

Economic Impact Study of Delhi Airport



National Council of Applied Economic Research

ECONOMIC IMPACT ASSESSMENT OF DELHI INTERNATIONAL AIRPORT

**National Council of Applied Economic Research
11 I.P. Estate, New Delhi-110 002 (INDIA)**

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Foreword

Rapid modernisation and expansion of infrastructure is critical to the rapid transformation and growth of India's economy. The public-private partnership (PPP) model, aimed at combining the financial resources and the competition-induced efficiencies of the private sector with the public sector's mandate for the equitable sharing of benefits, has become a key strategy for infrastructure development in India.

The Indian economy faced the challenge of airport modernisation as it began to deepen its integration with global markets. The PPP model has been applied successfully for the development of green-field airports in Bengaluru and Hyderabad and for the modernisation of the Mumbai and Delhi airports.

This NCAER study assesses the impact of the Delhi Airport on the national economy and an understanding of this impact relative to Delhi's economy. The impact of civil aviation on the economy has several dimensions. While air transportation is relatively expensive, it is also the most practical way of covering long distances within a reasonable time frame. Civil aviation is also a complex and technology-intensive industry. The sector requires a variety of inputs and skilled labour for its operations. It helps build new industries not only associated with its backward linkages but also those which critically require air transportation, such as the export of perishable and high-value products.

The study highlights the need to distinguish between the construction phase of airport development and the long-term benefits to be derived from its operation. This exercise has required an understanding of costs and revenues in these two phases. The assessment of direct, indirect, and induced impacts also points to the many channels through which airport development affects the economy. The study estimates output multipliers of 2.80 for the airport services sector, indicating its significant inter-industry linkages.

The study posed a number of challenges as it is one of the first attempts at such an assessment in India. As more information on the Civil Aviation Sector and its linkages to the rest of the economy becomes available, more comprehensive analyses should be possible. We hope that the study will be useful both for policy making and for improving the methodologies for impact assessment in future research.

This study has been made possible through the generous support of the Delhi International Airport Limited (DIAL), which provided financial support for this research and also provided a range of data available with them. We gratefully acknowledge DIAL's support for this work. The study team wishes to place on record its sincere appreciation for the cooperation and

involvement of Mr A.K. Pandey and Dr P.S. Senguttuvan at DIAL, who facilitated interactions with a number of other professionals at DIAL in helping the study team understand the workings of a modern airport.

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The study team is grateful to thousands of respondents including passengers, government agencies, retailers/concessionaries, airlines, freight operators, and forwarders at Delhi airport. Without their cooperation the study would not have been possible.

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List of Abbreviations

AAI	Airport Authority of India
ACI	Airport Council International
Aero	Aeronautical
ATAG	Air Transport Action Group
ATC	Air Traffic Control
ATM	Aircrafts Movement
BCAS	Bureau of Civil Aviation Security
BCIA	British Construction Industry
BDDS	Bomb Disposal & Detection Squad
Bn	Billion
BPCL	Bharat Petroleum Corporation Limited
CAGR	Compound Annual Growth Rate
CIS	Change in Stocks
CISF	Central Industrial Security Force
CPD	Commercial Property Development
CS	Cargo Service Centre
CSO	Central Statistical Office
DAMEL	Delhi Airport Metro Express Private Limited
DGCA	Director General of Civil Aviation
DIAL	Delhi International Airport Private Limited
DOM	Domestic
DTC	Delhi Transport Corporation
FII's	Foreign Institutional Investors
FSI	Floor Space Index
GAWC	Globalisation and World Cities
GBA	Gross Building Area
GDP	Gross Domestic Product
GFCE	Government Final Consumption Expenditure
GFCF	Gross Fixed Capital Formation
GSP	Gross State Product
HD	Hospitality District
HPCL	Hindustan Petroleum Corporation Limited
ICAO	International Civil Aviation Organisation
INR	Indian Rupee
INT	International
I-O	Input-Output
IOCL	Indian Oil Corporation Limited

IPO	Initial Public Offering
JV	Joint Venture
LAC	Latin American Countries
MSF	Million Square Feet
NAS	National Account Statistics
NCAER	National Council of Applied Economic Research
NCR	National Capital Region
NCT	National Capital Territory
NIC	National Industrial Classification
Non-Aero	Non-Aeronautical
NSSO	National Sample Survey Organisation
OMDA	Operation, Management and Development Agreement
ONGC	Oil and Natural Gas Corporation
OOG	Out of Gauge
Pax	Passengers
PCE	Personal Consumption Expenditure
PCI	Per Capita Income
PFCE	Private Final Consumption Expenditure
PPP	Public-Private Partnership
PPP	Purchasing Power Parity
PSF	Passenger Service Fee
PWC	Price Waterhouse Cooper
RAF	Royal Air Force
T1	Terminal 1
T3	Terminal 3
WLU	Work Load Unit

Executive Summary

About the Study

- Modernisation and expansion of infrastructure is crucial to economic growth and development. India's Civil Aviation Sector has also attempted to keep pace with the rising demands from economic growth. This study provides an assessment of the economic impact of Delhi International Airport on the regional and the national economies in terms of output, value add (income) and employment.

About Delhi Airport

- Delhi airport is one of the busiest and fastest growing airports in the country and the Asia Pacific region. It is ranked 1st in the country in terms of passengers and 2nd in terms of freight. It is also ranked as the 2nd best airport worldwide in the 25–40 million passengers category for Airport Service Standards (ACI ASQ Rating, 2011). Delhi airport connects 51 international and 41 domestic routes. It ranks 47th in the world's top 100 international airports in terms of passenger traffic in 2010.
- During 2010–11, Delhi airport handled 29.94 million passengers and was ranked at the top spot in the total passengers handled in the country surpassing Mumbai airport (29.07 million). During 2011–12, Delhi Airport handled approx 35.94 million (Provisional) passengers
- The traffic ratio of Delhi airport is 31:69, that is 31.0 per cent are international travellers and the remaining traffic is domestic.
- In tourism, 91 per cent of the foreign tourists arrived by air in India in 2010 out of which Delhi airport's contribution was 34 per cent, the highest amongst the metropolitan airports.
- In terms of economic performance, a major portion of Delhi airport's revenue comes from non-aeronautical services (44.8 per cent) followed by aeronautical services (36.4 per cent) and the remaining portions of revenue comes from services like cargo, CPD and other income.
- In aeronautical revenue, airlines landing fee contributed about 69.5 per cent followed by passenger fee (26.4 per cent) in 2010–11. In the non-aeronautical revenue, the highest percentage share came from rental and services followed by retail and concession.
- DIAL's total expenditure suggests that the share of operating expenditure in total expenditure was the highest in 2010–11 (49.4 per cent) followed by staff costs (25.8 per cent) and administration and other costs (24.8 per cent).
- The total revenue per Pax increased from Rs. 419 in 2008–09 to Rs 421 in 2010–11. On the other hand, total cost per Pax declined substantially from Rs. 195 in 2008–09 to Rs.

188 in 2010–11. However, the revenue and cost ratio remained within the range of 1.2 to 1.3 since 2008–09.

Passenger Profile

A sample survey of passengers was carried out in this study to understand the profile of passengers using the airport and their expenditure pattern. In this survey, a total of 4,747 passengers were surveyed, out of which 3,278 (69.1 per cent) were domestic and 1,468 (30.9 per cent) were international passengers. The ratio is not an estimate of the ratio of international to domestic passengers but it is merely a description of the sample. The survey was spread over 10 days in the domestic and international departure and arrival sections.

- Among the Indian residents travelling by international flights, the top 20 per cent reported an average monthly income to the extent of Rs 4.2 lakh per month and the bottom 20 per cent had a monthly income of Rs 15, 525 per month.
- Among non-Indian residents travelling by international flights, the top one-fifth had a monthly personal income to the extent of US\$ 18.7 thousand per month. The monthly personal income reported by the 1st quintile group (or bottom 20 per cent) was US\$ 712 per month.
- The spending profile of air passengers in Delhi suggested that about 70 per cent of those who had come for business purposes spent more than Rs 5,000 on hotels. Similarly, about 80 per cent of the passengers who had come for Tourism purposes spent more than Rs 5,000 on hotels. About 70 per cent of the passengers in these two categories spent between Rs 1,001–10,000 on transportation.
- On the quality of services at Delhi airport, about 60 per cent of passengers said that they were 'good' and 20 per cent said 'excellent' on a scale of (poor/fair/average/good/ excellent).

Economic Impact of Delhi Airport

Contribution to Indian and regional GDP

Delhi airport's operations contributed in (2009–10) Rs 294.7 billion (0.45 per cent) to the national GDP and its contribution relative to Delhi's GSDP is 13.53 per cent. The total comprises of:

- Rs 42.9 billion directly contributed through value added (air transport and airport services)
- Rs 77.2 billion indirectly contributed through supply chain (multipliers impact).
- Rs 174.6 billion in induced impact through tourism and investment.

By 2020, the overall economic impact of Delhi Airport is expected to be approx Rs 909.5 billion, which will be 0.7 per cent of the National GDP and relative to Delhi's GSDP would be 22.2 per cent.



Delhi airport's construction sector contributed INR 68.23 billion (0.104 per cent) to the national GDP (in 2009–10) and its contribution relative to Delhi's GSDP is 3.13 per cent. This is a one-time impact which includes one-third of the total project cost. The total impact of the construction phase would, therefore, be three times this estimate but spread over three years. This total impact of construction phase in a year comprises of:

- INR 25.7 billion directly contributed through value added.
- INR 42.6 billion indirectly contributed through supply chain (multipliers impact).

Contribution to Employment

Delhi airport's operation sector contributes 1578 thousand jobs (0.34 per cent of national employment) and this represents as a ratio to Delhi's employment a significant 25.9 per cent. The total comprises of:

- 64 thousand directly contributed jobs.
- 452 thousand indirectly contributed jobs through supply chain (multiplier impact).
- 1062 thousand jobs in induced impact through tourism and investment.

Delhi airport's construction activities contributed total 614 thousand jobs in each of the three years of construction phase. This total comprises of:

- 35 thousand directly contributed jobs.
- 579 thousand indirectly contributed jobs through multiplier effects.

The study has illustrated the significant linkages of the Civil Aviation Sector with the rest of the economy. It has highlighted the catalytic role the sector can play in supporting economic growth of the region and the country. We should also note that linkages of the national and regional economies are also multifaceted and exact demarcation of these effects is also difficult. The study has required use of combination of approaches and assumptions to come up with the estimates of the economic impact, given the complexity of the sector. We believe that the insights from the study would be of significant value to the understanding of the role of the sector in the economy and to policies to enhance the positive effects of infrastructure development.

Chapter 1

Introduction

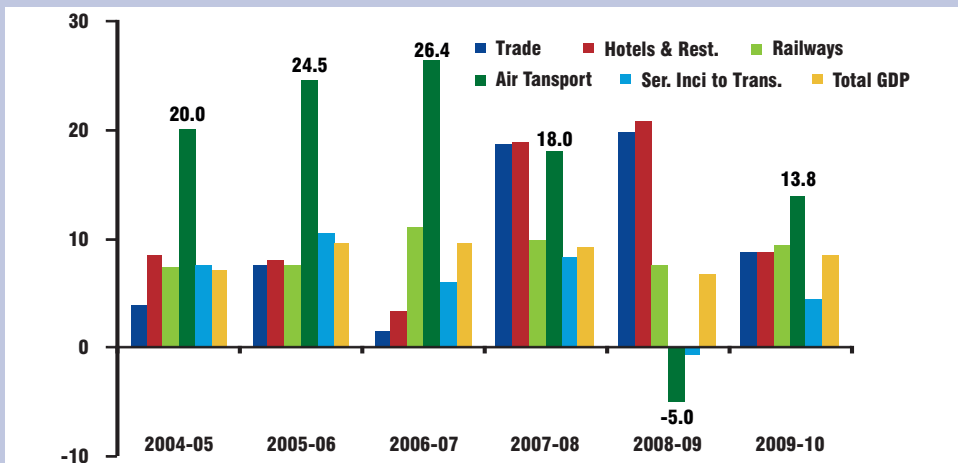
Aviation sector brings enormous benefits to communities and economies around the globe. It is a key enabler of economic growth, social development and tourism providing connectivity and access to markets. Air transport currently supports 56.6 million jobs and over US\$2.2 trillion of global GDP. It is a strategic contributor to economic growth and development.

The aviation industry in India has experienced remarkable transformation in the last 20 years. As the economy experienced changes in policies from a highly regulated regime to a more market oriented structure, there were also significant changes in the policies and demand for air travel. As the Indian economy moved towards becoming more outward oriented, rising per capita incomes, changes in the structure of the economy meant greater demand for mobility to meet business and personal needs. Thus, there was an increase in demand for physical infrastructure in general and transportation in particular. Air travel is now becoming an affordable mode of transportation for a much broader segment of the population than before.

In order to meet the growing demand for air transport, the Planning Commission of India set a target of investing Rs 300 billion in airport infrastructure during the 11th Five Year Plan (2007-12). The 11th Five Year Plan period also shows extensive modernization of airport infrastructure through a combination of public and private investment. The public sector is modernizing Chennai and Kolkata airports along with 35 non-metro airports while the two major metro airports in Delhi and Mumbai have been successfully modernized in the Public Private Partnership (PPP) mode. The new Mumbai airport is also expected to be bid out for development by the private sector. In addition, Hyderabad, Bengaluru and Cochin airports also offer good examples of the success of the PPP mode. This expansion of the airport network has increased air connectivity significantly, thus bringing mid-sized towns into the business network. This has meant wider provision of manufacturing and commercial services across the country.

To improve the airport infrastructure further, the Approach Paper for the 12th Plan Period (2012-17) outlines that on the basis of past experience and the experience of other large economies, requirements for transport services are likely to grow significantly faster than the overall growth in GDP. Growth in the air transport sector witnessed outstanding GDP growth between 2004-05 and 2006-07 (Figure 1.1). This sector also contributes directly or indirectly to the growth of other sectors in the economy. For example, the hotel industry's growth is statistically correlated with the growth of the Civil Aviation Sector. Building new airports or

Figure 1.1
Air Transport Sector Records Phenomenal Growth (% YOY, GDP)



renovating existing airports or improving operation of airports requires huge amounts of raw material which is usually supplied by various other sectors in the economy.

The air transport sector also renders a wide range of services; ranging from passengers to shipping tonnes of high value products in a shorter time as compared to other modes of transportation. Further, millions of local inhabitants also depend on and are either directly or indirectly associated with the airport business. A number of existing studies in literature have quantified the social and economic benefits of airports for the national and regional economy. Most of the existing studies analyze these benefits in terms of employment, output and tax revenue collection.

A study conducted by the Pennsylvania Bureau of Aviation (The Center for Rural Pennsylvania, 2001) compared the economic impact of rural versus urban airports. They concluded that out of the 134 public airports in the State, around 55 (41%) were found in rural areas. These rural airports generated US\$ 31.5 million in payroll (1,650 jobs) compared to US\$ 5.5 billion in payroll (286,500 jobs) for urban based airports in the State. Total economic impact from airport operations in the Pennsylvania study were estimated to be over US\$ 12.5 billion with US\$ 12.4 billion accounted for by the urban based airports.

According to the 2004 global estimates commissioned by the Air Transport Action Group (ATAG), 13.5 million jobs worldwide can be attributed to civil aviation of which about 5.1 million people were directly employed by air transport and aerospace industries, 5.8 million jobs supported indirectly at suppliers and another 2.7 million jobs created through induced



employment effects. The estimated total contribution of civil aviation in terms of value added amounted to US\$ 880 billion, which is composed of around US\$ 330 billion direct demand, US\$ 337 billion indirect demand and US\$ 176 billion induced demand.

