

Delhi Airport Metro Express

Case Study Leaders in Urban Transport Planning (LUTP) Program

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In early 2008, Mr. Gupta faced a challenging task. The Delhi Metro Rail Corporation (DMRC), which had built and was operating the acclaimed Delhi metro, had invited offers from interested private companies to part build and operate an express metro line to Delhi's airport. Mr. Gupta's company, Reliance Infrastructure Limited, was one of the leading infrastructure companies in India and a member of the Reliance group, one of the largest industrial houses in the world. Reliance Infrastructure would certainly be interested in a prestigious project like this in the nation's capital. Yet, he was not sure how viable a metro line to the airport would be in a city like Delhi.

This case study provides background information for discussion on how viable a metro line to the airport would be in a city like Delhi. The case goes over the large Mass Rapid Transit (MRT) project implemented as a Public-Private Partnership (PPP) and examines the factors impacting transport demand for travel, revenue, and the financial implications of different PPP structures. Putting yourself in the shoes of Mr. Gupta, consider the following questions as you read through the material:

- What risks should you pay the greatest attention to when preparing Reliance's bid?
- Does DMRC's estimate of 46,000 riders per day in 2010 and 86,000 in 2020 seem reasonable? How would you tell?

Growth of Airline Traffic in India

Air travel had become very popular in India in the last decade since the liberalization of the industry had encouraged the entry of private airlines, including low-cost carriers. Air fares had dropped significantly and services multiplied. As a result, one could get a ticket to go virtually anywhere in India at a reasonable price even at the last minute. By comparison, rail tickets were very difficult to get and had to be booked several weeks in advance to ensure availability. Moreover, airline tickets were not much more expensive than upper class rail tickets and going by air saved the time and hassles of a long rail journey. As a result, the middle class in India was taking to the skies in a big way.

The total number of airline passengers in India grew from 37 million in 1995-96 to 42 million in 2000-01, 73 million in 2005-06 and was projected to reach 120 million soon (Annex 1). As a result, most large cities in India began to witness severe congestion on the roads that led to their airports. Long queues were a common sight just before the airport terminals, especially at peak times, and many passengers missed their flights due to traffic bottlenecks. While the Ministry of Civil Aviation and airport authorities were aggressively expanding the capacity of the terminal buildings, baggage handling facilities and runways to cater to the increasing demand, city transportation agencies were focused on dealing with the congestion problems across the entire city. Few cities thought about the traffic to the airport, as it was only a very small portion of the total traffic in the city. Access to the airport became a problem that no one seemed to be attending to.

Delhi, as the nation's capital, was experiencing particularly rapid growth in air traffic. The number of airline passengers increased from 7.9 million in 1995-96 to 8.9 million in 2000-01, 16.2 million in 2005-06 making Delhi one of the busiest airports in South Asia (Annex 2). Projections suggested that the number of airline passengers using the Delhi airport would reach 100 million by 2020. If the projections were correct, the number of air passengers using the Delhi airport every day would increase from about 70,000 passengers in 2010 to 270,000 passengers in 2020. In addition, there would be an almost equal number of people employed in and around the airport for providing various services who had to commute there every day. The Government had already begun to expand the terminal capacity through as Build- Operate-Transfer (BOT) concession to a large private infrastructure company.

At present, passengers used personal or company-owned cars or taxis to get to or from the airport. Those working at the airport also used personal cars or motorbikes to commute. There was virtually no public transport service to the airport except for a few cities bus lines that stopped at the airport on route to and from other destinations.

Delhi

Delhi, officially known as the National Capital Territory (NCT) of Delhi, was the second-largest metropolis in India and the eighth-largest metropolis in the world. An estimated 16 million people lived in the NCT Delhi while 22 million lived in the greater National Capital Region urban area (which includes the cities of Noida, Greater Noida, Ghaziabad, Gurgaon and Faridabad along with other smaller nearby towns). Delhi is jointly administered by the federal Government of India and the local Government of Delhi.

