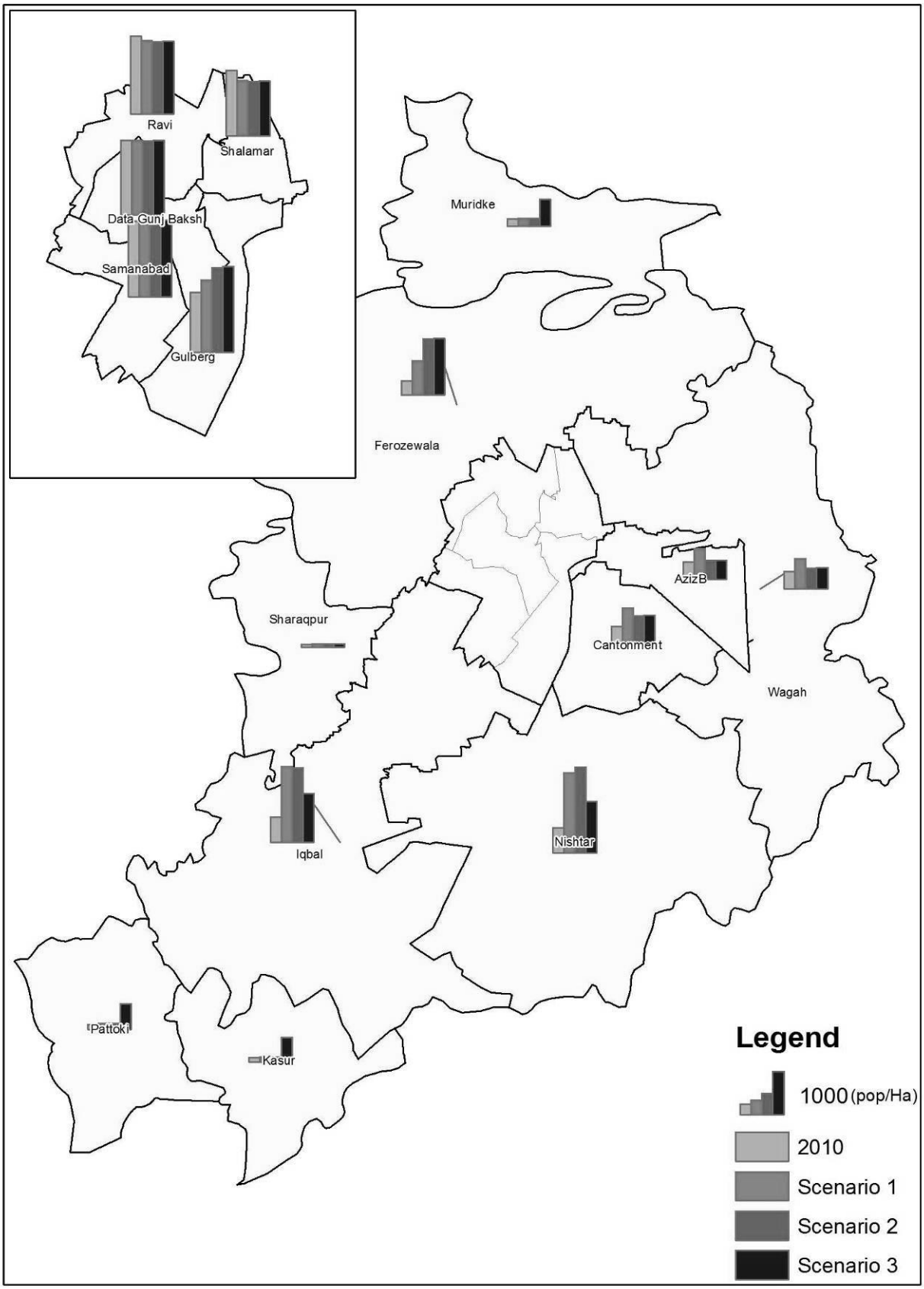
Source: JICA Study Team

Figure 3.2.3 2020 Population Forecast for Three Scenarios



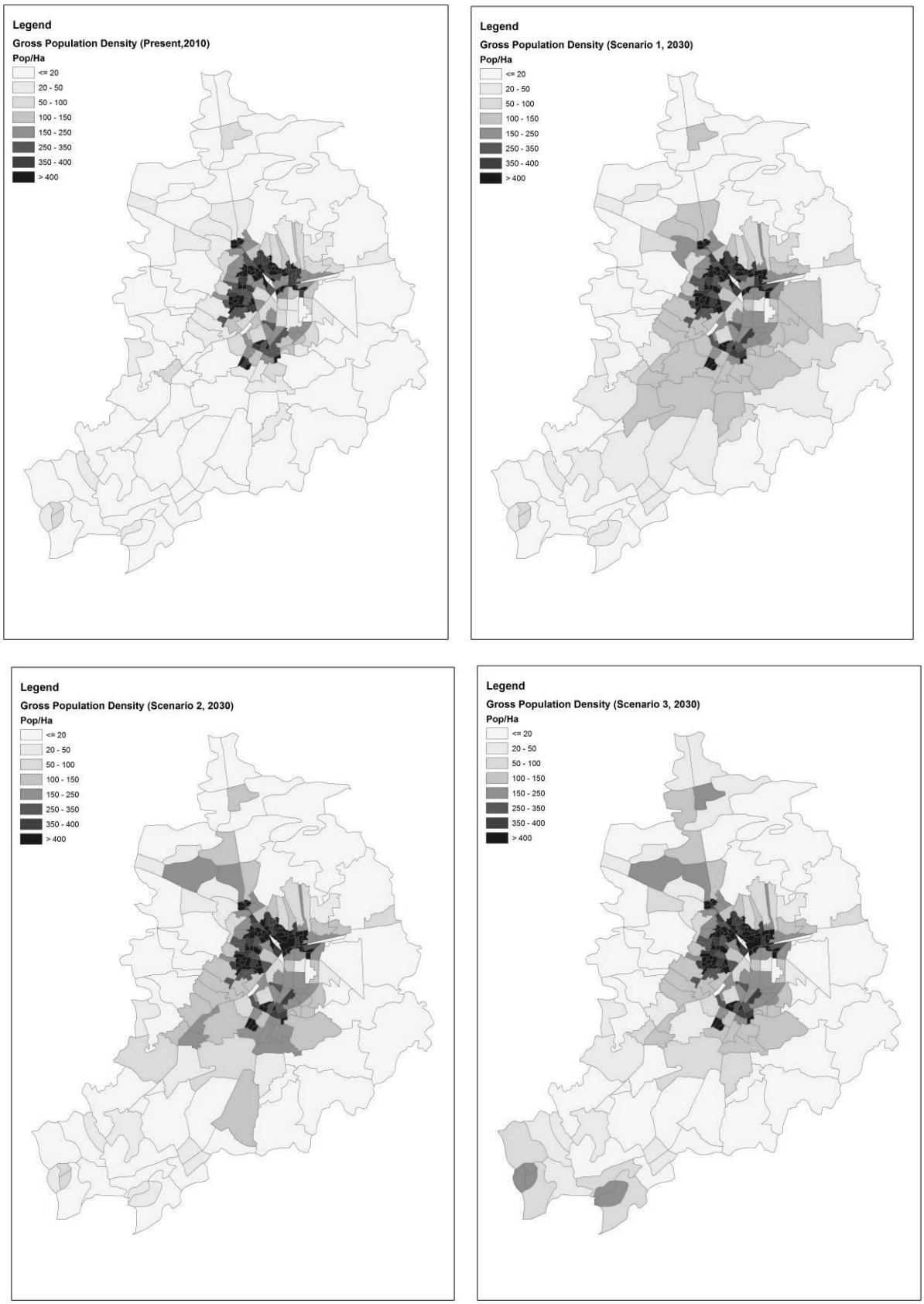
Source: JICA Study Team

Figure 3.2.4 2030 Population Forecast for Three Scenarios



Source: JICA Study Team

Figure 3.2.5 Gross Population Density, 2010 and 2030 by Scenario



Source: JICA Study Team

3.2.2 Employment

1) Ratio of Number of Workers to Population and Total Workers

According to LUTMP HIS, the ratio of Number of workers to population is 27.1 % for the Study Area. This is extremely low compared to international standard employment participation rate. This is due to the high unemployment rate and particularly the lack of female workers due to social issues. However, female employment participation rate is gradually progressing as can be seen in Table 3.2.5.

Table 3.2.5 Past Trend in Female (15 years +) Employment Participation Rate in Pakistan

1995	2000	2005	2006	2007	2008
10.7	13.5	**16.8**	**18.8**	**19.0**	**19.8**

Source: World Development Indicators 2010

Judging from this table, female labour participation rate is on an increasing trend, and it will naturally be 21 % in 2020 and 33 % in 2030 if the past trend is to continues. Although the basis is different between HIS (total population) and WDI (population age 15 years+), only growth rate of labour participation rate is used for the analysis. Meanwhile, male labour participation rate is assumed to be constant at 80 % in the future as no remarkable change has been observed in the past.

Since male and female contribution to labour participation rate is 80:20 according to World Development Indicators of WB, female labour participation rate will grow from 5.4 % (20 % of 27.1 %) in 2010 to 8.5 % (1.57 times of 5.4 %) in 2030 while male labour participation rate will remain at 21.8 % (80 % of 27.1 %). Thus the total labour participation rate will become 28.8 % in 2020 and 30.3 % in 2030.

As a result the total number of workers in 2020 and 2030 is estimated by multiplying these ratios with population for entire Study Area as whole and for each zone. These are 3.8 million in 2020 and 5.1 million in 2030 for the Study Area. In addition, the current labour participation rate by zone is almost constant at 26-29 % according to HIS.

Table 3.2.6 Forecast No. of Workers for the Study Area

Description	2010	2020	2030
Population ('000)	9,928 (100.0)	12,925 (130.2)	16,429 (165.5)
Number of Workers ('000)	2,691 (100.0)	3,722 (138.3)	4,978 (185.0)
Participation Rate (%)	27.1 %	28.8 %	30.3 %

Source: JICA Study Team

2) Employment by Sector

(i) Primary Sector Employment

In Pakistan, the share of primary sector workers has dropped from 51.5 % in 1990 to 43.6 % in 2007, while the number of primary sector workers has increased by about 4 million during the same period. In the Study Area, however, the number of primary sector workers is considered to have been and will continue decrease due to rapid urbanization.

In the period 1994 to 2000, urbanized area has increased by about 41 thousand hectare (from 21 to 62 thousand hectare). Assuming this is due to the decrease of agricultural land, and its declining rate is about 1 % per year. Assuming again that the number of agricultural workers has decreased and will decrease at the same pace, the total number of primary sector workers in the future will be as follows:

2010: 179 thousand
2020: 160 thousand
2030: 146 thousand

For zonal disaggregation of primary employment following steps were taken:

a. For 2030, no primary sector workers are assigned to zones in the CBD, High-Density Urban Area, Mixed-use Urban Area, University Area and Industrial Area.

b. For 2030, one half of primary sector workers of the present numbers are assigned to zones in the Residential Area.

c. For 2030, remaining primary sector workers are assigned to other zones in proportion to the present numbers.

d. The assigned result is adjusted to the predetermined control to total given above.

e. The 2020 numbers are estimated by interpolation using 2010 and 2030 figures. Then the assigned result is adjusted to the predetermined control to total given.

f. For primary sector workers, the number is assumed to be the same for daytime and nighttime (i.e. they live and work in the same zone).

(ii) Secondary and Tertiary Sector Employment

General

The sectoral composition of workers in the Study Area is characterized by the high percentage of the tertiary sector at 78.3 % according to 2010 LUTMP HIS. Out of this (78.3 %) 27.3 % is the contribution of wholesale/ retail commerce sector employment and this is comparable to major cities in the world. However the remaining 51 % is very high presumably due to contribution of provincial government and other public services concentration in Lahore. As a result, the share of the secondary sector is small at 15.1 % of the total employment.

