Working paper

International Growth Centre

Metropolitan Lahore - Economic Geography, Labor Markets, and Growth

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Metropolitan Lahore – Economic Geography, Labor Markets and Growth

Revised Final Report

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The International Growth Centre

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PROJECT OVERVIEW

The project is entitled "Metropolitan Lahore – Economic Geography, Labor Markets and Growth."

The study views the Lahore Metropolitan Region as a labor market on the premise that the larger the market, the more will be the potential for the city to increase its productivity. This emphasizes the critical role of mobility which affects the size of the labor market and is thereby essential to the prospects of economic dynamism in a city.

Within this theme, the project addresses the following questions:

1. To what extent are the labor markets of small cities surrounding Lahore integrated in a metropolitan labor market?
2. What are the principal constraints limiting the size of the metropolitan labor market?
3. Is the labor market in Lahore fragmented, and, if so, what is the effective size of the labor markets in Lahore?
4. What are the principal constraints limiting the size of the labor market in Lahore?
5. How has the BRT impacted the local and metropolitan labor markets?

The aim of the project is to produce findings and recommendations that would prove valuable in formulating:

- Economic growth policy: In particular, how to enhance labor productivity by increasing the size and efficiency of the labor market.
- Transportation policy: By identifying infrastructure bottlenecks and traffic management issues that limit the size of the labor market.
- Investment policy: By identifying beneficial investments to expand the size of the labor market.
- Governance policy: By providing indicators and benchmarks that would make transparent the effectiveness of planning and investment decisions.
- Accountability policies: By enhancing citizen understanding of issues related to their welfare.

EXECUTIVE SUMMARY

- Economic growth is positively correlated with worker productivity which itself is an increasing function of the size of a labor market. The size of labor markets thus has a direct bearing on economic growth.
- Mobility is one of the key determinants of the effective size of urban labor markets. There is growing agreement that an hour's commute (one-way) is the absolute limit when defining the spatial extent of a labor market. Thus city-size is not a good proxy for the size of the labor market – it is possible for a city's labor markets to be fragmented thereby compromising its economic potential.
- In this study of the Lahore metropolitan region we link mobility with the effective size of the labor market. Ideally, we need to estimate the average number of jobs that can be reached by workers within a travel time of less than one hour. This requires sophisticated modeling. Given data and budgetary constraints, we employ a simplified indicator – the population that can access a designated node in the city in less than one hour using means of public transport affordable for the majority of the population. This indicator controls for congestion effects and can therefore be compared across cities.
- Using this indicator we show that the labor markets of none of the three cities close to Lahore included in the study (Sheikhupura, Kasur and Pattoki) are integrated with the labor market of Lahore. We show further that given existing per capita incomes and wage rates, it may not be economically justified to integrate these markets by faster bus connections since incremental transport fare expenses will dominate incremental wage gains for the majority. Improvements in existing train connections might be a more feasible option to explore.
- A significant portion of the city-center-to-city-center travel times is consumed within Lahore because of congestion. Therefore traffic improvements in Lahore can yield additional benefits of reducing travel time to nearby cities.
- The three cities suffer from not being within commuting distance of Lahore but being close enough for non-commuting trips. One result is that most of the purchasing power of these cities is expended in Lahore leaving them as pockets of poverty which has a negative impact on their economic growth.

- We show that all three cities can be made to fall within the two-hour commute circle that is used as the threshold for business-to-business freight transactions. With the right policies, back-office functions of firms in Lahore can be encouraged to relocate to any one of the smaller cities, which would boost their economies.
- Using the one-hour commute circle indicator, we show that the labor market of Lahore city itself is fragmented – Lahore comprises at least four overlapping labor markets. The city thus has all the disadvantages of a large population with few of the advantages of a large labor market.
- We show that road investments in Lahore have not been growth-enhancing but access-facilitating for owners of private automobiles. Instead of increasing mobility in dense areas, which would increase the number of economic transactions, the investments have focused on transporting private car owners from less dense areas of the city to work locations in the more dense areas. This policy has had the perverse outcome of encouraging sprawl into low-density farmland. Thus while the area of the one-hour circle has increased, population density has fallen.
- We highlight the policy issue of whether at existing per capita incomes and private vehicle ownership rates, a city like Lahore should favor connectivity or compactness. We suggest the latter to be a more sensible option and recommend use of measures like Floor Area Ratios, Transferrable Development Rights, and Urban Growth Boundaries to optimize land use. While it may be too late to reverse the sprawl in Lahore, this is an important policy lesson for many medium-sized cities given that Pakistan is still in the middle of its urban transition.
- The study shows that the BRT has been the first major infrastructure investment aimed at increasing speed in a dense part of the city. A very rough first estimate suggests that the size of relevant labor market has increased by about a third as a result of the investment. However, the ridership in the corridor is too small a proportion of the total number of trips in the city to have a significant economic impact just yet. Speed along other corridors also needs to be increased.

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1. SIZING A METROPOLITAN LABOR MARKET

1.1 INTRODUCTION

This study looks at the Lahore Metropolitan Region as a labor market on the premise that the larger the market, the greater would be the potential to improve the economic efficiency of the city. In doing so it emphasizes the critical role of mobility which affects the size of the labor market and is thereby essential to the prospects of economic dynamism in a city.

The hypothesis that we wish to confirm is that the labor market in the Lahore metropolitan region and even within Lahore city is fragmented and that this fragmentation causes the area to function below its economic potential which translates into a lower standard of living for its residents.

The argument that the labor market of Lahore city is fragmented may seem counter-intuitive to many but should become obvious on reflection. We know from casual observation that often the offer of a better paying job in another part of the city has to be declined for reasons of accessibility. To avail the opportunity, the individual has to shift residence closer to the offered job, i.e., move, as if, to a new city. Thus we start with an observed awareness that Lahore does not comprise of one labor market. However, we do not know the extent of the fragmentation and aim to verify that empirically with the help of a simple methodology.

The dramatic impact of the speed of travel is documented by JICA (2011) where it is reported that the average number of trips per person per day in Lahore, excluding walking, is about half the figure for many other cities in Asia. This is inevitably due to relatively higher trip-times in Lahore. Thus, even if city sizes are comparable, we would expect about half the economic activity in Lahore compared to the other cities. Table 1.1.1 shows the average of daily trips per person in Lahore.

	Male	Female	Total
Including Walking	1.32	0.53	0.97
Excluding Walking	0.86	0.24	0.58

Table 1.1-1: Lahore Average Daily Trips per Person, 2010

We wish to highlight that the speed of travel is one of the key determinants of the size of a labor market and lack of mobility is an aspect of the Lahore metropolitan region that needs critical attention if the region is to realize its economic potential.

Our aim is to substantiate the following conclusions:

1. The overall population of a city is not a reliable indicator of the size of its labor market.
2. The same population size can yield very different levels of economic activity because of constraints on mobility.

If the above are true, it is quite possible for a city to have all the disadvantages of a large population (congestion, pollution, slums, and poor services) without having much of the advantages of a large labor market in terms of increased economic activity and efficiency measured by labor productivity.

Our objective is to highlight these aspects for policymakers responsible for Lahore (the second largest city in Pakistan and the 40th largest in the world based on its estimated population of approximately 9 million - JICA, 2011; World Atlas, 2014) and initiate a discussion of the causes and consequences. We intend to do this primarily via a visual presentation of the contours of the labor market in Lahore because of the greater impact of pictorial data. We will examine the labor market(s) in the metropolitan region as well as in Lahore city itself. We will also estimate the first order impact on the labor market of an infrastructure investment like the recent Bus Rapid Transit (BRT). The analysis would yield recommendations for increasing the size and efficiency of labor markets and guidelines for planning to do so effectively.

1.2 BRIEF LITERATURE REVIEW

There has been a snowballing acceptance of the argument that cities are or can be engines of economic growth. Much evidence in favor of the proposition was presented in the 2009 World Development Report (*Reshaping Economic Geography*) and the 2009 report of the Commission on Growth and Development (*Urbanization and Growth*). The argument gained further momentum with its endorsement by China and India, the world's most populous countries presently in the middle of their urban transitions. China has launched the world's most ambitious acceleration of urbanization while India, without going that far, has articulated a similar vision to build a hundred new 'smart' cities. Both countries have commissioned studies from the McKinsey Global Institute (2009, 2010) to flesh out the modalities of city-led development.

The arguments summarized in the above-mentioned reports are based on theory and evidence accumulating over the past two decades. Many studies confirm the potential gains from agglomeration economies due to the concentration of buyers, sellers, products and production capacity (Moretti 2014, Duranton 2008, Overman and Venables 2005, Ciccone and Hall 2003). Rosenthal and Strange (2004) estimate for developed countries that a doubling of city size leads to a 3 to 8 percent increase in labor productivity. Using data for China, Au and Henderson (2006) show higher gains in developing cities, stating "real incomes per worker rise sharply with increases in city size from a low level."

However, the city-size variable needs to be treated with caution especially in the case of cities in developing countries. It is not even adequate to demarcate sub-city labor markets using geographical boundaries (Manning and Petrongolo 2013). Empirical investigations by Prud'homme (1997) show that productivity is indeed a function of the size of a city or geographical area but the "greater productive efficiency of large cities…is only *potential*." It is conditional upon the appropriate management of urban areas, and particularly upon the efficiency of the transport system." Moretti (2014) also makes this point with special reference to cities in developing countries emphasizing that gains cannot be taken for granted and warning of the dangers of "urbanization without industrialization."

Focusing on the contribution of transport to urban development Prud'homme (1997) shows that urban productivity is based not on the size of a city or a geographical area but on the size of labor markets, which depends on access to jobs. The latter is a function both of the speed

and cost of transport. He draws the attention of policy makers to the conclusion that urban transport policy should aim to increase the effective size of urban labor markets.

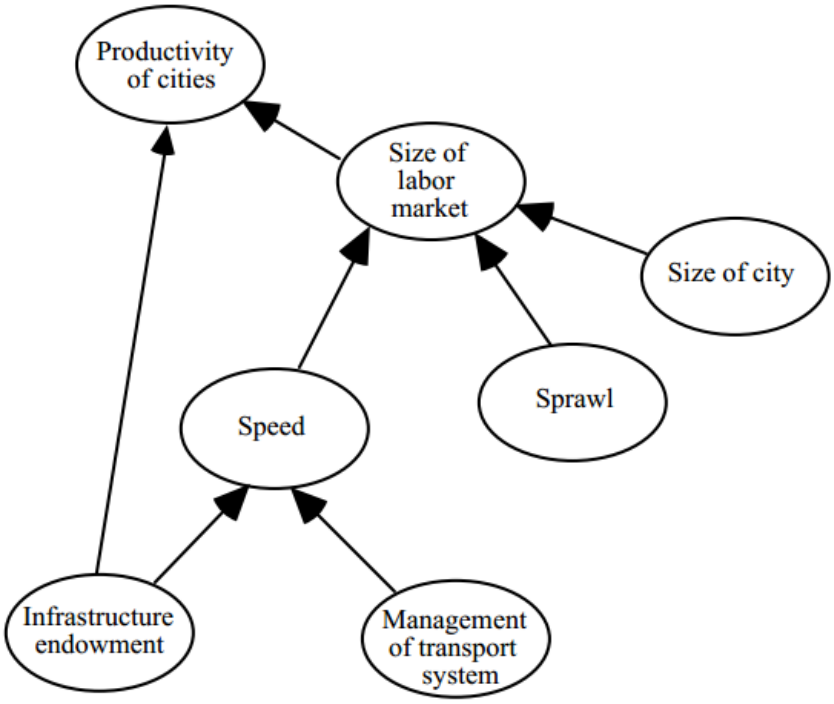

Figure 1.2-1: Factors Explaining Productivity of Cities

Figure 1.2-1 (Prud'homme 1997) illustrates how the size of a city is only one determinant of its productivity. Also critical are sprawl, which takes into account how far jobs and residences are located, and the speed of transport, which qualifies the access to jobs. The speed itself is an outcome of management of the transport system and infrastructure endowments with the latter also having an independent effect on productivity. This conceptualization enables us to focus on the key determinants of urban productivity separately. According to Prud'homme the purpose of efficient transport policies is to increase the size of a labor market in an urban area. This conceptualization allows us to use the size of the labor market as a useful summary indicator of the effectiveness of policies aimed at increasing urban productivity.

Prud'homme and Lee (1999) elaborate these ideas with more evidence and define urban efficiency in terms of labor productivity and the 'effective size' of the labor market of a city as "the average number of jobs available in less than *t* minutes to workers in the city." Their study concludes that "the efficiency of a city is a function of the effective size of its labor

market, and that this labor market size is itself a function of the overall size of the city, but also of its sprawl and of the speed at which trips in the city are made."

Bertaud (2014) elaborates the importance of mobility and states explicitly that the labor market of a city can fragment: "A city's welfare depends on its labor market. As long as a labor market does not fragment into adjacent, smaller ones as it grows, the larger the market, the more innovative and productive the city will be. Maintaining mobility is therefore essential to the economic viability of cities." He also standardizes the effective size of a labor market equating *t* minutes to 60 minutes thereby yielding the increasingly popular concept of a 'one-hour commute circle." He defines the effective size of a labor market as follows: "I consider an hour's commute (one way) to be the absolute limit when defining the spatial extent of a labor market. For a worker, the number of jobs that can be reached within a travel time of less than one hour defines the size of his labor market." Harmon (2013) uses the same one-hour commute as a measure of choice as do Melo et al (2012). The latter show that beyond one hour the productivity effects of agglomeration die out completely.

Bertaud (2014) shows the percent of total jobs in a metropolitan area that is accessible by workers in various US cities within a one hour commute. The percentage is 100 in Los Angeles, Chicago, Washington, DC, and Atlanta – i.e., the cities constitute integrated labor markets; New York City at 89 percent is the only metropolitan area with a lower than full percentage. The high access despite the well-known sprawl of these cities is due to the combination of high-speed public transit (NYC, DC, Chicago) or reliance on the personal automobile for commuting (LA, Atlanta).[1] The situation is very different in developing countries where both options are lacking.

Estimating the average number of jobs that can be reached by workers in one hour requires sophisticated modeling and a rich source of data. Given data and budgetary constraints, a more readily measurable indicator for the size of a labor market needs to be created. In empirical work, the population that can access a particular node in the city within a one-hour commute is often used as an adequate proxy of the effective size of a labor market. This was measure used to estimate the increase in the effective size of labor markets in cities in the Yangtze River Delta (Chreod 2007) as shown in table 1.2.1. In Shanghai, the node chosen was the port.

[1] It is a separate issue as to which option is more cost-effective or environmentally sustainable.

Locations	1990				2007				Percentage Change 1990 – 2007			
	1 hour drive-time		2 hour drive-time		1 hour drive-time		2 hour drive-time		1 hour drive-time		2 hour drive-time	
	area km^2	pop (m)	area km^2	pop (m)	area km^2	pop (m)	area km^2	pop (m)	area km^2	pop (m)	area km^2	pop (m)
Strategic Locations in Shanghai												
Waigaoqao Port	630	4.13	2706	10.55	2422	12.31	11468	23.5	284	198	324	123
Strategic Locations in Jiangsu												
Kunshan	899	1.03	5590	13.72	2994	5.69	17503	31.67	233	452	213	131
Suzhuo	955	2.04	5226	7.5	2991	4.55	20973	34.79	213	123	301	364
Strategic Locations in Zhejiang												
Hangzhou	935	3.44	5851	6.91	1735	3.73	13356	13.91	86	8	128	101
Jiaxing	1373	1.74	6421	6.5	2873	3.23	19430	32.23	109	86	203	396

Table 1.2-1: Changes in one- and two-hour drive times in selected cities in Yangtze Delta Megalopolis 1990-2007 (area in square kilometers; population in millions) – *Source: Chreod (2007)*

The same study also shows how the population within a one-hour circle is being used as a planning tool and investment guideline in China, its key advantage being that it is so easily monitored. More recently the city of Chongqing in China has elaborated a development strategy centered round the expansion of the one-hour commute circle over time (Kan 2007).

1.3 CONCLUSIONS FROM LITERATURE REVIEW

The argument that cities are or can be engines of development rests, ceteris paribus, on the premise that labor productivity is positively correlated with the size of the labor market which itself is positively correlated with city size. The positive outcomes are due to the increased density of population, which leads to a higher number of economic interactions per unit of area, a characteristic of well-functioning cities.

It should be equally obvious that the ceteris paribus condition is non-trivial – increased density is accompanied by congestion (as also of pollution which is not considered in the present study) which limits intra-city mobility. Quite clearly, no measure of population alone can serve as a reliable indicator of the size of the labor market without including the effects of speed at which that population can travel. For example, the old walled cities had very high densities but travel was limited by the speed of non-motorized transport. Also, what is needed is a measure of the effective size of a labor market that could be compared across cities after controlling for congestion.

As discussed in the literature review, the simplest, most readily estimated measure of the effective size of a labor market is the one-hour commute circle around an important location in a city. The number of people who can access the node within one hour using the most commonly employed means of public transport serves as a proxy[2] for the effective size of the labor market related to home-to-work travel.[3] The circle delineates the spatial circumference from which it takes exactly one hour to reach the designated node – locations beyond the circumference fall outside the market centered round the selected node, e.g., a port or industrial estate. The measure adjusts for congestion since the more the congestion the smaller would be the number of people who are able to access the node in one hour. This measure has been used successfully in China (Chreod 2007, Kan 2007) both as an indicator of progress and as a planning tool to identify optimal investments and to monitor them easily over time.

Table 1.2.1 in the literature review shows the dramatic changes in the effective size of labor markets, both in area and population, in Shanghai as well as in neighboring smaller cities.

[2] This assumes a uniform relationship between working-age and total population.
[3] The two-hour commute circle is considered appropriate for business-to-business freight transactions.

Looked at on a map, these reveal that some smaller cities have become integrated into the metropolitan labor market, i.e., they are within one-hour travel from Shanghai port. This integration has significant implications for the choice of work and residence locations and thereby for welfare of residents and development prospects of smaller cities.

It should be clarified that the area of a one-hour circle is not the critical dimension; it is the population resident within the circle. Thus extending a rapid transit artery into a very low-density area would increase the area of the one-hour circle but would have a marginal impact on the population resident within it. This would be even more the case if the population in the low-density areas has relocated from the high-density parts of the circle. At best it would have a limited impact on travel speed in the latter but even that cannot be taken for granted if the migrant residents are using automobiles to travel back to work in their previous places of employment. The net effect could well be negative.

The impact would be different if the transit artery, after passing through low-density areas, connects another high-density node to the origin. This is what underground metros and high-speed trains accomplish. For example in China, Beijing and Tianjin, about 140 kilometers apart, are now within a one-hour travel time by high-speed train. By contrast, in Pakistan Rawalpindi and Islamabad, less than 20 kilometers apart, are more than one-hour travel time apart. A faster connection would integrate the Rawalpindi and Islamabad labor markets which are now fragmented. The importance of these caveats will become apparent in the context of labor markets in Lahore city.

The literature review did include a paper (Moretti 2014) stressing, rightly, the fact that productivity and growth effects of labor market size are conditional on initial levels of human capital in the city. “Realizing the productive potential of these cities depends on developing a large mass of skilled workers and firms. This becomes self-sustaining as skilled workers move there as they know there are jobs that are good matches and, similarly, firms move there as they know there is a base of skilled workers. It is also possible for a city to become stuck in a bad equilibrium where there are few jobs and few skilled workers, with little incentive for either firms or workers to move there. This is a primary danger for the cities growing in developing countries, where many may experience urbanization without industrialization.”

This focus on matching skills and jobs seems to imply that the size of the labor market does not matter for unskilled workers. While this may or may not be true, in our study we are

focusing on all workers, not just unskilled workers. We are also putting forth the weak claim that, *ceteris paribus*, while a larger labor market may not be beneficial, it would certainly not make the situation any worse off.

2. INVESTIGATION OF LABOR MARKETS IN THE LAHORE METROPOLITAN REGION

2.1 BACKGROUND

Because of its simplicity, the one-hour commute circle is particularly appropriate for a study aimed not at an academic audience but intended to facilitate engagement with local policymakers and planners. We begin by extending the preliminary analysis conducted for the first research report in this LUMS-IGC series on small cities (Altaf, 2013).