Airport Council International (ACI) Europe (2004) finds that European airports support 950 on-site jobs per million passengers per annum. For every million passenger, it creates 2,950 jobs nationally, 2,000 jobs regionally and 1,425 job sub-regionally. The report also indicates that the airport sector contributes 1.4-2.5 per cent of GDP, not including induced impact (tourism). A study on the economic impact of Sydney airport (2008) suggests that the airport generates 75,580 jobs directly and a gross output of US\$ 14.8 billion or GSP (value added) of \$8.0 billion. The study finds that airport generates indirect jobs of 130,553. In terms of indirect GSP contribution, the report suggests a GSP of US\$ 8.5 billion at the airport.

Beyers and Hyde (2003) conducted a study to estimate the economic impact of King Country International Airport in the US. By using an input-output methodology they estimated indirect and induced impacts on the local and regional economy. According to the study, the airport generated more than 10,000 jobs in King County in 2002, was responsible for sales of \$1.6 billion King County businesses and it supported the earnings of \$0.5 billion in labour income. Over \$39 million in state and local taxes were generated as a result of the economic activity at the airport. Three thousand and nine hundred people had direct employment at the airport in 2002, earning \$261 million in labour income. Direct sales by businesses at the airport were \$1.04 billion, \$.68 billion of which were accounted for by aerospace activity.

By using the estimated direct impact values and generated indirect and induced impacts, the multipliers were calculated for all the three aggregate values. The multipliers for output, employment and labour income were 1.59, 2.59 and 1.93 respectively. At a disaggregated level, strong impacts were reported within transport services such as retail trade, finance, insurance and real estate whereas the impact within the aerospace sector was very small, reflecting the relatively weak inter-industry linkage within this sector in the regional economy.

Gallagher (2008) estimates economic impact for Salina Municipal Airport and the Salina Airport Industrial Center. Her study used appropriate components of the Fiscal Impact Model along with Regional Input-Output Multiplier System to calculate multipliers for each industry and for many industry sub-sectors. As per the study direct employment in the Salina Airport Industrial Center accounted for close to 14 per cent of the total Saline County workers and total employment including indirect and induced through multiplier accounted for almost 29 per cent of total Saline County workers. Benefits, costs and net benefits (benefits minus costs) were calculated based on the total employment and payroll figures, direct employment and payroll plus indirect employment and payroll, based on the multipliers for each industry sector, to arrive at total employment and payroll.

Bunting et al., (2006) conducted a study on the economic impact of Spokane International Airport. They adopted input-output analysis to assess the economic size of the Airport. As in most input-out studies, the study provides three measures of size: output (sales), wage income and jobs. The study examined five important components of airport activity such as visitors, facility tenants, business park tenants, capital spending and internal operations. Three conventional indicators of economic activity, output, labor income, and employment, are used to estimate the economic impact of the Airport.

The study finds that direct output stood at 1.8 per cent of total regional output while indirect and induced went up to 3.1 per cent of the regional output because of multiplier effect. Similarly, direct employment generation was at 2.6 per cent of the regional total where as indirect and induced came around 4 per cent of the regional. The values of the multipliers for output, wages and jobs were: 1.68, 1.59 and 1.52, respectively. The study results outline the multipliers of direct output.

Purcell (2010) using the input-output table generated by the Manitoba Bureau of Statistics; the author estimated economic impacts of Kingston Airport. Initially the direct impact was calculated from the data generated through survey, and then the indirect and induced impacts were estimated using corresponding multiplier from the readymade I-O table for each sector. The study therefore appears to be very simplified version of the I-O method since one can easily calculate total impact provided I-O table that acutely reflects the economic structure of the region. The calculated figures were 336 jobs including direct, indirect and induced with the total revenue of U\$ 49.5 million.

Kansas City Aviation (2006) was entrusted to study the economic impact of Kansas City International Airport on the regional economy and to prepare an impact report that documents the direct, indirect, induced, and total impacts derived from Airport operations. Using well generated Regional input-output (I-O) multipliers, the study systematically estimated regional inter-industry relationships and the additional economic activities are referred to as the multiplier effects of the direct and indirect impacts. The main three variables such as output, revenue generation and employment generation were taken for estimation. The direct output contribution was 20 per cent of the total output generated while the remaining being indirect and induced output. Similar trend prevailed in revenue generation and employment generation as well.

To sum up, all the above studies have examined the impact of airports on the national and regional economy in terms of output, employment and tax revenue collection. However, the existing literature suggests that very few studies have been done in the case of Indian airports and their contribution to the regional and national economy.



In the case of India, a recent study done by Oxford Economics (2011) on overall Civil Aviation Sector in India suggests that the aviation sector supports 8.8 million employment out of which 1.7 million people are directly and indirectly employed in the sector. The bigger contribution comes through induced (tourism and others) impact where 7.1 million people are employed due to aviation sector activities. The report indicates that the aviation sector contributes 0.5 per cent of national GDP or Rs. 330 billion (direct and indirect) and even more 1.5 per cent of GDP (including catalytic impact) or Rs. 912 billion and pays over Rs 87.5 billion in taxes including income receipts from employees, social security contributions and corporation tax levied on profits. This study however does not examine the economic impact of a particular airport on the regional and national economy. Further this study does not examine the direct and indirect economic benefits of airport construction.

In this context, the GMR Group, a leading private player in the infrastructure sector in India requested NCAER to take up a study on Delhi International airport.

1.1 Study Objectives

This study provides an assessment of the economic impact of Delhi International Airport on the regional and the national economy in terms of:

- Output
- Value added
- Employment (number of jobs)

These three dimensions of economic impact are captured through various effects catalyzed by the airport:

- Direct economic impact: Direct contribution of the airport through construction and operation.
- Indirect economic impact: Indirect contribution of construction and operation of airport through its supply chain captured through the input-output model.
- Induced economic impact of airport operation: Inflow of foreign capital, tourist arrivals.
- Total impact of airport operation = (direct impact) + (indirect impact) + (induced impact).

1.2 Scope of the Study

The present study covers following aspects:

- Emergence of Delhi as a world class city in the South East Asia with growing per capita income and world class infrastructure.
- The study assesses the economic benefits from Aerotropolis which is coming up in a substantial way at the Delhi airport.

- This study focuses only on the economic impact in terms of output and employment.
- These issues are analyzed in the context of both the national (all-India) and regional economies (Delhi).
- A long term (10 year) assessment is made with respect to passenger traffic at Delhi airport.

A similar projection is also done on revenue and value added generation of Delhi airport operations in the next 10 years.

1.3 Report Structure

This report is structured as follows:

- Chapter 2 outlines the methodology for the study, using the input-output analysis.
- Chapter 3 examines the current economic performance of Delhi International Airport.
- Chapter 4 outlines Delhi as a world class city.
- Chapter 5 examines the direct economic contribution of Delhi airport to the national and regional economy.
- Chapter 6 covers indirect (multiplier), induced and total impact of Delhi airport in national and regional economy.
- Chapter 7 covers the airport growth strategy and forecasting.
- Chapter 8 outlines the profile of passengers at Delhi airport.
- Chapter 9 summarises the key findings of the study.

Chapter 2

Study Methodology

2.1 Introduction

Modern airports share many responsibilities with their host communities and provide essential services to the public. Modern airports not only provide passenger related services, but are also actively involved in non-aeronautical businesses to make the airport services viable and sustainable from a long-term perspective. Other than the airport operator, there are thousands of agencies involved either directly or indirectly in airport businesses starting from the construction of an airport to running its operations. For example, in case of the Delhi International Airport, besides passenger related services undertaken by Delhi International Pvt. Ltd (DIAL), there are thousands of agencies involved in commercial activities such as hotels, retail/concessionaires, cargo, freight forwarders, taxis and commercial property developers within the premise of the airport. Outside the airport, thousands of inhabitants are also using its services as passengers, cargo exporters and importers, truckers and even rickshaw pullers who serve the tourists. Services at the airport also play a role in attracting tourists to the city, and in attracting investment and trade. Capturing the economic benefits of an airport is not an easy task considering the variety of direct and indirect services that it offers to society.

In this chapter, we conceptualise what is economic impact and types of economic impact that an airport has and the methodology used to capture the economic impact of Delhi airport.

2.2 Scope of an Economic Impact Study

Literature suggests that an economic impact study measures the contribution of a major private, public or PPP project to the regional or the national economy. Economic impact is usually measured in terms of contributions to four key economic indicators:

- output
- value added (that is, GDP)
- employment
- tax revenues

In this study we focus only on the first three components of output, employment and value added. Economic literature classifies economic impacts into two components– direct component and indirect or flow-on component.

The direct component relates to the direct contribution of an industry or an airport or a project

to the regional or national economies in terms of output and employment. Output can be measured either as the value of production or in terms of expenditures incurred in the production process. Under the expenditure approach, output can be measured using various expenditures incurred by agencies in the airport's premises which make it functional. Some of the airport functions can be called 'essential services' while others can be called 'enabled services' or 'supporting services'. For example, at Delhi airport, services provided by government and DIAL are called essential services which include core operations of the airport, whereas, airlines operations are enabled by the airport services. Similarly, for the construction of an airport, the output can be measured via the total amount spent by the airport operator for the project. It is important to note that utmost care should be taken while compiling the direct output contribution of an airport because of the likelihood of double counting of expenditures of different agencies.

For the second component of economic impact, the indirect impact, an appropriate methodology to capture it is the Input-Output analysis. This indirect impact is defined as – output or employment generation by other industries due to the construction or operations of an airport.

2.3 Insights from Economic Impact Studies

Aviation and airports have become deeply embedded in a variety of aspects of an economy. Air transport is used by millions of passengers for different purposes like business and leisure. With the arrival of low cost carriers, air travel has now transformed from being a luxury to a necessary mode of transport for many. There was a sharp increase in air traffic in India in the 2000s. Not only did passenger traffic go up, but an increasing proportion of global trade was undertaken via air transport. As a result, the impact that an airport has on the economy and society has also grown considerably.

Although there is little question about the ability of an airport to generate various economic activities and growth, measuring that contribution can be a difficult task. Airport's contribution to any economic activity is actually a combination of the contribution of hundreds of organizations/agencies operating in and around the airport. In case of Delhi airport, there are more than 30 airport service providers (see the list in **Table A2.1 in the Appendix-A**). As mentioned earlier, an airport's contribution to the regional or national economy is accounted for not only by the activities at the airport, but also outside the airport. Therefore the benefits accruing to or the income generated by different agencies is called the economic contribution of an airport to the regional and national economy. The nature of activities in airports and the scale of many modern airports mean that they have many external stakeholders, including commercial organizations, governments, neighbouring communities and the travelling public.

In this context, an economic impact study provides quantitative and qualitative evidence on the



importance of an airport to the regional and national economy. Such economic impact studies help in understanding the key role air transportation sector plays in meeting the many needs of the economy beyond just transportation.

2.4 Types of Airport Economic Impacts

In broad terms, economic impacts for airports have been defined under three categories. They are:

- **Direct impact** – The direct impact of an airport on the regional economy reflects jobs and income directly originating from the construction of an airport or its operations or usage of the services provided by the airport, either on site or in the surrounding area.
- **Indirect or flow-on impact** – Income and employment generated in the regional economy (by other industries) of the study area due to activities and incomes generated by the direct impact.
- **Induced or catalytic impact** – Income and employment generated in the regional economy of where the airport is located thanks to the wider role of an airport in attracting other activities, such as new investment and tourism.

2.5 Methodology and Approach to Measure Economic Impacts

In this study we capture economic effects in terms of income or value added accruing to the economy and also reflect on other dimensions of this impact such as the profile of users of airport and service providers in airport infrastructure.

We first distinguish between the development and operations of an airport. This includes both airport infrastructure and development of any other facilities around the airport. We then consider the impact of airport development on the services ‘enabled’ by the airport which is called induced impact and includes tourism and investment flow.

Development of the airport: direct and indirect impact

The construction of an airport is a major investment activity which requires huge quantities of material, equipment, services and of course technology. Some of this may be produced in the domestic or local economy and some may be procured from international markets.

An understanding of the impact that the construction of the Delhi airport has in terms of employment and income generation is captured through information obtained from the airport operator.

The production and supply of these inputs has multiplier effects. The input-output (I-O) analysis is an appropriate approach to provide an assessment of these multiplier effects. This point has also been made in a recent study by the International Civil Aviation Organisation

(ICAO) study ICAO, 2008). However, to the extent that demands for the various goods and services that is generated by the airport sector may have to be met by imports, the overall impact on the domestic economy may be less than our estimates. There may be other economic activities that imports require, offsetting to some extent this over-estimation of the multiplier effects. In the absence of adequate assessment of imports and the impact of imports we have not made any adjustments to the methodology in assessing the indirect impact of the airport.

Operation of an airport: direct and indirect impact

The operation of an airport requires a variety of inputs, labour, technology and other services which have to be procured by an airport operator. While the demand for an airport's operations emanates from its users, the operation requires a variety of inputs. One aspect of the economic impact of the operation of an airport is generation of income and employment for those who make the airport work.

The indirect impact of the operation of airport is captured through an I-O analysis of multiplier effects, as in the case of airport construction noted above. The impact of operations is a 'flow effect' and will accrue to the economy so long as the airport is functional.

Induced impact of airport

The 'induced impact' essentially refers to the economic activities that are made possible because of the airport. The availability of air transportation makes it possible for the far-away tourists to reach new destinations; availability of airport makes it possible for enterprises to be set up which require fast and safe transportation of high valued or perishable commodities; air transportation makes it possible to set up enterprises which require close global linkages. From an economic perspective, we consider the total value these services contribute to the national economy as the 'induced impact'. We also consider the employment effects of these induced activities to the extent possible. The assessment is based on the information from a sample survey of service providers and from information available from secondary sources.

In this context, we also examined the profile of 'users' of airport services: mainly passengers and freight operators. A sample survey of passengers was carried out to get details of their profiles and their pattern of travel. The sample size and results of this survey are discussed in Chapter 8.

An illustrative summary of the direct and indirect economic impacts of the development of airport infrastructure is given in **Table 2.1**.

Table 2.1**Summary of direct and indirect economic impacts of the development of Delhi Airport**

Stages	Direct Impact	Indirect Impact
Development of an airport	Income and employment generated in the development or construction process; impact on affected persons in the process of land acquisition; environmental impact; the economic impact is captured through expenditure patterns of airport development	Income and employment impact through the multiplier effects; captured through I-O analysis
Operation of an airport	Income and employment generated in the process of an airport's operations; environmental impact of an airport's operations captured based on information provided by the airport operator and a survey of service providers	Estimates generated through an I-O analysis
Services enabled by an airport: infrastructure (may also be considered as an 'induced effect')	Direct users are passengers and freight operators (information captured through primary sample survey)	Income and employment generated through investment, tourism, etc.

2.5.1 Economic modelling: I-O analysis for flow-on impact

As mentioned before, the present study uses the I-O methodology to measure the *indirect or flow-on* impact of Delhi airport in terms of output and employment generated on the national and regional economy. The definition and detailed description of various components of the I-O table are given in **section-B of Appendix A**. This flow-on impact in terms of output and employment is captured through estimating multipliers of output and employment for three important airport related sectors:

- airport construction
- airport operation
- air transport

The first two sectors which are part of some of the aggregate sectors in the 130-sector National I-O Table 2006-07 have been constructed as two separate sectors in this study.

We have used a 35-sector I-O table for the present analysis. This has been derived from 130-sector I-O table available at the national level. The mapping of our 35-sector I-O table to that of 130-sector I-O table is given in **Table A2.3 in Appendix -A**. Aggregation of the existing 130-sector I-O model into 35 sectors, was made keeping in mind the inter-sectoral dependence of three important sectors representing the airport industry.