Due to the estimated improvement of labour participation rate, the growth of employment is higher than population. Moreover, the number of secondary and tertiary workers will grow rapidly due to the decrease of primary sector workers.

It is essential for the economy of Lahore to absorb more workers into the secondary sector by effective political intervention. This is the reason why academic town and industrial estates are proposed under development Scenario 2 and 3.

It is assumed that the number of tertiary sector workers increases in proportion to population as seen in other major cities of the world. Once the number of tertiary sector workers is estimated, the remainder is the number of workers of the secondary sector. In addition, it is also assumed that the number of secondary and tertiary sector does not change between daytime and nighttime as a whole for the Study Area considering the present day/night ratio revealed by 2010 HIS (0.996 and 1.008 for the secondary and tertiary sector, respectively). The results are tabulated below in Table 3.2.7 and employment by sector for year 2010 is shown in Figure 3.2.6.

Table 3.2.7 Forecast No. of Workers by Employment Sector for the Study Area

Description	2010		2020		2030	
	No. ('000)	%	No. ('000)	%	No. ('000)	%
Total Workers	***2691***	***100.0***	***3722***	***100.0***	***4978***	***100.0***
Primary Sector	179	6.6%	164	4.4%	154	3.1%
Secondary Sector	406	15.1%	819	22.0%	1339	26.9%
Tertiary Sector	2107	78.3%	2740	73.6%	3485	70.0%

Source: JICA Study Team

Zonal Breakdown of Tertiary Sector Workers (night-time)

The ratio of the number of tertiary sector workers to population ranges between 0.22-0.28 for most of the urbanized zones and 0.12-0.15 in the surrounding areas. It is assumed that the number of tertiary sector workers is 25 % of population for zones already built up or to be urbanized in the future and 15 % for other zones. The values thus calculated are then adjusted to the control totals of predetermined above.

Zonal Breakdown of Tertiary Sector Workers (day-time)

First, planned number of workers is allocated to the proposed projects including redevelopment of the super high-density area, CBD redevelopment and academic town. The rest is then assigned to other zones in proportion to the present number of tertiary sector workers (day-time).

Zonal Breakdown of Secondary Sector Workers (night-time)

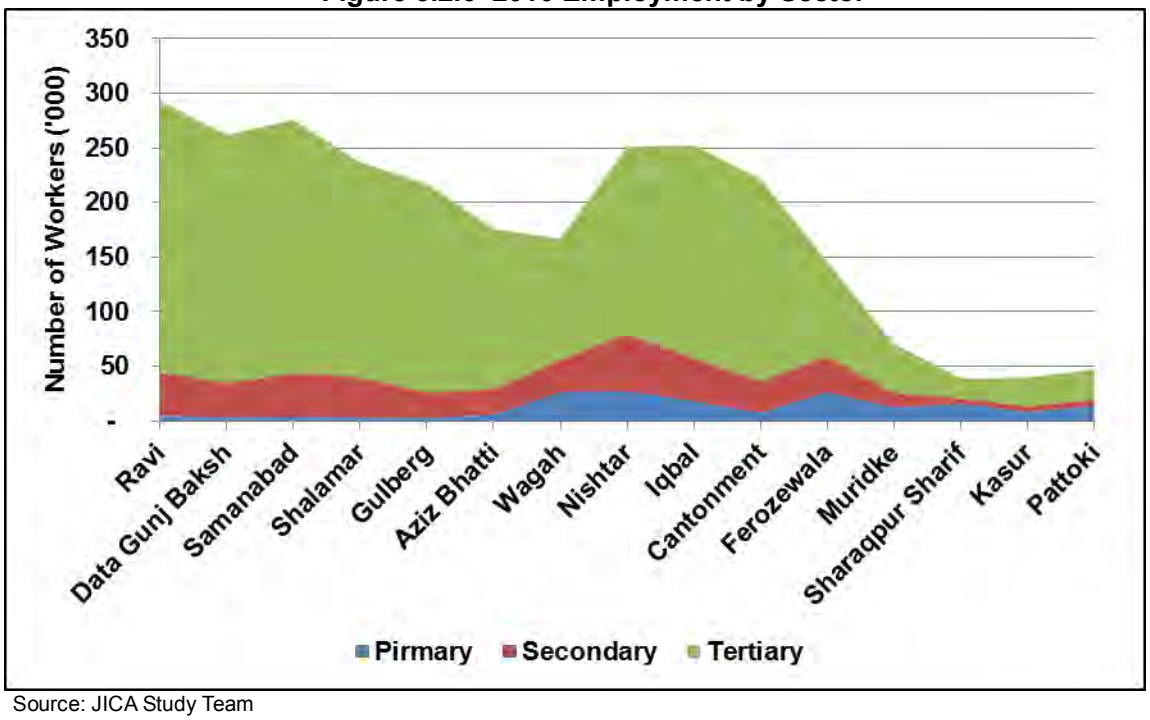
This is calculated simply by subtracting the number of primary and secondary sector

workers from the total employment.

Zonal Breakdown of Secondary Sector Workers (day-time)

For zones of industrial estates, planned number of secondary workers is allocated, and the rest is then assigned to other zones in proportion to the present number of secondary sector workers (day-time).

Figure 3.2.6 2010 Employment by Sector



Source: JICA Study Team

(iii) Result of Zonal Breakdown

Table 3.2.8 to 3.2.14 details the result of zonal breakdown of number of workers by Town/ Tehsil for night-time and day-time population for the Study Area Towns and Tehsils. All employment sectors Night-time comparison of forecast for different scenarios are shown in Figure 3.2.7 and 3.2.8, and Day-time shown in Figure 3.2.9 and 3.2.10.

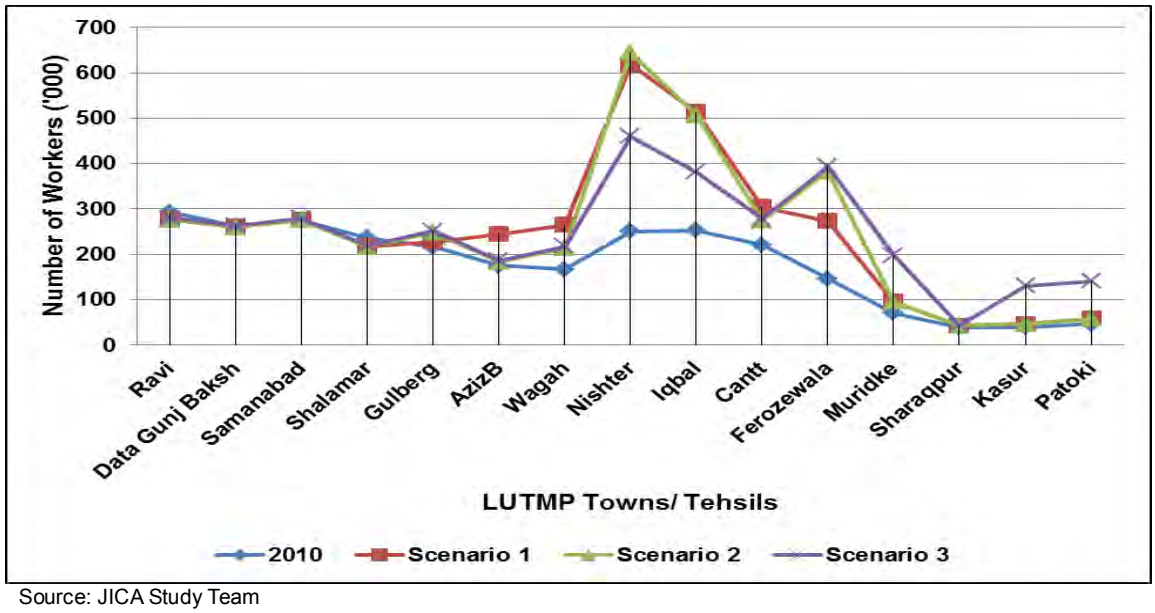
Table 3.2.8 Summary Forecast Result of Zonal Breakdown of Number of Workers

(All Employment Sectors, Night-time, '000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	293	278	277	281	273	271	279
2	Data Gunj Baksh	262	261	260	263	270	267	275
3	Samanabad	275	276	275	279	288	286	295
4	Shalamar	237	217	217	219	205	204	210
5	Gulberg	217	228	248	252	248	291	298
6	AzizB	174	244	183	186	329	201	206
7	Wagah	167	266	214	217	383	273	281
8	Nishter	251	618	645	460	1040	1096	705
9	Iqbal	252	513	506	382	812	797	535
10	Cantt	221	305	274	278	405	341	350
11	Ferozewala	146	274	382	393	422	651	675
12	Muridke	70	95	95	198	127	126	343
13	Sharaqpur	39	43	43	43	48	48	50
14	Kasur	40	47	47	131	56	56	232
15	Patoki	47	58	58	140	72	72	245
1-10	**Lahore**	**2348**	**3206**	**3099**	**2817**	**4253**	**4026**	**3434**
11-13	**Sheikhupura**	**254**	**411**	**519**	**634**	**597**	**825**	**1068**
14-15	**Kasur**	**87**	**105**	**105**	**271**	**129**	**128**	**477**
1-15	**The Study Area**	**2689**	**3722**	**3722**	**3722**	**4978**	**4978**	**4978**

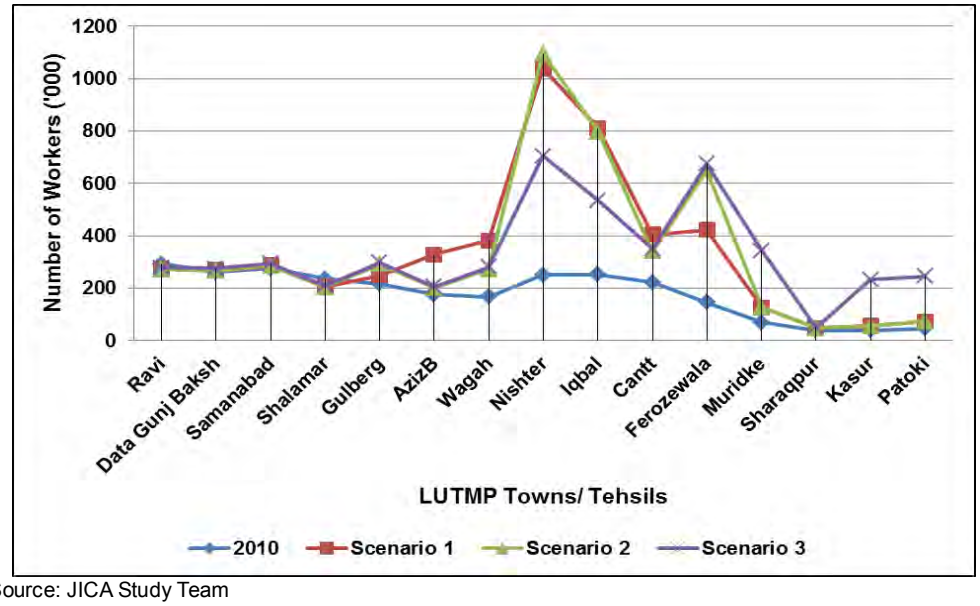
Source: JICA Study Team

Figure 3.2.7 2020 Night Time Forecast for Workers of All Employment Sectors by Scenario



Source: JICA Study Team

Figure 3.2.8 2030 Night Time Forecast for Workers of All Employment Sectors by Each Scenario