The first report included seven small cities in a 100-mile radius of Lahore (Figure 2.1-1). We now take three of the closer ones, Sheikhupura, Kasur, and Pattoki, to examine in greater detail the integration of their labor markets with that of the metropolis. The connectivity of these cities to Lahore is assessed via the available public transport options affordable to the majority of the working population.

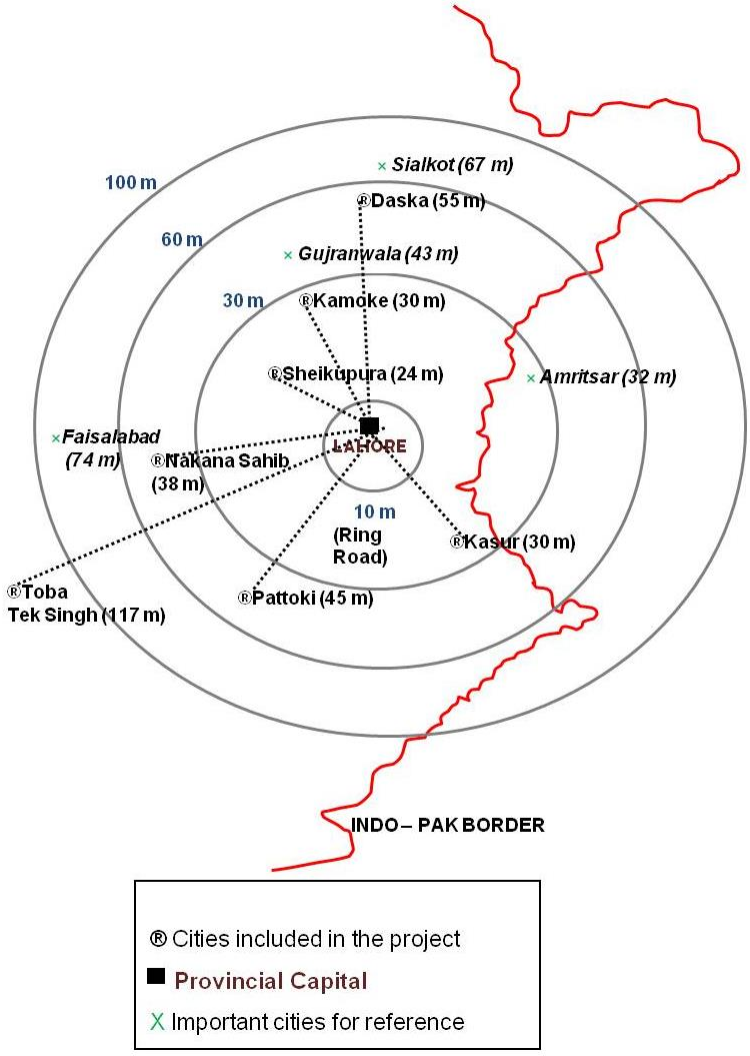

Figure 2.1-1: Orientation of Cities included in the Project

2.2 SHEIKHUPURA

Distance from Lahore: 25 Miles (41.3 Km)

Location: North-West of Lahore

Population: 500,000

Sheikhupura is the most populous and economically prosperous of the cities neighboring Lahore. It has a significant industrial base and also many factories along the road connecting it to the metropolis.

Connectivity of Sheikhupura to Lahore

Sheikhupura and Lahore are connected by public and private bus services. There are frequent departures from bus stations located near the Lahore Railway Station. The Lahore Transport Company (B 21) and Daewoo (Route 53) are two of the main service providers. Besides these, many independent vans and buses depart from the main Laari Adda (General Bus Stand) in Lahore. The relevant details of the two principal bus services are as follows:

Daewoo: Departs every 50 minutes; Fare Rs. 120; Trip time 60 minutes, non-stop

LTC: Departs every 15-20 minutes; Fare Rs. 55; Trip time 70-90 minutes, with stops

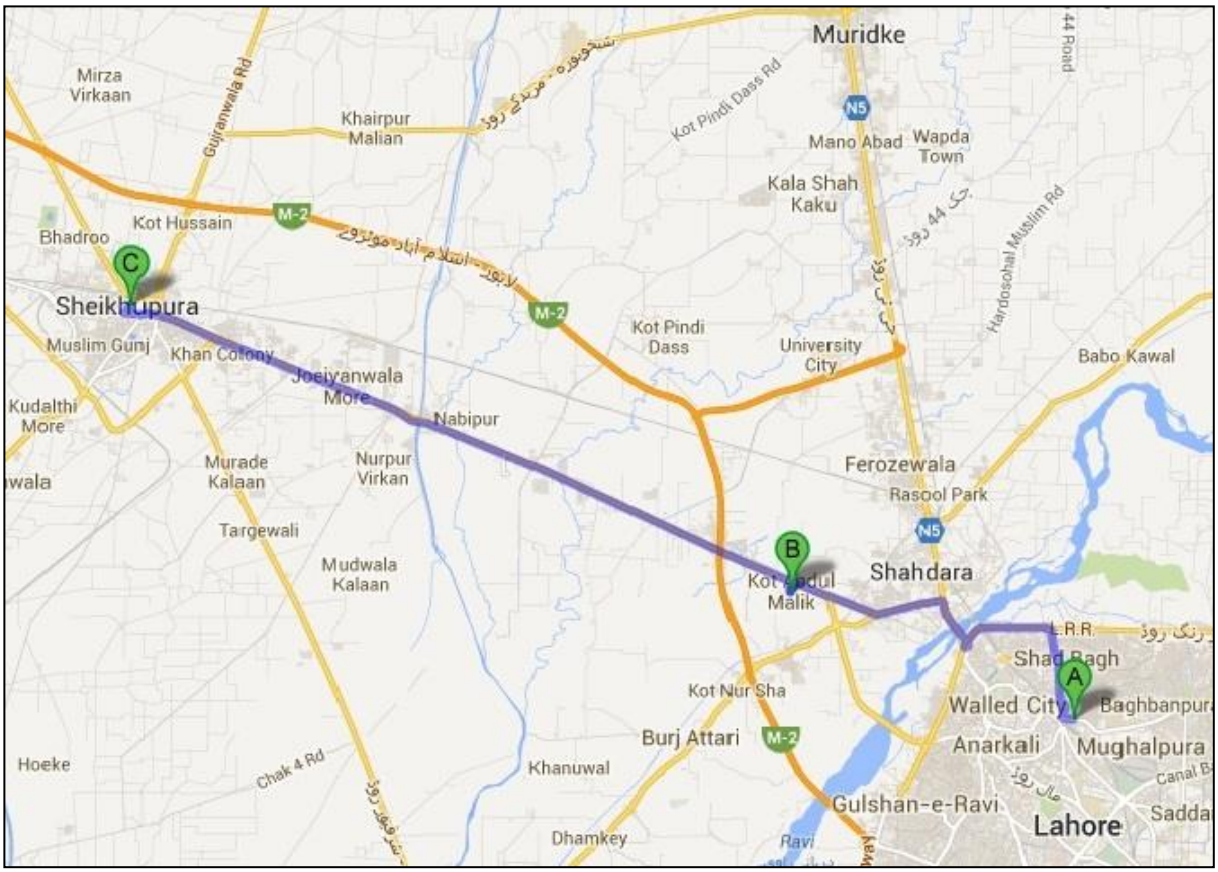

Figure 2.2-1: Lahore-Sheikhupura Route

Summary of Findings

The study estimated off-peak and peak travel times from city-center to city-center using the most cost-efficient travel options. Anarkali was considered the city center in Lahore. From there to the bus terminus at the Lahore Railway Station, the most feasible mode of transport was a Qingqi Rickshaw. From there to Sheikhupura the journey was on the LTC bus.

The following results were obtained for the journey from Lahore to Sheikhupura:

Off-peak hours travel time: 1 hour 37 minutes

Peak-hours travel time: 1 hour 53 minutes

Total cost: Rs. 80

The time and cost breakdowns are presented in the following tables.

Route	Time	Price	Note
Anarkali – Railway Station (Qingqi Rickshaw)	**17 minutes** (07:46 - 08:03)	**Rs. 25**	
Waiting Time at Railway Station - **11 minutes** (08:03 - 08:14)			
Railway Station – Sheikhupura (Batti Chowk) (LTC BUS – B 21)	**69 minutes** (08:14 -09:23)	**Rs. 55**	
LTC Route B21 Stops: Railway Station – General Bus Stand – ShahdaraMorr – Kot Abdul Malik – Qila Sattar Shah – Khanpur Canal – Sheikhupura			

Table 2.2-1: Lahore - Sheikhupura

Total Time Taken: 1 Hour 37 Minutes (97 Minutes) (Add 16 minutes during peak hours)
Total Cost: Rs. 80

Route	Time	Price	Note
Batti Chowk Sheikhupura – Railway Station (LTC Bus – B21)	**91 minutes** (09:49 – 11:20)	**Rs. 55**	
Transition time at Railway Station - **4 Minutes** (11:20 – 11:24)			
Railway Station to Anarkali (Qinqgi Rickshaw)	**18 minutes** (11:24 – 11:42)	**Rs. 25**	

Table 2.2-2: Sheikhupura - Lahore

Total Time Taken: 1 Hour 53 Minutes (113 Minutes)

Total Cost: Rs. 80

Observations

Although there is significant daily traffic on the Sheikhupura-Lahore route, we found it was mostly people commuting to and from factories and smaller towns along the route. Daily commuting between Sheikhupura and Lahore was limited both because of the excessive time

required (close to two hours one-way during peak hours) and the cost (Rs. 80 per day, one-way). An expense of Rs. 4,000 per month (assuming 25 working days per month) would erode the wage differential to be expected from employment in Lahore as compared to Sheikhupura.

Our observations suggest that creating divergences around Yadgaar and Do-Mori Pul to improve traffic flow between Lahore Railway Station and Shahdara could reduce travel time. A non-stop LTC service would further reduce the trip time. Travel time within cities remains a barrier but the cost of travel is the binding constraint standing in the way of the integration of the Sheikhupura and Lahore labor markets.

2.3 KASUR

Distance from Lahore: 30 Miles (48 Km)

Location: South East of Lahore

Population: 400,000

Connectivity of Kasur to Lahore

There is frequent bus service between Lahore and Kasur connecting the Laari Addas (General Bus Stands) in the two cities. The TranBus Company (otherwise referred to as LTC) operates the B51 on this route. Prior to the commencement of the Lahore BRT, the route connected the two Laari Addas but it has now been altered and shortened. The popular route from Lahore now includes riding the BRT to its last stop (Gajju Mata) and then connecting to B51, which makes five further stops on the way to Kasur. This cuts down the travel time through the Lahore city traffic.

The summary of the commute parameters is as follows:

Off-peak hours travel time: 1 hour 16 minutes

Peak-hours travel time: 2 hours

Total cost: Rs. 70

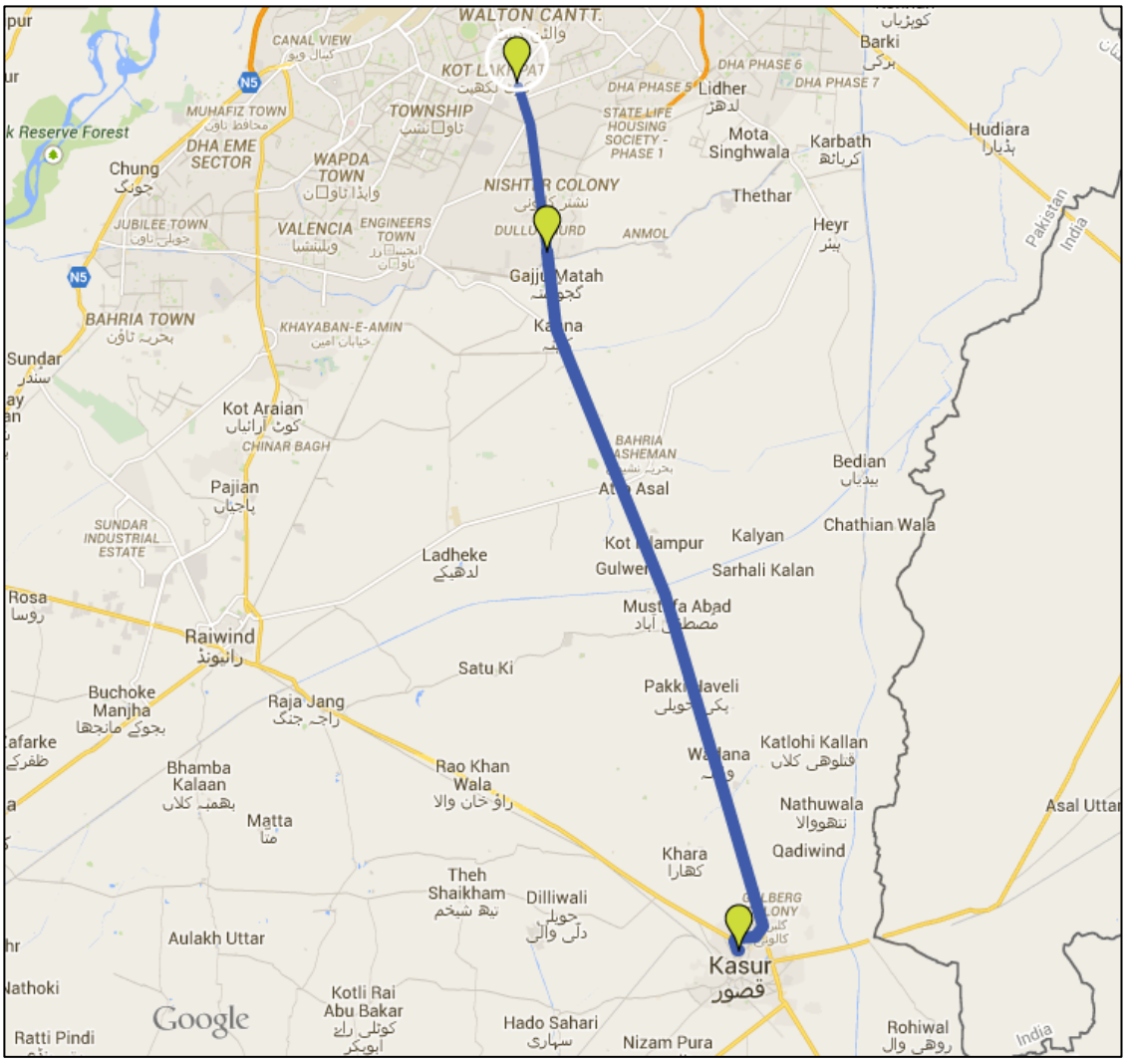

Figure 2.3-1: Lahore - Kasur Route

Summary of Findings

The study estimated off-peak and peak travel times from city-center to city-center using the most cost-efficient travel options. Qainchi was considered the city center in Lahore and Mazar Bulleh Shah in Qasur.

The following results were obtained for the journey from Lahore to Kasur:

Frequency: Every 15 minutes

Off-peak hours travel time: 1 hour 16 minutes

Peak-hours travel time: 1 hour 42 minutes

Total cost: Rs. 70

The time and cost breakdowns are presented in the tables that follow.

Route	Time	Price	Note
Qainchi – Gajjumata (Metro Bus)	**18 minutes** (14:52 – 15:10)	**Rs. 20**	
Waiting Time at Gajjumata for Transbus: **8 minutes** (15:10 - 15:18)			
Gajju Mata – LaariAdda/GTS Kasur	**44 minutes** (15:18 -16:02)	**Rs. 40**	Reached Kasur Steel Bagh in **35 minutes** (15:53)
LaariAdda/GTS Kasur – Near Mazar Bulleh Shah/City Centre (Qingqi)	**6 minutes** (16:02 – 16:08)	**Rs. 10**	

Table 2.3-1: Lahore - Kasur (non-peak hours)

Total Time Taken: 1 Hour 16 Minutes (76 Minutes)

Total Cost: Rs. 70

Route	Time	Price	Note
City Centre Kasur - LaariAdda/GTS Kasur (Qingqi)	**7 minutes** (17:33 – 17:40)	**Rs. 10**	
Waiting Time at LaariAdda/GTS Kasur for Transbus: **12 minutes** (17:40 – 17:52)			
LaariAdda/GTS Kasur - Gajju Mata (TransBus)	**55 minutes** (17:52 – 18:48)	**Rs. 40**	Reached Wadaan in 23 minutes at 18:16 Reached Puraana Kahna in 22 minutes at 18:38
Waiting/Transition Time at Gajju Mata for Metro Bus: **9 Minutes**			
Gajju Mata – Qainchi (Metro Bus)	**19 minutes** (18:57 – 19:16)	**Rs. 20**	
Qainchi – Ichra (Metro Bus)	**18 minutes** (19:16 – 19:34)		

Table 2.3-2: Kasur - Lahore (peak hours)

Total Time Taken: 1 Hour 42 Minutes (102 Minutes) (Kasur City Centre – Qainchi Lahore)

Total Time Taken: 2 Hours (120 Minutes) (Kasur City Centre – Lahore City Centre)

Total Cost: Rs. 70

Observations

It was observed that the difference between peak and off-peak trip times was not due to traffic congestion on the road. The Kasur Road is wide enough to handle the peak-hour traffic. Rather, it was due to the increased number of passengers, which added to the time consumed in ticketing, entry and exit. There is also congestion at the BRT Gajju Mata station where there is only one ticketing booth and no self-service machines resulting in long queues. The buses are generally packed indicating a demand for more frequent service.

Most passengers approached for feedback welcomed the relief provided by the BRT in reducing the trip time within Lahore. It was reported that the Shahdara to Gajju Mata leg was reduced from 90 minutes to 45 minutes at lower cost. Passengers from Kasur expressed satisfaction with TransBus (B51) in particular with it being air-conditioned.

Once again, the length of the commute time (approximately 2 hours during peak times) and the cost (Rs. 70 one way) prevented the integration of the Kasur-Lahore labor markets for employment or educational purposes. However, people from intermediate locations like Kahna are increasingly commuting for work to Lahore as some parts of the latter can be accessed within an hour and the cost via local buses is also lower. If an integration of the Lahore-Kasur labor markets is desired, the feasibility of extending the BRT to Kasur may be considered.

2.4 PATTOKI

Distance from Lahore: 45 Miles (72 Km)

Location: South West of Lahore

Population: 150,000

Connectivity of Pattoki to Lahore

Pattoki is accessed mostly by buses and wagons starting from the Thokar Niaz Baig Bypass in Lahore to the Main Bazar Adda in Pattoki. However, there are no established bus companies operating a regular schedule on this route. Buses and vans depart only when filled to capacity which results in varying waiting times for passengers at the Thokar Bypass. There is a scheduled LTC service from the Lahore Railway Station but this is away from the direction of Pattoki.

Summary of Methodology and Results

The summary of the commute parameters is as follows:

Fare Rs. 140; Trip time 2 hours 34 minutes (off-peak), 2 hours 44 minutes (peak)

The route is shown in the Figure below.