Delhi began as an important city along the trade routes crossing Northern India and in 1639 the Mughal Emperor Shajahan built a new walled city that served as the capital of the Mughal Empire from 1649 until it was conquered by the British in 1857. In 1911 the British decided to move the capital of the colonial government from Calcutta to Delhi and during the 1920s they built a new government office and residential complex south of the Mughal's walled city and called it New Delhi. When India gained independence in 1947, Delhi was declared its capital and the New Delhi complex became its seat of government. New Delhi houses important offices of the federal government, including the Parliament of India, as well as numerous national museums, monuments, and art galleries. Urban planners greatly limited the densities and the heights of new buildings in New Delhi, however, in an effort to control congestion and preserve the architectural character of the area. The combination of these density controls, the need to accommodate a growing population and the preference of the upper and middle class for higher quality housing in the suburbs has encouraged the rapid suburbanization of the city. The suburban cities of Gurgaon and Noida just south of Delhi were the residential locations most preferred by the professional class. Gurgaon was also the location of a large car manufacturing plant (where the most popular Maruti model was produced) and a host of ancillary suppliers. A major new office and commercial district was also developing to the southeast, not too far from the airport, that was beginning to rival the traditional central business district of New Delhi.

Delhi's population and economy grew rapidly during the 1990s although the growth rates had declined in the last decade. By 2007, Delhi had a per capita income of 66,728 (US\$1,268) at current prices, the third highest in India after Chandigarh and Goa. The economy was dominated by the service sector, which accounted for 71 percent of the city's domestic product while manufacturing account for 25 percent and agriculture and extractive industries account for 4 percent.

Delhi's population and economic growth rate had resulted in an ever-increasing demand for transport creating excessive pressure on the city's transport infrastructure. As of 2008, the number of vehicles in the metropolitan region, i.e., Delhi NCR was 11.2 million. There were 85 cars for every 1,000 residents in Delhi, among the highest in India.

Delhi Metro

In 1995, after decades of debate, officials decided that Delhi had to build a metro to help deal with the city's growing congestion and air pollution. The Delhi Metro Rail Corporation (DMRC), a new company, owned 50 percent by the national government and 50 percent by the local Delhi government, was set up to oversee the construction and operate the metro. Construction of a first phase consisting of three lines covering 65 kilometers began in 1998 and was already in service with the Red Line opening in 2002, the Yellow Line in 2004 and the Green Line in 2005. A second phase with another three lines covering 128 kilometers was under construction with the Blue Line extension scheduled to be completed in 2009 and the Green and Violet Lines in 2010. By 2008 the metro had 116 kilometers of line in service and was carrying nearly a million passengers every day, about 8 or 9 percent of the total public transportation ridership in the metropolitan area. There were plans for further expansion and the full network was projected to reach a length of 414 kilometers by 2020.

Delhi's metro was widely regarded as a tremendous success. The system was being built on time and on budget and the reliability of the services and the design and cleanliness of the cars and stations met the highest international standards, appropriate for the capital city of a great country. Ridership had been somewhat lower than projected, but was sufficient to make Delhi one of only five metro systems in the world that did not need operating subsidies – in fact DMRC claimed to be making enough to defray part of its capital costs as well.

Much of the credit was given to E. Sreedhardan, the Managing Director of DMRC since its inception. Sreedhardan had become a celebrity for these achievements and was decorated with one of highest national awards of excellence, the Padma Vibhushan. Popularly known as the —Metro Manll, he was seen by many as the savior for the urban transport problems of India. It was easy for him to get an audience with the top political leadership in any province and the immediate reaction among the public was that their city would now get a metro. His reputation for being incorruptible also meant that he brooked no interference from vested interests in the award of contracts. And delays in payments to contractors by his staff incurred his wrath and severe punishment. As a result, contractors were happy to work with him and cut no corners with regard to quality. Given his reputation, he got what he asked for and, in return, delivered projects in time.

Delhi Airport Metro Express Limited

Recognizing the increasing traffic to the airport and the fact that the Delhi metro, unlike metro systems in many large cities, provided no airport connection, the DMRC had proposed to build a dedicated and high-speed metro line from the New Delhi railway station, located in the traditional center of New Delhi—, to the airport.