The two new sectors of *airport construction* (sector 19) and *airport services* (sector 25) have been derived based on the information's available from DIAL and other published sources.

Output and Employment Multipliers

- **Output multiplier:** An output multiplier of a particular sector (say airport construction) indicates that if the final demand (comprising of consumption, capital formation and net exports) of this sector increases by one rupee, then due to the direct and indirect linkages of this sector with other sectors of the economy, the overall output of all the sectors together will increase by the multiplier factor. For example, if the output multiplier of the 'airport construction' sector is 2.650, it can be interpreted as 'if the final demand of this sector increases by one rupee, then due to the direct and indirect linkages of this sector with other sectors of the economy, the overall output of the economy will increase by Rs 2.65'.
- **Employment multiplier:** Suppose the employment multiplier of the 'airport construction' sector is 1.58. This can be interpreted as '1.58 jobs are generated in this sector due to an increase of Rs 1 lakh in the final demand for the 'airport construction' sector owing to the direct as well as indirect effects'.

2.5.2 Data collection

Three main sources of information were used for the study.

2.5.2.1 Data from DIAL

We received the following information from DIAL for our analysis:

- Project cost of Delhi airport in its construction phase.
- Employment data: Construction phase.
- DIAL's revenue and operational cost.
- DIAL's revenue, expenditure and value of output for the operation phase.
- Employment data for the operation phase.
- Input cost structure for the operation phase.
- Physical and throughput data for Delhi airport.

2.5.2.2 Survey Data

- A primary survey of more than 4,000 passengers (domestic and international, arrival and departure) was carried out to examine the profiles of 'users' of airport services.
- A primary survey of 50 freight forwarders was carried out.
- We also carried out a primary survey on the freight service providers, airlines, retailers/concessionaries and government agencies operating at the airport.

2.5.2.3 Data from published sources

We used various reports and publications. Some of them are:

- National Account Statistics (NAS), Central Statistical Office (CSO), Government of India.



- National Industrial Classification (NIC), Ministry of Statistics and Programme Implementation, Government of India.
- Reports of National Sample Survey Organisation (NSSO), Ministry of Statistics and Programme Implementation, Government of India.
- State level GDP, Central Statistical Office (CSO), Government of India.
- Domestic Tourism in Delhi (2008-09), Directorate of Economics and Statistics, Government of Delhi.
- Indian Tourism Statistics (2010), Ministry of Tourism, Government of India.
- Foreign Direct Investment, Ministry of Commerce and Industry, Government of India.
- Input-Output Table (2006-07), Central Statistical Office (CSO), Government of India.
- Airports Authority of India.
- Ministry of Civil Aviation, GOI.
- Oxford Economics Report, 2011.



Chapter 3

Delhi Airport: A Snapshot

3.1 Delhi Airport

Delhi airport is one of the busiest and fastest growing airports in the country. In 2010-11 on average it serviced (excluding military and other exempted categories) 764 flights, 81,293 passengers and 1,652 tonnes of cargo per day. The Delhi airport, which was earlier known as the Palam airport, was built around World War II as RAF Station Palam and after the British left, it served as an Air Force Station for the Indian Air Force. Passenger operations were shifted to this airport from Safdarjung airport in 1962 due to an increase in traffic. At that time, Palam airport had a peak capacity of around 1,300 passengers per hour. Owing to an increase in air traffic in the 1970s, an additional terminal with nearly four times the area of the old Palam terminal was constructed. With the inauguration of a new international terminal (Terminal 2), on 2 May 1986, the airport was renamed Indira Gandhi International (IGI) airport. With the starting of operations at the new Terminal 3 in July 2010, Delhi's Indira Gandhi International airport became India's and South Asia's largest and one of the most important aviation hubs, with a current capacity of handling approximately 63 million passengers; it is proposed that the airport will be able to handle up to 100 million passengers at saturation as per the Master Plan.

3.2 Scale of Facility

There are two primary aspects in the scale of Delhi airport: a physical aspect and a throughput aspect.

3.2.1 Physical Scale

Delhi airport is built on approximately 5,000 acres of land, one of the biggest airports in India in terms of area (Table 3.1). There are four sponsors for the airport-GMR, Airports Authority

Table 3.1
Comparison of Land Area

Airports	Land Area (acres)
Delhi	5,000
Mumbai	1,500
Chennai	1,283
Kolkata	5,400
Hyderabad	5,500
Bengaluru	4,000

Source: Airport's website.

of India (AAI), Fraport and Malaysia Airport. GMR is the lead member of the consortium with a 54 per cent share. Fraport AG is the airport operator with a 10 per cent share whereas Eraman Malaysia is the retail advisor which has the same number of shares as Fraport AG. AAI's share is 26 per cent. The concession period for 60 years.

One of the physical attributes of Delhi Airport as compared to other airports in India is its existing extraordinary infrastructure. It is ranked 1st in the country in terms of passengers (Pax) and 2nd in terms of freight. It is also ranked as the 2nd best airport worldwide in 25-40 million passengers category in the ASQ ratings carried out by ACI (ACI, 2011) and was awarded as the Best International Project by British Construction Industry (BCIA). It ranks 47th in the Airport traffic of the world's top 100 international airports. IGI airport is the home to several Indian airlines including Air India, Indigo, Jetlite, Spice Jet, Jet Airways, Kingfisher Airlines and Go Air which use IGI airport as their secondary hub. Approximately 80 airlines operate from this airport.

The Delhi airport has three runways-11-29, 10-28 and 09-27 with a total length of 4.43 km, 3.81 km and 2.81 km each respectively (Table 3.2). It is the only airport in India which has three runways and it has India's longest runway of 4.43 km. Currently there are six operational terminals at Delhi Airport-Terminal 1 (T1) (C&D), Terminal 3 (T3), T2 (currently being used for Hajj), terminal and two cargo terminals.

Table 3.2

Comparison of Scale of Delhi Airport's Facilities

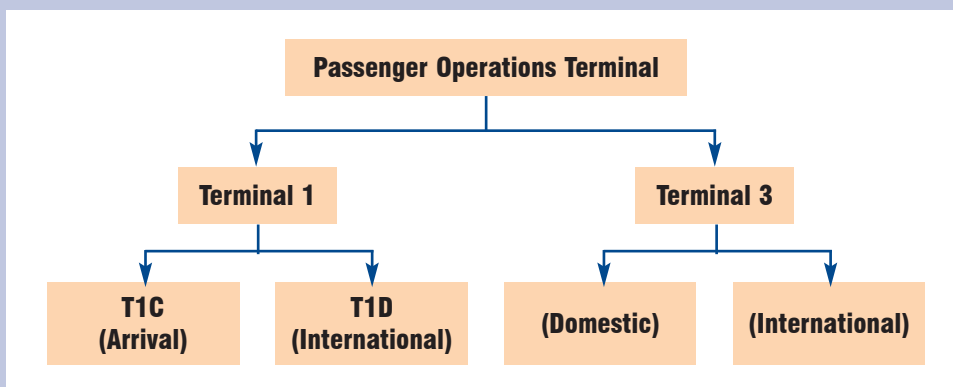
Facility	Handling Capacity	Length (m)
Runways		
11-29		4430
10-28		3810
09-27		2813
Terminal Buildings		
	Million per annum	Area (sq .m)
1A (moth ball) & 1D	9.65	52571
1C	9.65	11575
T2	9.40	54729
T3	34.00	553887

Source: Delhi International Airport Ltd. (DIAL)

There are four terminals for passenger operations in the Delhi airport (Figure 3.1). All the domestic and international passenger traffic is handled from these terminals. Terminal 1 handles domestic traffic with T1C for arrival and T1D for departure. Terminal 3 is an integrated terminal which handles both domestic and international traffic.

Figure 3.1

Passenger Operations Terminals

*Domestic Passenger Terminal*

Terminal 1C- The terminal in which domestic flights arrive. The total area of this terminal is 11575 sq. meters.

Terminal 1D- It is used for the departure of domestic airlines (Indigo, Go Air and Spice Jet). Terminal 1D has the capacity to handle 8.15 million passengers per year and is commenced its operation on 15 April 2009.

International Passenger Terminal

T3 consists of international and domestic. It is the 24th largest building in the world and the 8th largest passenger terminal. This terminal was inaugurated on 3rd July 2010. It occupies 553,887 m² with a capacity to handle 34 million passengers annually. All international and full service domestic carriers operate from T3. T3 is a two-tier building, with the bottom floor being the arrival area, and the top being the departure area. It has a nine level passenger terminal building and two piers each of which is 1.2 km long. This terminal has six common check-in islands, 168 check-in counters, 95 immigration counters (49 outbound and 46 inbound immigration counters), 78 passenger boarding bridges (including three passenger boarding bridges for A380 or similar sized aircraft), 14 baggage reclaim belts including two belts for out of gauge (OOG) bags, 30 parking bays, 30 security channels, 92 automatic travelators/walkways (longest one being 118 meters), 34 escalators, 63 lifts,. Over 20,000 sq metres of retail space is also available in T3. The total additional area under aprons is 9.47 lakh sqm .

T3 has a multi-level car parking facilities which can accommodate 4,300 cars.

There is a hotel at the airport which is located in T3. There are 90 rooms in this hotel, 30 rooms of which can be used by domestic transit passengers and 60 rooms by international

transit passengers. T3 is connected to Delhi by an eight-lane motorway (National Highway 8) and the Delhi Aero Express.

Cargo Terminal

There are two separate terminals for cargo operations namely Greenfield cargo terminal and the Brownfield cargo terminal. Brownfield terminal is operated by Celebi Delhi Cargo Terminal Management India Private Limited which is located at a distance of about 1 km from the main terminal T3 while the Greenfield terminal is operated by the Delhi Cargo Service Centre Private Limited. The total area under the Brownfield cargo terminal is approximately 70,000 sq meters while the Greenfield terminal has an area of approximately 48,500 sq meters. The Delhi Airport received an award in 2007 for its excellent and organized cargo handling system.

Haj Terminal

This terminal (T2) is used for the annual Muslim pilgrimage to Haj. Specified flights are arranged from this terminal to prevent disruption of other flights from the main airport. This terminal has the capacity to handle 9.4 million passengers per year. This terminal was also used for emergency evacuation from Libya.

3.2.1.1 Facilities at Delhi Airport

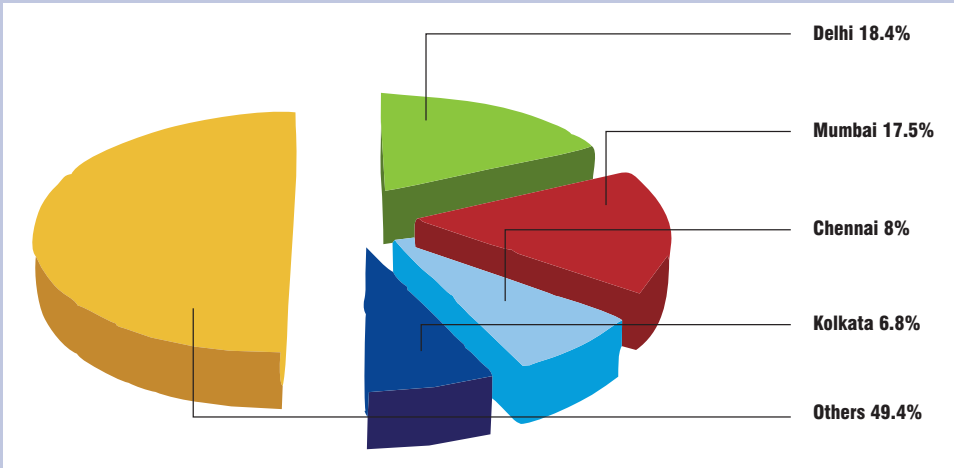
The Delhi airport is located 23 km to the south of the city, along the main south-bound roads from Delhi. Bus facilities are available to the Kashmir Gate in every 25 minutes for which the travel time is approximately 50 minutes. Luxury air-conditioned buses depart from the international terminal. Delhi Transport Corporation buses ply from various location of Delhi to and fro from the airport. There are many options available at the airport for taxis and private car rentals.

3.2.2 Throughput Scale

Delhi airport is one of the busiest airports in India in terms of total passenger traffic (both domestic and international), flights (both domestic and international) and cargo (domestic) handled per day. In terms of flights and passenger handled per day, it is positioned far ahead of other airports located in metropolitan cities like Mumbai, Kolkata and Chennai (**Figures 3.2 and 3.3**). In terms of international cargo handling, it is 2nd top airport after Mumbai (**Figure 3.4**).

Figure 3.2

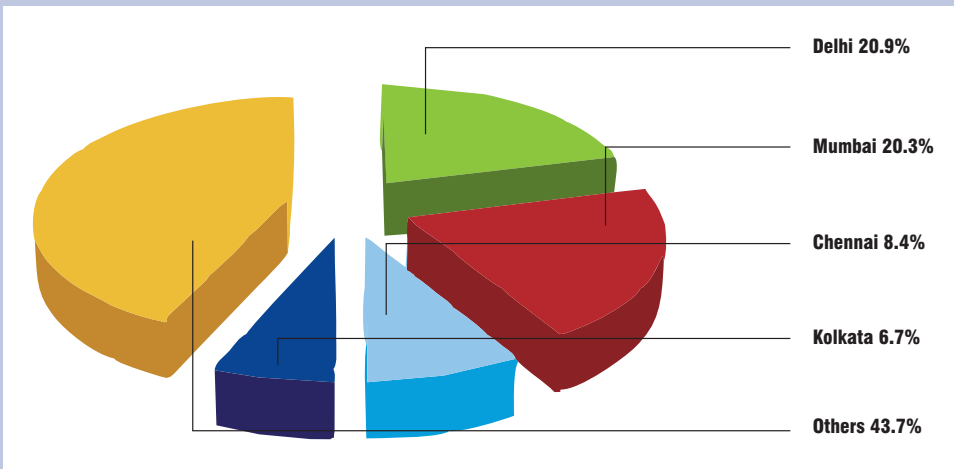
Average No. of flights Handled per day in 2010-11 (%)



Source: Based on data from AAI, Government of India.

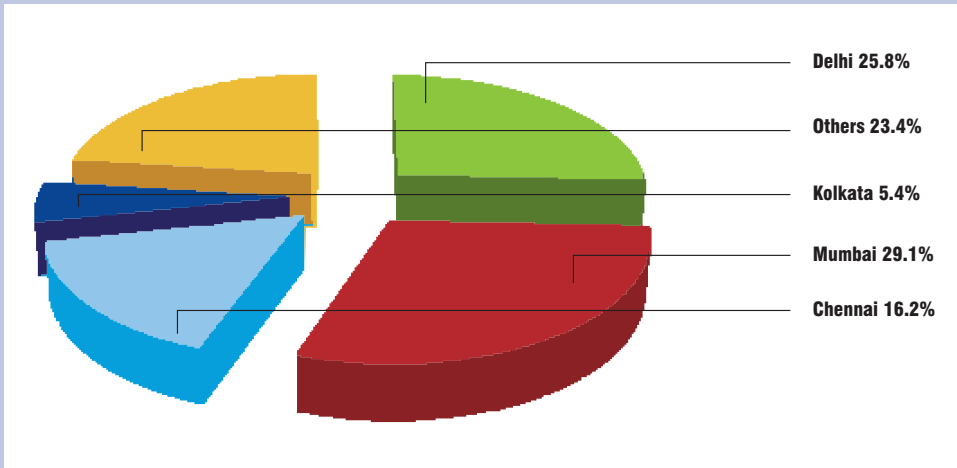
Figure 3.3

Average No. of Passengers Handled per day in 2010-11 (%)



Source: Based on data from AAI, Government of India.