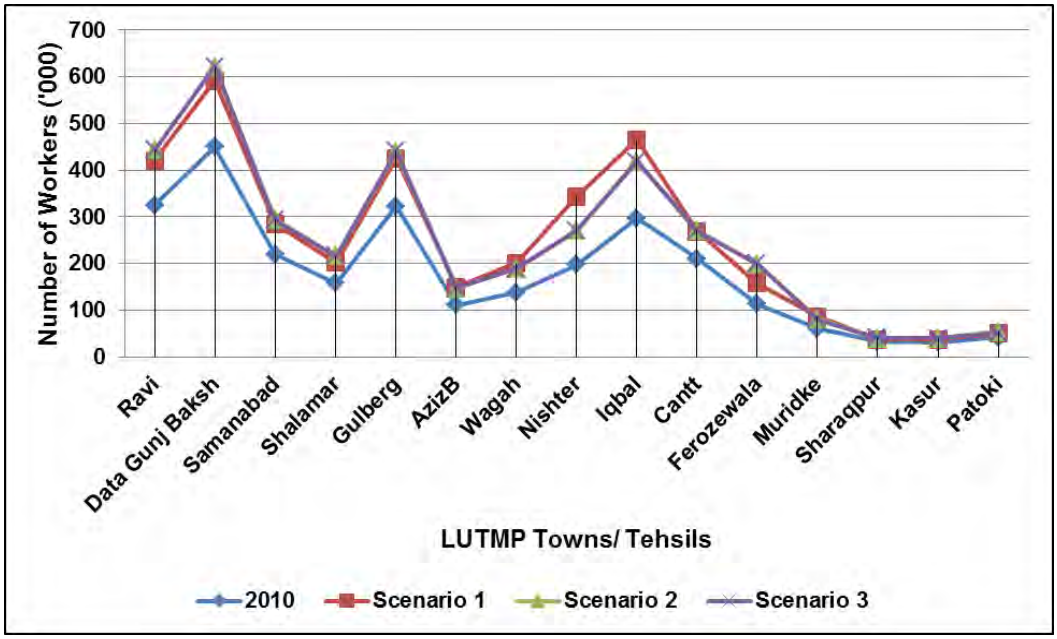
Source: JICA Study Team

Table 3.2.9 Summary Forecast Result of Zonal Breakdown of Number of Workers (All Employment Sectors, Day-time, '000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	325	421	443	443	541	589	589
2	Data Gunj Baksh	450	592	622	622	767	831	831
3	Samanabad	219	285	295	293	366	388	386
4	Shalamar	158	202	217	216	259	289	289
5	Gulberg	323	426	439	441	553	581	585
6	AzizB	111	150	147	147	198	193	193
7	Wagah	138	202	189	189	280	253	253
8	Nishter	198	344	270	271	520	360	363
9	Iqbal	298	465	418	419	669	568	570
10	Cantt	210	269	270	270	344	347	347
11	Ferozewala	113	157	198	200	213	299	303
12	Muridke	61	87	82	80	119	109	106
13	Sharaqpur	32	37	40	40	44	49	51
14	Kasur	31	37	40	39	46	52	50
15	Patoki	42	50	54	52	60	69	65
1-10	**Lahore**	**2427**	**3354**	**3309**	**3311**	**4496**	**4400**	**4404**
11-13	**Sheikhupura**	**205**	**281**	**320**	**321**	**376**	**458**	**459**
14-15	**Kasur**	**73**	**87**	**94**	**91**	**106**	**121**	**115**
1-15	**The Study Area**	**2705**	**3722**	**3722**	**3722**	**4978**	**4978**	**4978**

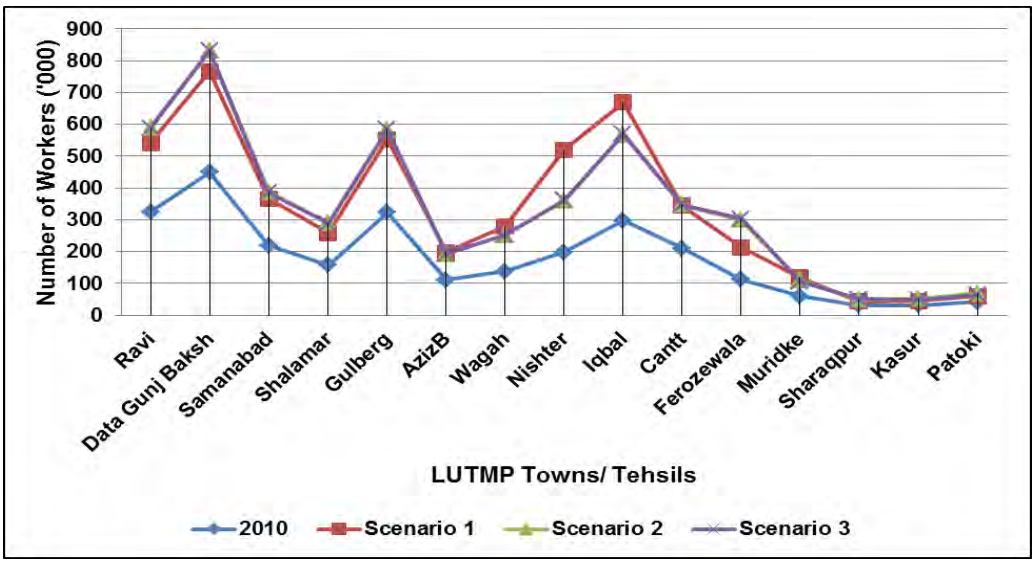
Source: JICA Study Team

Figure 3.2.9 2020 Day-Time Forecast for Workers of All Employment Sectors by Each Scenario



Source: JICA Study Team

Figure 3.2.10 2030 Day-Time Forecast for Workers of All Employment Sectors by Each Scenario



Source: JICA Study Team

Table 3.2.10 Summary Forecast Result of Zonal Breakdown of Number of Workers (Primary Sector, Night-time and Day-time, '000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	5	3	3	3	1	1	1
2	Data Gunj Baksh	3	2	2	2	-	-	-
3	Samanabad	4	2	2	2	1	1	1
4	Shalamar	3	2	2	2	0	0	0
5	Gulberg	3	2	2	2	-	-	-
6	AzizB	5	4	4	4	2	2	3
7	Wagah	27	26	28	28	27	30	29
8	Nishter	27	24	24	25	22	22	24
9	Iqbal	18	16	16	17	14	13	15
10	Cantt	8	5	5	5	2	2	2
11	Ferozewala	27	27	26	28	29	27	31
12	Muridke	12	13	13	11	14	14	10
13	Sharaqpur	16	16	16	17	18	18	19
14	Kasur	8	9	9	8	9	9	8
15	Patoki	14	14	14	12	15	16	11
1-10	**Lahore**	**103**	**85**	**86**	**88**	**70**	**71**	**75**
11-13	**Sheikhupura**	**54**	**56**	**55**	**56**	**60**	**59**	**60**
14-15	**Kasur**	**22**	**23**	**23**	**20**	**25**	**25**	**19**
1-15	**The Study Area**	**179**	**164**	**164**	**164**	**154**	**154**	**154**

Source: JICA Study Team

Table 3.2.11 Summary Forecast Result of Zonal Breakdown of Number of Workers (Secondary Sector, Night-time, '000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	40	52	53	56	71	71	77
2	Data Gunj Baksh	32	45	45	48	64	64	70
3	Samanabad	40	54	55	58	75	76	82
4	Shalamar	36	42	42	45	53	53	58
5	Gulberg	23	34	38	40	49	57	62
6	AzizB	24	48	33	35	78	47	51
7	Wagah	29	67	50	53	113	77	83
8	Nishter	53	200	206	152	377	390	272
9	Iqbal	39	108	106	80	193	187	130
10	Cantt	29	51	49	52	81	76	83
11	Ferozewala	33	72	98	105	121	177	193
12	Muridke	13	29	29	62	48	48	120
13	Sharaqpur	5	5	5	5	6	6	6
14	Kasur	5	5	5	15	6	6	28
15	Patoki	6	6	6	15	7	7	25
1-10	**Lahore**	**343**	**702**	**676**	**617**	**1152**	**1096**	**968**
11-13	**Sheikhupura**	**51**	**106**	**132**	**172**	**174**	**231**	**319**
14-15	**Kasur**	**11**	**11**	**11**	**30**	**13**	**13**	**53**
1-15	**The Study Area**	**405**	**819**	**819**	**819**	**1339**	**1339**	**1339**

Source: JICA Study Team

Table 3.2.12 Summary Forecast Result of Zonal Breakdown of Number of Workers (Secondary Sector, Day-time, '000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	49	66	97	97	91	158	158
2	Data Gunj Baksh	47	72	93	93	107	151	151
3	Samanabad	28	39	56	54	56	90	88
4	Shalamar	27	36	54	54	48	88	88
5	Gulberg	35	55	67	69	81	108	112
6	AzizB	15	29	30	30	47	48	48
7	Wagah	28	67	56	56	114	91	91
8	Nishter	41	152	82	82	283	134	133
9	Iqbal	56	161	122	121	288	203	203
10	Cantt	33	56	63	63	86	100	100
11	Ferozewala	23	48	55	55	80	95	95
12	Muridke	11	26	23	23	44	37	37
13	Sharaqpur	3	3	6	6	4	10	10
14	Kasur	4	4	8	8	5	13	13
15	Patoki	5	5	10	10	6	16	16
1-10	**Lahore**	**358**	**732**	**718**	**718**	**1200**	**1170**	**1170**
11-13	**Sheikhupura**	**37**	**78**	**84**	**84**	**128**	**141**	**141**
14-15	**Kasur**	**9**	**9**	**18**	**18**	**11**	**28**	**28**
1-15	**The Study Area**	**404**	**819**	**819**	**819**	**1339**	**1339**	**1339**

Source: JICA Study Team

Table 3.2.13 Summary Forecast Result of Zonal Breakdown of Number of Workers (Tertiary Sector, Night-time, '000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	248	223	222	223	201	199	201
2	Data Gunj Baksh	227	214	213	214	206	203	205
3	Samanabad	232	220	219	220	213	210	212
4	Shalamar	197	173	173	173	153	151	152
5	Gulberg	191	192	209	210	199	234	236
6	AzizB	147	193	146	147	249	152	153
7	Wagah	111	173	136	137	243	166	168
8	Nishter	171	394	415	283	640	684	409
9	Iqbal	195	389	385	286	606	598	390
10	Cantt	185	249	220	221	323	263	265
11	Ferozewala	87	175	258	260	273	448	452
12	Muridke	44	54	53	125	65	64	213
13	Sharaqpur	18	21	21	21	25	24	25
14	Kasur	27	33	33	108	41	40	197
15	Patoki	28	38	38	114	50	50	209
1-10	**Lahore**	**1902**	**2419**	**2337**	**2113**	**3031**	**2859**	**2390**
11-13	**Sheikhupura**	**149**	**249**	**332**	**406**	**362**	**536**	**689**
14-15	**Kasur**	**54**	**71**	**71**	**221**	**91**	**90**	**405**
1-15	**The Study Area**	**2105**	**2740**	**2740**	**2740**	**3485**	**3485**	**3485**

Source: JICA Study Team

Table 3.2.14 Summary Forecast Result of Zonal Breakdown of Number of Workers (Tertiary Sector, Day-time, '000)

No.	Town/ Tehsil in the Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	272	352	343	343	449	430	430
2	Data Gunj Baksh	400	518	527	527	661	680	680
3	Samanabad	188	243	237	237	310	297	297
4	Shalamar	127	165	161	161	211	202	202
5	Gulberg	285	370	371	371	472	473	473
6	AzizB	91	117	114	114	149	143	143
7	Wagah	84	109	106	106	139	133	133
8	Nishter	130	168	164	164	214	205	205
9	Iqbal	223	288	281	281	368	352	352
10	Cantt	169	208	203	203	255	244	244
11	Ferozewala	63	82	117	117	105	178	178
12	Muridke	37	48	47	47	61	58	58
13	Sharaqpur	14	18	17	17	23	22	22
14	Kasur	19	25	24	24	31	30	30
15	Patoki	24	31	30	30	39	38	38
1-10	**Lahore**	**1966**	**2537**	**2505**	**2505**	**3226**	**3159**	**3159**
11-13	**Sheikhupura**	**114**	**148**	**181**	**181**	**188**	**258**	**258**
14-15	**Kasur**	**43**	**55**	**54**	**54**	**70**	**68**	**68**
1-15	**The Study Area**	**2123**	**2740**	**2740**	**2740**	**3485**	**3485**	**3485**

Source: JICA Study Team

3.2.3 Number of Students

1) Ratio of Students in the Same Age Group and Number of Students

(i) Ratio of Students in the Same Age Group

Ratio of students (high school and above) in the same age group is shown in Table 3.2.15 by Town/ Tehsil. These Towns/ Tehsils were classified into three groups; A, B and C. A is a group of high income and a number of high schools, universities, etc. are located in the same Town/ Tehsil. C belongs to the area of relatively low income with insufficient number of high-grade education facilities, and B comes in between A and C. This grouping may change in the future depending on economic growth and location of high-grade education facilities.