The airport line would cover a route of 22.7 kilometers with only six stations, so as to provide faster service. It would extend about 4 kilometers beyond the airport to Dwarka, which was a fast-growing residential area. It would connect with the rest of the metro system at its two endpoints: at New Delhi Downtown station (which was also served by the Yellow Line) and at the Dwarka station (which was also served by the Blue Line extension). A map of the first two phases of the regular metro system that also shows the proposed airport express line is attached as Annex 3.

The airport express line was to operate from 5:30 am to 11:30 pm and charge a fare of INR 100 (US\$ 2.00) per trip. Commuters who bought monthly passes would get a 50 percent discount. Typical bus fares for a journey of this length would be INR 20 (\$0.40) and typical cab fares INR 250 (\$5.00). For the convenience of airline passengers, arrangements were to be made with airline companies to open check in counters at some of the stations. The line was to be commissioned by October 2010, in time for the Commonwealth games that were to be held in the city.

While the DMRC was building and operating the first two phases of the metro system itself, it decided to offer the airport line as a public-private partnership (PPP) in which a private concessionaire would be responsible for building the extension, operating it for a period of 35 years and then turning it over to the public sector. The cost of building the airport line was so high, however, that the DMRC knew that the concessionaire would not be able to recover its full capital and operating costs from fares alone. To help solve this problem it proposed that it would be responsible for building and financing all the civil

works—including the viaduct, the tunnels and the stations—while the private concessionaire would be responsible for financing only the operating systems—primarily the track, signals, power distribution system and rolling stock—and for paying operating expenses. But the DMRC suspected that even this contribution might not be enough to make the private concession financially viable since the capital costs for the operating systems alone were estimated to be INR 15,380 million (approximately US\$ 300 million). Accordingly, the agency invited potential concessionaires to bid based on the amount of additional capital subsidy they thought the government would have to supply in order to make the concession viable. The concession would be awarded to the bidder who requested the least amount of—viability gap funding from the government.

Ridership Forecasts

The concessionaire would assume a variety of risks including whether the operating systems could be built on time and budget and would operate as reliably and efficiently as expected. Ridership was also a key risk since the main source of revenue for the concessionaire (aside from any viability gap funding it was successful in winning) would be the fares it collected.

DMRC forecast that around 46,000 people would use the airport express each day soon after the project was commissioned in 2010 and that ridership would grow to 86,000 per day in the next 10 years. The DMRC's forecast was based on hourly counts of passengers at the airport terminals and surveys of departing and arriving air passengers who were asked where in Delhi their trip began or would end.

The passenger counts, shown in the graph at Annex 4, revealed that the airport was busy around the clock. Domestic services peaked during the day while international services peaked in the late evening and early morning.

For the passenger origin-destination survey DMRC's planners divided the metropolitan area into 29 zones. Zones 1 to 4 were within the airport complex itself, covering the domestic and international terminals and their respective parking complexes. Thus, these were taken to be a common point for the analysis. Zone 5 covered the airport hotel, which was within a distance of 2 kilometers from the airport.

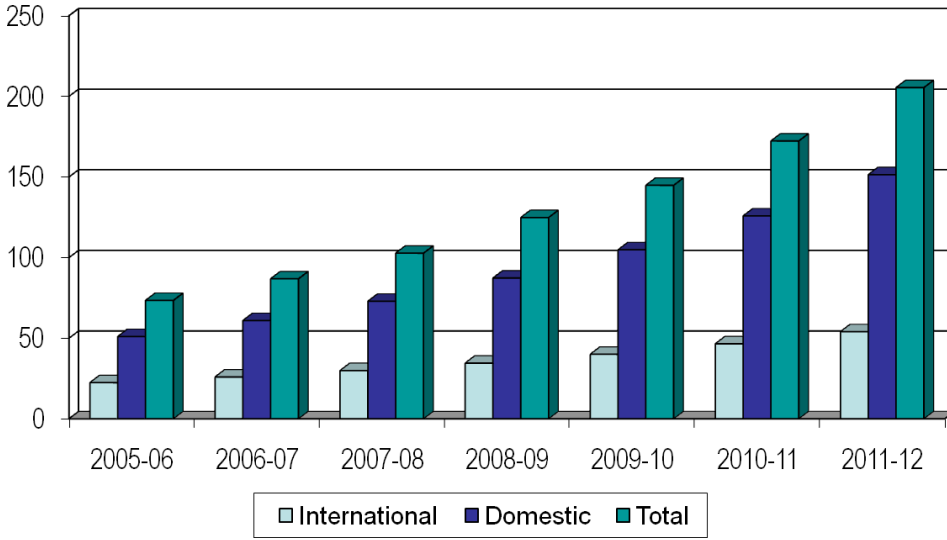
The remaining 24 zones were in the city and its suburbs. The share of passenger trips generated by the different zones is as given in the table at Annex 5 and a map of the zones is shown in Annex 6. (Note that zones 1 through 5 are not identified on the map but are the shaded area surrounded by zones 6, 7, 8, 9 and 10.)