Figure 3.4
Average Cargo Handled (in Tonnes) per day in 2010-11 (%)



Source: Based on data from AAI, Government of India.

In terms of the growth rate in passengers, cargo and flights handled, Delhi airport has also performed well as compared to other airports in recent times. Table 3.3 shows the Annual Average Growth Rate (AAGR) of the average number of flights, passengers and cargo handled per day at Delhi airport between 2008-09 and 2010-11. The AAGR of the average number of flights and passengers handled per day at Delhi airport is considerably higher than the other metropolitan airports during 2008-09 and 2010-11. It is 6.2 per cent for average no. of flights and 8.1 per cent for the average no. of passengers handled per at Delhi airport. In terms of cargo, AAGR at Delhi Airport is higher than the national average. More importantly, the AAGR for cargo handling at Delhi airport is 11.6 per cent higher than the Mumbai airport during the 2008-09 and 2010-11.

Table 3.3
Annual Average Growth Rate (AAGR) from 2008-09 to 2010-11 (%)

	Delhi	Mumbai	Chennai	Kolkata	Other airports	Total
Average number of flights handled per day	6.2	1.5	-1.5	5.4	0.9	1.9
Average number of Pax handled per day	8.1	4.5	4.7	9.3	8.9	7.4
Average cargo handled per day	11.6	8.2	12.4	11.2	8.0	9.7

Source: Based on data from AAI, Government of India.

During 2009-10, Delhi airport handled 26.12 million passengers—the highest number handled by an airport and surpassing Mumbai airport (25.60 million). Delhi airport connects 51 destinations all over the world with an operation of 53 international airlines. In the domestic sector, there are 11 (10 Pax airlines and one air cargo) scheduled airlines operating to five

major trunk routes (Mumbai, Chennai, Kolkata, Bengaluru and Hyderabad) and 36 other major cities. Table 3.4 shows the share of Delhi airport in passenger traffic. The share of international traffic reduced from 34.0 per cent in 2008-09 to 31 per cent in 2010-11, while the share of domestic traffic increased from 66.0 per cent in 2008-09 to 69.0 per cent in 2010-11. This shows that domestic traffic has increased exponentially. The major reasons for increase in domestic passenger traffic at Delhi airport are increase of per capita income, better business opportunities, availability of better infrastructure, tourism and frequent of national and international events like sports, book fairs, and auto expo.

Table 3.4

Delhi Airport: Passenger Traffic Share (%)

Traffic proportion	2008-09	2009-10	2010-11
International	34.0	31.8	31.0
Domestic	66.0	68.2	69.0

Source: AAI, Government of India.

3.3 Scope of Activities

Delhi airport is operated by DIAL. There are two types of operations taking place in the airport premises-aeronautical and non-aeronautical. Aeronautical operations comprise aircraft and passenger handling, while non-aeronautical operations include cargo handling, fuel farm, ground handling duty free retail, advertising, food and beverages, car rental concessions, multi level car parking etc. There are different partners/operators who perform these operations (Figure 3.5). Besides aero and non-aero activities, other important activities are also coming up around the airport which includes commercial development.

3.3.1 Aviation or Aeronautical Operations

Aeronautical operations refer to all those services that are related to the movement of aircraft. These include services like landing and takeoffs, parking and housing of aircraft.

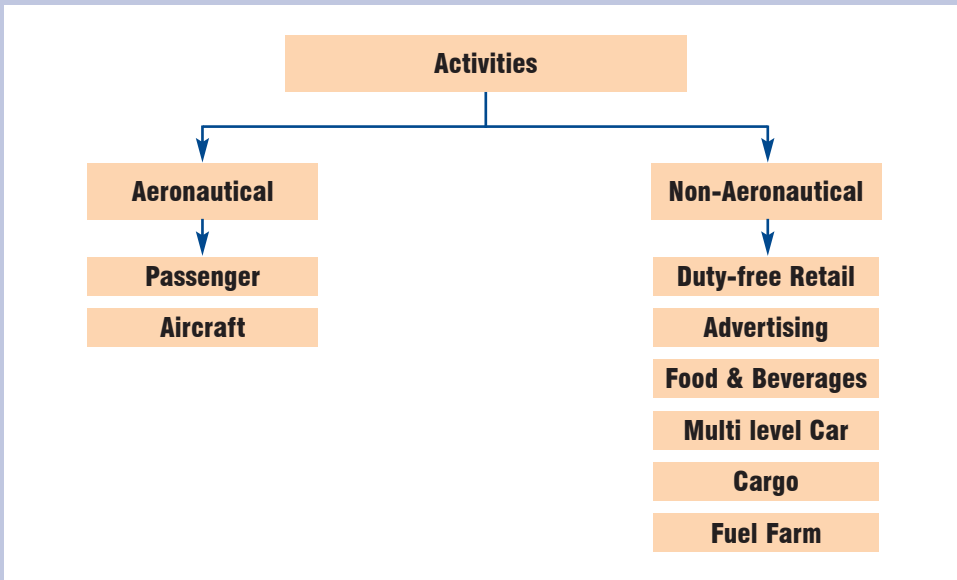
3.3.2 Non-Aeronautical Operations

Non-aeronautical services include duty free retail, advertising, food & beverages, trade & concessionaire, car rental concessions multi level car parking, Cargo, Ground Handling and Fuelling Concessions.

3.3.3 Other Commercial Development

Commercial district encompasses a range of commercial facilities supporting both aviation-linked businesses and air travelers. This facility is being developed to provide hotels for accommodation, commercial complexes and all other activities permitted under the concession agreement. Air travelers and locals can work, shop, meet, exchange knowledge, conduct

Figure 3.5
Airport Activities



business, eat, sleep, and can be entertained without going out of the airport. So far 45 acres have been identified and given for the various commercial and hospitality facilities. The first phase consists of developing 14 assets consist of hotels and commercial complex. There are approx. 5,000 rooms in these 14 assets. Out of 5,000 rooms, 3,000 rooms are budget rooms while the remaining are luxurious rooms. The cost of construction ranges from Rs.75 lakh to Rs.1 Crore per room.

3.4 Economic Performance

Every airport has its own way of managing operations because of which the question of comparing the performance of different airports for benchmarking in the airport industry arises. The economic performance of an airport is evaluated to know its contribution to the national income of the country. The economic performance of an airport can be seen in terms of revenue and cost comparison over the years. An airport improves its performance by converting traffic into revenue through providing infrastructure and services. The profit margin is driven by traffic volume, asset utilization and operating efficiency.

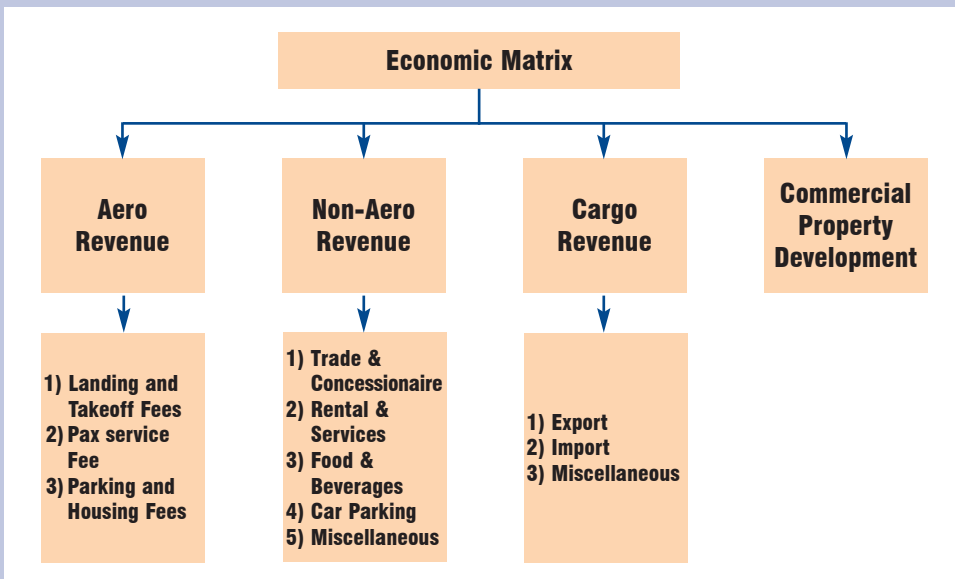
3.4.1 Airport Economic Performance Matrix

The Airport Economic Performance Matrix is a matrix of revenue and cost performance. These two elements of revenue and cost play a key role in analyzing an airport's economic efficiency. The efficiency of an airport can be measured through the difference between the

cost and revenue structure. Therefore, the revenue that an airport generates plays a vital role in its efficient operations.

The economic efficiency of an airport ensures that all the airport resources are utilized in an effective, timely and reliable manner in order to generate the maximum value. Airport utility charges vary as per the type of aviation uses. The Airport Economic Performance Matrix is based on four businesses in the airport-aero-business, non-aero business, cargo business and commercial property development (CPD). An airport operator also earns revenue from other sources like investment and interest payment received (other income) (Figure 3.6).

Figure 3.6
Economic Matrix



3.4.2 Global Airports Economic Performance

The economic performance of global airports has shown wide fluctuations over the years. International traffic data shows that Q1 of 2009 witnessed the peak of a global crisis in air travel, causing a significant fall in international passenger and freight traffic to 9.0 per cent and 20.0 per cent respectively. As a result, both the developing and developed countries saw job cuts and rising unemployment which contributed to a steep fall in consumer spending towards leisure and business travel. Secondly, during the Q2 and Q3 of 2009, the impact of H1N1 in Central and Latin America in particular reduced the demand considerably. In order to keep air fares stable and load factors high, air carriers responded to the slower demand by withdrawing capacity, cutting routes and rationalizing operations particularly in North

America, Europe and the Asia Pacific regions. Despite the global recession in 2009, its impact on air traffic and the timing and speed of the recovery varied across regions. Domestic traffic saved the overall traffic volume from a larger decline in international traffic due to strong economic growth in China, India, Brazil and Indonesia. International traffic however recovered in 2010 due to the recovery by advanced economies and strong growth in emerging developing economies.

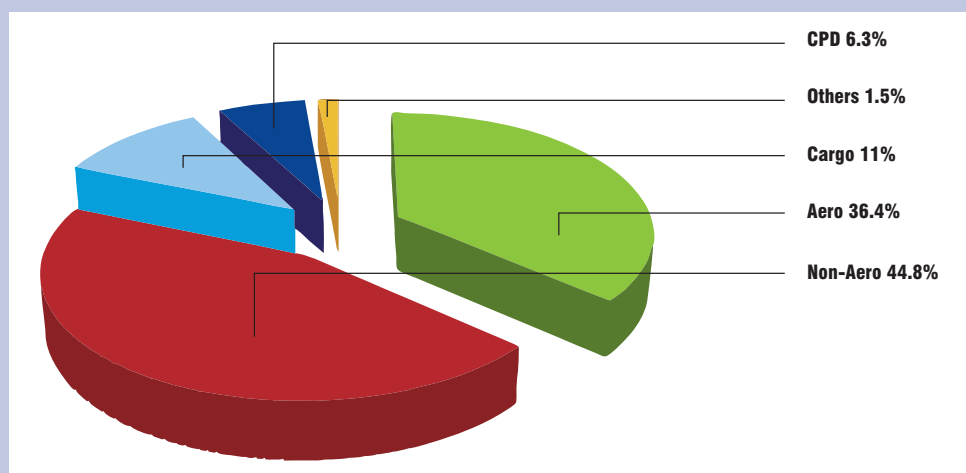
3.4.3 Economic Performance of Delhi International Airport

3.4.3.1 Revenue Source

Before 2007-08, aeronautical revenue was the major source of income for Delhi airport. Since then, non-aeronautical revenue has become the prime source of income and this is increasing much faster rate than aeronautical revenue. **Figure 3.7** shows the distribution of revenue from different source. Non-aeronautical operations contributed a larger share of 44.8 per cent followed by aeronautical operations (36.4 per cent) in 2010-11. The share of revenue to DIAL from cargo and CPD was 11.0 and 6.3 per cent respectively.

Figure 3.7

Sources of Revenue of DIAL in 2010-11 (%)



While aero revenue recorded 15.6 per cent growth in 2009-10, non-aero revenue on the other hand, registered much higher of 37.3 per cent in the same year. This was mainly due to increasing of revenue from rental businesses. CPD segments were added as a new revenue source during 2009-10, so the total revenue generated from this segment stood at Rs 791 million in 2010-11. The total operating income increased to Rs 11,068 million in 2009-10 from Rs 9,476 million in 2008-09, with an annual growth rate of 21.7 per cent. Total income which comprises operating income and other income was Rs 11,717 million in 2009-10 increased by

22.3 per cent over Rs 9,581 million in 2008-09. In 2010-11, the growth rate of revenue from both aero and non-aero has significantly declined (Table 3.5).

Table 3.5
Airport Revenue Source from 2008-09 to 2010-11 (Rs million)

Revenue Sources	Aero *	Non-Aero**	Cargo***	Operating Income	CPD	Other	Total Income
2008-09	3,610	3,746	2,119	9,476	0	105	9,581
2009-10	4,172	5,144	1,753	11068	464	186	11,717
2010-11	4,597	5,658	1,386	11641	791	185	12,617
%YOY 2009-10	15.6	37.3	-17.3	16.8	-	77.1	22.3
%YOY 2010-11	10.2	10.0	-20.9	5.2	70.5	-0.5	7.7

Source: Calculated using data from DIAL.

Note: *Aero revenue includes landing, parking, housing, PSF and baggage x-ray

** Non- Aero revenue includes amongst others fuel throughput revenue, ground handling and cute counter charges

*** Cargo in non-aeronautical revenue as per the concession agreement

3.4.3.1.1 Aeronautical Revenue

The total aeronautical revenue generated in 2010-11 was Rs 4,597 million, with an increase of 10.2 per cent over 2009-10. In 2010-11, the component of landing revenue in aeronautical revenue had the maximum share of 69.5 per cent with a growth of 18.9 per cent over 2009-10. While the Pax service fee (PSF) and housing/parking contributed to Rs 1,214 million and Rs 175 million with an increase of 16.6 per cent and 19.0 per cent respectively during the same year. Revenue from X-Ray was Rs 295 million in 2009-10 and declined by 96.3 per cent to Rs 11 million in 2010-11. The reason for this fall was due to discontinued of these charges (Table 3.6).

Table 3.6
Aeronautical Revenue (Rs. Million)

Years	Landing	Parking/Housing	Pax Service Fee	X-Ray	Total
2008-09	2435	134	852	189	3610
2009-10	2689	147	1,041	295	4172
2010-11	3197	175	1214	11	4597
%YoY, 2009-10	10.4	9.7	22.2	56.1	15.6
%YoY, 2010-11	18.9	19.0	16.6	-96.3	10.2
% Share (2010-11)	69.5	3.8	26.4	0.2	100.0

Source: Calculated using data from DIAL.