Table 3.2.15 Ratio of Students in the Same Age Group

No.	Town/ Tehsil	Ratio of Students (%)	Group
1	Ravi	39.6	B
2	Data Gunj Baksh	48.8	A
3	Samanabad	44.7	B
4	Shalamar	51.6	A
5	Gulberg	56.6	A
6	Aziz Bhatti	47.8	A
7	Wagah	30.5	C
8	Nishtar	31.4	C
9	Iqbal	43.2	B
10	Cantonment	51.8	A
11	Ferozewala	27.3	C
12	Muridike	31.9	C
13	Sharaqpur	32.9	C

No.	Town/ Tehsil	Ratio of Students (%)	Group
14	Kasur	42.8	B
15	Pattoki	28.6	C
1-15	**The Study Area**	**43.2**	**B**

Source: JICA Study Team

In the world, this ratio is as follows[2]:

United States	57.1	(2005)
UK	52.4	(2006)
Germany	51.5	(2006)
France	56.2	(2006)
Japan	67.1	(2008)
Korea	116.7	(2007)

In Lahore, this ratio is almost comparable with developed countries reflecting the fact that a lot of academic and educational facilities are accumulated in Lahore. Actually the ratio is only 6.4 % for entire Pakistan (2008, United Nations Educational Scientific and Cultural Organization (UNESCO)). This trend/ tradition should be maintained also in the future.

(ii) Future No. of Students

It is assumed that the upper limit of the ratio of students in the same age group will become as follows by 2030:

Group A: 55 %

Group B: 44 % (80 % of Group A)

Group C: 35 % (80 % of Group B)

The population ratio of zones belonging to Group A, B and C is 5:2:3 at present and the weighted average of the Study Area is calculated at 46.8 % for 2030 and 45.0 % for 2020. Average growth rate is 1.8 % p.a. The result is given in Table 3.2.16.

Table 3.2.16 Forecast Number of Students for the Study Area

Description	2010	2020	2030
Population ('000)	9,928	12,925	16,429
Population of the Age Group ('000)	1,986	2,665	3,386
Ratio of Students in the Age Group	0.43	0.45	0.49
No. of Students ('000)	857	1,163	1,597

Source: JICA Study Team

2) Zonal Breakdown of Student Population

(i) No. of Students (Night-time)

The number of students residing in a zone is first estimated by multiplying population with the present ratio of number of students to population. Then it is adjusted to the total of the Study Area control total as predetermined above. The result is presented in Table 3.2.17.

[2] source: Ministry of Education and Science, Japan

Table 3.2.17 Forecast Number of Students ('000) by Town/ Tehsil (Night-time)

No.	Town/ Tehsil in Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	80	84	82	84	90	86	89
2	Data Gunj Baksh	95	102	99	101	111	106	110
3	Samanabad	102	112	109	112	128	122	126
4	Shalamar	82	83	81	82	84	81	83
5	Gulberg	88	106	113	115	130	148	153
6	AzizB	64	84	71	72	112	81	84
7	Wagah	40	57	46	47	81	56	58
8	Nishter	59	122	134	90	209	237	133
9	Iqbal	83	169	177	131	291	306	198
10	Cantt	86	129	114	117	190	154	160
11	Ferozewala	29	59	82	84	101	155	160
12	Muridke	17	20	19	40	24	23	73
13	Sharaqpur	7	8	8	8	9	9	9
14	Kasur	14	17	16	46	20	19	90
15	Patoki	12	14	13	37	17	16	72
1-10	**Lahore**	**778**	**1046**	**1025**	**949**	**1426**	**1376**	**1194**
11-13	**Sheikhupura**	**53**	**87**	**109**	**132**	**135**	**186**	**242**
14-15	**Kasur**	**26**	**31**	**30**	**83**	**37**	**35**	**162**
1-15	**The Study Area**	**857**	**1163**	**1163**	**1163**	**1597**	**1597**	**1597**

Source: JICA Study Team

(ii) Number of Students (day-time)

For Scenario 1, the number of students by zone was estimated by distributing the predetermined total in proportion to the present number of students (daytime).

For Scenario 2 and 3, 40 thousand students were allocated to the academic town proposed in Ferozewala. Then the rest was distributed to zones in proportion to the present numbers. The result is summarized in Table 3.2.18.

Table 3.2.18 Forecast Number of Students ('000) by Town/ Tehsil (Day-time)

No.	Town/ Tehsil in Study Area	2010	2020			2030		
			Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	54	59	59	61	65	64	68
2	Data Gunj Baksh	186	212	214	221	249	247	261
3	Samanabad	136	155	156	161	181	180	190
4	Shalamar	66	69	70	72	74	74	78
5	Gulberg	129	154	163	168	189	204	216
6	AzizB	33	44	37	38	61	42	44
7	Wagah	26	44	31	32	70	37	39
8	Nishter	38	88	94	63	157	167	96
9	Iqbal	75	160	164	114	277	280	166
10	Cantt	63	111	94	97	180	134	141
11	Ferozewala	15	29	42	44	48	121	126
12	Muridke	14	16	16	30	19	19	52
13	Sharaqpur	5	5	6	6	7	6	7
14	Kasur	6	7	7	23	8	8	47
15	Patoki	11	12	13	35	15	15	69
1-10	**Lahore**	**806**	**1094**	**1081**	**1027**	**1501**	**1428**	**1297**
11-13	**Sheikhupura**	**33**	**50**	**64**	**79**	**74**	**147**	**184**
14-15	**Kasur**	**16**	**19**	**19**	**58**	**23**	**22**	**116**
1-15	**The Study Area**	**855**	**1163**	**1163**	**1163**	**1597**	**1597**	**1597**

Source: JICA Study Team

3.2.4 GDP and Per Capita GDP

1) Past Trends

Past trends of Pakistan Gross Domestic Products (GDP) are outlined in Table 3.2.19 and GDP Growth rate past trend is shown in Figure 3.2.11.

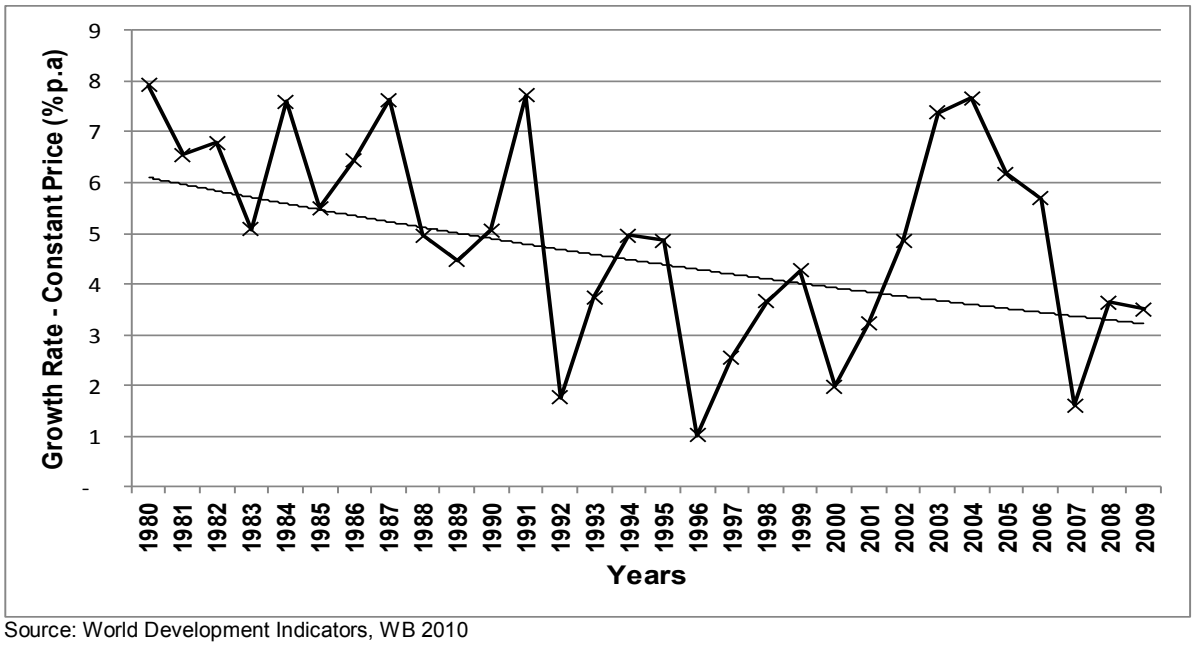
Table 3.2.19 Past Trends of Pakistan GDP and GDP per Capita

Year	Population (Million)	GDP (PKR billion)		Annual GDP Growth Rate - Constant price (% p.a.)	GDP per Capita at 2010 Constant price (PKR '000)
		Current Price	2010 Constant Price[1]		
1980	82.73	234.53	3,309.55	-	40.0
1981	85.10	278.20	3,571.69	7.92	42.0
1982	87.44	324.16	3,805.19	6.54	43.5
1983	89.83	364.39	4,063.12	6.78	45.2
1984	92.28	419.80	4,268.92	5.07	46.3
1985	94.79	472.16	4,593.03	7.59	48.4
1986	97.35	514.53	4,845.72	5.50	49.8
1987	99.95	572.48	5,158.38	6.45	51.6
1988	102.62	675.39	5,551.72	7.63	54.1
1989	105.27	769.75	5,827.07	4.96	55.4
1990	107.98	855.94	6,086.88	4.46	56.4
1991	110.75	1,016.72	6,394.97	5.06	57.7
1992	113.56	1,205.20	6,887.76	7.71	60.6
1993	116.44	1,333.04	7,008.83	1.76	60.2
1994	119.40	1,561.10	7,270.78	3.74	60.9
1995	122.37	1,865.92	7,631.60	4.96	62.4
1996	125.41	2,120.17	8,001.47	4.85	63.8
1997	128.46	2,428.31	8,082.64	1.01	62.9
1998	131.58	2,677.66	8,288.76	2.55	63.0
1999	134.79	2,938.38	8,592.14	3.66	63.7
2000	138.08	3,826.11	8,958.18	4.26	64.9
2001	141.45	4,209.87	9,135.77	1.98	64.6
2002	144.90	4,452.65	9,430.35	3.22	65.1
2003	148.44	4,875.65	9,887.37	4.85	66.6
2004	152.06	5,640.58	10,615.93	7.37	69.8
2005	155.77	6,499.78	11,429.89	7.67	73.4
2006	159.14	7,623.21	12,135.97	6.18	76.3
2007	162.59	8,673.01	12,825.67	5.68	78.9
2008	166.11	10,242.80	13,030.37	1.60	78.4
2009	169.71	12,739.34	13,503.70	3.63	79.6
2010	168.26	13,976.33	13,976.33	3.50	83.1

Note: 1) Calculation assuming a growth rate between 2009 and 2010 predicted by International Monetary Fund (IMF).
Source: World Development Indicators 2010

As seen in the table, Pakistan economy has been growing. However, the growth has not been stable and has been fluctuating year to year. Although average growth rate was 4.9% between 1972 and 2010, it has declined recently (Pakistan: Framework for Economic Growth, April 2011, Planning Commission).