The zone that includes central New Delhi (14) alone accounted for 21.51 percent of the origins and destinations of air passenger trips and another three zones in South Delhi (6 and 7) and the suburb of Gurgaon (17) each accounted for another 9 to 10 percent of trips. Five zones scattered across the west (11), south (8), southeast (15 and 16) and east (20) each accounted for another 5 to 7 percent of trips.

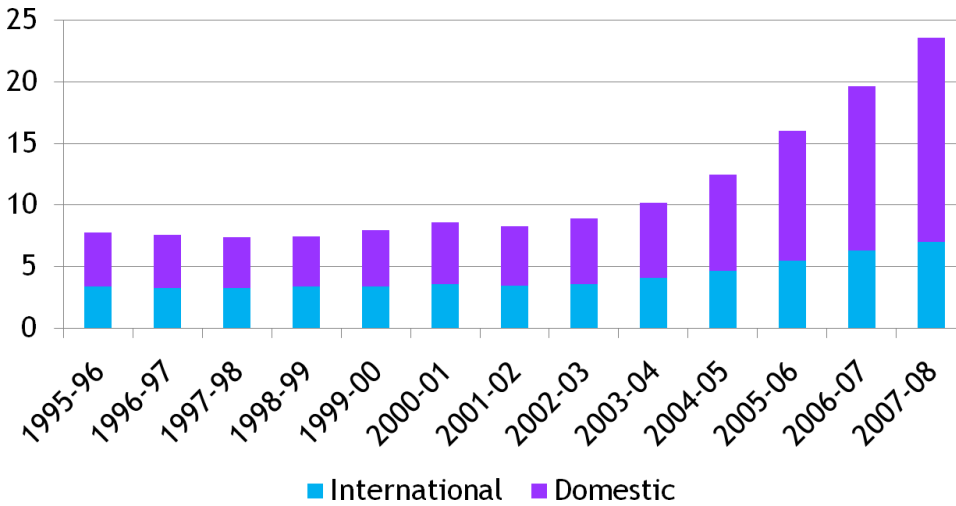
DMRC's forecast for the airport express also seemed consistent with the experiences of the major cities of Europe and Tokyo showed that public transportation could capture 28 to 62 percent of the airline passengers, with half or a bit more typically arriving by bus and the rest by rail (see Annex 7). Reliance was a world class company and so there was every reason to believe that Delhi's airport express, in Reliance's hands, would operate to

the highest international highest standards. And the invitation to bid on such a prestigious project was tempting. But Mr. Gupta knew that the financial fortunes of any concession rested on its ridership forecast, and he needed to know how credible DMRC's calculations were.