3.4.3.1.2 Non-Aeronautical Revenue

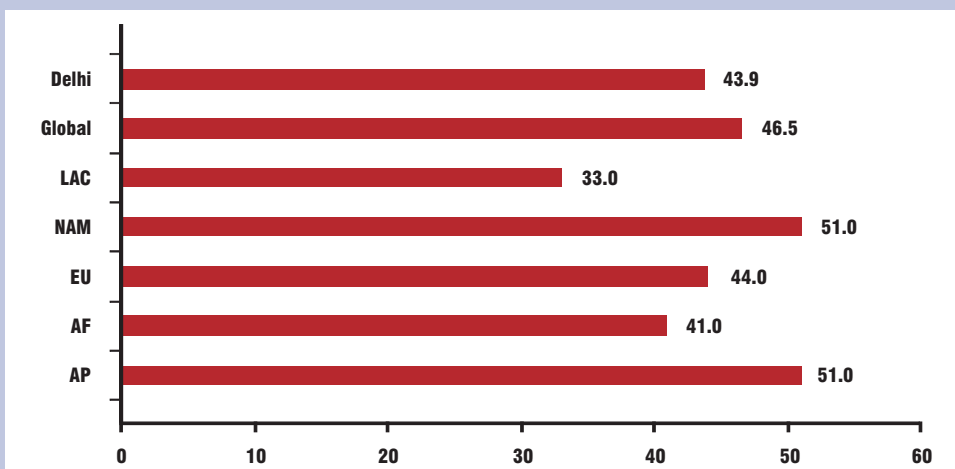
Non-aeronautical revenue (excluding cargo) contributed Rs 3746 million for the year 2008-09, and this was increased to Rs.5658 million in 2010-11. This indicates that the non-aero revenue was much higher than aero revenue during the period, making a steady transformation in the airport's commercialization, especially in airport rental, food & beverages, car parking and other miscellaneous services. Non-aeronautical income's share in total income was 43.9 per cent in 2009-10, was far behind of the world average of 46.5 per cent in 2009.

Figure 3.8 shows the share of Delhi airport as compared to global airports in non-aeronautical revenue. Delhi airport's share was 43.9 per cent in 2009 and much higher than some the other airports like those in LAC and Africa. However, Delhi airport's share in non-aero revenue is far behind that in Asia Pacific which is led by Hong Kong and Beijing airports. Delhi airport's share in non-aero revenue will further decrease once the revision of very low aero charges is implemented.

The 'Airport Economic Survey' study carried out by Airport Council International (ACI 2009) shows that non-aeronautical income contributes 46.5 per cent of the total airport income in 665 study airports. Asia Pacific and North America share the highest revenue in this component with an average of 51.0 per cent each followed by Europe (44.0 per cent) and Middle East/Africa (41.0 per cent). As against this, the Caribbean, Central and South American regions showed the lowest regional average of 33.0 per cent (Figure 3.8).

Figure 3.8

Non-aeronautical revenue: share of Delhi Airport Vs Asia Pacific and Global Airports-2009



Source: ACI Airport Economic Survey 2010 & DIAL

3.4.3.1.3 Cargo Revenue

The third important source of an airport's income is cargo revenue. The share of cargo revenue to the total income was 11 per cent during 2010-11. The total cargo revenue amounted to Rs 1753 million in 2009-10 with a drop of 17.3 per cent over 2008-09. The major reason for this drop was due to cargo business was concessioned out to our new operator as per the statutory requirement under OMDA with effect from November 2009 (Table 3.7).

Table 3.7**Cargo Revenue (Rs. Million)**

Year	Total
2008-09	2,119.2
2009-10*	1,753.1
2010-11	1386
%YoY, 2009-10	-17.3
% share (2009-10)	100.0

Source: Calculated using data from DIAL.

Note: *November, 2009 onwards the cargo business was concessioned out

3.4.3.1.4 Commercial Property Development

A new fourth source of airport income is through commercial property development (CPD). The major focus of CPD is developing Aerotropolis. The share of CPD revenue in the total airport income was 4 per cent in 2009-10 which increased to 6.3 per cent in 2010-11. The total CPD revenue was Rs 791million during 2010-11.

3.4.3.1.5 Other Income

Apart from airport services some minor income is also generated through investments and interest. This had a negligible share of less than 1.5 per cent of the total revenue (Rs 185 million in 2010-11, a marginal decline of 0.5 per cent over Rs 186 million in 2009-10.

3.4.3.2 Operating Expenditure

The total cost increased from Rs 3,702 million in 2009-10 to Rs 5,621 million in 2010-11 with an increase of 51.8 per cent. Staff, administration and other costs increased to 37 per cent and 69.9 per cent respectively in 2010-11 over 2009-10. The share of staff costs in the total costs reduced to 24.8 per cent from 27.5 per cent and in absolute value term this was Rs 1393 million during 2010-11. Operating costs increased from Rs 1,831 million in 2009-10 to Rs 2,776 million in 2010-11 with an increase of 51.6 per cent. The share of operating costs in the total operating expenditure reduced marginally by 0.2 per cent during 2010-11. **Table 3.8** and **Figure 3.9** show the total operating expenditure pattern of Delhi airport.

Table 3.8**Operating Expenditure (Rs in million)**

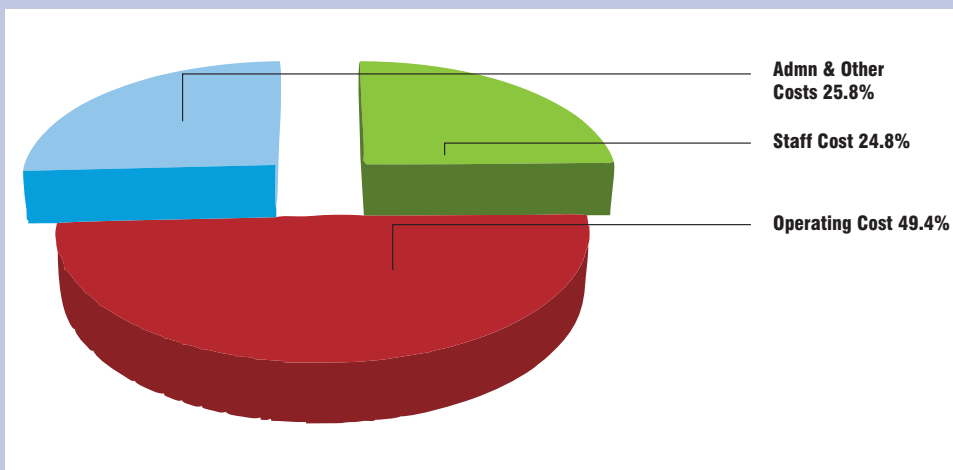
	staff cost	operating cost*	Adm & other costs	Total
2008-09	2,053	1,458	942	4,453
2009-10	1,017	1,831	854	3,702
2010-11	1,393	2,776	1,451	5,621
% YoY, 2009-10	-50.5	25.6	-9.3	-16.9
% YoY, 2010-11	37.0	51.6	69.9	51.8

Source: Calculated using data from DIAL.

* Includes electricity costs.

Figure 3.9

Expenditure Pattern of DIAL in 2010-11 (%)



Source: Calculated using data from DIAL.

3.4.3.3 Unit Revenue Performance

Airport revenue performance can be analysed through airport throughput or passenger output and work load unit (WLU). Table 3.9 shows the revenue trends from 2008-09 to 2010-11. Aeronautical revenue per passenger increased from Rs 158 in 2008-09 to Rs 160 in 2009-10 but declined marginally to Rs 154 in 2010-11. This decline is mainly due to passenger traffic has increased relatively more than the increase of aero revenue. The same trend is also seen in the case of non-aeronautical revenue per passenger in 2010-11.

Table 3.9

Revenue Indicators Trend (2008-09 to 2010-11) (in Rs)

	2008-09	2009-10	2010-11
Aero Rev. per Pax	158	160	154
Non-Aero Rev. per Pax	164	197	189
Operating Rev. per Pax	415	424	389
Total Rev. per Pax	419	449	421
Aero Rev. per ATM	16595	18200	17996
Non-Aero Rev. per ATM	17220	22441	22150
Operating Rev. per ATM	43555	48288	45572
Total Rev. per ATM	44042	51115	49393
Aero Rev. per WLU	133	134	127
Non-Aero Rev. per WLU	138	165	157
Operating Income per WLU	348	355	323
Total Rev. per WLU	352	376	350

Source: Calculated using data from DIAL.

The aeronautical revenue per aircraft movement witnessed an upward trend between 2008-09 and 2009-10. It recorded Rs. 18,200 in 2009-10 as compared to Rs 16,595 in 2008-09, but it declined marginally to Rs 17,996 in 2010-11. The same trend can be seen in total revenue per ATM which increased from Rs 44,042 in 2008-09 to Rs 51,115 in 2009-10 and reduced to Rs 49,393 in 2010-11. The overall performance of unit revenue reveals efficient utilization of resources which in turn shows a major shift in all the categories of revenue during 2010-11.

In terms of WLU, the performance of Delhi airport is as per global standards, where the average revenue per WLU for aero and non-aeronautical services was Rs 127 and Rs 157 respectively during 2010-11. The total revenue per WLU reduced from Rs 376 in 2009-10 to Rs 350 in 2010-11. The operating income per WLU has also declined significantly from Rs 370 in 2009-10 to Rs 345 in 2010-11.

3.4.3.4 Unit Cost Performance

The overall total cost per Pax declined sharply from 2008-09 to 2009-10 but then again increased in 2010-11 (**Table 3.10**). Staff cost per Pax, total cost per Pax, staff cost per WLU and total cost per WLU all show the same fluctuating trend. They all increased till 2008-09 and then decreased in 2009-10 and then again increased during 2010-11. The increase in staff costs till 2008-09 was due to payment made to AAI staffs. Since then the staff costs have been reduced by more than 50 per cent. On the other hand, operating costs per Pax has witnessed continuous increase over the years. Because of the new terminals in operation, the area of the operations of the terminal has increased by 4.5 times.

Table 3.10

Indicators Trend (2008-09 to 2010-11) (in Rs)

Components	2008-09	2009-10	2010-11
Staff cost per Pax	90	39	47
Operating Cost per Pax	64	70	93
Total Cost per Pax	195	142	188
Staff cost per WLU	75	33	39
Operating cost per WLU	54	59	77
Total cost per WLU	164	119	156
Total cost per ATM	20470	16150	22005

Source: Calculated using data from DIAL.

Note: net revenue = Gross revenue - share of AAI in gross revenue.

The reason for increase in costs is manifold increase in infrastructure as given in **Table 3.11** below:

Table 3.11**Infrastructure Development at Delhi Airport**

Categories	Earlier	Additions
Apron area (sqm)	750000	947000
Runway & Taxiway areas (Sqm)	1183000	1658100
Passenger Terminal Buildings (Sqm)	125160	553887
Escalators	6	34
Elevators	19	63
Travellators	0	92
Passenger boardings Bridges	12	78
DG sets (KVA)	8000	42000
Chillers (TR)	9000	20000

Source: DIAL

Over the years, both domestic and international traffic in terms of aircraft, passengers and cargo has increased at Delhi airport. While international passenger traffic has declined domestic traffic has increased. Our analysis also reveals that the operating expenditure and revenue increased during 2010-11. On the expenditure side, a large increase can be seen in the operating and administration and other costs. The reason for this increase in expenditure may be contributed by both the increase in the number of staff members and increase in the salaries of existing employees. On the revenue side, a large amount was generated from non-aeronautical businesses as volume of traffic increased.

Chapter 4

Delhi - As a World City

4.1 Introduction

Delhi is increasingly becoming a 'world city' in terms of its role in providing linkages between Indian and global economy. The flow of goods and services, movement of people across national boundaries requires infrastructure that provides transportation and communication. In this chapter we discuss issues relating to the role of a world class airport in the economic growth of a city.

Delhi city is also known as National Capital Territory (NCT). It is now the largest metropolis by area and the 2nd largest metropolis by population in India. Delhi's total area is 1,483 sq km. It is the 8th largest metropolis in the world by population with 16.7 million inhabitants as per the 2011 Census. There are nearly 22.2 million residents in the greater National Capital Region urban area (which also includes cities such as Noida, Greater Noida, Ghaziabad, Gurgaon and Faridabad along with other smaller nearby towns). The city is sprinkled with monuments, museums and art galleries, architectural wonders, a performing-arts scene, eating places and bustling markets. Delhi is famous for its tourism potential and has attractions like Dilli Haat, Akshardham Temple, India Gate, Jantar Mantar, Lodi's Tomb, Parliament House and Purana Quila. Delhi is also famous for its world heritage monuments like Red Fort, Humayun's Tomb and Qutab Minar.

Trends in Economic Growth

Delhi's economy has shown tremendous growth during the last decade. This growth has mainly been driven by the service sector followed by the manufacturing sector. Agriculture plays a minor role in the overall economic growth of Delhi. One of the reasons for the high growth in the service sector is that Delhi is a trading hub in northern India. Most of the north Indian states like Punjab, Haryana, Uttar Pradesh and Rajasthan export their products to Delhi. And interestingly, 50 per cent of imported agriculture products from these states to Delhi are again re-exported to both these and other states. The reason for this lies in the fact that Delhi has better infrastructure such as large mandis equipped with modern technology, storage facilities, electricity and water as compared to other states in the region. Besides trade, other services like real estate, hotels, restaurants, financing, banking, insurance, business services and other service-centred industries also played an equally important role in the growth of the service sector.

Table 4.1 shows the average Gross State Domestic Product (GSDP) growth rate for different states. The average GDP growth rate for Delhi is quite high as compared to other metropolitan and non-metropolitan states. Delhi recorded a growth of 8.7 per cent on an average during the period 1993-94 to 2009-10, whereas two industrialized states like Maharashtra and Tamil Nadu registered only 7.4 per cent and 7 per cent GSDP growth, respectively, during the same period. Delhi's GSDP growth is also much higher than the national GDP growth of 7 per cent. One of the reasons for Delhi's higher growth is the contribution of the service sector which is growing faster than the national level. Sectors like real estate, trade, hotels, and transportation are growing at higher rate due to inflows of capital

Table 4.1
Average Annual GSDP Growth Rate (%)

States	1993-94 to 2009-10
West Bengal	6.7
Andhra Pradesh	6.8
Karnataka	6.9
Tamil Nadu	7.0
Maharashtra	7.4
Delhi	8.7
All India	7.0

Source: Based on data from the Central Statistical Office (CSO), Government of India.

and also labour as business and employment opportunities are expanding. Delhi's per capita income is far above that of other states. In 2004-05 and 2010-11 it was also higher than the all-India average (**Table 4.2**). The CAGR of per capita income from 2004-05 to 2010-11 was higher for Delhi than Andhra Pradesh and West Bengal and also higher than the all-India level.

Table 4.2
Per Capita Income

States	2004-05	2010-11	CAGR (2004-05 to 2010-11)
Andhra Pradesh	19,963	39340	12.0
Maharashtra	26,603	62729	15.4
Tamil Nadu	22,975	51928	14.6
West Bengal	19,367	32751	9.2
Delhi	45,157	95943	13.4
All India	19,331	35917	10.9

Source: Based on data from the Central Statistical Office (CSO), Government of India.

Across cities in India, Delhi ranks 2nd with a GSDP of US\$ 167 billion after Mumbai, which has a GSDP of US\$ 209 billion. Given the fast paced growth of Delhi, the city may overtake Mumbai in terms of GSDP. The availability of world class infrastructure like the Delhi Metro, clean energy bus transport, modern airport, and other physical infrastructure will spur service sector growth and hence the overall economic growth of Delhi (**Table 4.3**).

Table 4.3**Top Ten Cities in India**

Rank	Cities	GSDP 2008 (at \$ bn)	Population in 2011 (million)
1	Mumbai	209	19.0
2	Delhi	167	16.7
3	Kolkata	150	14.8
4	Bengaluru	83	6.5
5	Chennai	67	7.5
6	Hyderabad	60	7.0

Source: PricewaterhouseCoopers projections using UN population definitions.

4.2 What is a World City?

The world city concept was articulated in the Globalization and World Cities (GAWC) Study Group and Network (www.lboro.ac.uk/gawc). It refers to various attributes which characterise a city as a distinct region playing a pivotal economic, financial, social and cultural role. However, the primary criterion for inclusion in the list of world cities is the provision of 'advanced producer services' such as accountancy, advertising, finance and law by international corporations. World cities make a global network which transcends national boundaries and the historical ties in which business is conducted within the network with more emphasis on existing financial institutions. A world city is a city generally considered to be an important node in the global economic system whereby the linkages binding a city have a direct and tangible effect on global affairs through socio-economic means.