Figure 3.2.11 Past Trends - Growth Rate at Constant Price (% of Per Annum)



Source: World Development Indicators, WB 2010

As for the Punjab, Lahore District as well as the Study Area, there is no GDP or GRDP statistics available. However, Price Water House Coopers of UK estimated 2008 GDP of Lahore in purchasing power parity (PPP) at USD 40 billion using population and income statistics available for Lahore and other similar cities (Economic Outlook, Nov. 2009). In this estimate, "Lahore" means urban agglomeration of Lahore based on UN definition, and this is almost comparable to the Study Area.

We estimated 2010 GDP of the Study Area at about PKR 1,341 billion or USD 17 billion at 2010 constant prices using GDP growth between 2008 and 2010 and the ratio between PPP and 2010 constant price basis estimated by IMF (2010 Economic Outlook).

2) GDP Projections

In the absence of available data and considerable fluctuation of economy in the past, it is difficult to forecast future GDP. In order to forecast GDP and GDP per Capita in the future both for Pakistan and the Study Area, the following assumption were introduced:

A. For entire Pakistan, between 2010 and 2015, the forecast of IMF's 2010 economic outlook was referred. This assumes the following growth rates:

2010-11: 2.8 %
2011-12: 4.0 %
2012-13: 5.0 %

2013-14: 5.5 %
2014-15: 6.0 %

2.8 % of 2010-11 is the same as the Planning Commission's "Pakistan Economic Outlook, Feb. 2011". In this Study, these rates were taken and for 2016 and after, it were assumed that the growth rate would be constant at 6.0 %. Then the average growth for 2010-30 is 5.7 %. This is comparable to the forecast of Price Water House Coopers at 5.6 % for 2008-25 (Economic Outlook, Nov. 2009).

B. For Lahore or the Study Area, no reference is exists as to GDP. Thus it was assumed that the 2010 GDP of Lahore estimated above would grow in parallel to national economy with slightly higher rate due to higher population increase.

The result is presented in Table 3.2.20 below. It should be noted that this is just an approximation on most likely basis. However, this indicative estimate provides a relatively good basis for transport demand forecast.

Table 3.2.20 Projected GDP and GDP per Capita for Pakistan and the Study Area

Year	Population (million)		Assumed GDP Growth Rate (% p.a.)		GDP at 2010 Constant Price (PKR billion)		GDP per Capita at 2010 Constant Price (PKR '000)	
	Pakistan	LUTMP	Pakistan	LUTMP	Pakistan	LUTMP	Pakistan	LUTMP
2010	168.26	9.93	-	-	13,976	1,341	83.1	135.1
2011	171.84	10.20	2.8	2.81	14,368	1,387	83.6	136.0
2012	175.50	10.48	4.0	4.01	14,942	1,451	85.1	138.4
2013	179.24	10.77	5.0	5.01	15,689	1,532	87.5	142.3
2014	183.06	11.06	5.5	5.52	16,552	1,626	90.4	147.0
2015	186.96	11.36	6.0	6.02	17,546	1,734	93.8	152.6
2016	190.75	11.66	6.0	6.02	18,598	1,848	97.5	158.5
2017	194.62	11.96	6.0	6.02	19,714	1,970	101.3	164.7
2018	198.58	12.28	6.0	6.02	20,897	2,101	105.2	171.1
2019	202.61	12.60	6.0	6.02	22,151	2,239	109.3	177.8
2020	206.72	12.93	6.0	6.02	23,480	2,387	113.6	184.7
2021	210.69	13.25	6.0	6.01	24,889	2,545	118.1	192.1
2022	214.73	13.58	6.0	6.01	26,382	2,712	122.9	199.8
2023	218.86	13.91	6.0	6.01	27,965	2,891	127.8	207.8
2024	223.06	14.26	6.0	6.01	29,643	3,081	132.9	216.1
2025	227.34	14.61	6.0	6.01	31,421	3,284	138.2	224.7
2026	231.48	14.96	6.0	6.01	33,307	3,500	143.9	234.0
2027	235.69	15.31	6.0	6.01	35,305	3,730	149.8	243.6
2028	239.98	15.68	6.0	6.01	37,423	3,975	155.9	253.6
2029	244.35	16.05	6.0	6.01	39,669	4,237	162.3	264.0
2030	248.80	16.43	6.0	6.01	42,049	4,515	169.0	274.8

Source: JICA Study Team

3) Zonal Breakdown

For distributing the estimated Study Area GDP to traffic zones, the following procedure was adopted:

1. Development of regression equation to estimate average per capita GDP by zone based on sector distribution of employment. Using WDIs from 1980 to 2007 for entire Pakistan, the following equation was developed:

   $$y = c1 * p1 + c2 * p2 + c3 * p3 + c4$$

   Where,

   y: GDP per capita (PKR/person)

   p1-p3: employment composition of the Primary, Second and Tertiary sectors (%)
   c1-c4: parameters be determined by regression

   The values of these parameters were estimated by least square regression method as:

   c1: 10,233.9 (*1.216*)

   c2: 11,046.6 (*1.295*)

   c3: 12,467.9 (*1.515*)

   c4: -1,050,940.8 (*-1.257*)

   Correlation Coefficient R^2 **= 0.82**; and

   figures in parenthesis give the (*t-statistics*); indicating that there is good correlation and all parameters are statistically significant.

2. Using worker's sectoral composition by zone, per capita GDP was calculated by the above equation for each zone. For 2010, the result of HIS was used, and for 2020 and 2030, the estimated values described in previous sections were used.

3. By multiplying population with per capita GDP is estimated as above, GDP was calculated by zone. The total of these values, however, is slightly different from the GDP estimated earlier for the Study Area.

4. To keep consistency, the total GDP of the Study Area was distributed to zones in proportion to the value by zone calculated in 3 above.

The results are presented in Tables 3.2.21, 3.2.22 and 3.2.23 for 2010, 2020 and 2030, respectively.

Table 3.2.21 2010 Estimated GDP and GDP per Capita by Town/Tehsil

No.	Town/ Tehsil in the Study Area	Population ('000)	GDP (PKR, billion)	GDP per Capita (PKR, 000)
1	Ravi	1007	148	146.7
2	Data Gunj Baksh	970	145	149.4
3	Samanabad	984	144	146.3
4	Shalamar	854	125	145.2
5	Gulberg	778	119	152.2
6	AzizB	667	96	143.3
7	Wagah	656	75	112.9
8	Nishter	945	114	120.0
9	Iqbal	960	128	133.0
10	Cantt	831	120	144.0
11	Ferozewala	534	57	105.1
12	Muridke	266	30	110.9
13	Sharaqpur	101	8	73.7
14	Kasur	168	19	110.9
15	Patoki	207	20	95.5
1-10	Lahore	8,653	1,210	139.8
11-13	Sheikhupura	901	94	103.3
14-15	Kasur	375	39	102.4
1-15	**The Study Area**	**9928**	**1341**	**135.1**

Source: JICA Study Team

Table 3.2.22 2020 Projected GDP and GDP per Capita by Town/Tehsil

No.	Town/ Tehsil in LUTMP Study Area	Population ('000)			GDP (PKR billion)			GEP per Capita (PKR '000)		
		Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	978	971	976	194	192	192	197.4	197.4	195.9
2	Data Gunj Baksh	968	961	966	195	194	193	201.1	201.1	199.6
3	Samanabad	990	983	988	195	194	193	196.5	196.4	194.9
4	Shalamar	790	784	788	156	155	154	196.8	196.7	195.3
5	Gulberg	850	926	931	175	190	190	204.9	204.7	203.3
6	AzizB	901	686	690	176	135	134	194.8	195.7	194.1
7	Wagah	881	713	717	144	113	113	162.9	158.1	157
8	Nishter	1906	2007	1399	320	340	228	167.7	169.2	162.6
9	Iqbal	1840	1824	1366	347	345	254	188.5	189	185.8
10	Cantt	1149	1018	1024	230	201	201	199.7	197.2	195.7
11	Ferozewala	883	1268	1275	145	218	216	163.1	171.9	168.8
12	Muridke	284	282	609	42	41	102	145.1	144.6	166.5
13	Sharaqpur	108	107	107	13	12	12	112.8	112.3	110.4
14	Kasur	179	177	520	30	30	102	166.9	166.5	196
15	Patoki	221	219	568	34	34	109	152	151.5	191.6
1-10	**Lahore**	**11252**	**10873**	**9846**	**2127**	**2054**	**1848**	**189**	**188.9**	**187.7**
11-13	**Sheikhupura**	**1274**	**1656**	**1992**	**198**	**271**	**329**	**154.9**	**163.4**	**165**
14-15	**Kasur**	**399**	**397**	**1088**	**64**	**63**	**211**	**158.6**	**158.2**	**193.7**
1-15	**LUTMP Study Area**	**12925**	**12925**	**12925**	**2387**	**2387**	**2387**	**184.7**	**184.7**	**184.7**

Source: JICA Study Team

Table 3.2.23 2030 Projected GDP and GDP per Capita by Town/Tehsil

No.	Town/ Tehsil in LUTMP Study Area	Population ('000)			GDP (PKR billion)			GEP per Capita (PKR '000)		
		Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
1	Ravi	949	938	947	272	268	266	285.7	285	280.3
2	Data Gunj Baksh	970	958	967	284	280	278	292.3	291.6	287.2
3	Samanabad	1002	990	999	286	282	280	285.1	284.4	279.7
4	Shalamar	720	711	717	206	203	202	286.2	285.4	280.7
5	Gulberg	937	1102	1112	283	334	332	301.9	302.2	298.2
6	AzizB	1175	714	721	339	207	205	288.6	288.5	283.9
7	Wagah	1145	784	792	284	186	185	248	236.6	233.3
8	Nishter	3017	3226	1927	764	828	469	253.1	256.5	243.4
9	Iqbal	2857	2818	1838	816	808	513	285.3	286.5	279.1
10	Cantt	1521	1240	1251	460	366	365	302.1	295.1	291.1
11	Ferozewala	1288	2110	2130	331	568	560	256.4	269	262.7
12	Muridke	305	302	1005	66	64	260	213	211.8	258.3
13	Sharaqpur	116	114	115	21	21	20	178.9	177.2	171.3
14	Kasur	192	190	927	51	50	285	263.6	262.5	306.6
15	Patoki	238	235	983	59	58	302	246.7	245.4	306.7
1-10	**Lahore**	**14291**	**13479**	**11270**	**3990**	**3756**	**3091**	**279.2**	**278.6**	**274.2**
11-13	**Sheikhupura**	**1708**	**2526**	**3250**	**416**	**652**	**839**	**243.4**	**258**	**258.1**
14-15	**Kasur**	**430**	**424**	**1910**	**110**	**108**	**586**	**254.3**	**253**	**306.7**
1-15	**LUTMP Study Area**	**16429**	**16429**	**16429**	**4515**	**4515**	**4515**	**274.8**	**274.8**	**274.8**

Source: JICA Study Team

3.2.5 Household Income and Car Ownership

1) Current Situation

Table 3.2.24 presents the present household income and car ownership by Town/ Tehsil in the Study Area. Between car-owning and non-car-owning households, there is a big difference in household income of about 2.3 times. Thus higher-income towns/ tehsils have high car ownership. The highest car ownership is found in Cantonment at about 40 % which also has the highest average income in the Study Area. The average percentage of car-owning household is about 18% in the Study Area at present.