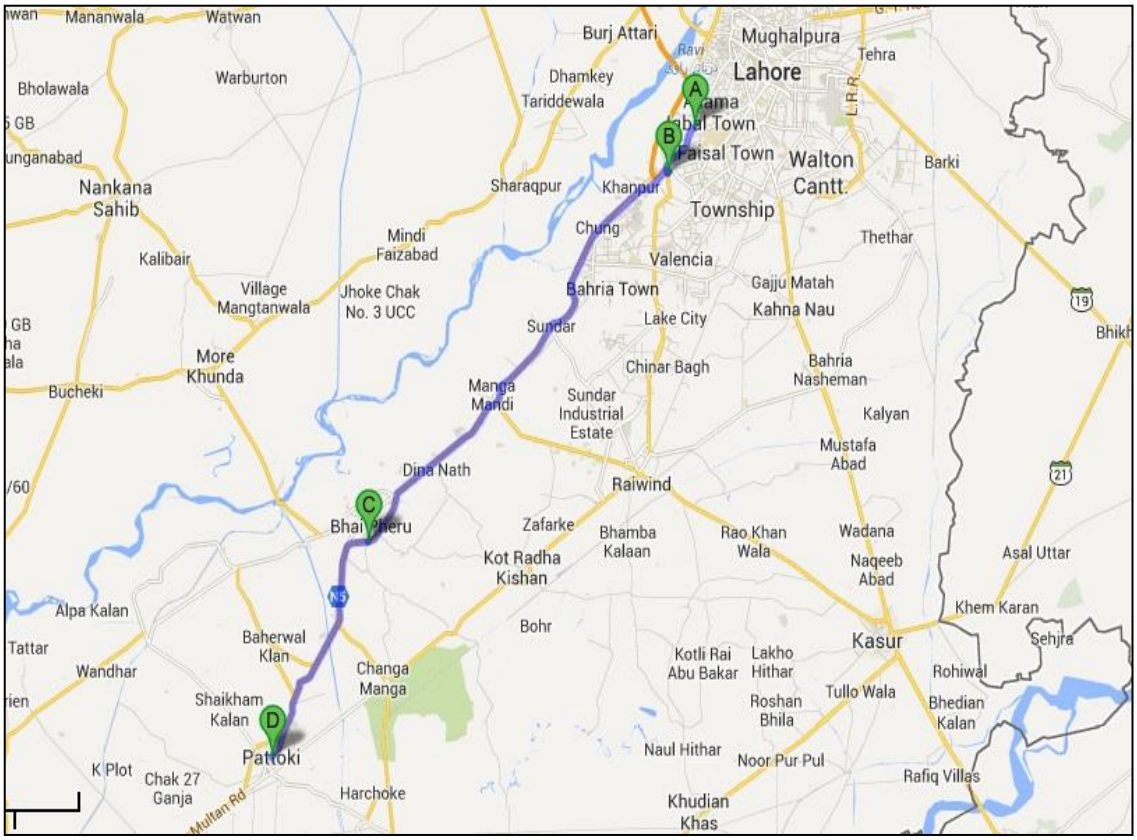

Figure 2.4-1: Lahore - Pattoki Route

The time and cost breakdowns are presented in the tables that follow.

Route	Time	Price	Note
Anarkali – Thokar Bypass (Local Van)	**38 minutes** (14:01 – 14:39)	**Rs. 40**	Reached Awan Town in 22 minutes at 14:22
Waiting Time at Thokar Bypass - **22 minutes**			
Thokar Bypass - Pattoki Main Bazar	**127 minutes** (15:01 – 17:08)	**Rs. 100**	Thokar Bypass - BhaiPheru Bypass: 40 minutes (plus 33 minutes lost in bus breakdown) BhaiPheru - Malan Wala: 32 minutes Malan Wala - Main Bazar Pattoki: 22 minutes

Table 2.4-1: Lahore - Pattoki (non-peak hours)

Total Time Taken: 3 hours 07 minutes (187 minutes)

Total Time Taken (less time lost due to bus break down): 2 hours 34 minutes (154 minutes)

Total Cost: Rs. 140

Route	Time	Price	Note
Pattoki Main Bazar - Thokar Bypass	**81 minutes** (17:47 - 19:08)	**Rs. 80**	
Waiting time at Thokar Bypass - **6 Minutes** (19:08 – 19:14)			
Thokar Bypass to Thokar Niaz Beg	**14 minutes** (19:14 -19:28)	**Rs. 10**	
Thokar Adda to Anarkali	**63 minutes** (19:28 – 20:31)	**Rs. 40**	

Table 2.4-2: Pattoki - Lahore (peak hours)

Total Time Taken: 2 hours 44 minutes (164 minutes) (Pattoki Main Bazar – Anarkali Lahore)

Total Cost: Rs. 130

Observations

For purposes of this study, a local wagon was used to get to the Thokar Bypass from where another van was boarded for Pattoki. This was preferred to the bus which charges Rs. 10 less but is much slower because of unscheduled stops to pick up passengers along the route. Neither the buses nor the vans are air-conditioned.

Both travel time and cost suggest that Pattoki is unlikely to be integrated into the Lahore labor market for purposes of employment although various efficiencies could reduce the travel time to some extent. It is worth noting that a major component of the commute time is within Lahore city.

2.5 CONCLUSIONS

Using the one-hour commute circle as the indicator of choice, the study findings suggest that the labor markets of none of the cities included in the analysis are integrated with the labor markets of Lahore. This is true even for Sheikhupura which, at a distance of 24 miles, is very close to the metropolis.

The economic and social benefits of integrated labor markets are well recognized at the conceptual level. At the minimum, workers can live in the less expensive location and commute to work in the metropolis. The relocation of relatively affluent workers to the smaller city then provides the dynamic for the growth of services boosting the local economy. The case of suburbs surrounding major cities linked by good metro systems in the US is a relevant example. Almost all cities at a 30 mile distance from the metropolitan center are linked to it either by metro or the private automobile which is available to and affordable for the majority. These then constitute integrated labor markets deriving the benefits mentioned earlier.

The lack of integration presents a special conundrum for nearby cities in Pakistan. While the benefits of daily commuting are ruled out, these cities are close enough for frequent occasional trips to the metropolis. Thus, while the lower income groups cannot benefit from an integrated labor market, the affluent spend all their discretionary income in the metropolis squeezing the economic development of the satellite city from both ends. This can be imagined as the flip side of the phenomenon that hit the American inner cities at the time of suburbanization – they were left as pockets of poverty with the flight of purchasing power to the peripheries.

The relevant analytical question that arises from these findings is whether investments to integrate these labor markets are warranted. Our preliminary findings suggest that the relevant variable would be travel cost rather than travel time. At existing levels of per capita income, the incremental gains from employment in the metropolis would not outweigh the incremental increase in travel costs. A more detailed study is needed to determine if potential social welfare gains might be large enough to warrant a subsidy for faster commuter services.

Notwithstanding the above, the study shows that a significant proportion of the commuting time is consumed within Lahore. Therefore, any investments to increase the speed of public

transport within the city, which might have stronger economic justification, would help the integration of the metropolitan labor markets. Thus, a focus on Lahore should have a higher priority than on faster inter-city links, as it would serve both purposes at the same time.

Our fieldwork suggests that low-cost improvements from strategic traffic divergences and operation of non-stop buses would also reduce commuting time. Much more importantly, our discussions with railway officials suggest that faster and more reliable commuter rail services with existing infrastructure are a feasible proposition. It is ironic that commuter trains that were operational in the past have fallen into disuse because of their lack of reliability. A feasibility analysis of the rail option should be high on the priority list and could radically alter the conclusions offered above.

While the three cities considered in this study fall outside the one-hour commute circle, all of them can be made to fall within the two-hour commute circle, which is considered the relevant indicator for business-to-business interactions. With the appropriate measures, a number of functions and processes currently being undertaken in-house by firms in Lahore can be outsourced to subsidiaries or vendors in nearby cities. This pattern was observed in Shanghai when its two-hour circle incorporated nearby cities. The most important element in such relocation is the security of investment (including investment in land) in the small cities and this is something that only the provincial or municipal governments can ensure. Transparency in land policy and minimizing the risks of outsourcing fall out as important issues to consider if metropolitan economic growth is to be promoted.

3. EFFECTIVE SIZE OF LABOR MARKETS IN LAHORE

3.1 ESTIMATION OF THE SIZE OF LABOR MARKETS IN LAHORE

Having established that the labor markets of nearby cities are not integrated with that of the metropolis and that congestion within Lahore is a significant contributory factor, it is natural to turn to an examination of the labor market of the city itself. We hypothesize that the labor market of the city is also not integrated. We know from experience that the offer of a better paying job in another part of the city has to be declined often for reasons of accessibility. Availing the opportunity requires shifting residence closer to the offered job, i.e., moving, as if, to a new city. Thus we start with an educated guess that Lahore does not comprise one labor market and aim to confirm that empirically with the help of the one-hour commute circle, the simple measure of the size of an effective labor market.

For this study we have identified four key locations in the city to represent centers of services and industry and low- and middle-income residential areas. The objective is to construct one-hour commute circles around these points at peak hours using the most commonly employed and least expensive public transport options accessible to the majority of workers who do not own private means of transport (JICA, 2011).

Two methods were used to construct the one-hour commute circles. In the first, we employed field workers to simulate the commutes from each location in every direction possible using GPS-equipped phones to mark the 15, 30, 45, and 60 minute grid-lines along their routes. These would be home-to-work commutes for the residential nodes and work-to-home commutes for the employment nodes. The data enabled construction of the commute circles and also identification of the location of choke points along the various routes, which would help plan for transport management and identification of future infrastructure investments. The populations inside the commute circles were estimated using extrapolated census data within boundaries of the Union Councils obtained from the Urban Unit.

It should be kept in mind that the last population census for Pakistan was conducted in 1998. Population projections used in this study are those employed by international agencies. For UCs that only fall partly inside the commute-circle boundaries, populations were estimated by dividing each UC into ten parts and prorating its total population in accordance with density estimates derived from satellite observations. Precise population estimates are not needed for the limited purpose of demonstrating that the Lahore labor marketed is fragmented. The UC density profile is shown in Figure 3.1-1.

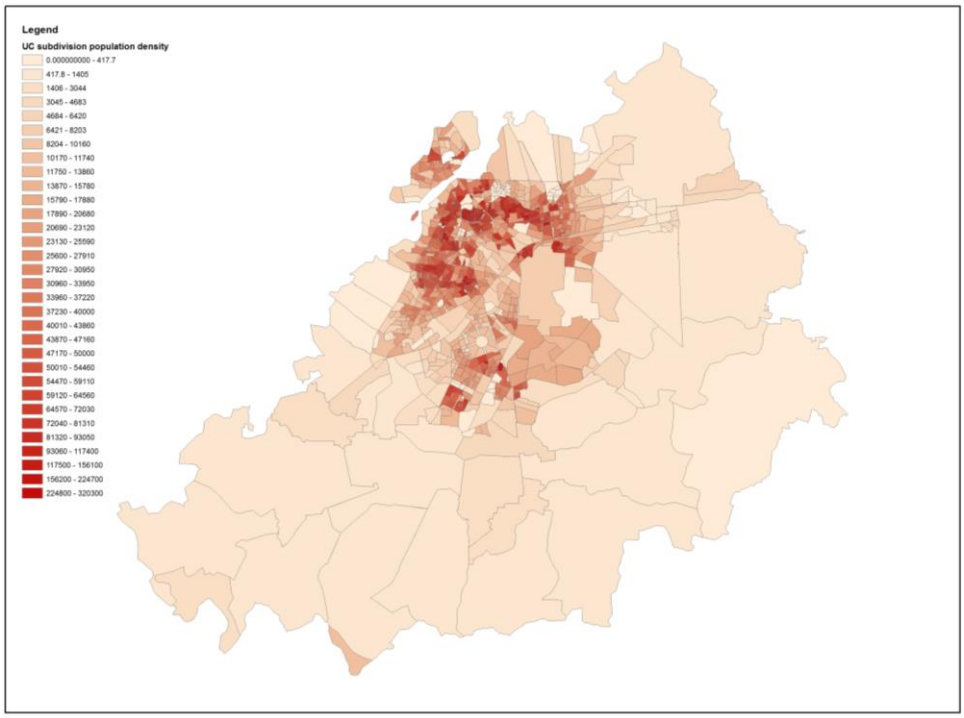

Figure 3.1-1: UC Population Density - Lahore (courtesy TPI)

The sides of the resulting polygons of the one-hour circles, obtained by joining adjacent end-points of the roads traversed, are necessarily approximations since there is no guarantee that there is an actual road to be travelled to any of the intermediate points on any side of the polygon. Thus we expect that the estimated population over-estimates the actual population of the commute circle.

To overcome this limitation an independent delineation of the commute circles was made using GIS technology. Using Google Earth it is possible to identify the road network around any of our nodes as well as the designated categories of the various roads. The speed norm for automobiles on various types of roads was used to estimate the distance that could be travelled by car along each of these roads assuming no congestion but calibrating for the fact that public transport is not non-stop and is required to halt at designated places. Where no roads existed, the speed of walking was used instead.

This independent estimation corrects for the absence of roads in all directions but ignores congestion. It therefore shows how far the commute circles can extend if congestion problems are relieved. It is reassuring to see that the commute circles obtained using the two methods are fairly similar in shape and size. Both versions would be displayed for each of the four nodes selected for this study.

The four locations selected as nodal points in Lahore were the following:

- General Post Office (GPO) on Mall Road (Service Employment Hub)
- Kot Lakhpat Industrial Estate at the intersection of Maulana Shaukat Ali Road and PECO Road (Industrial Employment Hub)
- A point near Shalimar Garden in Baghbanpura (Low-Income Residential Hub)
- The intersection of Multan Road and Main Boulevard at Scheme Morr (Middle-Income Residential Hub)

These four locations yield a good cross-section of the economic geography of Lahore City. We can estimate the size of the labor pool available to the major service and industrial employers as well as the extent of the job market accessible to residents of the dense low- and middle-income housing areas in the city. While these areas may not be completely representative of their category types they can yield sufficiently illustrative results useful for understanding and planning.

The locations of these four points are displayed on the following map of Lahore city (Fig 3.1-2). The line in black marks the route of the BRT; four additional nodes used for the impact analysis of the BRT are also shown on the map.

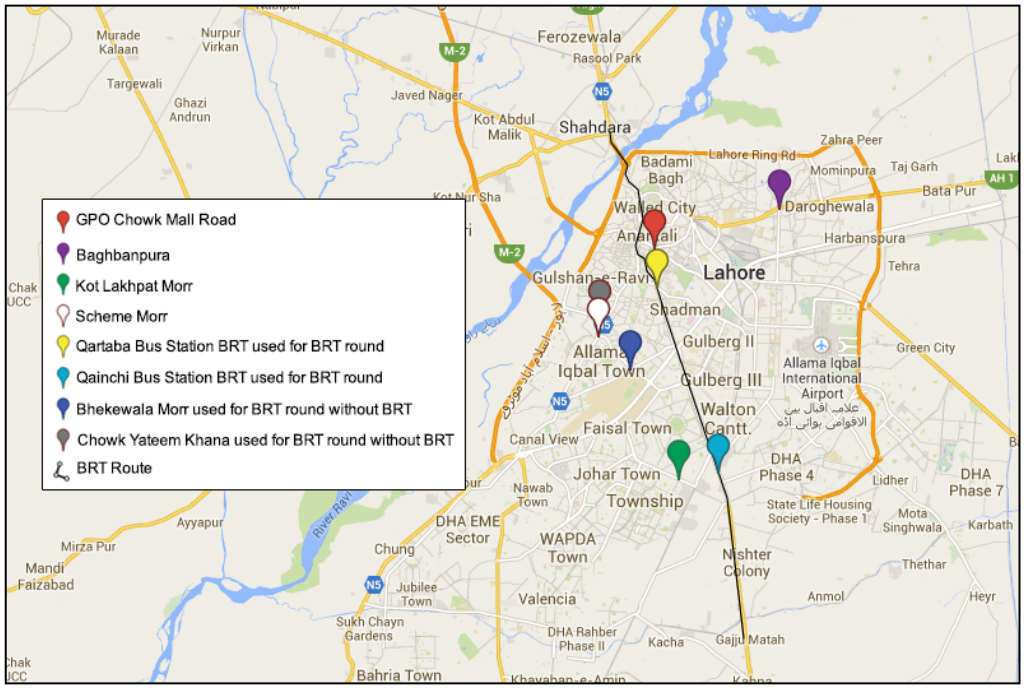

Figure 3.1-2: Study Nodes and BRT Route

3.2 STUDY FINDINGS

3.2.1 GPO

The GPO, a landmark site on the Mall Road and the center of one of the densest commercial and service employment areas in the city, is linked via a rich network of road and transport facilities. Ease of access varies by direction: In general, locations to the east and south are more accessible than those to the west and north which are quite squeezed. The schematic with the 15, 30, 45, and 60-minute gridlines around GPO shown below depicts this asymmetry very clearly.

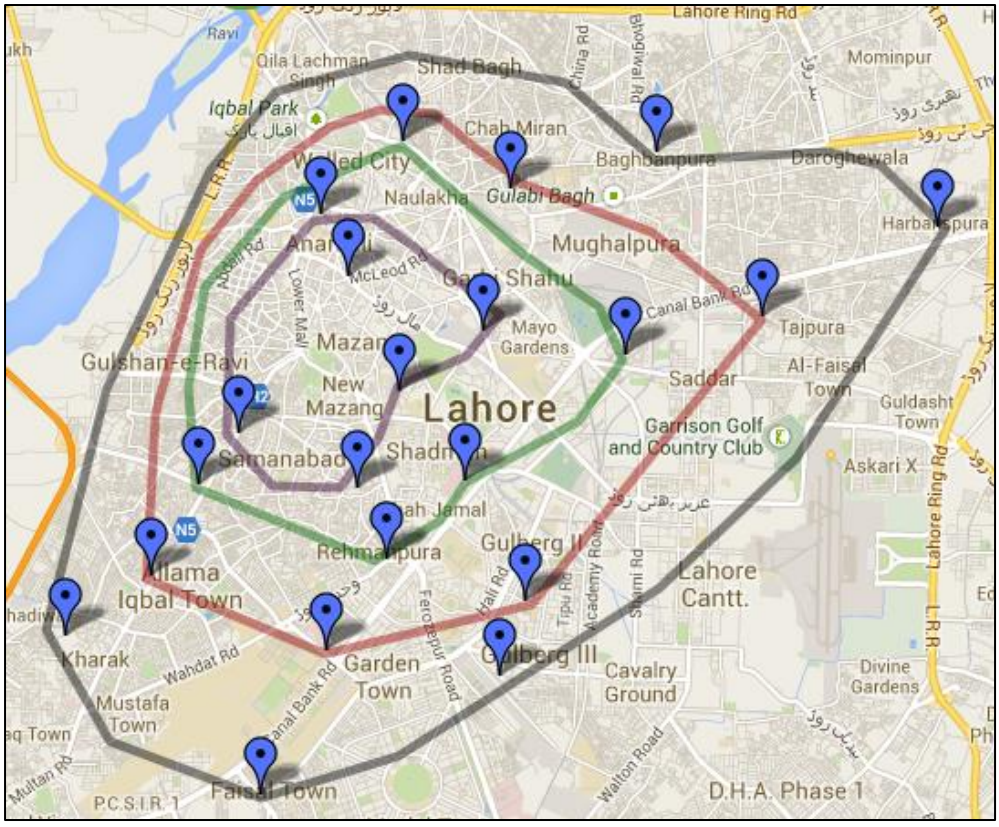

Figure 3.2-1: Travel-circles around GPO at each 15-minute interval

The population residing in this one-hour commute circle is of the order of 4 million, i.e., slightly less than half the population of Lahore can be considered to have access to this labor market.

The Mall Road, Canal Bank Road, Ferozepur Road, and GT Road connect GPO to other areas in the city. The Canal Bank Road, a three-lane divided road stretching alongside the banks of the Lahore Canal and passing through Harbanspura, Mughalpura, Gulberg, University of Punjab, and Thokar Niaz Beg, is the principal artery facilitating access to the

east and south. With many educational and health institutions located along the canal and by virtue of it being an important inlet for traffic from outside the city, the government has invested heavily in remodeling and widening the artery and linking it to other roads. With the construction of strategically located underpasses and flyovers, the Canal Bank Road has been converted into a signal-free highway greatly increasing travel speed.

Ferozepur Road, running between Chungi Amer Sidhu and Kalma Chowk, also plays an important role in making areas in the south more accessible and facilitating important localities such as Model Town, Shadman, Ichhara, Mozang, GajjuMatta, Wahdat Colony, and Gulberg, amongst others.

However, it is not these roads alone that ease access towards the south and east. As can be seen on the population density map in Figure 3.1-1 earlier, these regions have a much lower population density than regions in the other directions in which congestion restricts accessibility despite the existence of roads and public transport. This density profile will be relevant when the impact of road investments in Lahore is discussed later.

The old walled city of Lahore, north of the GPO, is the densest part of the city – aggregation of Union Council data suggests that 10 percent of the area of Lahore radiating outward from the old city houses 60 percent of the city's population. A large proportion of the trips within the city either originates from this dense area or is directed there and it is this area where a significant proportion of the Lahore's economic activity takes place. Here traffic management, more than infrastructure investments, holds the keys to increased access.