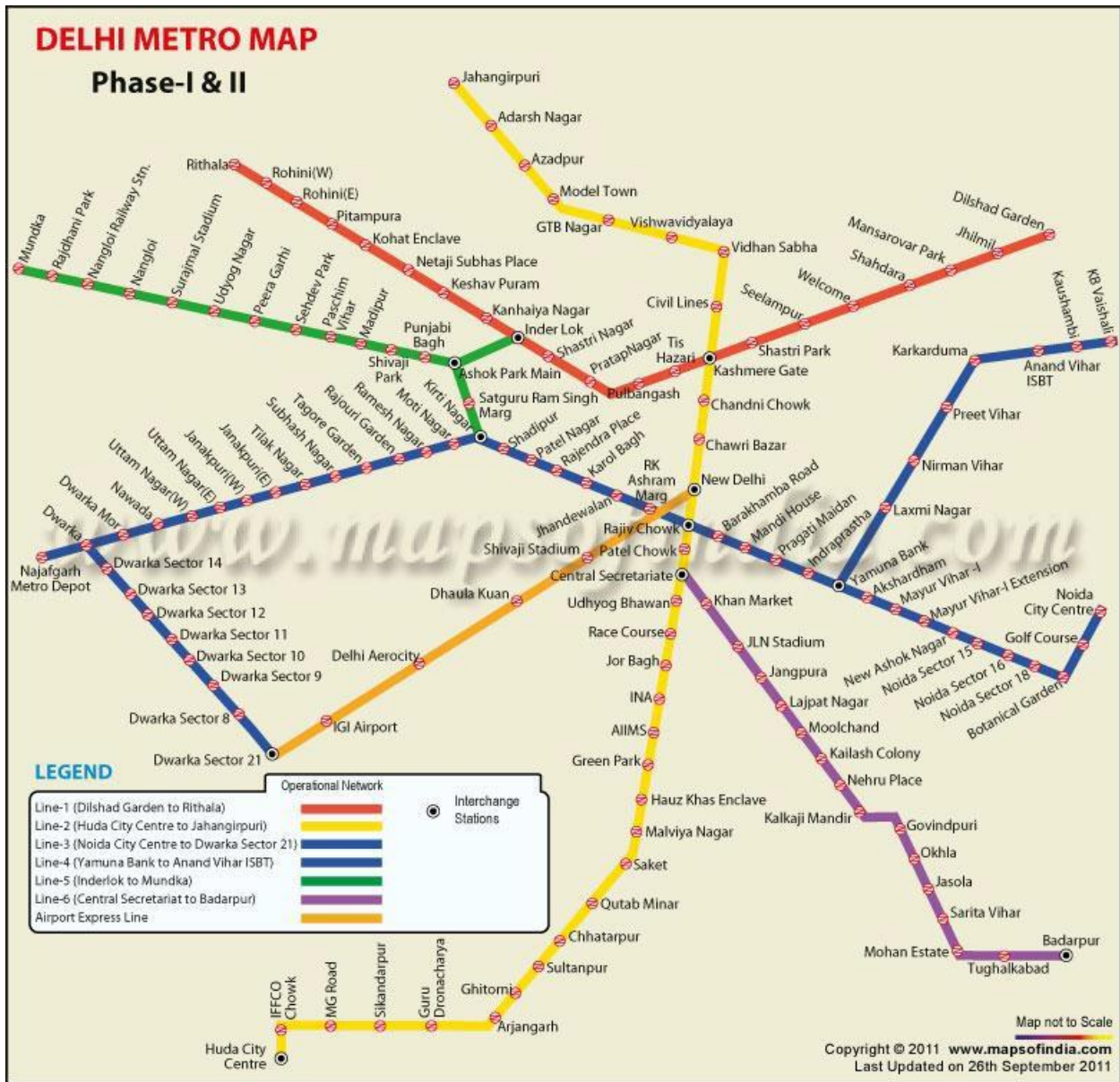
Annex 1: Growth of airline passenger traffic in India