Table 3.2.24 Present Household's Income and Car Ownership, 2010

No.	Town/ Tehsil	No. of Households			Car Owning HH (%)	Ave. HH Income (PKR/month)		
		Car Owning	Non-Car Owning	Total		Car Owning	Non-Car Owning	Average
1	Ravi	13,052	159,723	172,775	7.5	42,356	19,098	20,855
2	Data Gunj Baksh	30,859	142,579	173,438	17.8	40,849	20,337	23,987
3	Samanabad	39,950	135,553	175,503	22.8	40,507	23,101	27,063
4	Shalamar	18,343	126,403	144,746	12.7	39,237	19,948	22,392
5	Gulberg	40,550	97,992	138,542	29.3	44,612	23,412	29,617
6	Aziz Bhatti	20,201	101,391	121,592	16.6	34,660	17,867	20,657
7	Wagah	7,432	99,347	106,779	7.0	34,035	15,976	17,233
8	Nishtar	14,408	147,451	161,859	8.9	36,428	16,314	18,104
9	Iqbal	49,646	127,990	177,636	28.0	43,550	17,735	24,949
10	Cantonment	64,188	97,114	161,302	39.8	50,950	20,215	32,446
11	Ferozewala	8,888	89,648	98,536	9.0	34,967	14,524	16,368
12	Muridike	2,991	42,274	45,265	6.6	37,829	14,754	16,279
13	Sharaqpur Sharif	3,964	23,930	27,894	14.2	39,385	18,140	21,159
14	Kasur	6,372	21,739	28,111	22.7	56,975	13,432	23,302
15	Pattoki	1,757	31,438	33,195	5.3	34,624	14,301	15,376
1-10	**Lahore**	298,629	1,235,543	1,534,172	19.5	43,099	19,371	23,990
11-13	**Sheikhupura**	15,843	155,852	171,695	9.2	36,612	15141	17,122
14-15	**Kasur**	8,129	53,177	61,306	13.3	52,144	13945	19,010
1-15	**The Study Area**	**322,601**	**1,444,572**	**1,767,173**	**18.3**	**43,009**	**18,715**	**23,150**

Source: JICA Study Team

2) Car Ownership Forecast

Car ownership has a strong correlation with household income. Therefore the first step to forecast car ownership is to estimate future household income. It is well known that income increases or decreases in proportion to GDP per capita. Since GDP and GDP per Capita have been forecast by zone as explained in the previous section, it is easy to know the income level by zone.

Next step is to analyze the interrelationship between household car ownership and household income. As analyzed by regression analysis, household car ownership and household income by zone have shown a very good correlation as anticipated. However,

this analysis tends to lead very high forecast. Because all the zones have the same weight in this analysis regardless of the size of zones. Hence, the following equation was selected to forecast the future car ownership.

NC = 0.0000109 HI – 705.308

Where, NC: No. of cars by zone

HI: Total Household Income by zone

(R^2=0.69, T-statistics: 21.6 for HI and -7.3 for Constant)

In addition, for extremely densely built-up 8 zones located in the center of the city, car ownership rate was assumed to remain stable, and for other densely built-up 17 zones, car ownership was assumed to grow only by 5 % and 10 % for 2020 and 2030, respectively.

The result of forecast is shown in Table 3.2.25 to 3.2.30 for 2020 and 2030 by urban development scenario and illustrated in Figure 3.2.12 for the three urban development scenarios. Car ownership by Household will increase from 18 % in 2010 to 29-30 % and 43-45 % in 2020 and 2030, respectively.

Table 3.2.25 Household Income and Car Ownership, 2020 Scenario-I

No.	Town/ Tehsil in the Study Area	No. of Households			Car Owning HH (%)	Ave. HH Income (PKR/month)		
		Car Owning	Non-Car Owning	Total		Car Owning	Non-Car Owning	Average
1	Ravi	29,648	137,496	167,144	17.7	48,385	23,716	28,092
2	Data Gunj Baksh	57,080	115,931	173,012	33.0	48,129	24,355	32,199
3	Samanabad	69,691	103,845	173,537	40.2	48,545	28,228	36,387
4	Shalamar	33,825	100,120	133,945	25.3	47,258	24,549	30,284
5	Gulberg	58,728	82,369	140,830	41.7	54,878	26,748	38,529
6	AzizB	44,745	112,869	157,614	28.4	46,256	22,442	29,202
7	Wagah	32,182	108,870	141,052	22.8	44,584	19,644	25,334
8	Nishter	72,150	242,613	314,763	22.9	44,938	19,685	25,473
9	Iqbal	86,361	208,907	294,943	29.3	63,753	27,270	37,983
10	Cantt	92,215	132,292	224,507	41.1	63,048	24,687	43,397
11	Ferozewala	32,946	128,259	161,204	20.4	46,199	20,182	25,499
12	Muridke	8,413	35,471	43,572	19.3	45,035	16,663	22,260
13	Sharaqpur	9,361	20,362	29,724	31.5	55,777	24,854	34,593
14	Kasur	7,566	22,389	29,955	25.3	70,066	18,918	34,749
15	Patoki	4,910	30,463	35,372	13.9	54,450	21,615	26,172
1-10	**Lahore**	576,627	1,345,313	1,921,347	30.0	52,858	23,853	32,918
11-13	**Sheikhupura**	50,720	184,092	234,500	21.6	47,774	20,021	26,050
14-15	**Kasur**	12,476	52,852	65,327	19.1	63,921	20,473	30,105
1-15	**The Study Area**	**639,823**	**1,582,256**	**2,221,175**	**28.8**	**52,649**	**23,280**	**32,108**

Source: JICA Study Team

Table 3.2.26 Household Income and Car Ownership, 2020 Scenario-II

No.	Town/ Tehsil in the Study Area	No. of Households			Car Owning HH (%)	Ave. HH Income (PKR/month)		
		Car Owning	Non-Car Owning	Total		Car Owning	Non-Car Owning	Average
1	Ravi	29,416	136,511	165,927	17.7	48,364	23,711	28,081
2	Data Gunj Baksh	56,788	114,964	171,752	33.1	48,093	24,335	32,190
3	Samanabad	69,349	102,924	172,273	40.3	48,505	28,197	36,372
4	Shalamar	33,601	99,369	132,970	25.3	47,235	24,539	30,274
5	Gulberg	60,726	93,129	153,587	39.5	54,861	25,381	37,081
6	AzizB	36,370	84,593	120,962	30.1	42,622	21,750	28,026
7	Wagah	25,479	90,619	116,098	21.9	39,623	19,806	24,155
8	Nishter	76,226	252,774	329,000	23.2	45,535	19,549	25,569
9	Iqbal	83,533	221,982	305,190	27.4	70,046	30,053	41,032
10	Cantt	84,854	112,909	197,763	42.9	64,367	24,984	45,183
11	Ferozewala	57,960	183,482	241,442	24.0	52,437	22,107	29,388
12	Muridke	8,314	35,253	43,255	19.2	44,815	16,641	22,177
13	Sharaqpur	9,254	20,254	29,507	31.4	55,484	24,752	34,390
14	Kasur	7,509	22,228	29,737	25.3	70,211	18,921	34,694
15	Patoki	4,811	30,304	35,115	13.7	54,303	21,582	26,065
1-10	**Lahore**	556,342	1,309,772	1,865,522	29.8	53,578	24,289	33,389
11-13	**Sheikhupura**	75,528	238988	314204	24.0	51,972	21,525	28,865
14-15	**Kasur**	12,319	52,532	64,851	19.0	63,999	20,456	30,021
1-15	**The Study Area**	**644,189**	**1,601,293**	**2,244,578**	**28.7**	**53,570**	**23,738**	**32,658**

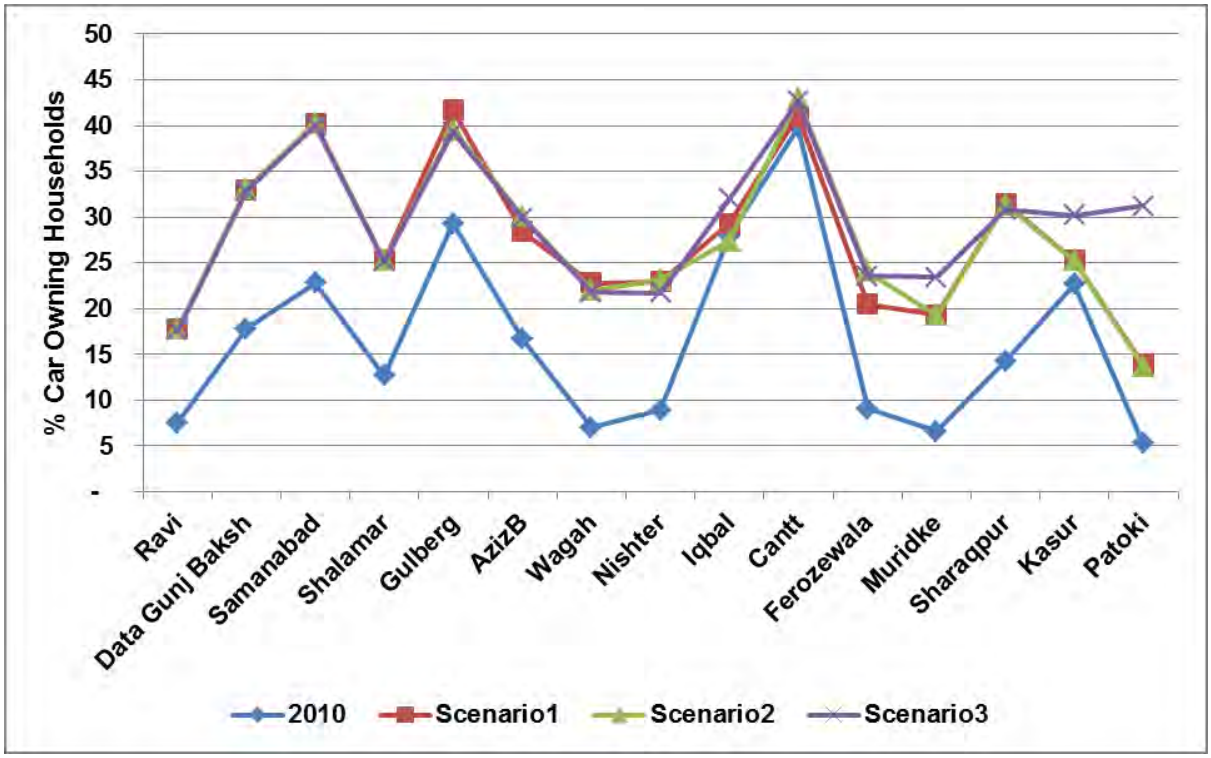
Source: JICA Study Team

Table 3.2.27 Household Income and Car Ownership, 2020 Scenario-III

No.	Town/ Tehsil in the Study Area	No. of Households			Car Owning HH (%)	Ave. HH Income (PKR/month)		
		Car Owning	Non-Car Owning	Total		Car Owning	Non-Car Owning	Average
1	Ravi	29,379	137,463	166,842	17.6	48,040	23,555	27,866
2	Data Gunj Baksh	56,734	115,965	172,699	32.9	47,862	24,185	31,964
3	Samanabad	69,247	103,977	173,223	40.0	48,201	28,012	36,083
4	Shalamar	33,577	100,126	133,704	25.1	46,953	24,381	30,050
5	Gulberg	60,685	94,017	154,435	39.3	54,552	25,248	36,807
6	AzizB	36,326	85,304	121,630	29.9	42,362	21,611	27,809
7	Wagah	25,412	91,326	116,739	21.8	39,470	19,658	23,971
8	Nishter	50,960	184,055	235,015	21.7	44,946	18,995	24,622
9	Iqbal	74,855	159,851	234,380	31.9	62,310	25,979	37,618
10	Cantt	84,751	114,103	198,854	42.6	64,091	24,840	44,883
11	Ferozewala	57,205	185,570	242,774	23.6	51,758	21,809	28,866
12	Muridke	21,488	70,615	91,791	23.4	51,061	17,807	25,652
13	Sharaqpur	9,146	20,524	29,670	30.8	54,676	24,420	33,747
14	Kasur	26,520	61,258	87,778	30.2	61,206	19,735	41,087
15	Patoki	28,539	62,994	91,534	31.2	72,443	22,971	38,396
1-10	**Lahore**	521,926	1,186,188	1,707,522	30.6	52,317	23,516	32,724
11-13	**Sheikhupura**	87,838	276709	364236	24.1	51,891	20,982	28,454
14-15	**Kasur**	55,059	124,253	179,312	30.7	67,031	21,375	39,713
1-15	**The Study Area**	**664,823**	**1,587,150**	**2,251,069**	**29.5**	**53,466**	**22,891**	**32,592**