To understand the problems of traffic congestion, we need to analyze the daily commute in this region in more detail. People residing close to the center, i.e., areas such as the Data Darbar, Shalimar Town, and Ravi Town, mostly belong to low- and middle-income households. They choose to live in this high-density area because of its proximity to the work place. Even when they relocate, most stay within commuting distance in the area or move to the proximate outskirts. Other than walking, these people mostly commute using motorcycles, bicycles, public buses, and wagons.

Many people living further out, in areas such as Gulberg and Cantonment, are also employed in the GPO cluster. These are mostly high-income earners who can afford private cars. The proportion of such people is increasing with affluent people choosing to relocate from the center to upscale areas further out. Over the last ten years, high-income households who have

chosen to relocate, unlike the aforementioned low/middle income households, have moved to Model Town, DHA, Johar Town, and now even farther away to EME and Bahria Town. Each day, cars from these areas carrying to work this upwardly mobile group enter the city center with serious consequences for congestion especially because commensurate infrastructure investments in the center are either not possible because of density or have not kept up with the needs.

The presence of an increased number of private cars is the main factor responsible for congestion simply because they are an inefficient means of urban transport with the highest road space per passenger ratio as well as consuming space for parking. The congestion is worsened because of the modal mix of traffic in the area – motorbikes, rickshaws, carts, bicycles, *tongas*, and pedestrians move alongside private cars and public buses at very dissimilar speeds thereby hampering a smooth flow of traffic. The problems are exacerbated by multiple unauthorized stops for vans and outages of traffic lights.

Anarkali, Sunday Bazaar, and Food Street in the vicinity add to the area's centrality as a commercial hub. People approach this area not only as a part of their daily commute for work but also for the purchase of numerous items sold in the market usually at a cheaper price due to greater competition between shops located close together. The roads in this commercial area are extremely narrow and the absence of service lanes limits parking space resulting in road encroachment that further hampers the flow of traffic.

Traffic blockage is a common phenomenon for the inhabitants and commuters of this area. Haphazard and disorganized lanes, narrow roads, overwhelming numbers of vehicles, modal mix, and lack of implementation of traffic laws are factors that drastically impair mobility in the region. Structural improvements alone have failed to solve the problems of traffic and congestion in the area which has very poor urban traffic management. The low average speed due to blockages reduces the geographical extent of the one-hour circle in this area.

Similar problems of congestion are found in Islampura, the region west of the GPO. Towards the south and east there is less congestion and greater accessibility. The one-hour circle stretches further but the impact on the size of the labor market is not commensurate because of the lower population density. Using census maps and GIS techniques, the population resident in the GPO one-hour commute circle is estimated to be around 4 million which is less than half the estimated population of Lahore city. The GPO cluster constitutes the largest labor market in the city but does not contain the population of the entire city. This establishes

clearly that Lahore city cannot be considered a unified labor market, which is something we wanted to confirm with this study.

Figure 3.2-2: A typical traffic jam at peak hours

The GIS derived commute circles for GPO are shown in Fig 3.2-3 superimposed on the polygons constructed on the basis of fieldwork. The impacts of congestion, lower traffic speeds and reduce mobility are starkly obvious by the divergences between the two overlays especially towards the north.

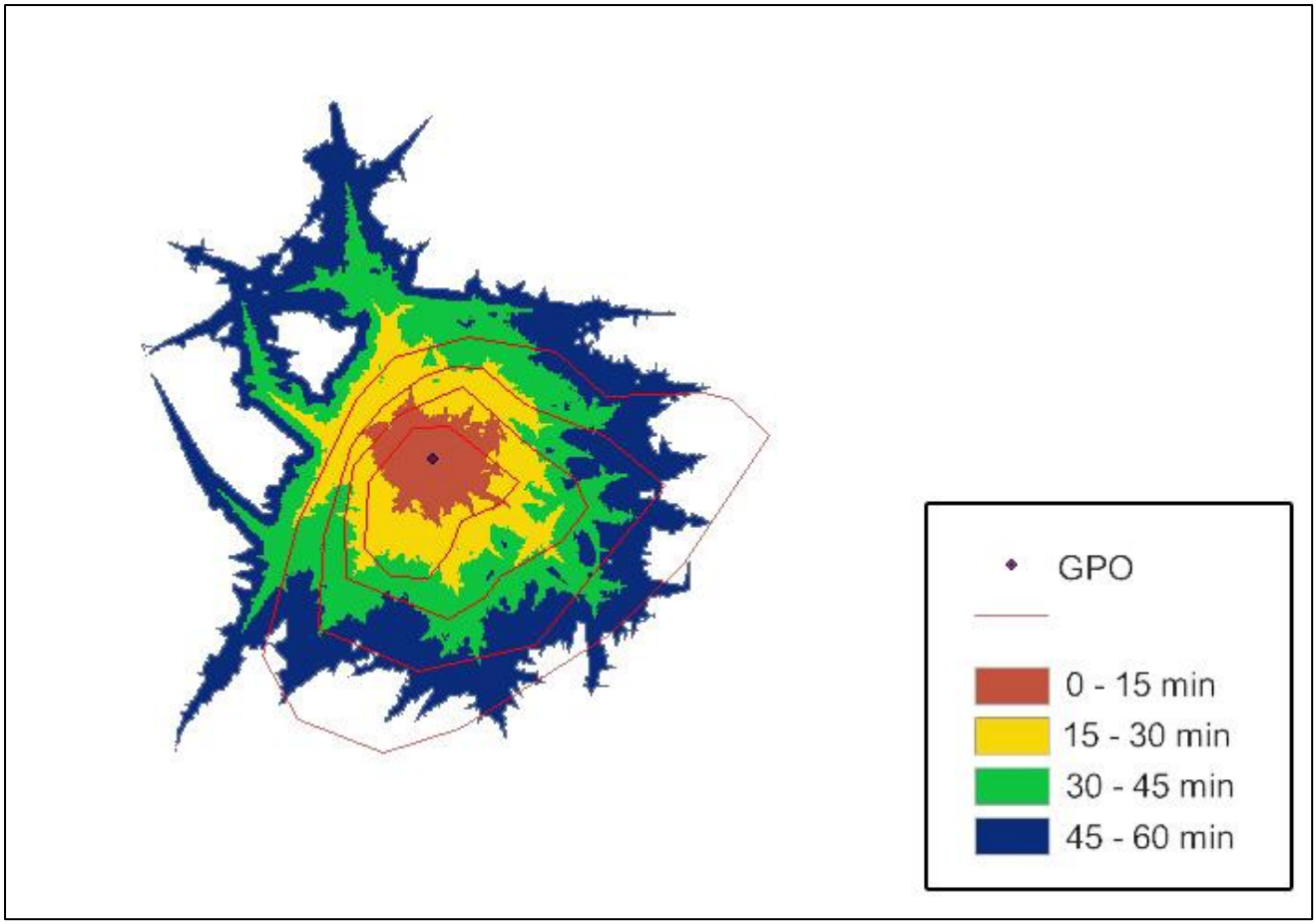

Figure 3.2-3: Circles around GPO after each 15-minute interval

3.2.2 KOT LAKHPAT

With the Quaid-e-Azam Industrial Estate located in the area, Kot Lakhpat is one of the most important industrial hubs of the city. Spread over 556 acres, the industrial estate employs over 50,000 workers. It is bordered by the Defense Housing Authority to the east and Township to the west and has many residential colonies and towns surrounding it such as the Johar Town, Walton Town, Green Town, and others.

Unlike the GPO, the one-hour commute circle around Kot Lakhpat is less skewed with just one outlier along the Ferozepur Road to the south which extends to Elite Town. The centrality of the Ferozepur Road artery in connecting different areas of Lahore has already been discussed. In Kot Lakhpat, feeder roads like Defense Road and Kahna Kacha Road add to its advantage. It should be noted that areas south of Kot Lakhpat are of low density accommodating comparatively new towns and residential colonies. Most of these lie beyond

the reach of low- and middle-income households which comprise three-quarters of Lahore's population. Once again, the affluent low-density parts are better connected in this circle.

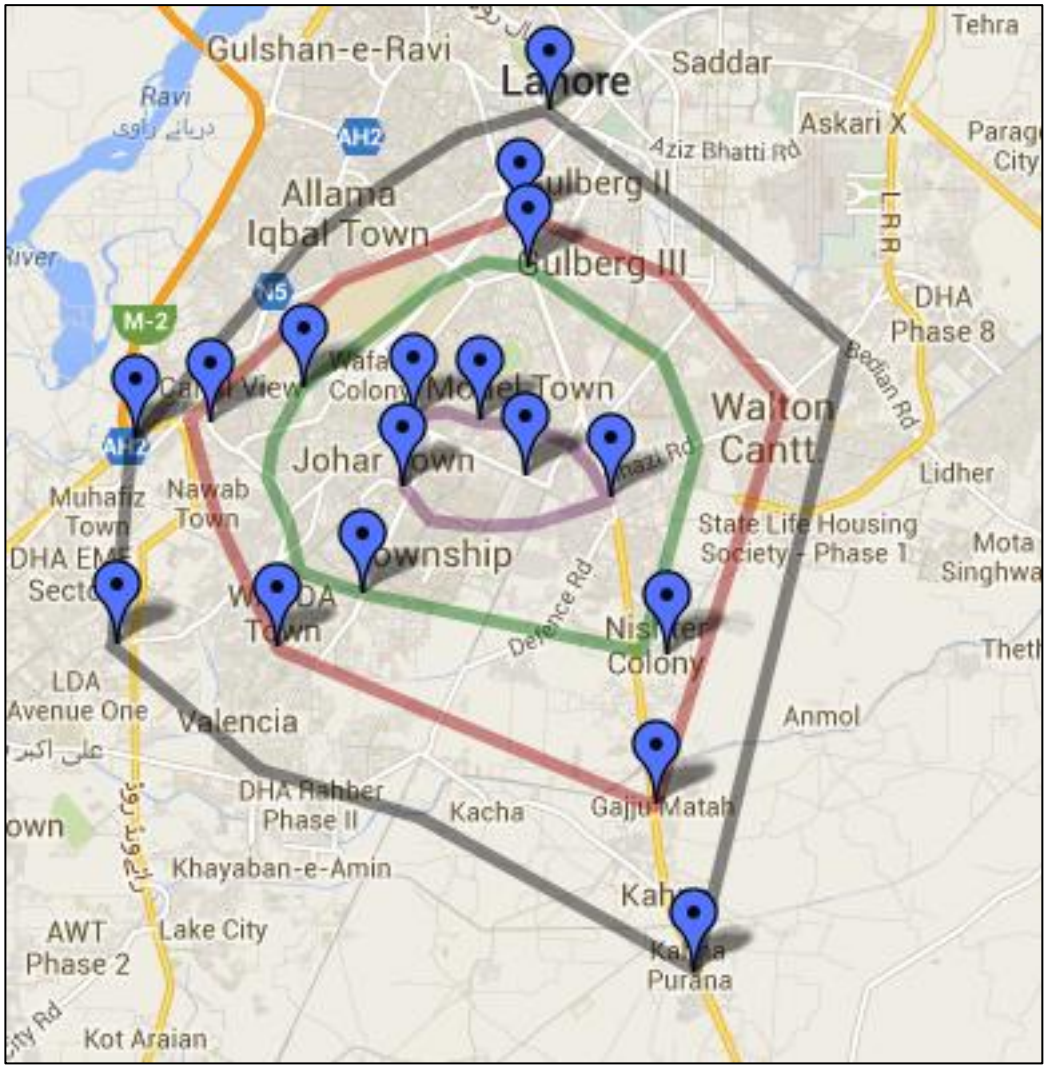

Figure 3.2-4: Travel-circles around Kot Lakhpat at 15-minute intervals

However, unlike the GPO there is less congestion in general in Kot Lakhpat. The Thokar-Raiwind Road bus stop in the East, Punjab Institute of Cardiology in the north, and Ghazi Road-Bedian Road intersection in the west are the outer limits of the one-hour commute circle. The primary Canal Bank Road and Ferozepur Road arteries coupled with good secondary and tertiary roads facilitate accessibility. Therefore, the land area covered by the one-hour commute circle is larger than GPO although the population it contains is smaller. Our estimate of the population is 2 million, about a fifth of Lahore's population, which constitutes a very small labor pool for the biggest industrial area in the city.

The economic implication is obvious. If an individual living in a non-overlapping labor market were to be offered a higher-paying job in Kot Lakhpat, he/she would have to decline or migrate as if to a neighboring town. However, there is no guarantee that affordable housing would be available to benefit from the higher pay. The strategic imperative follows from this observation. A focus on economic growth via expanded labor markets requires the location of affordable low-income housing within the one-hour commute circle more so than expanding the size of the circle itself.

The GIS derived commute circles for Kot Lakhpat are shown below superimposed on the polygons constructed on the basis of fieldwork. The impacts of congestion are much less marked compared to the GPO.

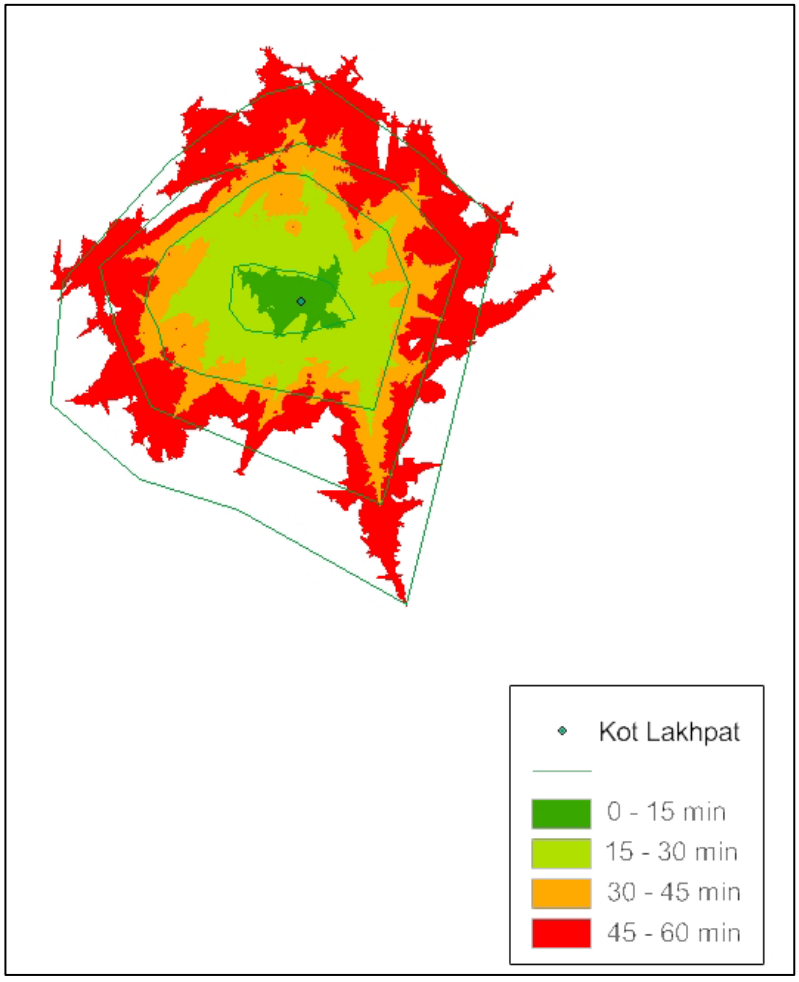

Figure 3.2-5: Circles around Kot Lakhpat at each 15-minute interval

3.2.3 BAGHBANPURA

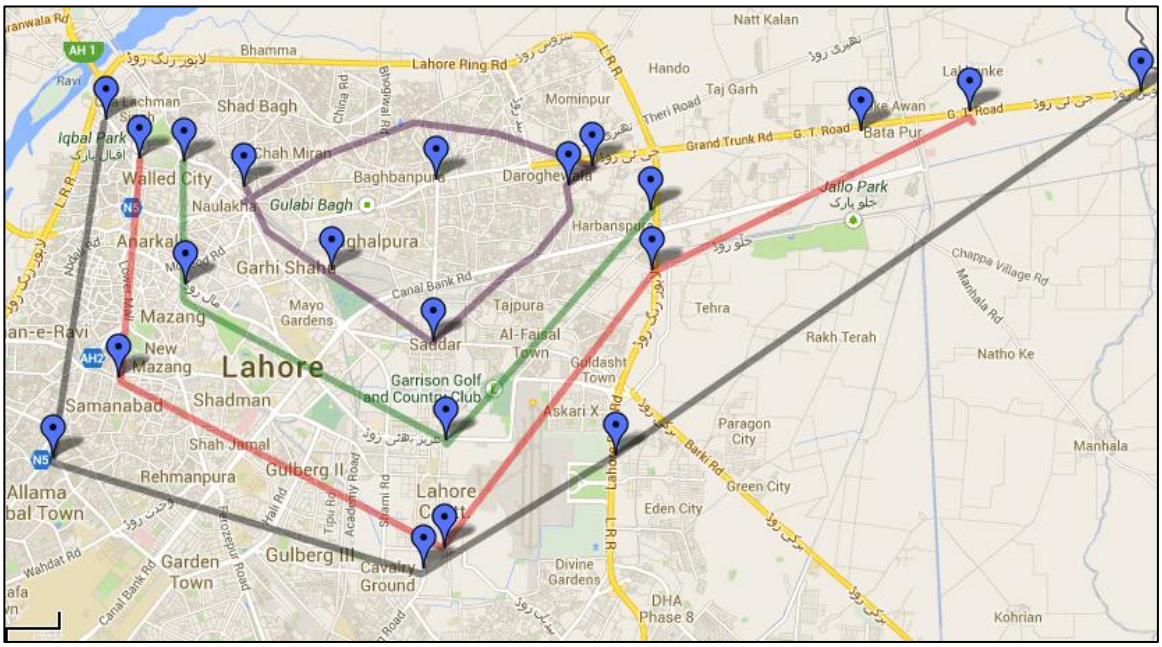

Figure 3.2-6: Travel-circles around Baghbanpura at 15-minute intervals

The Shalimar Garden bus stop was selected as the nodal point for the study in Baghbanpura, which is located close to the northern limit of Lahore city. For this reason the analysis in the northerly direction was restricted to the 15-minute interval.

Baghbanpura is a mixed-use locality and most people live and work there. When people relocate they move further out while remaining within the one-hour circle. JICA data shows that over the last decade one-third of low-income households have changed residences (2011).

With Gawalmandi, Naulakha, Mughalpura, Saddar, and Anarkali in close proximity, this area has territorial links with some of the busiest commercial and residential parts of Lahore. Being located on the Grand Trunk Road, it is served along the east-west axis by one of the most prominent roads not only of Lahore but also Pakistan. Therefore within the 15-minute circle the distance covered to the east and west is approximately the same. The western limit is marked by the Circular Road and the eastern a little beyond the Jamia Masjid Anwar-e-Madina. However, outside the 15-minute circle the west (approaching the old city) is much more congested than the east (leaving Lahore along the GT Road) and this is reflected in the shape of the 45-minute and one-hour circles.

The GT Road passes through many major cities of Pakistan including Lahore to continue beyond the national border into India. The volunteers for this study reached close to the national border within the one-hour limit using the GT Road. This was clearly an outlier in the otherwise more or less uniformly accessible area around the nodal point in Baghbanpura.

To the south of Baghbanpura, the circle expands to access Mughalpura and Saddar leading into Lahore Cantonment adjacent to Gulberg. The total population residing within the one-hour commute circle is about 3 million – approximately one-third the population of the city. With Gulberg, Anarkali, Gawalmandi, and Shadman falling within the circle, people residing in this area have access to diverse job opportunities. This access is limited by the congestion in the densely populated regions of Mughalpura and Baghbanpura where travel speed falls significantly. Thus the strategic imperatives in this area are two-fold: first, to improve traffic management in the dense mixed residential and commercial areas and, second, to explore the possibility of small-scale industrial job creation along the GT Road towards the west.

The GIS derived commute circles for Baghbanpura are shown in Fig 3.2-7 superimposed on the polygons constructed on the basis of fieldwork.