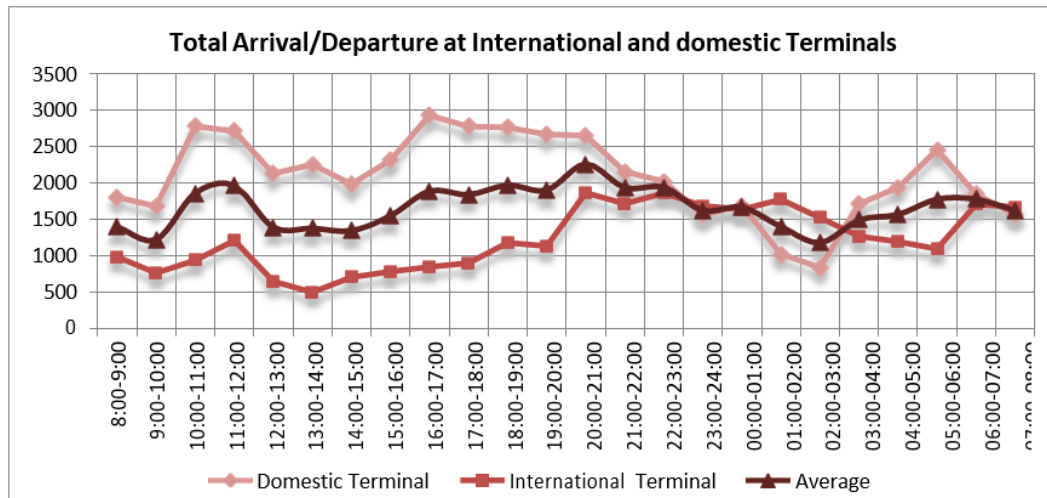
Annex 2: Growth of airline passenger traffic in Delhi



Annex 3: Delhi metro lines and proposed airport express



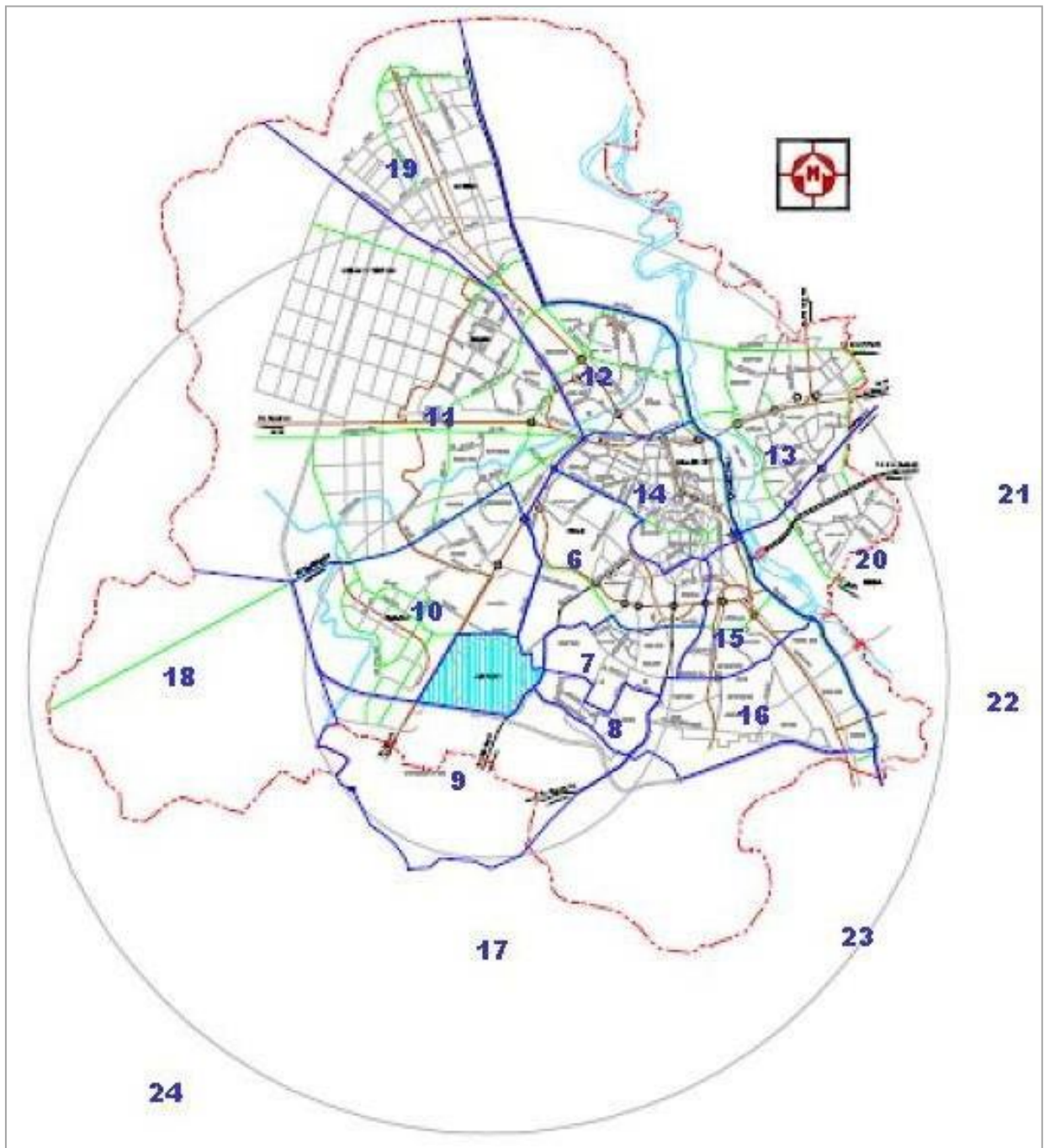
Annex 4: Total Arrival/Departure at International and Domestic Terminals