4.3 The Role of an Airport in a World City

An airport is a critical part of any large city but the day to day business that defines a world city requires a modern and efficient airport. In fact, one of the characteristics defining a world city is the presence of a major airport that serves as an established hub for several international airlines.

The world city concept describes a network of cities with international firms who have offices in many different cities all over the world. Fast efficient air transport is critical for multi-national firms or organisations and without a well run airport, operating as a world city will not be possible. This report quantifies the significant beneficial impact of the Delhi airport on the city and the national economy. Apart from the employment and revenue that it adds to the economy, Delhi airport also provides one of the most critical services to Delhi in terms of connectivity, in its role as a world city.

4.4 Comparable World Cities

In terms of the world city ranking prepared by PricewaterhouseCoopers (PWC) based on GDP, Delhi's position was 37 in 2008 (Table 4.4). Tokyo was at the number one position with US\$ 1,479 billion followed by New York with US\$ 1,406 billion GDP in 2008. Among the

Indian cities, Mumbai's position was higher than all the other cities. Delhi ranked after Mumbai and was followed by other cities such as Kolkata, Chennai and Hyderabad.

Table 4.4
City Ranking by GDP

PWC Rank	Country	City	GDP 2008 (in \$ bn)
1	Japan	Tokyo	1,479
2	US	New York city	1,406
27	Singapore	Singapore	215
29	India	Mumbai	209
37	India	Delhi	167
38	China	Beijing	166
40	Philippines	Manila	149
54	Thailand	Bangkok	119
56	Brazil	Brasilia	110
61	India	Kolkata	104
62	South Africa	Cape town	103
70	Indonesia	Jakarta	92
87	India	Chennai	66
93	India	Hyderabad	60

Source: PricewaterhouseCoopers projections using UN population definitions.

Passenger and freight traffic levels are good indicators of the economic vibrancy of a city. The city, which handles a higher number of passengers and freight results in busier airports. Table 4.5 presents the World Cities Airport Statistics. The Beijing Capital International Airport has shown tremendous growth in the number of passengers and its share is also the highest in both passenger and freight handling despite a reduction in the share freight from 2006-07 to 2010-11.

Table 4.5

World Cities Airport Statistics

Airports	2006	2007	2008	2009	2010
Indira Gandhi International Airport (Delhi), India					
Passengers (millions)		24.0	23.2	25.3	35.0
Freight ('000 tonnes)		432.963	426.263	497.385	600
Chhatrapati Shivaji International Airport (Mumbai India)					
Passengers (millions)		25.9	24.3	24.8	30.0
Freight ('000 tonnes)		433	529.938	566	671
Beijing Capital International Airport (China)					
Passengers (millions)	49.6	53.6	55.9	65.4	73.9
Freight ('000 tonnes)	2,168	1,193	1,366	1,476	1,549
London Heathrow Airport (UK)					
Passengers (millions)	68.3	68.1	67.1	66.0	65.9
Freight ('000 tonnes)	1,344	1,396	1,486	1,350	1,551
John F. Kennedy International Airport (New York USA)					
Passengers (millions)	44.8	47.7	47.8	45.9	46.5
Freight ('000 tonnes)	1,636	1,607	1,451	1,145	1,343
Singapore Changi Airport (Singapore)					
Passengers (millions)	35.03	36.7	37.7	37.2	42.0
Freight ('000 tonnes)	1,932	1,918	1,884	1,661	1,841
Kuala Lumpur International Airport (Malaysia)					
Passengers (millions)			27.5	29.7	
Freight ('000 tonnes)	677		667	602	697
Suvarnabhumi Airport (Bangkok Thailand)					
Passengers (millions)	43.8	41.2	38.6	40.5	42.8
Freight ('000 tonnes)	1,182	1,220	1,173	1,045	1,310

Source: Airport Council International (ACI).

Indira Gandhi International Airport's (Delhi) share in the total number of passengers and freight traffic increased from 2006-07 to 2010-11. Delhi airport's share of passenger traffic was higher than Chhatrapati Shivaji International Airport (Mumbai) and Kuala Lumpur International Airport (Malaysia) but far lower than other international airports like the Beijing Capital International Airport (China), London Heathrow Airport (UK), John F. Kennedy International Airport (USA), Singapore Changi Airport, Suvarnabhumi Airport (Bangkok). In terms of cargo handling, Delhi's share was the lowest. But its share in both passengers and freight handling is growing at a faster rate over the years.

Improved airport infrastructure in major cities in India during the last few years has helped in improving the country's overall ranking at the global level. Table 4.6 shows countries by rank in total passenger-kilometre flown (international and domestic). The United States, China and UK remained at the same rank from 2008-09 to 2010-11. During 2008 and 2009, India was ranked 12th in total passenger-kilometre performed. In 2010, it performed better and was ranked 11th. The Russian Federation also performed well leaving India and other countries far behind and was ranked 9th in 2010-11.

Table 4.6**Ranking in Passenger-Kilometre Performed (International and Domestic)**

Countries	Ranking 2008	Ranking 2009	Ranking 2010
United States	1	1	1
China	2	2	2
United Kingdom	3	3	3
Singapore	13	13	17
Russian Federation	14	14	9
India	12	12	11
Brazil	17	17	14
South Africa	27	27	26

Source: International Civil Aviation Organization (ICAO).

Table 4.7 shows the rank of countries in total freight operations (international and domestic). Again, the US, China and UK remained at the same positions as they did in total passenger operations. India's performance was unsatisfactory. It ranked 12th in 2009 and dipped to 19th in 2010-11. South Africa's performance was also unsatisfactory. Singapore performed well by improving its rank from 13th to 7th position.

Table 4.7**Ranking in Freight-Kilometre Performed (International and Domestic)**

Countries	Ranking 2008	Ranking 2009	Ranking 2010
United States	1	1	1
China	2	2	2
United Kingdom	3	3	8
Singapore	13	13	7
Russian Federation	14	14	12
India	12	12	19
Brazil	17	17	16
South Africa	27	27	32

Source: International Civil Aviation Organization (ICAO).

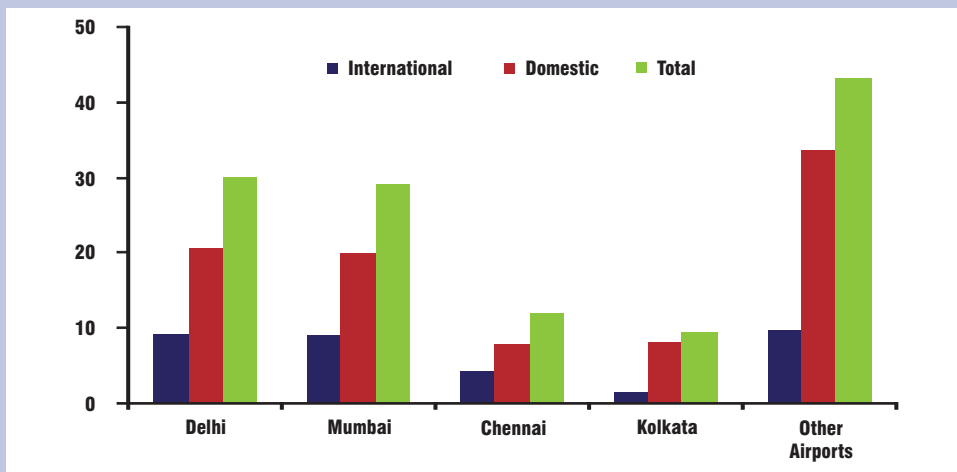
4.5 The Role of Delhi Airport

Delhi airport plays an important gateway for the Indian subcontinent by developing its air transport infrastructure. It has a major market share of air traffic volume to middle- East, European, Asian and American regions. It is one of the fastest growing airports in the South Asian region and has the capacity to handle more than 46 million passengers annually. Delhi airport has played a crucial role in connecting people to different destinations all over the world. In 2010-11 it showed an impressive growth in handling passengers, freight and aircraft movements thereby utilizing the maximum resources at the airport.

4.5.1 Passenger Movement

In terms of total passenger movements, Delhi airport handled more traffic than airports in other metropolitan cities such as Mumbai, Chennai and Kolkata. It handled 9.3 million passengers through international traffic and 20.7 million passengers through domestic traffic in 2010-11 (Figure 4.1). Delhi airport's share in domestic passenger traffic is much higher than it is in international passenger traffic.

Figure 4.1
Passenger Movement in Various Airports in India (Million)



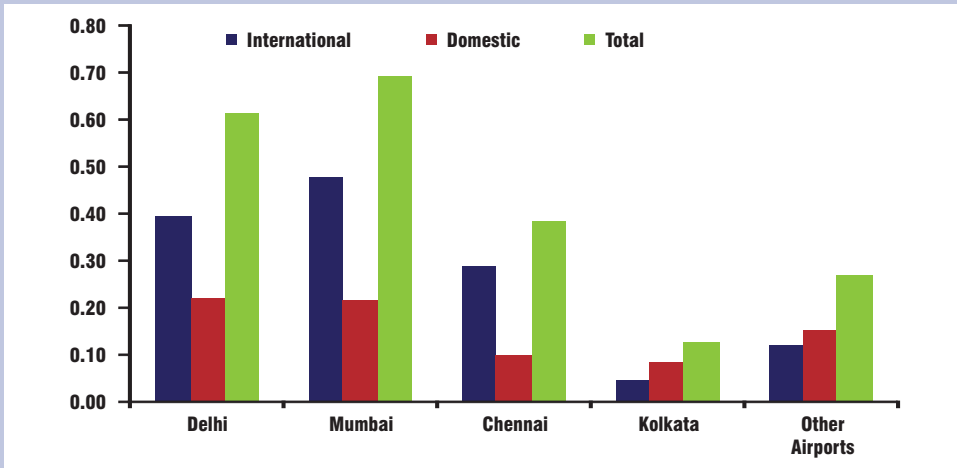
Source: Based on data from the Airports Authority of India, Government of India.

Mumbai airport holds the 2nd position in handling international and domestic passenger traffic in India; handling 9.1 million international passengers and 20.0 million domestic passengers in 2010-11.

4.5.2 Freight Movement

In terms of total freight movement, Mumbai airport handled more freight than other airports in India with 0.48 million tonnes of international freight and 0.22 million tonnes of domestic freight in 2010-11. Though Delhi airport handled slightly less freight than Mumbai, as compared to other airports such as Chennai and Kolkata it handled higher freight per annum (Figure 4.2). Delhi is growing at a much faster rate in terms of total (international and domestic) freight handling and it may surpass Mumbai airport in terms of cargo handling in the coming years.

Figure 4.2
Freight Traffic Movement in 2010-11 (million tonnes)

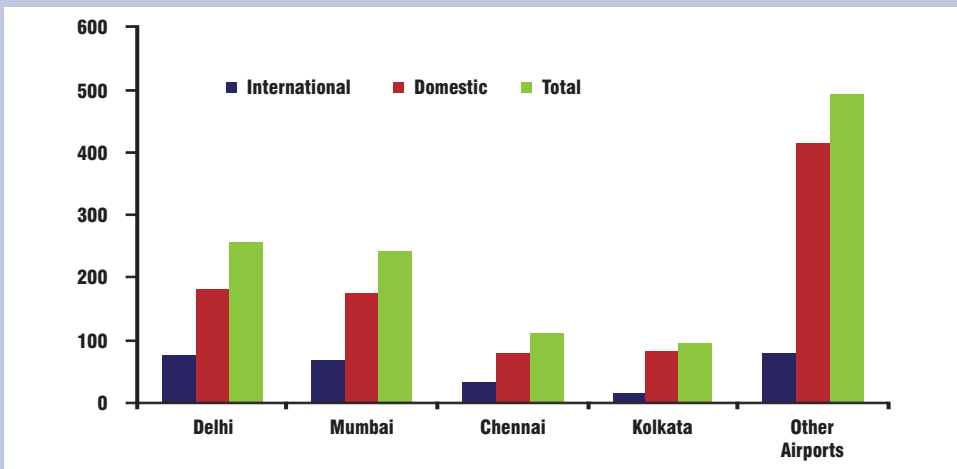


Source: Based on data from the Airports Authority of India, Government of India.

4.5.3 Aircraft Traffic Movement

In terms of air traffic movement, Delhi handled the highest number of aircraft as compared to the other metropolitan cities, with 74.7 thousand international and 180.7 thousand domestic aircraft during 2010-11 (Figure 4.3 shows aircraft traffic movement in Delhi airport during 2010-11).

Figure 4.3
Air Traffic Movements in 2010-11 ('000)



Source: Based on data from the Airports Authority of India, Government of India.

4.5.4 Air Routes

Delhi airport plays a crucial role in connecting Delhi with many domestic and international destinations.

4.5.4.1 City Connectivity (International)

Delhi airport connects 51 international routes. Among all the international destinations connected through Delhi airport, Dubai occupies the 1st position in terms of the number of passengers traveling from Delhi airport and accounts to 6.93 lakh followed by London (4.44), Bangkok (3.21), Hong Kong (3.05), Kathmandu (2.91), Singapore (2.65), Frankfurt (2.45), Amsterdam (1.26), Paris (1.25) and Bahrain (1.22)) in 2011-12 . (Table 4.8).

Table 4.8

Top 10 International Destinations: Ex Delhi in terms of Passengers (in Lakh)

Destinations	2008-09	2009-10	2010-11	2011-12*	CAGR %
Dubai	3.61	4.7	4.91	6.93	24.28
London	3.91	3.94	4.71	4.44	4.33
Bangkok	2.19	2.99	3.00	3.21	13.59
Hong Kong	1.64	2.3	2.88	3.05	22.98
Frankfurt	2.1	2.26	2.23	2.45	5.27
Kathmandu	1.85	2.13	2.66	2.91	16.30
Singapore	2.16	2.06	2.25	2.65	7.05
Amsterdam	1.1	1.15	1.12	1.26	4.63
Paris	1.11	1.13	1.24	1.25	4.04
Bahrain	0.86	0.97	0.87	1.22	12.36

Source: Market Forecast Airlines Operating at Delhi Airport 2010-14.

*Projections

4.5.4.2 City Connectivity (Domestic)

On the domestic front, Delhi airport connects to 41 destinations in the country. Traffic from Delhi airport moved to three primary airports (Mumbai, Bengaluru and Hyderabad and nine secondary airports in the remaining states. The high growth was seen in the destinations of Mumbai, Bengaluru, Kolkata, Jammu, and Guwahati during 2011-12.

Table 4.9**Top 15 Domestic Destinations from Delhi Airport in terms of passengers (in Lakh)**

Destinations in India	2008-09	2009-10	2010-11	2011-12*	CAGR(%)
Mumbai	17.26	21.05	25.15	32.83	23.90
Bengaluru	7.84	10.19	11.80	13.51	19.89
Hyderabad	6.14	7	8.33	8.43	11.14
Chennai	4.98	6.43	7.63	8.1	17.60
Kolkata	5.11	7.11	8.41	8.76	19.68
Pune	3.25	4.35	5.10	5.07	15.98
Ahmedabad	3.17	3.92	4.52	4.7	14.03
Jammu	1.58	2.27	2.68	2.91	22.58
Guwahati	1.7	2.65	3.10	3.28	24.49
Goa	1.96	2.27	2.37	3.14	17.01
Srinagar	2.14	2.65	3.12	3.32	15.76
Lucknow	2.53	2.55	3.05	3.52	11.64
Bhubaneswar	1.47	1.58	1.83	1.76	6.19
Varanasi	1.44	1.69	1.97	1.95	10.63
Chandigarh	1.41	1.3	1.53	1.54	2.98

Source: Market Forecast Airlines Operating at Delhi Airport 2010-14.