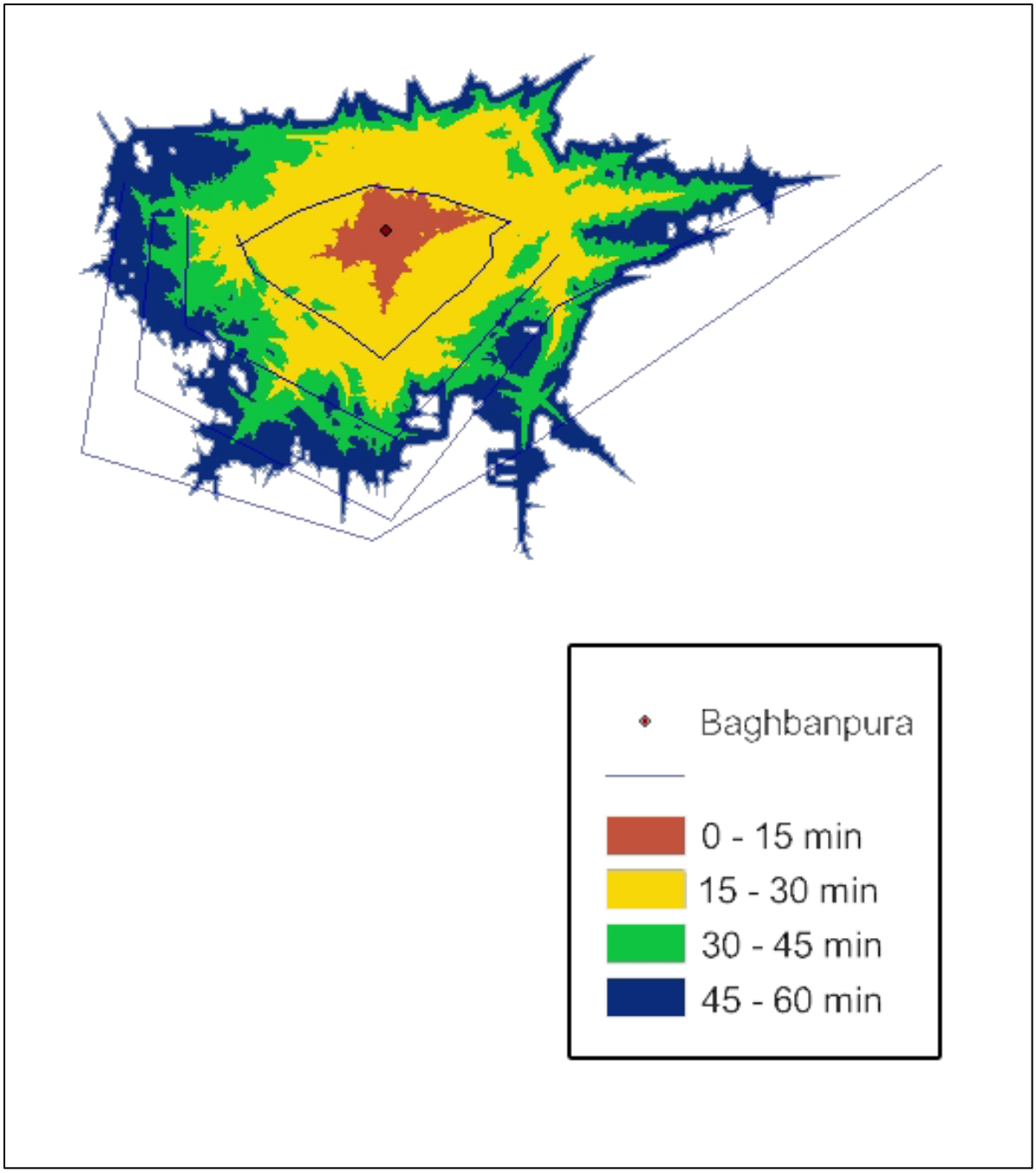

Figure 3.2-7: Travel-circles around Baghbanpura at 15-minute intervals

3.2.4 SCHEME MORR

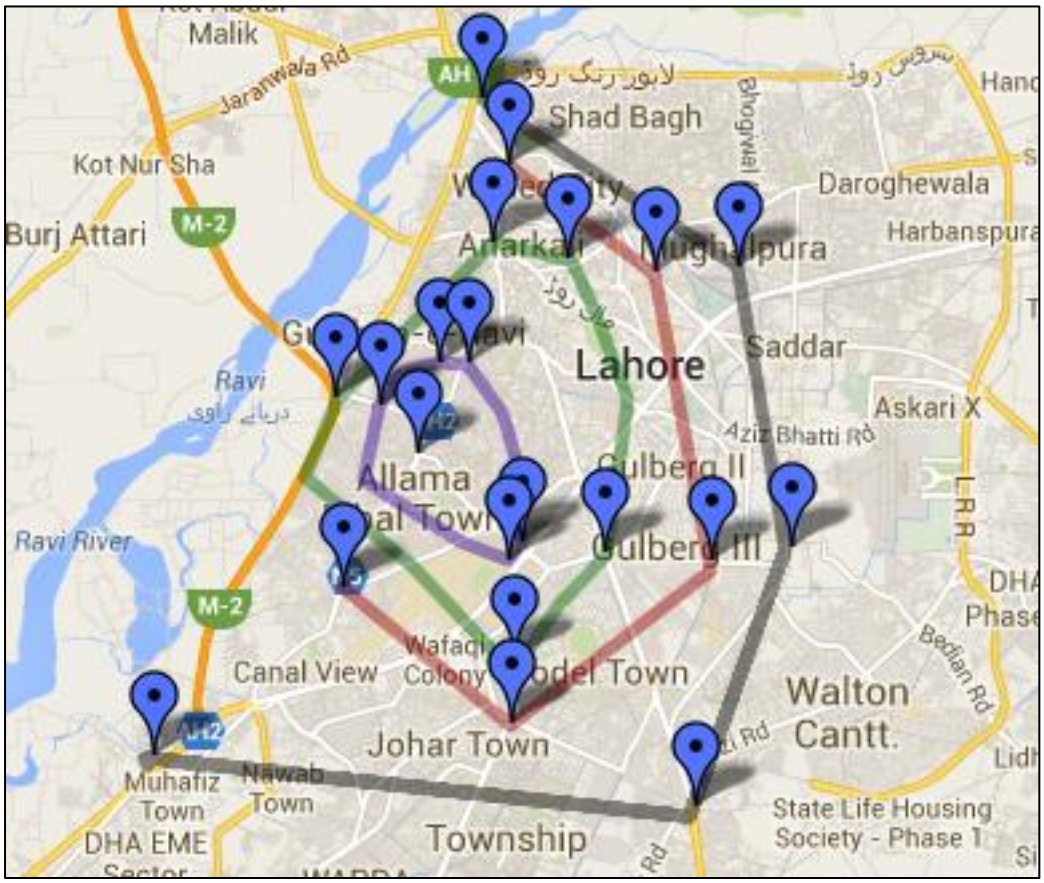

Figure 3.2-8: Travel-circles around Scheme Morr at 15-minute intervals

Scheme Morr is the intersection of Multan Road and Main Boulevard near Iqbal town, an important middle-income residential area in southwestern Lahore with limits demarcated by Multan Road to the west and north and Wahdat Road to the south. Since the starting point is close to the western border of the city, field workers discontinued the simulated commute to the west at the 30-minute interval.

The one-hour commute perimeter is roughly semi-circular in shape as the limits reached towards the north, south, and east are approximately equidistant from the origin. However, the same cannot be said of the 15-minute, 30-minute and 45-minute boundaries. Hence, even though at the end of the one-hour mark they approximately cover the same distance, no matter what the direction, the journey towards the north and east is much quicker than the journey towards the south when staying within lesser timeframes.

The traffic flow is not equally smooth in all directions. Towards the south it frees up only after 45 minutes while towards the north it slows down after the first 30 minutes. This

happens even though both directions use the same Multan Road artery. To the south time is consumed negotiating the congested part of Iqbal Town before passing through the busy area of Kharak, Mustafa town, and Karim Block Market. Unauthorized stops of private vans add to the decreased speed of travel. Beyond the 45-minute contour, speeds increase through the less congested areas of Hanjarwal, Johar Town (Phase II), Judicial Colony, and Sultan Town. Here infrastructure improvements on Multan Road and Canal Bank Road add to the faster flow. Away from these arteries, towards the southeast, speed falls till Ferozepur Road is approached when it picks up again.

The pattern is reversed towards the north of Scheme Morr. Anarkali is approached relatively quickly via the Multan Road and Lower Mall connectors. Beyond Anarkali are the walled city and Naulakha, amongst the most congested regions of Lahore, as described earlier for the GPO case.

Travel flow is much more uniform to the east: passing through Garden Town, Gulberg, and Cavalry Ground towards the Cantonment, this route spans congested but well-linked areas with adequate provision of public transport. To the west is one leg of the Lahore Ring Road which lengthens the span of the base of the semi-circle. However, it is only a connector to other locations and not a segment of job locations, so its relevance is limited.

The total population residing within the one-hour circle of Scheme Morr is around 3 million, about a third of the population of the city. The strategic imperatives in this area are traffic management within Iqbal Town and beyond Anarkali to the north and exploring the location of job opportunities along the Ring Road to the west.

The GIS derived commute circles for Scheme Morr are shown below superimposed on the polygons constructed on the basis of fieldwork.

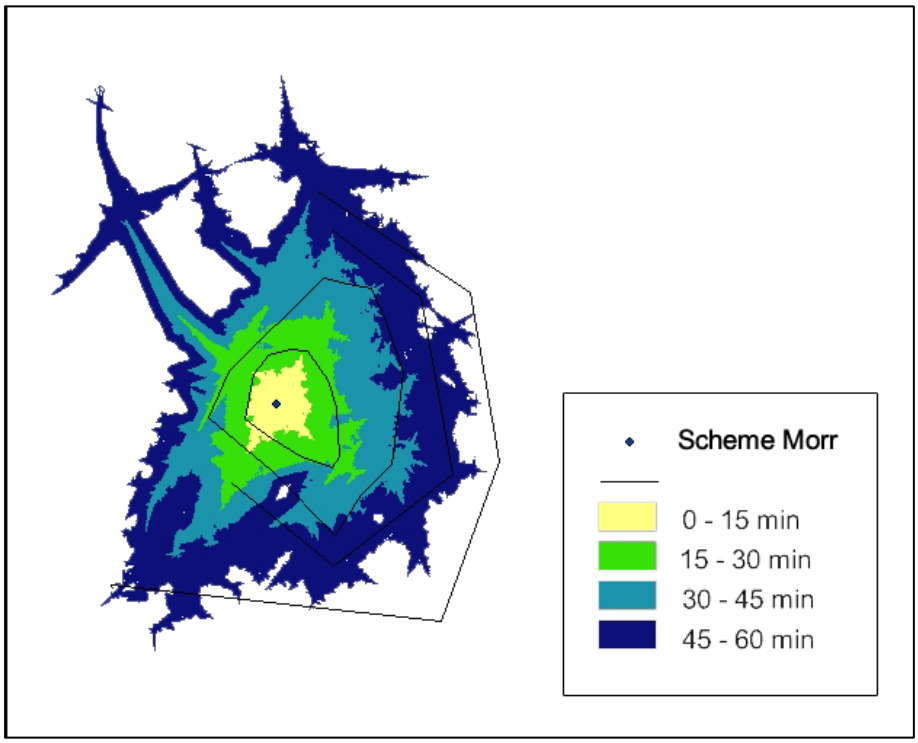

Figure 3.2-9: Travel-circles around Scheme Morr at 15-minute intervals

3.3 THE NUMBER AND SIZE OF LABOR MARKETS IN LAHORE

We have established that there are at least four labor markets in Lahore around the four nodal points we had selected. Clearly we have not exhausted the city so the total number of labor markets would be even greater. The populations of the four markets included in this study are shown below.

	GPO	Kot Lakhpat	Baghbanpura	Scheme Morr
15-minute	489,835	217,299	356,141	287,895
30-minute	1,671,662	817,062	1,631,220	1,021,030
45-minute	3,019,392	1,177,007	2,379,780	2,147,475
60-minute	**4,066,755**	**2,034,935**	**3,164,221**	**3,098,692**

Table 3.3-1: Labor Markets in Lahore (One-Hour circles at 15-minute intervals)

The population residing within the one-hour circles (a proxy for the size of the labor markets themselves) varies from 4 million for the largest to 2 million for the smallest. It is to be noted that the smallest in size is centered on the Kot Lakhpat Industrial Estate, the principal employer of industrial labor in the city.

The four labor markets are not mutually exclusive. There are overlaps as shown in the schematic below. Thus depending on where one resides in a particular market, an individual could have access to more than one market within a one-hour commuting time.

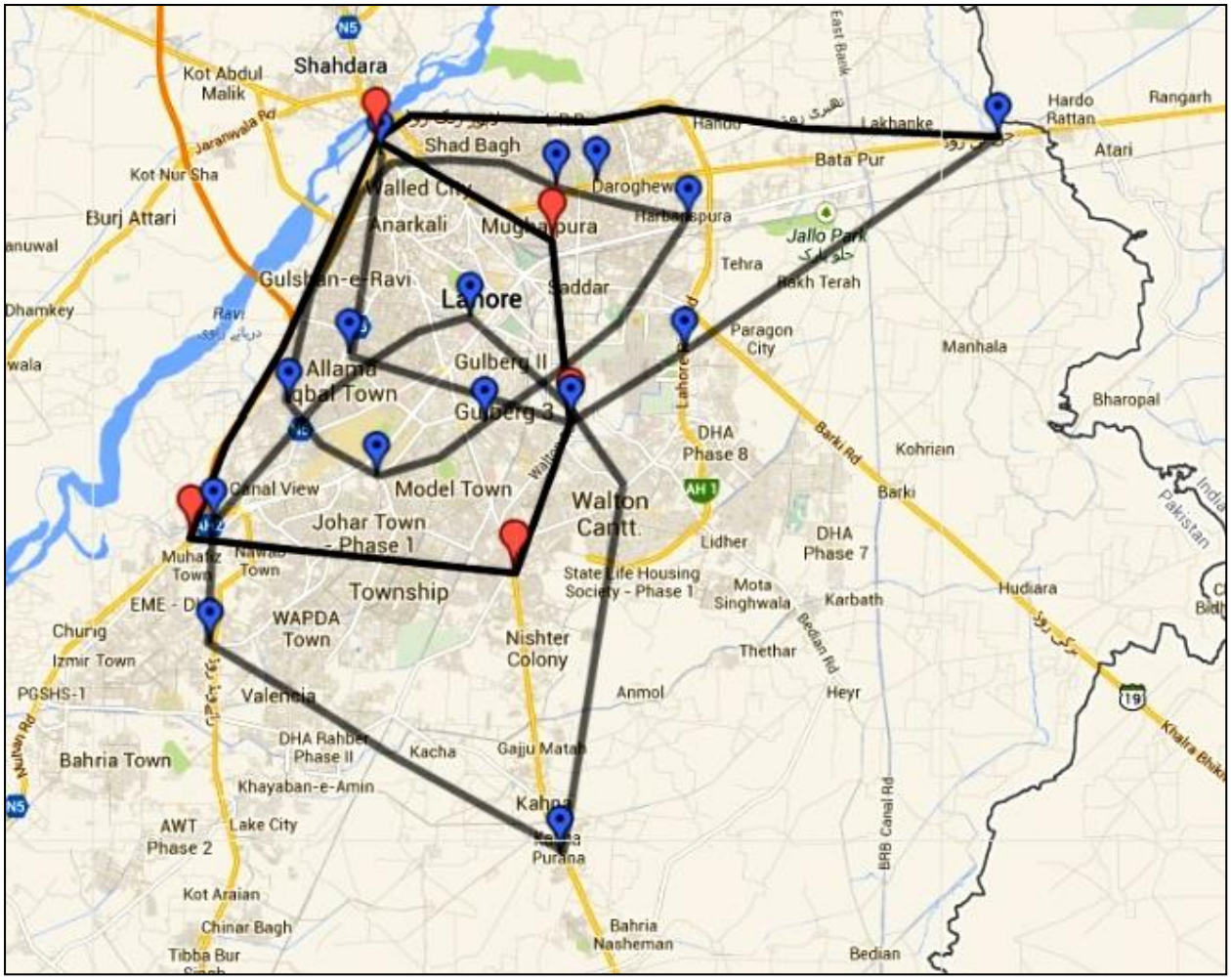

Figure 3.3-1: The overlap of all four one-hour circles

The maximum overlap is in the GPO and Scheme Morr markets while the ones with considerable exclusivity are the Kot Lakhpat and Baghbanpura markets that are skewed along specific roads. The area of Gulberg is of particular interest as it has accessibility from all four markets. We would expect for this reason that Gulberg real estate would command very high values and indeed we are aware of a continuous process of property transitioning there from residential to commercial uses.

One can also see from the schematic that the prestigious Defence Housing Authority (DHA) lies outside all four of the main labor markets. This residential area is exclusive to households with private automobiles (often more than one per household) who can reach the principal labor markets using their private transport. A detailed map of DHA will reveal the existence of low-income pockets within it. These cater to the population that provides low-wage services (mostly domestic help) to households in DHA – the service employees would be

unable to commute there from almost anywhere else in the city except from peri-urban locations beyond DHA. This pattern is common across all elite residential housing estates in Pakistan and one reason why low-income colonies are allowed to continue existing on prime residential land.

4. MAIN OBSERVATIONS: ANALYSIS OF THE SIZE OF LABOR MARKETS IN LAHORE

4.1 OBSERVATIONS

We have established that the labor market of Lahore is considerably fragmented. All theory suggests that this has a huge impact on the productivity of labor in the city. An earlier estimation (Altaf 2010) showed that while Karachi and Mumbai are roughly equal in population (of the order of 20 million), in 2008 the gross domestic product of Mumbai was $209 billion compared to $78 billion for Karachi. It is not that Mumbai is significantly better managed or has fewer social and political problems. A large part of the difference stems from the integration of its labor market. One of the unremarked advantages of Mumbai is its suburban railway system - claimed to be the busiest rapid transit system in the world. It transports about 7 million commuters per day compared to Karachi with its inoperative circular railway and no mass transit investments. In terms of population size Mumbai and Karachi are comparable but in terms of an effective labor market, Karachi is much smaller, perhaps one-third the size of Mumbai. This contributes to the significantly lower economic output in Karachi.

At one level the constraints limiting the size of labor markets in Lahore are the obvious ones – insufficient road network, the transport modal mix, inadequate traffic management, and the absence of rapid transit. Using the 15-minute grid lines and the photographic data compiled during the fieldwork, we have been able to identify these easily. For example, the photograph (Fig 4.1-1) shows the constraints posed by both the modal mix and inadequate traffic management.

Figure 4.1-1: Lahore's traffic mix

The 15-minute grid-lines towards the north and west of the GPO also identify how congested the traffic is in that part of the market.

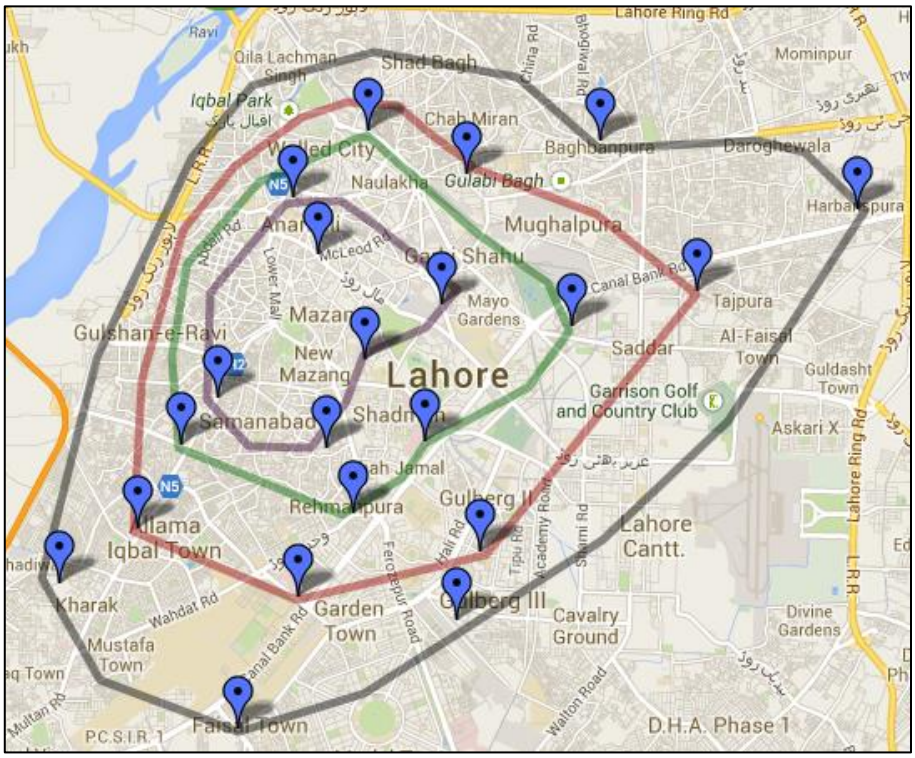

Figure 4.1-2: Travel-circles around GPO at each 15-minute interval

Based on the contours of the travel-circles around the four nodes considered in this study, we have been able to suggest some strategic measures and investments that would yield improvements and enlarge the size of the labor markets. For example, in the areas of GPO mentioned above, skywalks would be candidates for consideration in addition to the usual traffic management measures. In Kot Lakhpat, low-cost, high-density, housing for workers would help while in Baghbanpura, locating industry along the GT Road would make sense.