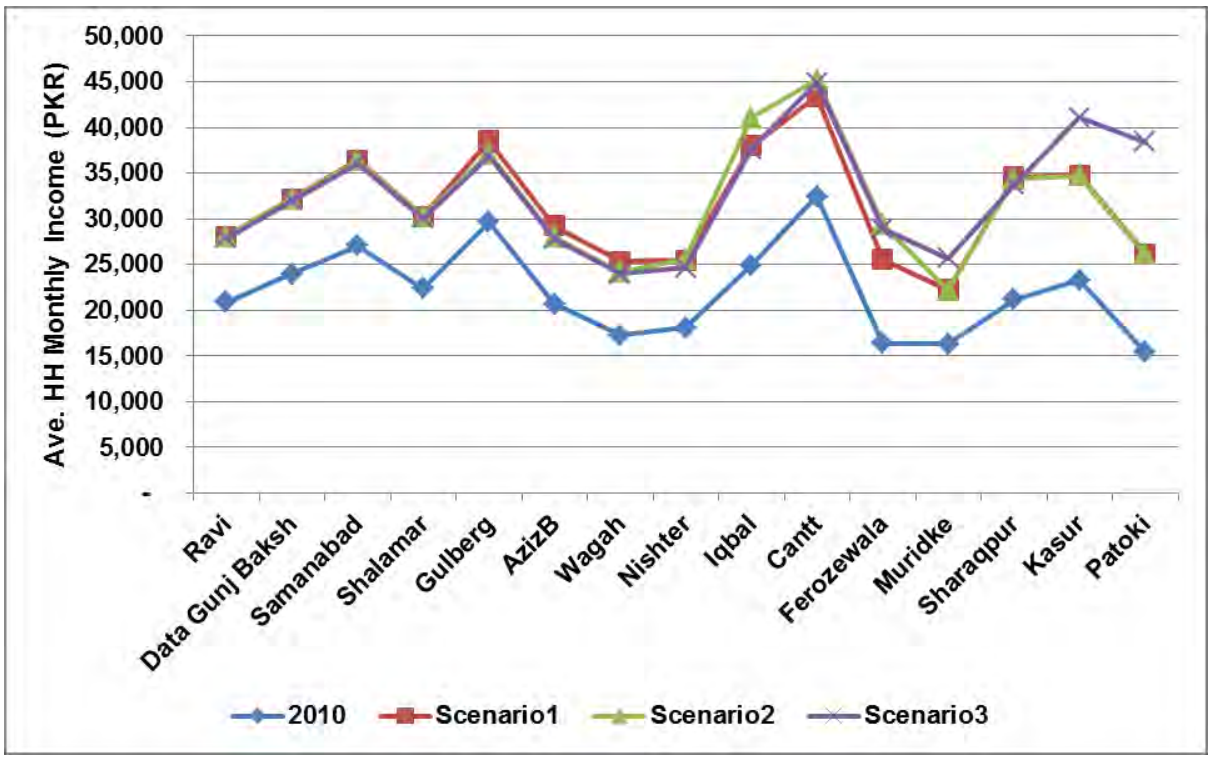
Source: JICA Study Team

Figure 3.2.12 2020 Percent of Car Owning Households for Three Scenarios



Source: JICA Study Team

Figure 3.2.13 2020 Average Household Monthly Income for Three Scenarios



Source: JICA Study Team

Table 3.2.28 Household Income and Car Ownership, 2030 Scenario-I

No.	Town/ Tehsil in the Study Area	No. of Households			Car Owning HH (%)	Ave. HH Income (PKR/month)		
		Car Owning	Non-Car Owning	Total		Car Owning	Non-Car Owning	Average
1	Ravi	47,376	114,191	161,567	29.3	61,181	32,228	40,718
2	Data Gunj Baksh	83,113	90,319	173,432	47.9	62,539	31,949	46,609
3	Samanabad	101,160	73,817	174,977	57.8	64,336	37,399	52,972
4	Shalamar	49,663	72,604	122,268	40.6	60,929	32,259	43,904
5	Gulberg	84,680	70,790	155,203	54.6	73,789	35,570	56,484
6	AzizB	89,416	115,061	204,477	43.7	63,731	29,794	44,634
7	Wagah	68,466	112,617	181,083	37.8	61,094	25,490	38,952
8	Nishter	175,964	315,741	491,705	35.8	60,375	26,466	38,601
9	Iqbal	215,074	228,394	443,142	48.5	85,630	33,714	58,935
10	Cantt	149,386	148,758	298,144	50.1	82,872	31,293	64,086
11	Ferozewala	84,670	149,224	233,893	36.2	63,776	26,241	39,828
12	Muridke	15,404	31,783	46,876	32.9	60,453	20,739	33,928
13	Sharaqpur	16,280	15,697	31,977	50.9	79,497	34,123	57,224
14	Kasur	11,390	20,836	32,226	35.3	86,188	24,262	54,655
15	Patoki	12,008	26,046	38,054	31.6	74,094	29,738	43,735
1-10	**Lahore**	1,064,297	1,342,293	2,405,998	44.2	70,709	30,693	49,267
11-13	**Sheikhupura**	116,354	196704	312746	37.2	65,536	25,981	40,723
14-15	**Kasur**	23,398	46,883	70,280	33.3	79,981	27,304	48,742
1-15	**The Study Area**	**1,204,049**	**1,585,879**	**2,789,025**	**43.2**	**70,365**	**29,980**	**48,293**

Source: JICA Study Team

Table 3.2.29 Household Income and Car Ownership, 2030 Scenario-II

No.	Town/ Tehsil in the Study Area	No. of Households			Car Owning HH (%)	Ave. HH Income (PKR/month)		
		Car Owning	Non-Car Owning	Total		Car Owning	Non-Car Owning	Average
1	Ravi	46,738	112,847	159,585	29.3	61,031	32,154	40,612
2	Data Gunj Baksh	82,173	89,132	171,305	48.0	62,385	31,861	46,503
3	Samanabad	100,047	72,784	172,831	57.9	64,154	37,276	52,835
4	Shalamar	49,046	71,722	120,768	40.6	60,780	32,172	43,790
5	Gulberg	92,078	90,996	182,807	50.4	73,630	31,466	52,750
6	AzizB	57,109	68,852	125,960	45.3	56,347	29,066	41,435
7	Wagah	49,364	78,275	127,639	38.7	52,095	25,881	36,019
8	Nishter	186,423	334,635	521,058	35.8	61,417	26,254	38,835
9	Iqbal	244,641	219,926	464,242	52.7	93,053	34,337	65,303
10	Cantt	126,773	113,960	240,733	52.7	85,726	31,322	68,420
11	Ferozewala	161,493	243,821	405,314	39.8	72,241	29,742	46,675
12	Muridke	15,146	31,467	46,301	32.7	60,043	20,672	33,691
13	Sharaqpur	15,989	15,596	31,585	50.6	78,784	33,881	56,612
14	Kasur	11,217	20,614	31,831	35.2	86,348	24,271	54,466
15	Patoki	11,731	25,856	37,588	31.2	73,843	29,657	43,447
1-10	**Lahore**	1,034,394	1,253,128	2,286,929	45.2	72,614	30,553	50,481
11-13	**Sheikhupura**	192,629	290,883	483,200	39.9	71,825	28,982	46,080
14-15	**Kasur**	22,948	46,470	9,418	33.1	79,955	27,267	48,499
1-15	**The Study Area**	**1,249,971**	**1,590,481**	**2,839,548**	**44.0**	**72,607**	**30,144**	**49,684**

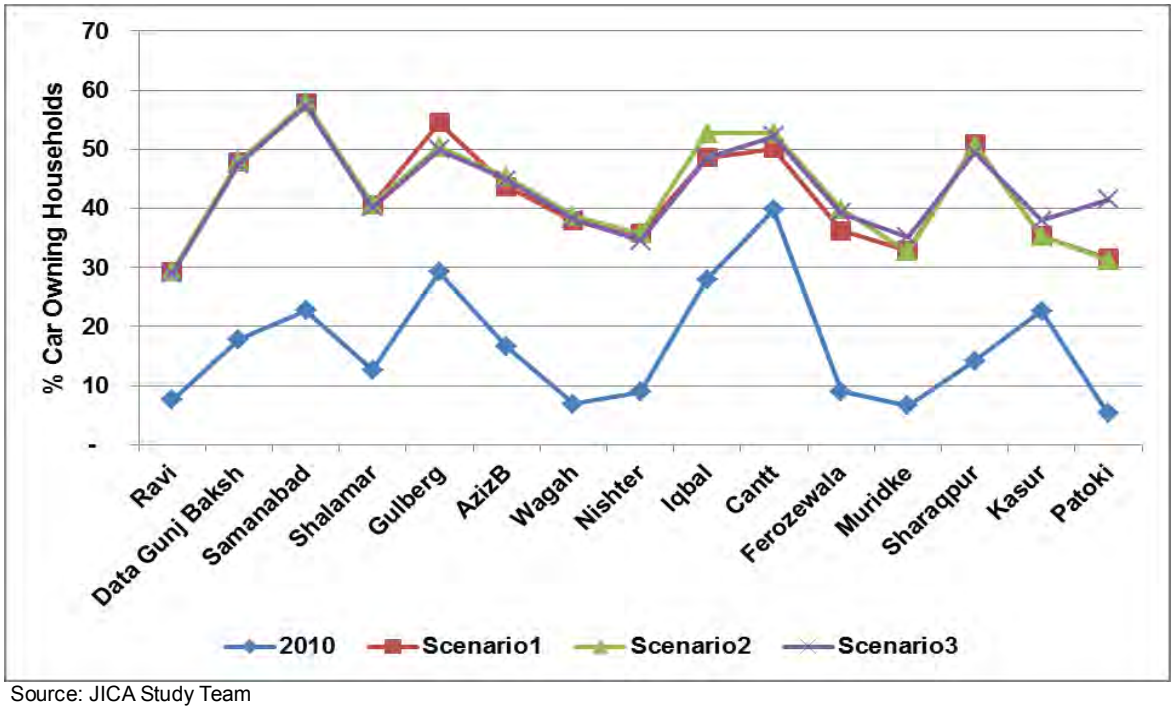
Source: JICA Study Team

Table 3.2.30 Household Income and Car Ownership, 2030 Scenario-III

No.	Town/ Tehsil in the Study Area	No. of Households			Car Owning HH (%)	Ave. HH Income (PKR/month)		
		Car Owning	Non-Car Owning	Total		Car Owning	Non-Car Owning	Average
1	Ravi	46,655	114,419	161,074	29.0	60,211	31,674	39,940
2	Data Gunj Baksh	82,123	90,780	172,903	47.5	61,686	31,434	45,803
3	Samanabad	99,909	74,534	174,443	57.3	63,300	36,760	51,960
4	Shalamar	48,979	72,915	121,894	40.2	59,994	31,688	43,062
5	Gulberg	92,138	92,641	184,512	49.9	72,782	31,158	51,988
6	AzizB	57,016	70,119	127,135	44.8	55,652	28,691	40,783
7	Wagah	49,192	79,637	128,829	38.2	51,576	25,567	35,498
8	Nishter	110,523	209,527	320,050	34.5	59,672	24,997	36,971
9	Iqbal	151,699	161,414	312,788	48.5	85,571	33,165	58,616
10	Cantt	126,786	116,193	242,979	52.2	84,907	31,018	67,573
11	Ferozewala	160,200	248,895	409,095	39.2	70,970	29,236	45,579
12	Muridke	52,871	97,963	150,522	35.1	70,229	23,909	40,228
13	Sharaqpur	15,749	16,131	31,880	49.4	76,583	33,049	54,556
14	Kasur	59,402	97,100	156,503	38.0	82,068	27,704	64,326
15	Patoki	65,808	92,956	158,764	41.5	100,666	36,802	63,274
1-10	**Lahore**	865,022	1,082,178	1,946,608	44.4	69,323	30,179	48,644
11-13	**Sheikhupura**	228,820	362,989	591,497	38.7	71,185	27,968	44,701
14-15	**Kasur**	125,210	190,056	315,267	39.7	91,843	32,154	63,796
1-15	**The Study Area**	**1,219,052**	**1,635,223**	**2,853,371**	**42.7**	**71,975**	**29,894**	**49,508**