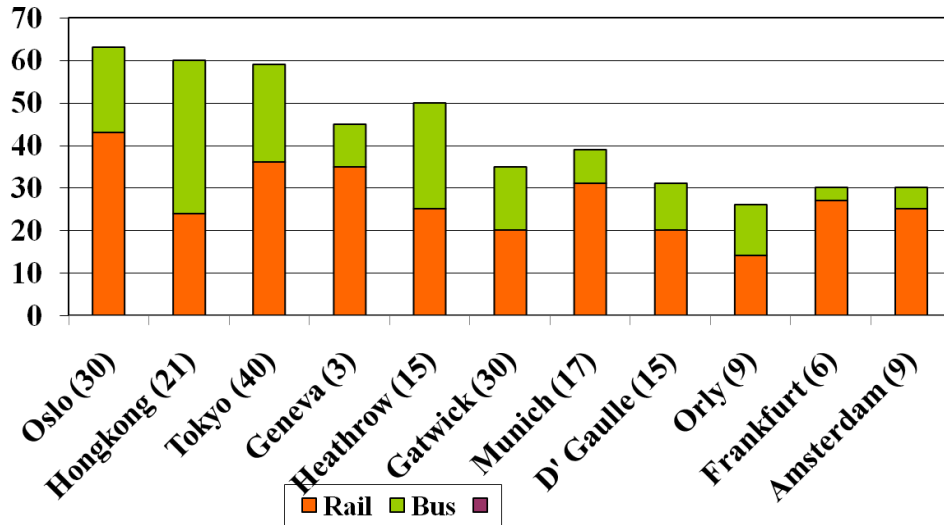
Annex 5: Distance from the airport and share of traffic

Origin Zone	Distance from the airport	Share of Traffic
5	< 2 Km	0.38%
6	2 – 10 Km	10.14%
7	2 – 10 Km	9.10%
8	2 – 10 Km	4.88%
9	2 – 10 Km	2.84%
10	2 – 10 Km	2.27%
11	10 – 25 Km	7.39%
12	10 – 25 Km	2.04%
13	10 – 25 Km	4.22%
14	10 – 25 Km	21.51%
15	10 – 25 Km	6.63%
16	10 – 25 Km	4.74%
17	10 – 25 Km	9.10%
18	10 – 25 Km	0.14%
19	25 – 50 Km	0.38%
20	25 – 50 Km	5.97%
21	25 – 50 Km	1.94%
22	25 – 50 Km	0.14%
23	25 – 50 Km	1.04%
24	25 – 50 Km	0.09%
25	25 – 50 Km	0.05%
26	50 – 200 Km	2.42%
27	50 – 200 Km	1.28%
28	50 – 200 Km	0.09%
29	50 – 200 Km	0.09%

Annex 6: Map of the zones



Annex 7: Share of airport traffic using public transport in different cities



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