Our findings on the size of the one-hour commute circles suggest a more important point at the conceptual level. We presented at the beginning of this report the increase in the size of the one-hour circles in the Yangtze River Delta between 1990 and 2007 and noted that although the area of the circles had expanded greatly, their population density had not declined.

For Lahore, we do not have comparative data for two points in time. However, by simply looking at the population density map of the city we can conclude with reasonable certainty that as road investments have increased the area of the one-hour circles, the population densities have gone down significantly so that the actual number of people living within the circles has not increased in proportion except for the natural growth of population.

An alternative way of interpreting our findings is to follow private incomes. There is a pernicious catch-up cycle in existence – the affluent move out to less-dense suburbs and begin to use private cars; infrastructure investments are made to facilitate their commutes back the city center (e.g., Canal Bank and Ferozepur Roads). The influx of cars further congests the center. Meanwhile the mobility of the lower-income majority that resides within the dense quadrants of the city continues to be neglected.

It should become clear that this infrastructure investment strategy caters to the convenience of the affluent and does virtually nothing for economic growth. It is a private-car centered strategy in a city where less than one-fifth of the population owns a private automobile. It should also be clear that such a strategy can never stay ahead of demand for road space because of the rapid growth in the number of private vehicles each moving one or two individuals per trip.

A strategy that is focused on urban economic growth needs to reorient itself to infrastructure and traffic management investments that positively impact the speed of movement in the dense areas themselves rather than in facilitating the access of a tiny minority to the dense areas.

This suggests an even less obvious and more conceptual second-order issue which pertains to the policy choice inherent in the building plans for Lahore: Should the city at its present level of economic development and per-capita income be a compact city or a connected city?

Clearly this issue has not received adequate attention. Lahore has chosen to spread out (sprawl) without adequate connectivity. It has become an automobile-centric city in which less than a fifth of the population own automobiles and there has not been investment in public transport to compensate.

For illustrative purposes consider this comparison of Atlanta and Barcelona (Fig 4.1-3). In 1990 both cities had a population of 2.8 million but the former's built-up area of 4,280 square kilometers was 26 times that of the latter's 162 square kilometers. It is obvious that cities have a choice and Atlanta chose to be an automobile-centric city. At the time the choice was exercised it could have been justified on the grounds that almost all families in the city owned an automobile. However, now with rising fuel prices and consciousness of global warming, even cities like Atlanta are having second thoughts. It has been estimated that more

than half the built-up area of Atlanta would have to be demolished for population density to reach the threshold at which public transport can become economically feasible.

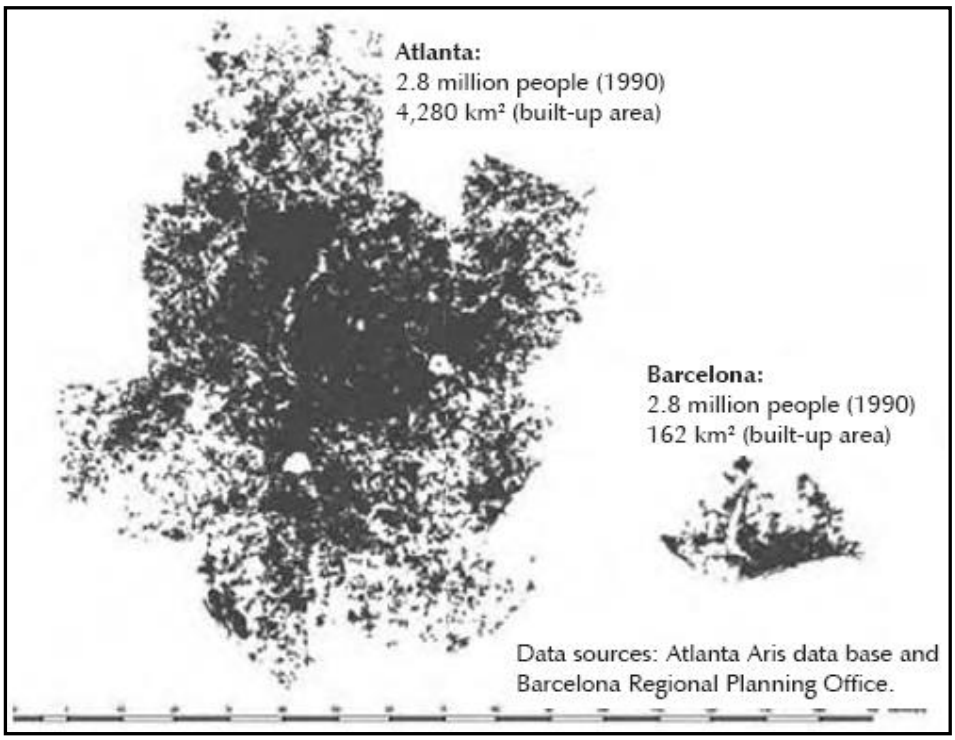

Figure 4.1-3: Built-Up Areas of Atlanta and Barcelona represented at the same scale (Bertaud and Poole 2007)

While it is too late for Lahore to reverse its sprawl, this discussion is very relevant for the smaller cities given that Pakistan is not yet half urban. Most of the smaller cities will double in population in less than 15 years and measures to enhance compactness now would have a large dividend in terms of mobility and feasibility of public transit.

Two analytical issues arise out of this observation. First, how should we distinguish the geographies of Atlanta and Barcelona asides from the general observation that the latter is more compact that the former. We know that almost everyone in Atlanta owns a private automobile so that the entire area can be traversed within a one-hour commute. Similarly, all of the area of Barcelona is accessible within one hour.

In this scenario, the size of the labor markets is the same – 2.8 million. Further suppose that the GDP of the two cities is also the same yielding a similar GDP per capita. What indicator would yield the conclusion that the economic geography of Barcelona is preferred to that of Atlanta? We suggest using GDP per square kilometer for this purpose – clearly that of Barcelona would be much higher than that of Atlanta.

GDP is dependent on economic activity and economic interactions. Therefore compactness by itself is not enough. The combination of compactness and mobility within the compact area is the desired objective.

Looked at in this perspective, we can see where the development of Lahore is failing. The areas where population density is high are congested limiting economic interactions and thereby GDP per unit of area. More critically, the infrastructure investments being made are not growth-oriented but convenience-oriented in favor of owners of private automobiles. As affluent people move out of the dense areas to low-density housing colonies on the outskirts, infrastructure investments are made to facilitate their travel back into the dense areas for work. This influx of vehicles further increases congestion in the dense areas inhibiting their economic potential even more. The policy being followed is clearly perverse.

Seen in this light, the policy focus needs to be on increasing mobility in the dense areas while limiting sprawl to the outskirts. This brings attention to issues of land use efficiency and to the standard planning tools utilized to enhance land use efficiency. These are Floor Area Ratios (FAR), Transferable Development Rights (TDR), and Urban Growth Boundaries (UGB).[4]

FARs should reflect the value of land and in turn impact it. In Lahore, for example, we have observed that the Gulberg area is of critical importance as it is accessible from most parts of the city resulting in high rates for commercial property. To leverage this advantage the FAR should be much higher than in other parts of the city. TDRs can be used to shift construction from zones to be preserved to zones designated as focal points for growth. Finally UGBs can be used to limit sprawl by designating the limits beyond which the city would not extend public service, which would raise the cost for investors pushing development into fringe locations.

Our research suggests that none of these tools are presently being used in Lahore. While a proxy for FAR exists in the form of building height restrictions, their use to designate and promote high-density zones is absent.

In Lahore, the allocation of FAR values and zoning of all the areas of the city is regulated by Director General's Office at the Lahore Development Authority (LDA). LDA has uniform FAR values across all plot sizes and regions. For instance, the commercial value on Civic

[4] For an application to China, see Altaf (2008)

Road Garden Town is much lower than that of Firdous Market in Gulberg but the FAR value is same for both of them. There is much greater emphasis on building height restrictions and specifications pertaining to set-backs, mandatory open spaces, and parking requirements, etc. The non-use of FAR as a tool for concentrating density in preferred commercial areas leads to inefficient land use.

While FAR does exist in the LDA regulations, there is no use of TDRs or UGBs to shape the direction or nature of urban growth. In this study we only wish to suggest that greater attention be paid to the use of these tools to increase the efficiency of urban land use.

Our principal recommendation is the use of the simple one-hour commute circle as a benchmark indicator. Repeating the simple exercise employed for this study can mark the year-on-year changes in the size of the effective labor markets. The data available from the 15-minute grid lines can help identify the congestion points that deserve immediate attention. The indicator can also serve as a useful guide for targeted planning to maximize the size of the labor market within a given time frame. The fact that the progress can be transparently monitored enables real-time adaptation of investment and management programs.

In this section we have highlighted the critical choice between compactness and connectivity for a city like Lahore. In the following section we will extend this analysis by assessing the impact of the recent investment in the Lahore BRT.

5. THE IMPACT OF BRT ON THE SIZE OF THE LABOR MARKET

5.1 INTRODUCTION

A new 27-kilometer Lahore Bus Rapid Transit (BRT) commenced operations in 2013. Because it traverses a high-density corridor, we would expect the size of the labor market, as measured by the population within a one-hour commute circle centered on a particular node along the BRT, to increase. In this section we attempt to arrive at a very preliminary estimate of this impact. We are concerned solely with estimating the first-order increase. We ignore any second-order effects, i.e., increase in the number of jobs in the market, relocation from other parts of the city, property rental values along the route, etc. We also ignore issues of route selection and cost-effectiveness of the BRT. All these are relevant but subjects for separate studies, which need the passage of time for a new equilibrium to be reached.[5]

[5] For an elaboration of some of these issues, see 'Just how 'Fit for the Purpose' are the Metrobus projects?' (Hasan, 2007)

5.2 METHODOLOGY

The methodology for estimating the size of the one-hour commute circles was the same as described earlier for labor markets in Lahore. We were not in a position to simulate pre- and post-BRT comparisons to estimate gains, because the traffic flow and patterns along the BRT corridor have changed significantly after the construction of the dedicated BRT roadway in the middle. We adopted the indirect approach of choosing otherwise similar comparator routes without the BRT. Qartaba Chowk Bus Station and Qainchee on Ferozepur Road were chosen as the starting points for regions serviced by the BRT while Chowk Yateem Khana and Bhekewaal Morr were chosen as starting points for comparator routes without the BRT. The population densities and congestion patterns of the BRT and non-BRT routes are similar. Moreover, the comparator nodes lie on the planned 'Orange' line of the Lahore BRT slated to be implemented next. In the comparisons that follow, Bhekewaal Morr is matched with Qainchi and Qartaba Chowk with Chowk Yateem Khana.

5.3 FIELDWORK

5.3.1 CHOWK YATEEM KHANA

Chowk Yateem Khana is at the intersection of Band Road and Multan Road. The high-resolution location is shown in Fig 5.3-1.

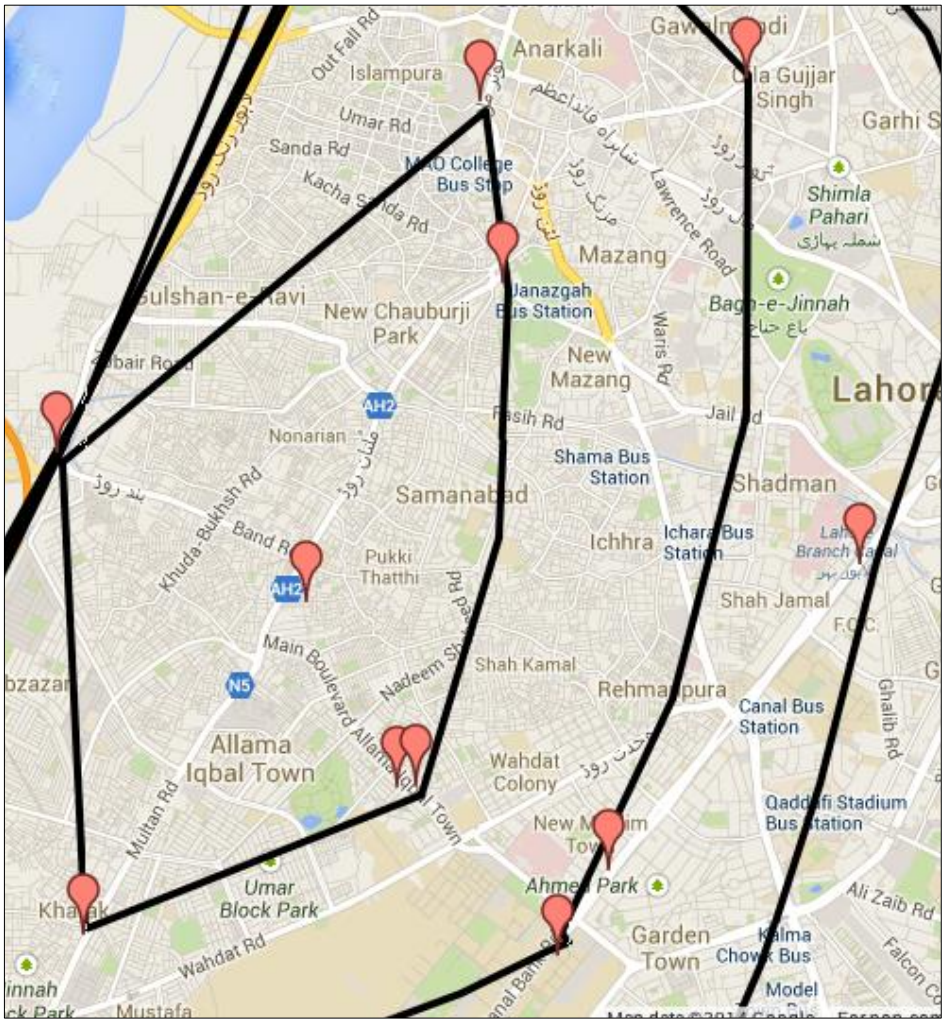

Figure 5.3-1: High Resolution Location - Chowk Yateem Khana

The details of the travel circles at 15-minute intervals are shown in the lower resolution image (Fig 5.3-2).

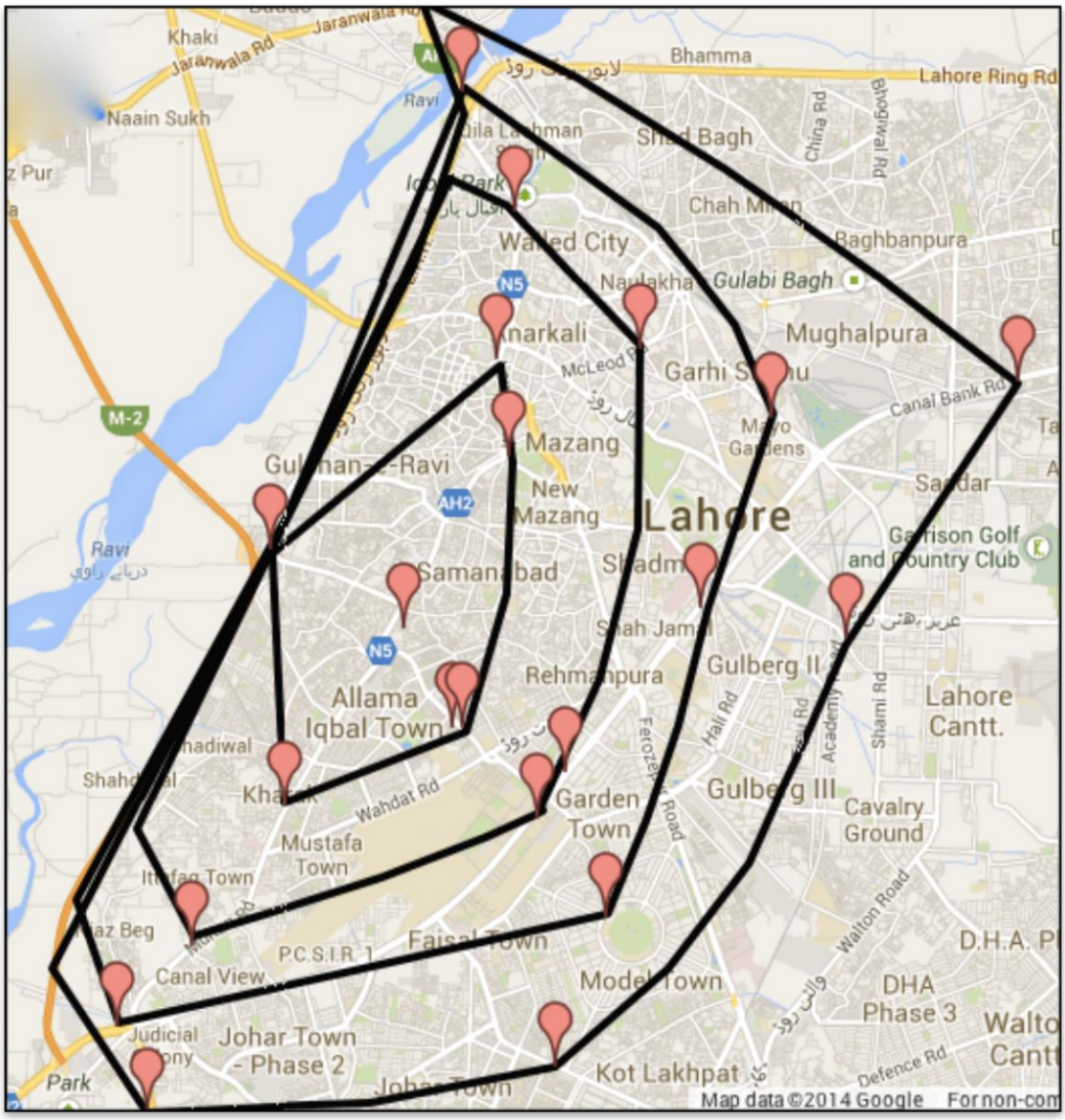

Figure 5.3-2: Travel-circles at 15-minute intervals - Chowk Yateem Khana

Multan Road, running northeast and southwest of Chowk Yateem Khana, greatly increases the accessibility in these directions while east-west accessibility along Allama Iqbal Boulevard and Band Road is more limited. Band Road ends close to the western end of the city circumscribed by the Lahore Ring Road (LRR).

The total population residing inside the one-hour circle centered on Chowk Yateem Khana is close to 2.8 million. The GIS derived contours are shown in Fig 5.3-3.