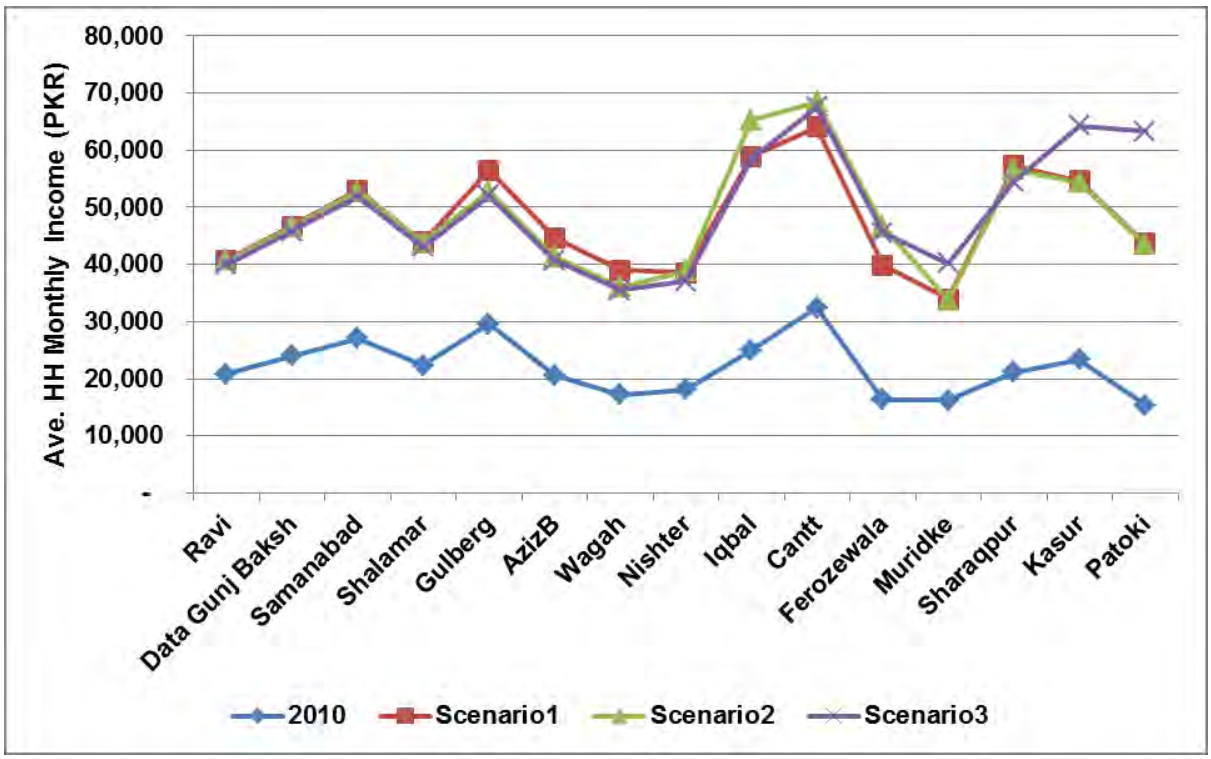
Source: JICA Study Team

Figure 3.2.14 2030 Percent of Car Owning Households for Three Scenarios



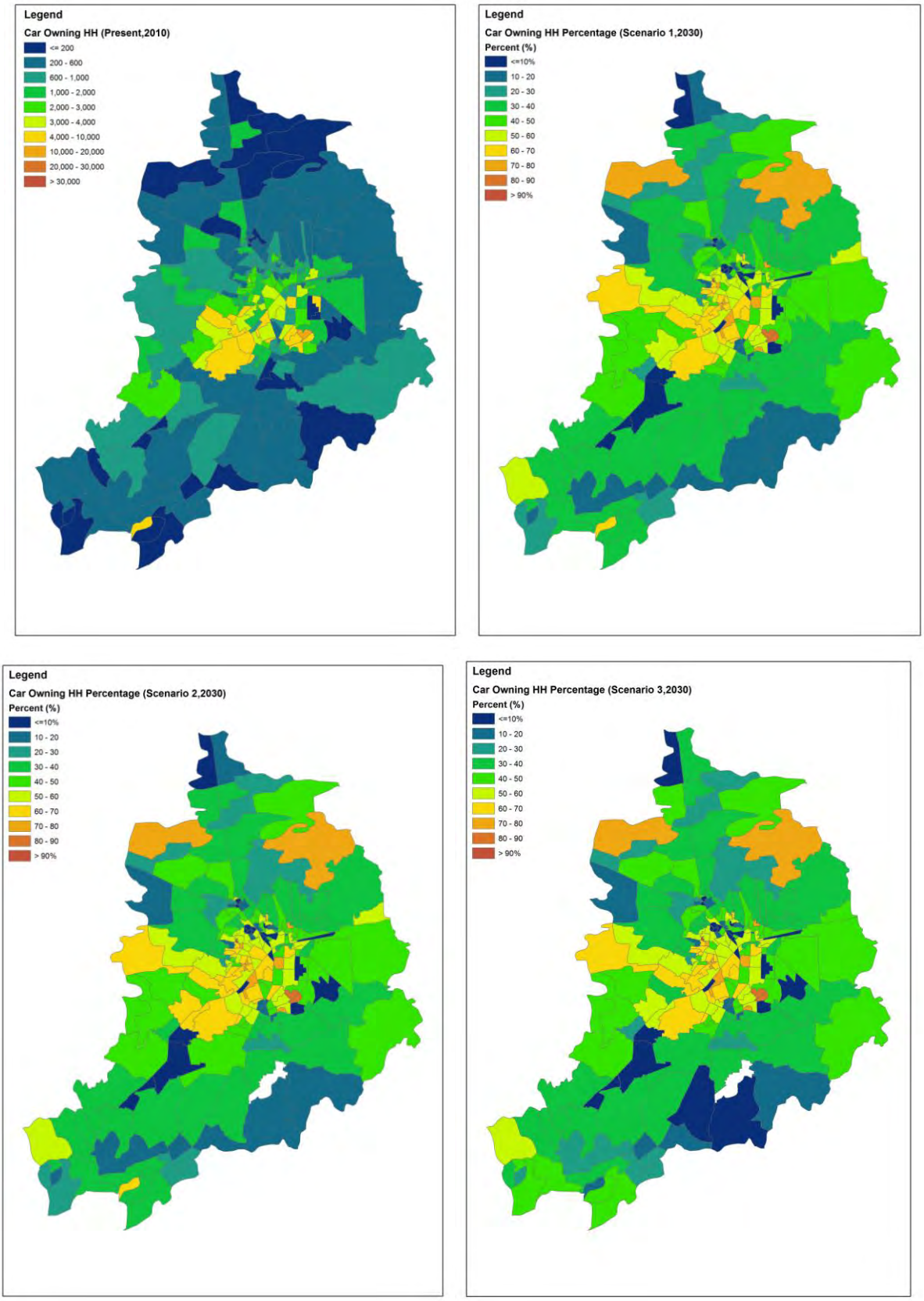
Source: JICA Study Team

Figure 3.2.15 2030 Average Household Monthly Income for Three Scenarios



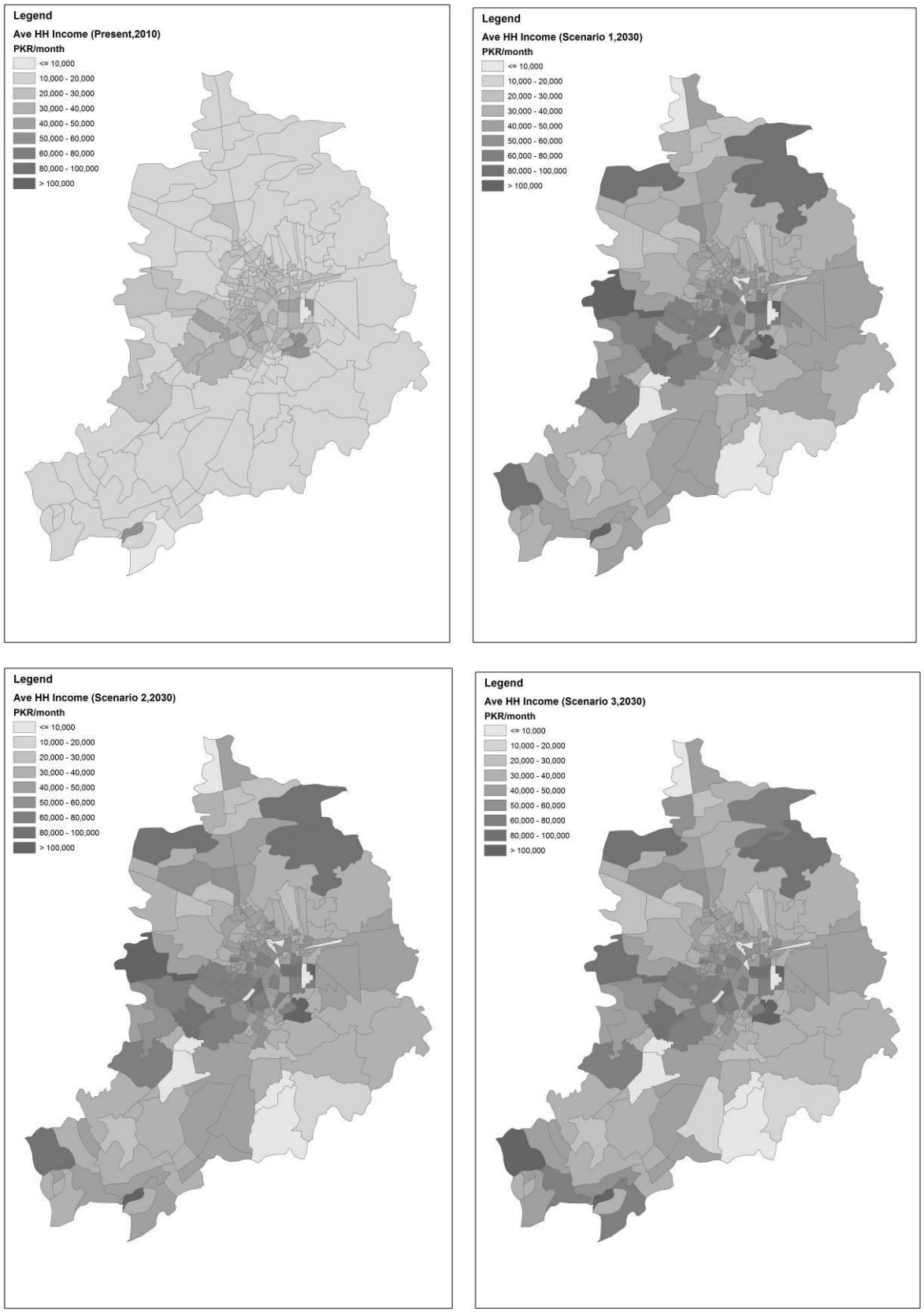
Source: JICA Study Team

Figure 3.2.16 Percent of Car Owning Households, 2010 and 2030 by Scenario



Source: JICA Study Team

Figure 3.2.17 Average Household Monthly Income, 2010 and 2030 by Scenario



Source: JICA Study Team