*Projections

4.5.5 Delhi Airport and International Trade

By definition, a world class city should have good business connectivity with the rest of the world or at least within the geographical areas of the country. Delhi airport has performed quite well in terms of trade. It has played a major role in facilitating international trade. This can be explained from the share of Delhi's air-borne trade in the country's total air-borne trade. Table 4.10 shows that the share of air-borne exports from Delhi airport has increased over the years with some minor fluctuations in between.

Table 4.10**Trend of Air-Borne Exports at Delhi Airport (Rs billion)**

Years	Total India air-borne	Total Delhi air-borne	% share of Delhi in India air-borne
2006-07	1,166	137	11.8
2007-08	1,308	145	11.1
2008-09	1,682	348	20.7
2009-10	1,690	351	20.8

Source: DGCI&S.

In 2008-09, India's total export by air stood at Rs 1,682 billion out of which Delhi airport contributed Rs 348 billion or 20.7 per cent of the total air-borne exports. In 2009-10, Delhi airport's share increased marginally to 20.8 per cent from 20.7 per cent in the previous year. Out of the total air-borne exports of Rs 1,690 billion, Delhi airport contributed Rs 351 billion.

Table 4.11 shows India's total imports by air and the percentage share of Delhi airport. The trend shows that total Indian air-borne imports have increased over the years. While Delhi airport's imports by air transport has increased from 2006-07 to 2008-09 in absolute value (Rs billion) they then decreased. The reason for this reduction in Delhi's total imports by air transport could be due to global recession in 2008-09. The share of Delhi airport's air-borne imports in the all-India imports reduced steadily from 2006-07 to 2009-10.

Table 4.11
Trends in Air-Borne Imports at Delhi Airport (Rs billion)

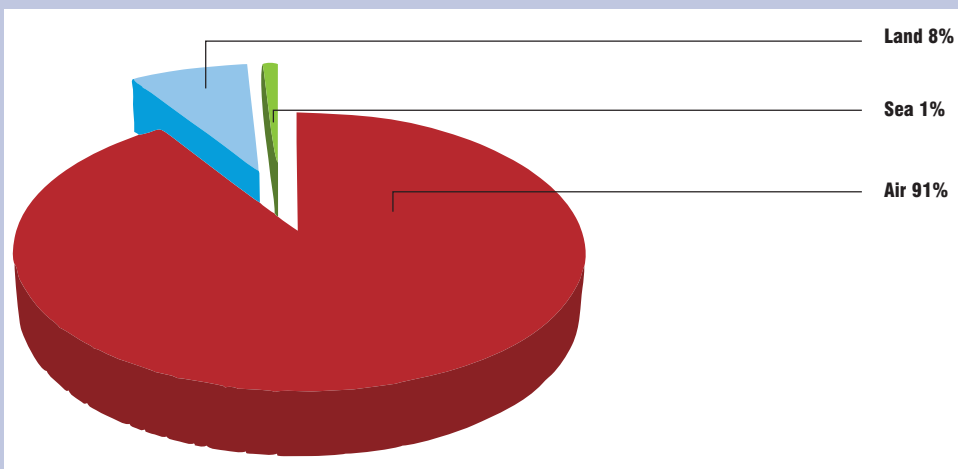
Years	Total India air-borne	Total Delhi air-borne	% share of Delhi in India air-borne
2006-07	2,083	467	22.4
2007-08	2,366	493	20.8
2008-09	3,299	674	20.4
2009-10	3,256	520	16.0

Source: DGCI&S.

4.5.6 Tourists in Delhi

Tourism is an important sector of Delhi and it contributes significantly to the growth of hotel, transportation and manufacturing sectors of the state economy. With its backward and forward linkages with other sectors of the economy, like transport, construction, handicrafts, manufacturing, horticulture, agriculture, etc. Air transport plays a critical role in tourism sector's growth. About 91 per cent of the foreign tourists arrive in India by air followed by land 7.5 per cent and the remaining 0.7 per cent arrives by sea transport (Figure 4.4).

Figure 4.4
Foreign Tourist Arrivals by Mode of Transport (%) in 2010



Source: Based on data from Ministry of tourism

Delhi airport plays an important role in tourism industry of Delhi where 34 per cent out of total foreign tourists arrive in India come through Delhi airport followed by 21 per cent arrived in Mumbai airport (Table 4.12)

Table 4.12
Foreign Tourist Arrival by Airport in 2010

States	Passengers (in million)	Share (in %)
Delhi	1.99	34.0
Mumbai	1.18	21.0
Chennai	0.62	11.0
Bengaluru	0.37	7.0
Kolkata	0.21	4.0
Others	1.41	24.0
Total	5.78	100.0

Source: India Tourism Statistics, Ministry of tourism, government of India

Out of the total number of foreign tourists arriving in India in 2010, Delhi airport accounts for the highest number of foreign tourists with 1.99 million passengers contributing a share of 34 per cent. Mumbai placed at the 2nd position among the metropolitan cities and contributed lower share as compared to Delhi at 21 per cent. While, Chennai, Bengaluru and Kolkata, together shared a total of 22 per cent of foreign tourists arrivals.

4.6 Qualitative Correlation between Aviation and the Economy

An airport and the economy are highly correlated. It has been debated whether a city develops as a world city because it has a first class airport or whether the airport develops because of a world class city. There is a high correlation between the economy of a city and the development of its airport. An essential requirement of a world city is efficient transport and communication.

The location of a city is also an important factor in the growth of an airport. For example, all the 'alpha cities'¹, which have world class airports which are major hub airports also have a larger proportion of transit passengers as compared to other cities. Airports that are transit airports also have part of their growth more or less independent of the economic conditions within the city. On the other hand, large numbers of transit passengers and airfreight requires resources at the airport. As such these activities contribute to the economic development of the city.

Table 4.13 presents the share of transport by other means (comprises water, road, air transport) in India's total GDP, the share of which has been reducing in India's total GDP from 5.72 per cent in 2004-05 to 5.51 per cent in 2009-10 after which it remained constant in 2010-11.

1. Alpha city is also called as global city. The Wikipedia definition defines global city as "a city is considered to be an important node of global economic system".

Table 4.13**Share of Transport by other means in total GDP at factor cost (Base: 2004-05 prices) - All India (Rs crore)**

Years	GDP at factor cost	Transport by Other Means
2004-05	29,71,464	1,69,995
2005-06	32,53,073	1,85,741
2006-07	35,64,364	2,02,367
2007-08	38,96,636	2,19,969
2008-09	41,58,676	2,31,564
2009-10	45,07,637	2,48,321
2010-11	48,85,954	2,69,208

Source: National Account Statistics, CSO, Government of India.

In the case of Delhi, we also find similar trends of transport by other means declining. Table 4.14 shows that the contribution of transport by other means in Delhi's total GDP reduced sharply from 2004-05 to 2010-11.

Table 4.14**Share of Transport by other means in total GDP at factor cost (Base: 2004-05 prices) - Delhi (Rs crore)**

Years	GDP at factor cost	Transport by Other Means	% share in GDP
2004-05	1,00,325	5,352	5.33
2005-06	1,10,406	5,504	4.99
2006-07	1,24,080	5,799	4.67
2007-08	1,37,961	6,103	4.42
2008-09	1,50,341	6,354	4.23
2009-10	1,65,796	6,645	4.01
2010-11	1,83,254	6,993	3.82

Source: Central Statistical Office (CSO), Government of India.

Table 4.15 shows the growth rate of the transport, storage and communication sector from 2005-06 to 2009-10. The transport and communication sector witnessed an increase in the growth rate from 11.8 per cent in 2005-06 to 14.8 per cent in 2009-10. The high growth in this sector was led by the growth in transport by other means. Further, air transport which is a part of the transport by other means sector was the leading sector in terms of annual growth rate, although its share in the transport by other means sector remained between 4-5 per cent.

Table 4.15**GDP growth of transports sectors and their correlation with overall GDP growth in India**

Years	GDP at factor cost	Transport, storage & communication	Transport by Other Means	Air transport
2005-06	9.5	11.8	9.3	24.5
2006-07	9.6	12.6	9.0	26.4
2007-08	9.3	12.5	8.7	18.0
2008-09	6.7	10.8	5.3	-5.0
2009-10	8.4	14.8	7.2	13.8
Correlation		0.18	0.97	0.98

Source: Based on data from National Account Statistics, CSO, and Government of India.

In order to illustrate the link between the economic performance of the transport sector and overall economic growth, we have reported a correlation between them in the last row of **Table 4.15**. The correlation between overall growth in the transport sector and overall GDP growth is very low at about 0.18. However, the correlation between transport by other means which comprises water, road, and air shows a high correlation (0.97) with overall GDP growth rate. This suggests that this sector is one of the driving forces of GDP growth in India. Importantly, the correlation between the GDP of the air transport sector and overall GDP growth is also very high (0.98) suggesting the increasing importance of the aviation sector in overall economic activities in the country.

Chapter 5

Delhi Airport - Direct Economic Impact

5.1 Introduction

Measuring direct impact of an airport on the regional and the national economy is at the core of the exercise of an assessment of the overall impact of the airport sector on the economy. This also requires a specific definition of the direct impact. Literature suggests that direct impact should include those activities which are directly related to the construction or operation of an airport. For example, servicing the flow of passengers or freight through the Delhi airport is called directly related activity but not the expenditure of the visitors coming to the city by air in Delhi city (called induced impact). Nevertheless, an airport plays an important role in inducing tourism activities by facilitating transport services to foreign and domestic tourists. In this chapter, we measure the direct impact of Delhi airport on the regional and the national economy in terms of:

- Output
- Value added
- Employment

To measure the direct impact of Delhi airport, we have used both primary and secondary information. Measuring the direct economic impact requires collecting information on financial and employment from a variety of businesses/stakeholders like airlines, freight companies, retailers, government agencies and other tenants operating within and in the periphery of Delhi airport. Given this complex structure, required information such as sales, expenditure and value added is difficult to obtain through official published sources. Therefore, we followed both secondary and primary survey based methods to collect relevant information.

As mentioned in Chapter 2, we conducted primary surveys to collect the financial and employment performance of some of the agencies. The agencies covered in the exercise are:

- Government agencies such as customs, immigration etc.
- Airlines.
- Cargo operators.
- Retailers/concessionaries.

We covered following agencies in our impact analysis:

Direct Services

1. Government agencies.
 - i. Central Industrial Security Force
 - ii. Immigration.
 - iii. Customs.
 - iv. ATC
 - v. BCAS
2. Airport operator (DIAL).

Enabling and enabled services

3. Concessionaires
4. Ground handling.
5. Baggage handling.
6. Domestic Airlines.
7. Foreign Airlines.
8. Cargo Handlers

Other than the primary survey, financial information for some of these agencies was also collected from the following published sources:

- Financial performance of Air India from the annual report published by the Directorate General of Civil aviation (DGCA).
- Financial performance of domestic airlines from the annual reports published by Directorate General of Civil aviation (DGCA).
- Financial performance of international airlines from the Air Transport World.
- Air Traffic Control (ATC) information from the Airports Authority of India (AAI).
- Financial information on the airport operator from DIAL.

Based on information from these sources we estimated the direct economic impact of Delhi airport on the economy.

5.2 Direct Impact Analysis

As discussed earlier in Chapter 3, Delhi airport handles the maximum passenger and flights per day or annum as compared to other airports in India. It is the 2nd busiest airport in India in terms of cargo handling per day. The airport contributes nearly 46 per cent of its revenue to AAI which is being used for the renovation of existing airports or for the construction of new airports in India. This has multiplier impact on the national economy in terms of output and employment. This is one of the best PPP airports in India in terms of the quality of services that it provides to passengers. Our passenger survey results indicate that more than 90 per cent of the passengers provide a high rating for quality of services (details are given in chapter 8).

Tourism Report 2010 of the Ministry of Tourism, Government of India report 2010 suggests that about 34 per cent foreign tourists arrived in India via the Delhi airport, which is the highest in terms of share in total tourist arrivals in India as compared to other airports in India. Therefore, the economic scale impact of Delhi airport on the regional and national economy is substantial in terms of indirect and induced impact also. As mentioned earlier, the scale of indirect impact is influenced by the degree of direct impact. Direct contributions of the 'airport construction' and 'airport operation' sectors to the national and the regional economy in terms of output, value added and employment is given in **Tables 5.1 and 5.2** and also summarised below:

- Delhi airport's aviation sector directly contributes Rs 42.9 billion in income to the national GDP. In terms of percentage, it contributes 0.065 per cent to the national GDP and nearly 2 per cent in terms of Delhi's GDP. It is difficult to estimate exactly the income that may accrue from the airport's operations to the economy of Delhi. However, a significant proportion of the direct impact is likely to accrue to the economy of Delhi.
- Construction of Delhi airport spread over a period of three years directly contributed Rs 25.71 billion in income to the national GDP with a share of 0.039 per cent. Relative to Delhi's GDP, its direct impact is 1.18 per cent.
- In terms of employment, Delhi airport's aviation sector directly contributes 64,074 jobs, which is 0.014 per cent of the national employment and 1.05 per cent of Delhi's employment.
- Construction of Delhi airport directly contributed 35,000 jobs over a three years period. In terms of percentage, it contributed 0.007 per cent to the national employment and 0.57 per cent to Delhi's employment.

Table 5.1
Direct Impact of Delhi Airport

	Gross output (Rs billion)	Value added (INR billion)	Employment
A. Airport construction*	42.86	25.71	35000
B. Airport operation	71.50	42.90	64074
— Airport transport	49.28	29.57	33956
— Airport services	22.22	13.33	30118

* One-third of the total project cost to be incurred in a financial year

Table 5.2
Direct contribution of Delhi Airport to the National and Regional Economies

	Contribution to the national economy		Contribution relative to Delhi's economy	
	% of GDP	% of Employment	% of GDP	% of Employment
A. Airport construction	0.039	0.007	1.18	0.57
B. Airport operation	0.065	0.014	1.97	1.05



Chapter 6

Delhi Airport - Indirect, Induced and Total Economic Impact

6.1 Introduction

In the previous chapter we presented the direct economic impact of Delhi airport on the national and the regional economies. This chapter provides an assessment of the indirect, induced and overall economic impact. While indirect impact is quantified using I-O multiplier analysis, induced impact is estimated from (1) the spending activities of a number of domestic and foreign tourists arriving in the city via Delhi airport and (2) the foreign capital flows into Delhi and the NCR region.

6.2 Indirect or Flow-on Model

We used the 130-sector National I-O Table 2006-07 published by the Central Statistical Office (CSO), Government of India as the base model for our I-O analysis. The 130-sector I-O table is first aggregated into a 33-sector I-O table and two new sectors- 'airport construction' and 'airport services' were added to the I-O table. Therefore, the I-O table used for the present analysis is now a matrix of 35 35 sectors. In this I-O table, we have three distinct airport sectors- airport construction, air transport and airport operations. Each of these sectors uses inputs from the others sectors of the economy either for construction/maintenance or for operational activities. Similarly, other sectors of the economy also use the airport industry's services as inputs for the production of goods and services. Therefore, the inter-transactions carried out by industries are called inter-industry flows or the input-output flow matrix. Besides this, all industries also sell their goods and services to final users such as consumers, exports and the government and for capital formation. The calculation of these transactional impacts involves working 'backwards' from the sale to final users to examine the various contributions in the creation of that final product. This works through the supply (or value) chain for that product or service and identifies all the trades that take place between contributing businesses.