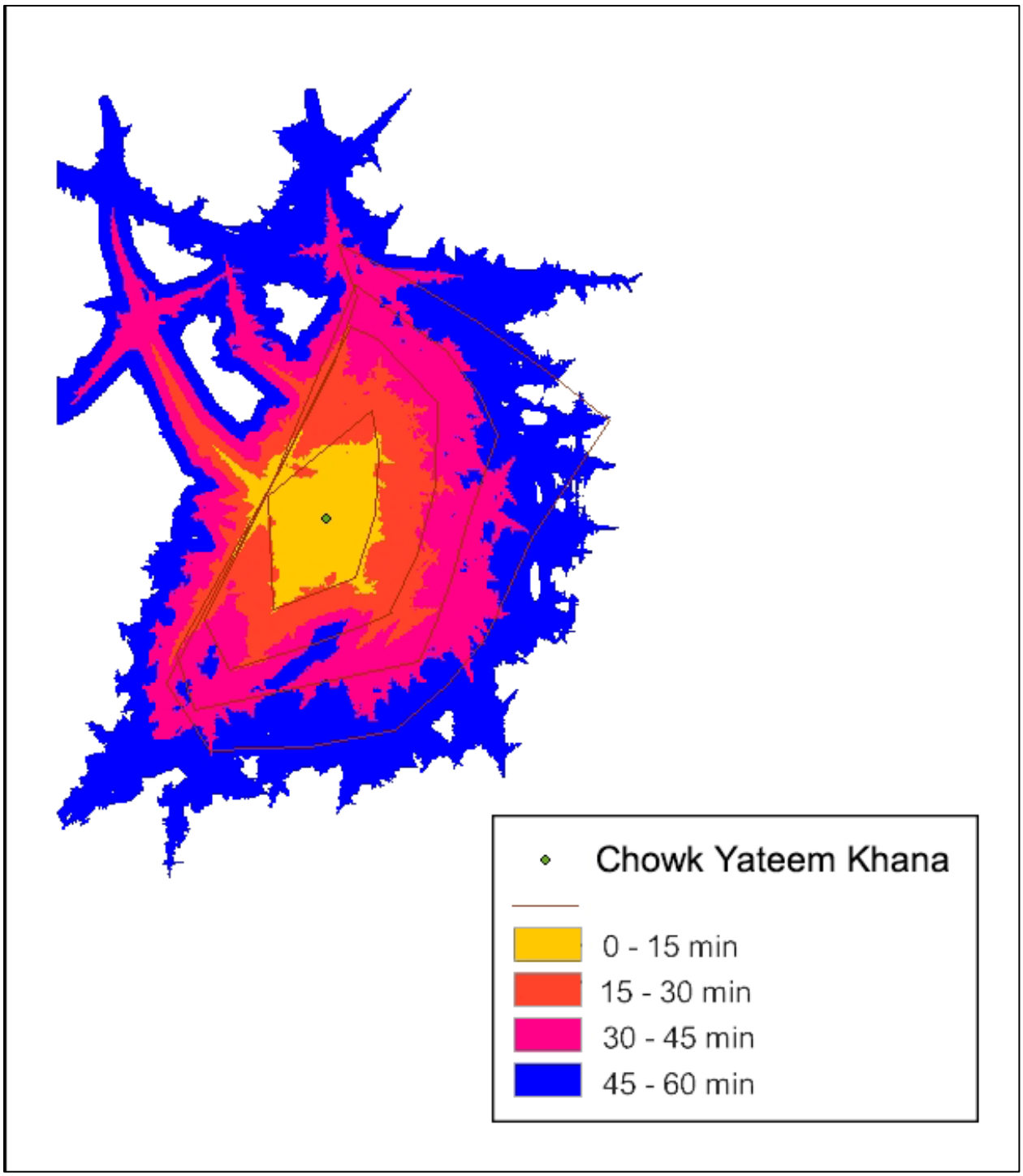

Figure 5.3-3: GIS Adjusted travel-circles - Chowk Yateem Khana

5.3.2 BHEKEWAAL MORR

Bhekewaal Morr is at the intersection of Allama Iqbal Boulevard and Wahdat Road. The high-resolution location is shown in Fig 5.3-4.

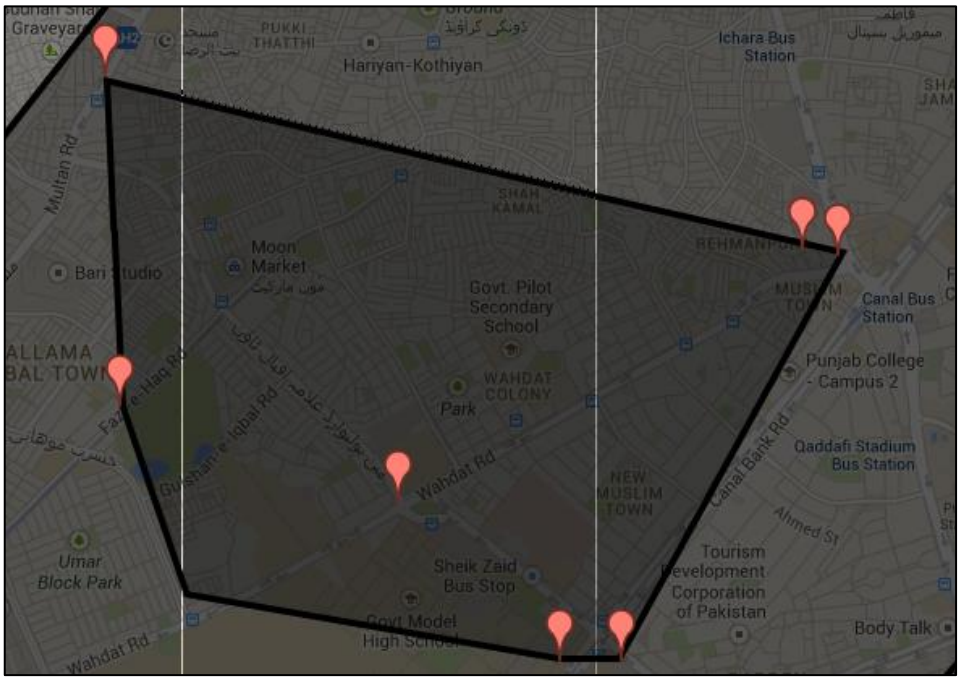

Figure 5.3-4: High Resolution Location - Bhekewaal Morr

The details of the travel circles at 15-minute intervals are shown in the lower resolution image below (Fig 5.3-5).

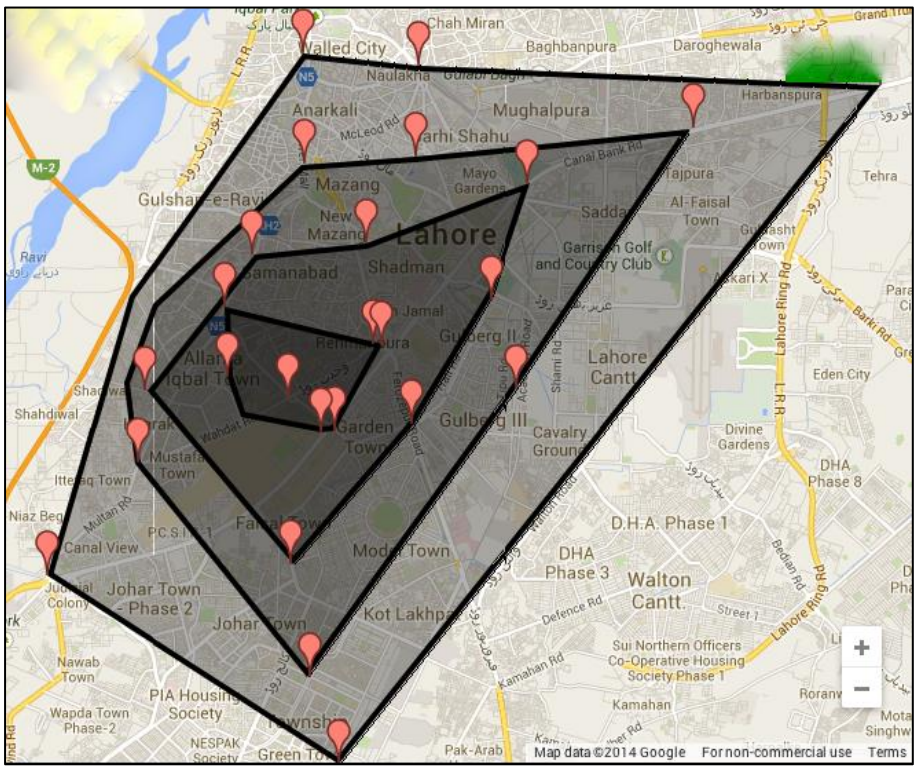

Figure 5.3-5: Travel-circles at 15-minute intervals - Bhekewaal Morr

The LRR boundary and the Canal Bank Road artery give shape to the distinct contour of the Bhekewaal Morr travel circle. The population residing in the circle is approximately 3.2 million. The GIS derives contours are shown below.

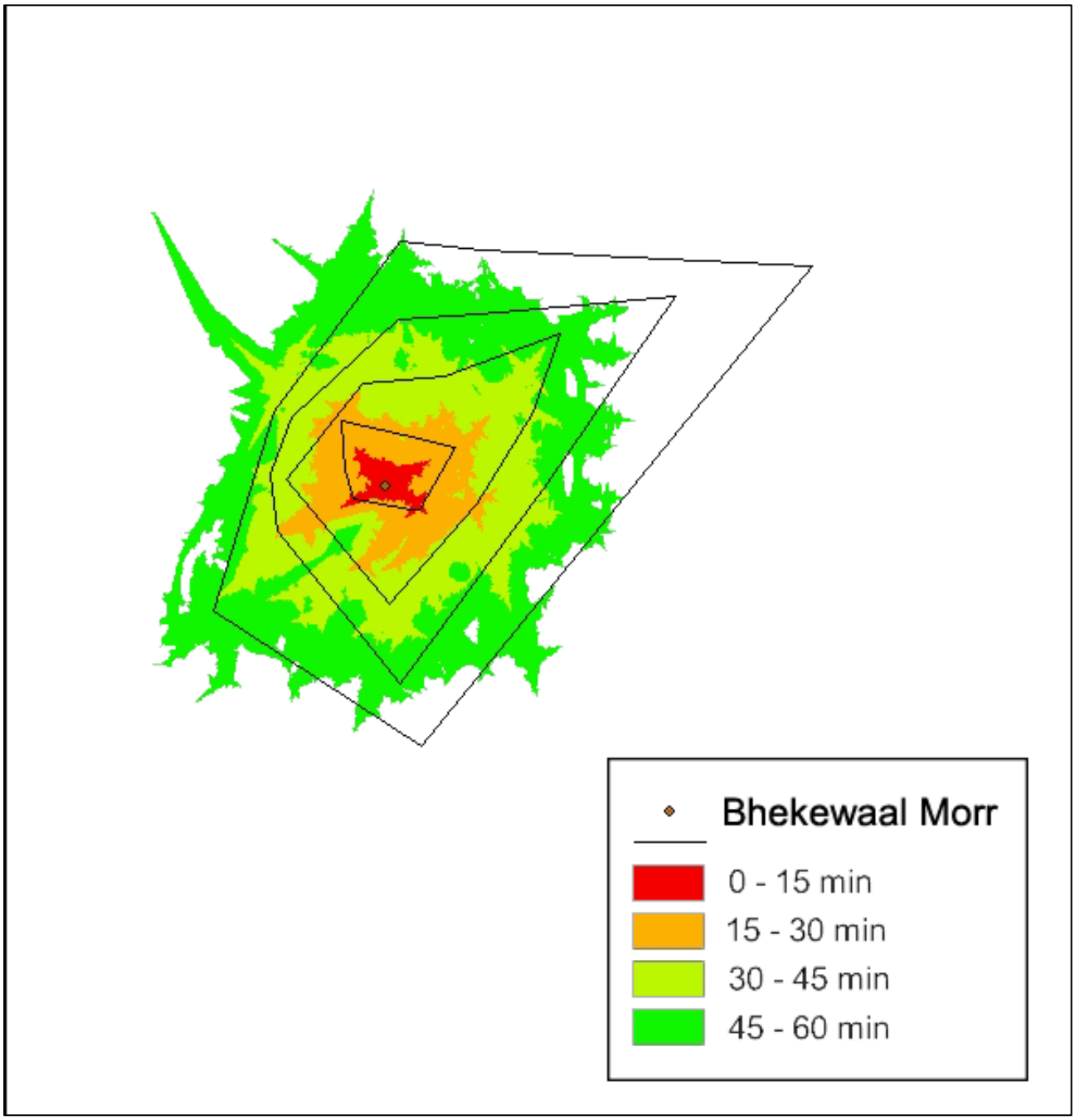

Figure 5.3-6: GIS Adjusted travel-circles - Bhekewaal Morr

5.3.3 QAINCHI

Qainchi is the Urdu word for scissors. The node is so-called because roads intersect at the point in a scissor-like manner. The high-resolution location is shown in Fig 5.3-7.

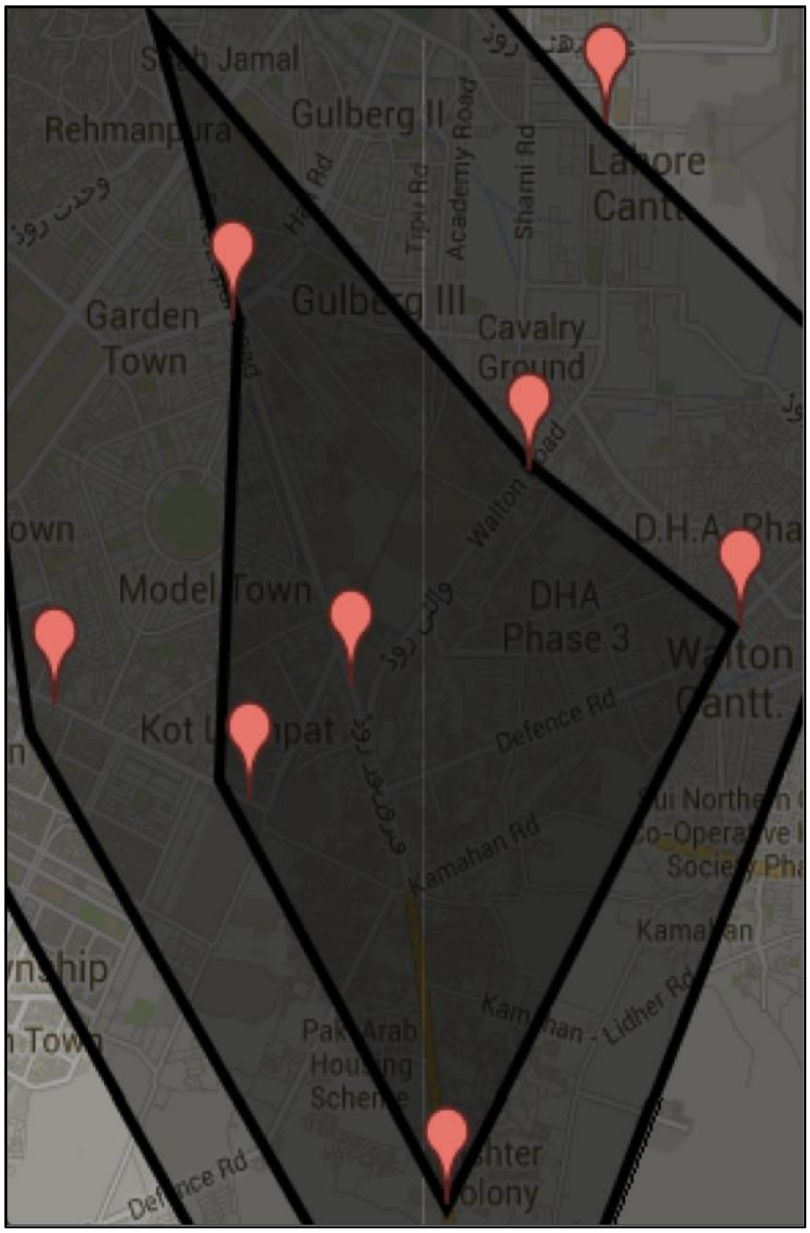

Figure 5.3-7: High-resolution location – Qainchi

The road network is dense at this intersection of Ferozepur Road and Walton Road with other secondary roads running into it. The BRT runs along Ferozepur Road in this area, which gives the one-hour travel circle its kite-like shape in the north-south direction. The details of the travel circles at 15-minute intervals are shown in the lower resolution image (Fig 5.3-8).

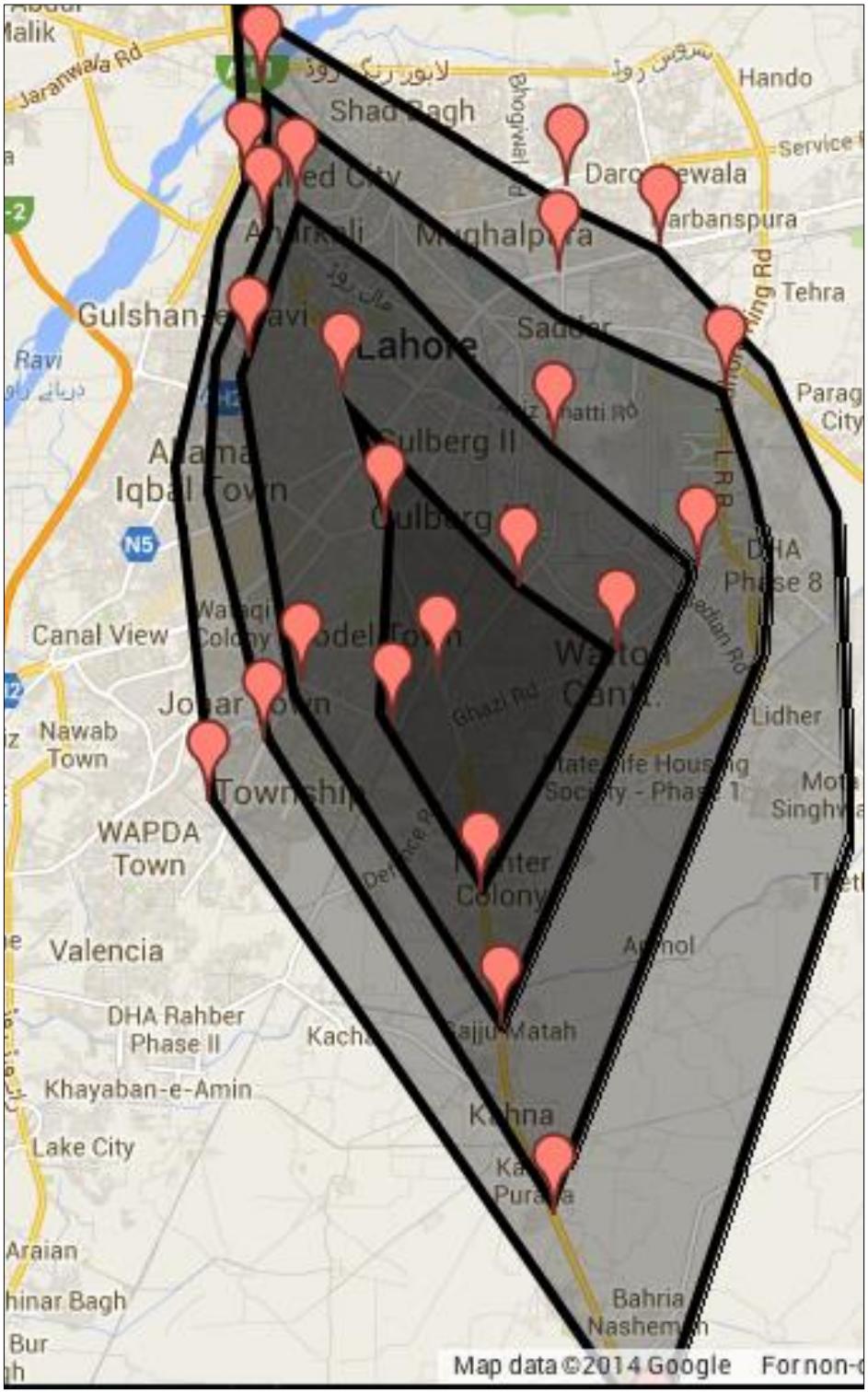

Figure 5.3-8: Travel-circles at 15-minute intervals – Qainchi

The north-south elongation of the contour is a direct impact of the BRT even though it runs in the northerly direction through the most congested parts of the walled city. The population residing in the one-hour circle is around 4 million. The GIS derived contours are shown

below. It is worth noting that the contours obtained by the two methods overlap along the BRT but diverge in the orthogonal direction. This confirms that the BRT has relieved congestion along its route.

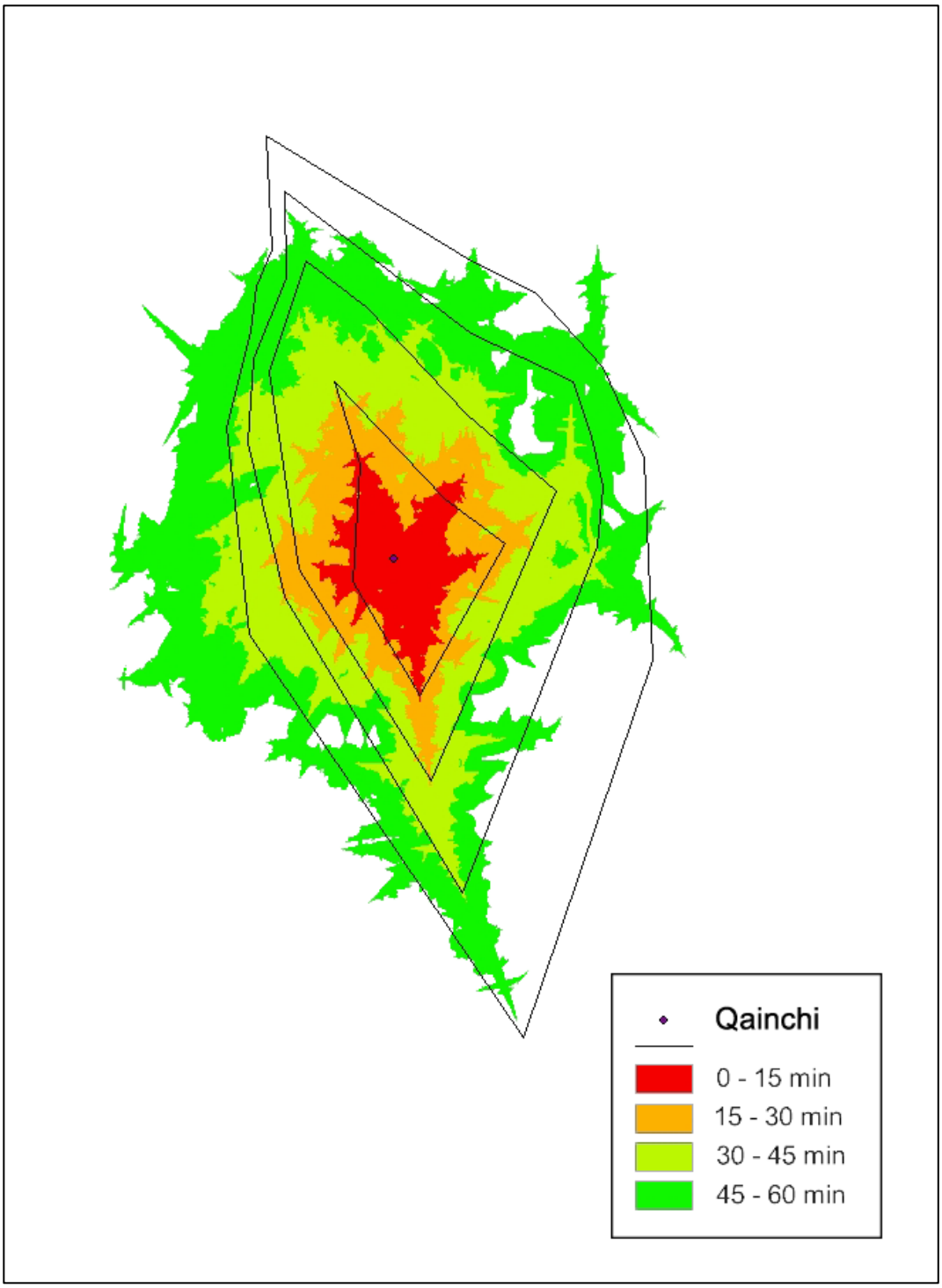

Figure 5.3-9: GIS Adjusted travel-circles – Qainchi

5.3.4 QARTABA CHOWK

The Qartaba Chowk Bus Station is located at the intersection of Ferozepur Road, Jail Road, Bahawalpur Road, Lytton Road, and Queens Road – again a dense road network. The high-resolution location is shown below.

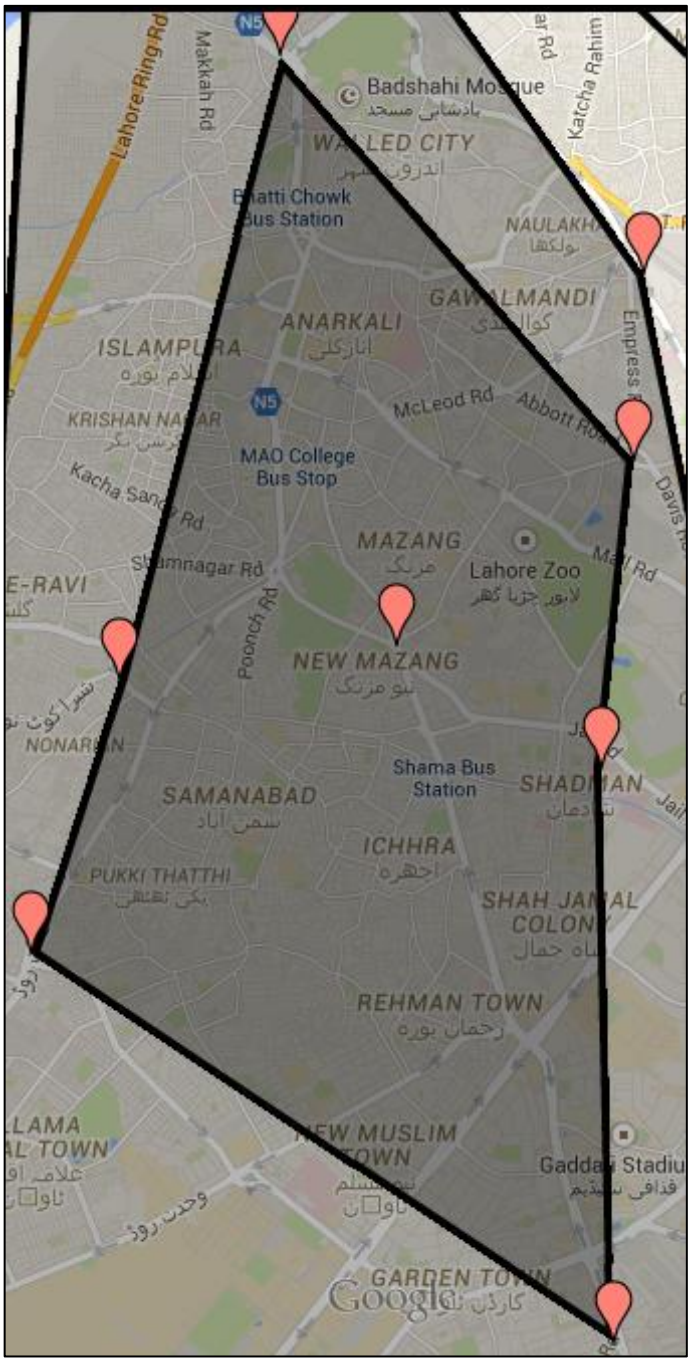

Figure 5.3-10: High-resolution location - Qartaba Chowk

The details of the travel circles at 15-minute intervals are shown in the lower resolution image below.

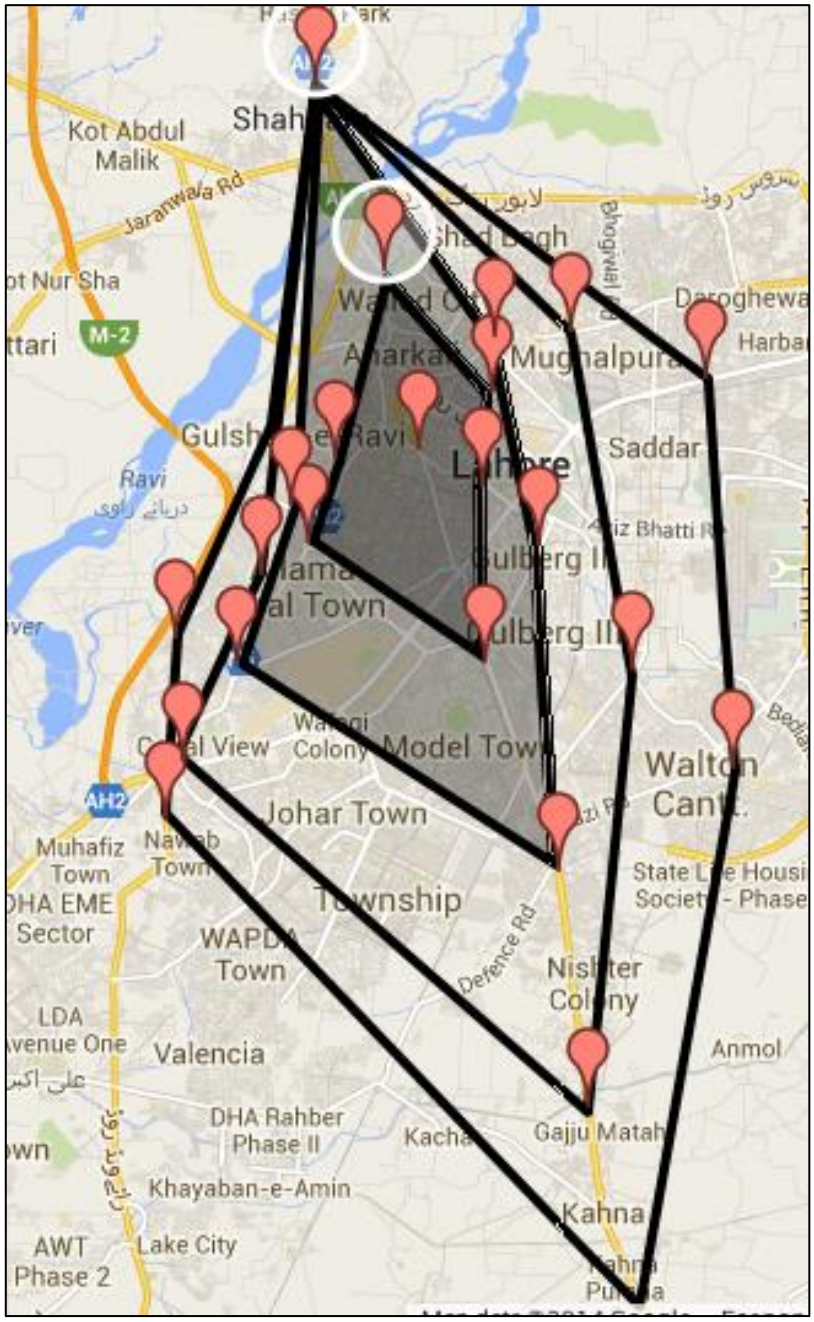

Figure 5.3-11: Travel-circles at 15-minute intervals - Qartaba Chowk

Once again, the impact on the BRT is visible in the kite-shaped contour of the one-hour commute circle. The population residing in the circle is 4 million. The GIS derived contours are shown in Fig 5.3-12. Again, the contours obtained by the two methods overlap along the BRT route, less so towards the walled city than in the other direction suggesting that

congestion still remains an issue in the walled city. The divergence is much greater in the orthogonal direction without a BRT.

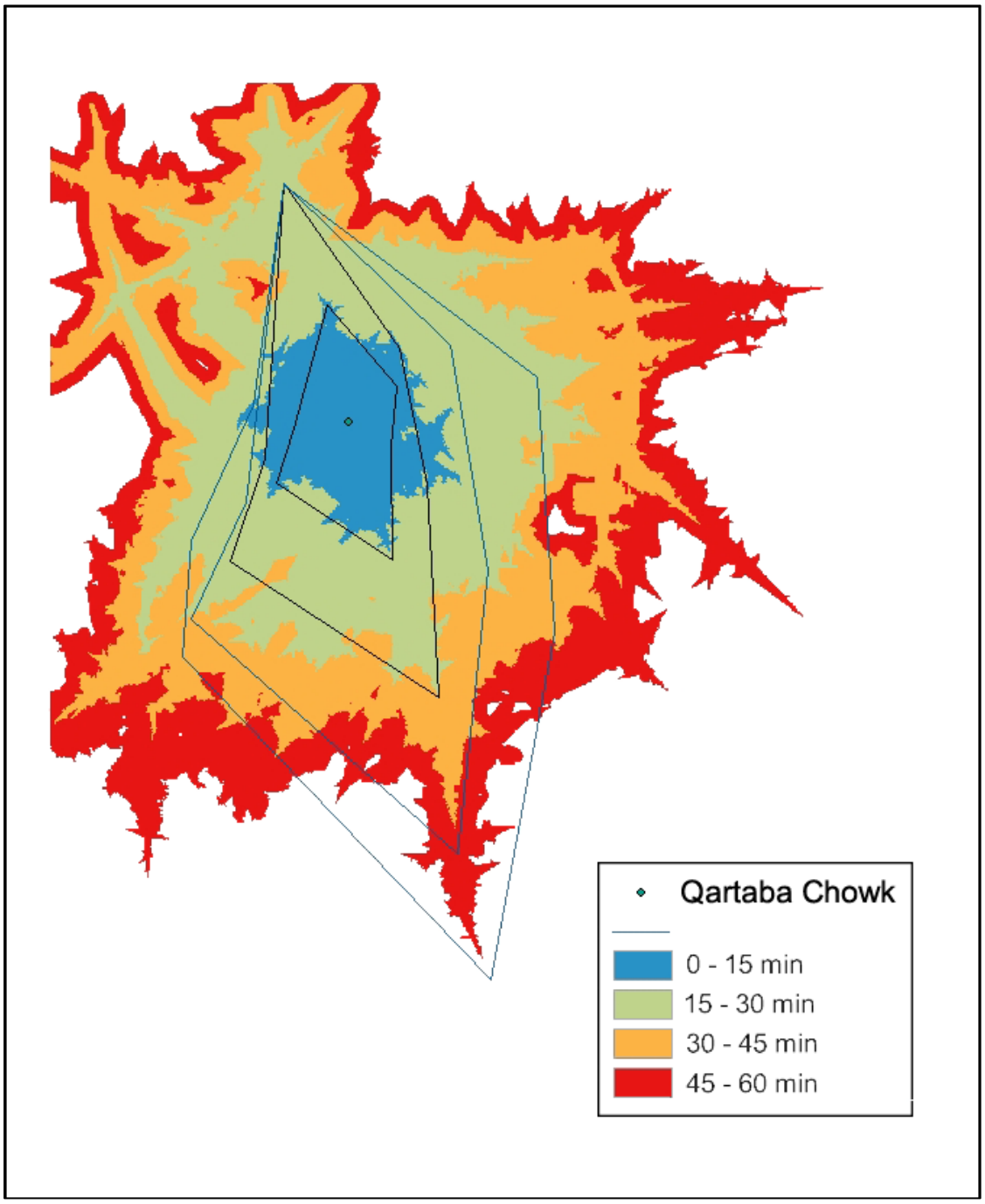

Figure 5.3-12: GIS Adjusted travel-circles - Qartaba Chowk

5.4 ANALYSIS

The populations in the four one-hour circles are shown in the table below.

Travel Circles	Qartaba Chowk*	Chowk Yateem Khana	Qainchi*	Bhekewaal Morr
60-minute	3,990,919	2,798,151	4,058,099	3,177,250
45-minute	2,327,565	2,310,649	2,027,399	1,661,376
30-minute	1,221,244	1,541,235	932,201	550,111
15-minute	465,404	594,348	433,309	52,485

Table 5.4-1: Population within one-hour travel-circles at 15-minute intervals
*** Nodes on the BRT**

One can note that the populations within the nodes served by the BRT are of the order of 4 million while that of the comparator routes without the BRT are of the order of 3 million. Thus as a rough measure we can state that the BRT has resulted in a 33 percent increase in the size of the labor market.

The selection of these nodes confirms the point that a dense network of roads by itself is not sufficient to yield a large labor market because traffic is slowed down by congestion. A mode of transport with dedicated lanes like the BRT can overcome these congestion barriers. In the absence of aggressive traffic flow management the BRT is one alternative if the objective is to increase access to specific labor markets.

Enrique Penalosa, President of the Institute for Transportation and Development, has argued (newsroom.scania.com 2014) that how a city uses its roads is a measure of democracy prevalent in it. A city with an extensive network of roads facilitating its elite is not a democratic city. Nor is a city where accessibility to different regions of the city is limited to a segmented population in it. The population figures in the table above confirm that dense networks of roads around Chowk Yateem Khana and Bhekewaal Morr do not increase accessibility to the same extent as the BRT does for Qartaba Chowk and Qainchi. It can be

argued that the BRT is a democratic investment as it increases the mobility of low-income residents using public transport.

Figure 5.4-1: Demand for the BRT (Photo Courtesy: Express Tribune)

A dense network of roads does not adequately relieve congestion. A decade of heavy spending on new roads, widening arteries, and building bridges, underpasses, and overpasses has not had sufficient impact. Provision of public transport that uses the same roads does not suffice either. The BRT with dedicated lanes has overcome the congestion barriers in a tangible manner.

A closer look at the maps shows that even though Qainchi is located south of the Bhekewaal Morr, the one-hour circle around it extends much further north than that around the latter. This is so even though the BRT traverses increasingly congested areas as it moves north. On the other hand, the one-hour circle centered on Bhekewaal Morr extends north-east along the Canal Bank Road into less dense parts of the city.

Similar conclusions can be drawn by examining the one-hour circles for Qartaba Chowk and Chowk Yateem Khana respectively.

The BRT investment according to the analysis of this study is only indicative of possibilities without assessing its cost-effectiveness. It has been mentioned that an effective public transport alternative should cater for at least 20 per cent of the total ridership, while the actual daily ridership for the Lahore Metrobus is 180,000 trips/day or 3.3 per cent of the total. The

impact reduces congestion in the BRT corridor but has a minimal impact on overall congestion in the city (Hasan, 2007).

6. CONCLUSIONS

This low-budget study (GBP 10,000) undertaken entirely by undergraduate students of the Lahore University of Management Sciences (LUMS) had very limited objectives. It aimed to draw the attention of policy makers to the link between economic efficiency and growth potential to the size of the labor market and to highlight the fact that the latter could not be considered equivalent to the population of a city. The size of the labor market is the outcome of city size, and mobility-enhancing infrastructure investments. Mobility is critical to expanding the size of labor markets.

The study introduced a particularly simple proxy indicator for the effective size of a labor market – the population resident within a one-hour commute of a prominent node in the city. This can be estimated inexpensively and can also serve as a useful planning tool since it can be monitored frequently and inexpensively.

Using this indicator the study showed that small cities near Lahore, even those within a short distance of 30 miles, are not integrated into the metropolitan labor market. We concluded further that at present levels of per capita income policies aimed at connecting these cities by faster road transit would not be viable because income gains would be dominated by increases in transit fares. Utilizing and improving the existing rail networks could however be explored. However, the cities are within the range to outsource business activities from Lahore. These would require risk mitigation measures particularly related to outsourcing of commercial activities and acquisition of land.

The principal result of the study was to show empirically that the labor market in Lahore city was indeed fragmented as hypothesized. The city has all the disadvantages of a large population and very few of the advantages of a large labor market. We estimated the size of labor markets around key employment and residential nodes and concluded that none of them was greater than half the population of the city. This has significant negative consequences for realizing the potential for economic growth. We recommended specific short-term measures for increasing the sizes of the various labor markets.

The study suggested that infrastructure investments in Lahore have been access-facilitating for owners of private automobiles but not growth-enhancing by increasing traffic speed in high density areas. We further showed that for rapidly urbanizing middle-sized cities it would

be prudent for policy makers to pay more attention to compactness than to connectivity. Measures to optimize land-use like Floor-Area Ratios, Transferable Development Rights and Urban Growth Boundaries need to be brought into use to keep cities compact while increasing mobility within them.

We estimated a very rough first-order impact of the BRT introduced in Lahore in 2013. We concluded that it had increased the size of the labor market along the corridor by about a third. However, no conclusions can be drawn about the cost-effectiveness of the BRT from this study. It does seem quite clear however that policymakers have to find ways to increase mobility in the city through some combination of better traffic management and infrastructure investments. Without an increase in mobility the economic potential of the city would remain underutilized at significant cost to the majority of its citizens.

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