Existing studies have not explored the impact of airport construction on local and national economies. Instead, they examine the economic impact of the airport operation sector which comprises air transport and some aspects of airport operations. Existing studies may not have explored the impact of airport construction on local and national economies due to lack of information on these activities. In order to capture the economic benefits of this sector, the present study makes an attempt to construct a new sector called 'airport construction' based on the information received from DIAL and CSO. Construction of an airport requires a one-time investment for purchasing large quantities of raw material. This activity also absorbs a chunk

of the labour force in the local economy. For example, DIAL spent Rs 128.6 billion for construction of Terminal T3 (T3) and T1D for the renovation of other terminals in Delhi airport. It employed 35,000 people for construction. The important point here is that this expenditure created a strong economic impact on the regional and national economies, although the impact was for a one-time change or for the duration of the construction. In case of Delhi airport, construction was carried over three years starting from 2006-07. It used a large amount of inputs from other sectors as well. Some of the selected sectors which supplied inputs to the construction of the airport are:

- Basic Metal & Metal Products
- Non-Metallic Mineral Products
- Trade
- Land Transport
- Mining and Quarrying

The important point here is that economic activities in each of these sectors also went up due to an increase in demand for their output, and therefore they hired more people or used more capital to produce more output. In other words, construction of the airport not only directly generated output and employment, but it also indirectly increased the output of other sectors.

Therefore, the construction of an airport creates significant impact on the output and employment of the regional and the national economies to the extent that such the inputs are produced in the boundaries of local or national economies. If a major portion of the raw material is imported, then the impact of airport construction on these sectors will be limited to this extent. However, imports in turn may lead to demand for other activities such as trade, warehousing, transportation and finance. The net effects are more difficult to quantify.

Besides inter-industry linkages, airport construction also involves capital formation.

Similarly, airport operations also use inputs from other sectors of the economy and sell these goods and services to final users like airlines, ground transport (bus, taxi, car rentals and car parks) and retail shops in the airport.

To sum up, the airport sector which comprises of airport construction and airport operations generates both direct as well as indirect impact on the economy in terms of output and employment.

As mentioned earlier, in order to measure the direct and indirect impacts on output and employment we used the 35 35 I-O table to estimate multiplier impacts. The detailed results are given in **Table A6.1 in Appendix B**. Our estimates give the following multipliers for the

airport construction and airport operation sectors:

- The output and employment multipliers of 'airport construction' (sector 19) are 2.655 and 1.433 respectively.
- The output and employment multipliers of 'airport operation' which includes air transport (sector 25) and airport services (sector 26) are 2.800 and 0.722 respectively.

The output multiplier of the 'airport construction' sector is 2.655, indicating that 'if the final demand (comprising consumption, capital formation and net exports) of this sector increases by Rs 1 lakh, then due to the direct and indirect linkages of this sector with other sectors of the economy, the overall impact will be an increase in output of the economy by Rs 2.655 lakh. The employment multiplier of the 'airport construction' sector is 1.43 which implies that 1.43 jobs are generated in the economy due to an increase of Rs 1 lakh in the final demand (comprising consumption, capital formation and net exports) for the airport construction sector owing to direct as well as indirect effects.

6.3 Induced Impact

The definition of 'induced impact' used in this study is synonymous with 'catalytic impact' described in some of the other studies of economic impact of airports. As mentioned earlier, the impact of airport operations on employment and output goes beyond its traditional direct and indirect impact. Induced impact covers the wider role of the airport in generating output and employment in the regional and national economies by attracting economic activities such as investment and tourism. For example, an airport will influence company location decisions and competitiveness, attract new investments to the economy, retain existing companies and secure their expansion projects, promote exports through airfreight, enhance competitiveness of an economy through the provision of efficient passenger and freight services and attract businesses, leisure activities and tourism generating both income and employment.

As discussed in Chapter 4, Delhi airport plays a major role in attracting tourists to the city and to the region. As per the Tourism Report 2010 published by the Ministry of Tourism, Government of India, 91 per cent of foreign tourists arrived in India by air, and out of which Delhi airport's share was 34 per cent followed by Mumbai airport with 21 per cent. Attracting tourists to the city generates multiple impacts on the regional economy. It increases the economic activities of many sectors particularly hotels, restaurants, finance and banking. Another induced impact of airport operations is attracting foreign direct investment into the region. World class infrastructure when combined with other favourable factors smoothens business interactions globally and improves productivity. In 2009, Delhi and the NCR region attracted the highest amount of foreign direct investment (FDI) in the country as compared to other regions. In total, the country attracted US\$ 25,834 million in FDI out of which, Delhi and NCR's contribution was US\$ 9,695 million, or 37.53 per cent. Although it is difficult to

say how much of the FDI came into the region because of Delhi airport, a good airport can only improve the attractiveness of the region as an investment centre.

Since induced impact covers a whole range of economic activities other than direct and indirect impact, the existing studies find higher multiplier impact of induced factors on output and employment as compared to direct and indirect multipliers.

6.4 Summary of Indirect and Total Impact

In this section we report the estimates of direct, indirect and induced impact of Delhi airport on the national and the regional economies. A summary of economic impact of airports worldwide are illustrated in **Table 6.1**.

Direct plus Indirect Impact

The estimates of direct and indirect impact of airport construction and airport operations are given in **Tables 6.2 and 6.3**. The main findings are:

- Delhi airport's services directly and indirectly contribute Rs 120.1 billion in income to the national GDP. In terms of percentage, it contributes 0.183 per cent to the national GDP and nearly 5.51 per cent relative to Delhi's GDP.
- Delhi airport's construction activities directly and indirectly contributed Rs 68.3 billion in income to the national GDP with a share of 0.104 per cent. Relative to Delhi's GDP, contribution of direct income from the airport amounts to 3.13 per cent.
- In terms of employment, Delhi airport's operations directly and indirectly generate 516.1 thousand jobs in a year, which is 0.110 per cent of the national employment and 8.47 per cent of Delhi's employment.
- Delhi airport's construction activities directly and indirectly contributed 614.1 thousand jobs. In terms of percentage, it represents 0.131 per cent of the national employment and 10.08 per cent of annual employment in Delhi. The employment generation due to construction activities is a 'one time effect' unlike the employment effect of airport services which are recurring output of the airport.

Total Impact (direct plus Indirect plus Induced)

The estimates of total impact of Delhi airport's operation are given in **Tables 6.4 and 6.5**. The main findings are:

- The total economic contribution of Delhi airport's operations is Rs 294.7 billion, which is 0.45 per cent of national GDP and 13.53 per cent relative to Delhi's GDP.
- In terms of employment, the total contribution of Delhi airport's operations is 1,577 thousand jobs, which is 0.34 per cent of the national employment and 25.9 per cent of Delhi's employment.

It is important to note here that multiplier impact results in terms of income and employment may not necessarily imply the current contribution of Delhi airport to the national and regional economies because many of goods and services are generally procured globally and hence are not produced in the domestic economy.

Table 6.1
Economic Impacts of Airports: World wide

Airports	Employment	Economic Output	% in GDP	Year of Study
Bradley	22,140	\$2037.5 Million	-	2005
Budapest	31,922	326.5 Billion HUF	2.60	2009
Sydney	2,06,133	\$ 30.4 Billion	2.00	2008
Hong Kong	65,000	\$ 78.0 Billion	4.60	2008
Kansas	47,500	\$ 10.4 Billion	8.50	2009
Virginia	2,58,996	\$ 28.8 Billion	4.40	2009
New York state	3,47,500	\$ 35.4 Billion	4.30	2003
Miami	2,82,000	\$ 36.9 Billion	4.00	2008
Dubai	2,50,000	\$ 22.0 Billion	28.0	2011
Detroit	70,000	\$ 7.6 Billion	4.00	2006
Atlanta*	4,34,400	\$ 32.6 Billion	-	2010
Delhi**	5,16,000	294.7 Billion INR	0.18	2012

Source: Individual website of all airports. * Oxford Economics. ** NCAER

Note: HUF = Hungarian currency

Table 6.2
Direct and Indirect Impact (Flow-on Impact)

	Gross Output (Rs billion)	Value added (Rs billion)	Employment ('000)
A. Airport Construction	113.8	68.3	614.1
B. Airport Operation	200.2	120.1	516.1
(i) Airport Transport	107.3	64.4	271.0
(ii) Airport Services	46.1	27.7	127.4

Note:

1. Employment and output in the case of airport construction are for one year. The same levels are assumed for each of the three years of the construction phase.
2. Employment and output levels in the case of airport operations are on a per year basis.

Table 6.3
Flow-on Contribution of Delhi Airport to the National and Regional Economies

	Contribution to the National Economy		Contribution Relative to Delhi Economy	
	% of GDP	% of Employment	% of GSDP	% of Employment
A. Airport Construction	0.104	0.131	3.13	10.08
B. Airport Operation	0.183	0.110	5.51	8.47

Note: As goods and services are procured globally in many cases, the entire multiplier effect may not be produced within the economy.

Table 6.4

Total Impact of Delhi Airport's Operation

	Gross Output (Rs billion)	Value added (Rs billion)	Employment ('000)
Direct and Indirect Impact	200.2	120.1	516.1
Induced Impact	291.0	174.6	1061.6
Total Impact	491.2	294.7	1577.7

Note: Please see note for Table 6.1.

Table 6.5

Total Contribution of Delhi Airport's Operation to the National and Regional Economies

	Contribution to the National Economy		Contribution Relative to Delhi Economy	
	% of GDP	% of Employment	% of GSDP	% of Employment
Direct and Indirect Impact	0.18	0.11	5.51	8.47
Induced Impact	0.27	0.23	8.01	17.43
Total Impact	0.45	0.34	13.53	25.90

Notes: Please see note for Table 6.2.

Chapter 7

Traffic Forecasting and Growth Strategy

7.1 Introduction

Delhi airport is one of the busiest airports in India in terms of passenger traffic (both domestic and international) per day. In terms of flights and passengers handled per day, it is positioned far ahead of other metropolitan airports in India. In terms of cargo handling, though its position is second in India, it is growing at a much faster rate than Mumbai in the last few years. During 2008-09 and 2010-11, Delhi airport has grown at AAGR of 11.6 per cent in terms of cargo handled as compared to 8.2 per cent of Mumbai during the same period. Till 2008-09, Mumbai airport was the number one airport in India in terms of total number of passengers handled. Since then, Delhi airport operations have expanded faster than Mumbai and Delhi is currently handling nearly 30 million passengers per year as compared to Mumbai's 29 million passengers. As per the Master Plan of Delhi airport, the present airport can handle approximately 60 million passengers per annum.

Strong growth in aircraft and passenger movements has increased the aeronautical and non-aeronautical revenue of Delhi airport. Before 2007-08, aeronautical revenue was the major source of income for Delhi airport. Since then, non-aeronautical revenue has become the prime source of income and this is increasing much faster rate than aeronautical revenue. As discussed in chapter 3, non-aeronautical revenue contributes nearly 44.9 per cent of total revenue followed by aeronautical revenue of 36.4 per cent. Within non-aeronautical revenue, the major source of revenue is generated from rental services and food and beverages, suggesting the growing importance in commercialisation of airport sector. Since the Delhi airport is based on the PPP model, sustaining the business growth model without sacrificing the quality of services is certainly a challenging task, needs a pragmatic policy approach to balance the both.

Developing a suitable model to project the passenger traffic continues to be challenging as the uncertainties confronting the aviation industry are significant. Before 2007-08, the aviation sector was growing at a high rate. During the global recession which started in early 2008 and continued till the end of 2009, the world aviation traffic declined significantly. On the global front, the continuing economic uncertainty in the US and Europe has dampened the business sentiments in the domestic economy. Further, high international oil and commodity prices since the beginning of 2010 have led to higher domestic energy and overall prices. The fuel cost of aviation sector has also increased considerably leading to substantial decline in profit margins of many private airlines. On the domestic front, absence of strong policy reforms and declining

of business and political confidence have in turn led to slowdown in investment and consumption spending. High inflation and increasing cost of borrowing have further dampened the business sentiments. Nevertheless, we have tried to project the passenger traffic (both domestic and international) for India and Delhi for the next 10 years (2011-12 to 2020-21).

7.2 Methodology and Result Analysis

Literature of aviation sector suggests that traffic is influenced by many demand influencing factors such as economic growth, rising per capita income, industrial development, employment opportunities, tourism development and so on. Prices also play an important role in traffic volume. In this study we focus mainly on impact of economic growth on passenger traffic. First of all, we have forecasted India's GDP growth for next 10 years using the Macroeconometric Model of NCAER. Then, the Ordinary Least Square Regression (OLS) method is estimated to get the income elasticity of passenger traffic with respect to GDP. The regression model of domestic and international passenger traffic is estimated in the following double-log linear form:

$$\text{Log (Domestic_Pax)}_t = a_0 + b_1 \text{Log (GDP)}_t + u_t \dots \quad (1)$$

$$\text{Log (International_Pax)}_t = a_1 + b_2 \text{Log (World GDP)}_t + e_t \dots \quad (2)$$

Where a_0 and a_1 are intercept terms, b_1 and b_2 are coefficients and u_t and e_t are statistical error terms.

As discussed earlier, domestic GDP growth rates for the future years are derived from macroeconomic projections. For the World GDP growth, we have assumed a certain growth rate for the next 10 years. Our GDP forecast reflects a baseline scenario. Nevertheless, we have taken into account the macroeconomic stresses on account of high oil prices, its impact on domestic fuel prices and the consequent fiscal impact in deriving the baseline macroeconomic scenario.

7.2.1 Traffic forecast

Our estimation shows that, the income elasticity for domestic traffic with respect to India's GDP and international traffic with respect to world GDP are:

Domestic traffic = 1.6

International traffic = 2.0

Based on the projected growth rates of GDP and estimated income elasticity, we have projected domestic and international passenger traffic for All India and Delhi airport. The results are given in **Tables 7.1 and 7.2**. We have also given the traffic forecast carried out by Mott MacDonald for Delhi airport in **Table 7.3**.

A comparison of Global forecast carried out by Airbus on India and our results show that our projection on domestic traffic is relatively higher and the opposite is the case of international passenger traffic. The important point here is that as per our projection, Delhi's total traffic would cross 60 million by 2017-18 which is two years ahead of the expectations held at the time of development of the airport project.

Table 7.1
Passenger Traffic Forecast by Different Agencies (million)

	Global market forecast, Airbus Industries, 2010 for All India*			NCAER Projection for All India**			NCAER Projection for Delhi**		
	Domestic	International	Total	Domestic	International	Total	Domestic	International	Total
2007-08	87.05	29.65	116.70	87.1	29.7	116.7	16.6	7.3	24.0
2008-09	77.24	34.22	111.47	77.2	34.2	111.5	15.1	7.8	22.8
2009-10	89.14	34.28	123.43	89.1	34.3	123.4	17.8	8.3	26.1
2010-11	100.53	37.63	138.16	105.3	37.8	143.1	20.7	9.3	29.9
2011-12	113.10	41.21	154.31	117.4	41.1	158.6	25.2	10.7	35.9
2012-13	127.23	45.12	172.35	128.7	44.8	173.5	27.6	11.7	39.3
2013-14	143.14	49.41	192.55	141.1	48.9	189.9	30.3	12.7	43.0
2014-15	161.03	54.10	215.13	154.6	53.3	207.9	33.2	13.9	47.1
2015-16	177.94	58.43	236.37	169.4	58.1	227.5	36.4	15.1	51.5
2016-17	196.62	63.10	259.72	184.3	63.3	247.6	39.6	16.5	56.1
2017-18	217.27	68.15	285.42	200.6	67.7	268.3	43.1	17.6	60.7
2018-19	240.08	73.60	313.68	218.2	72.5	290.7	46.9	18.9	65.8
2019-20	265.29	79.49	344.78	237.4	77.5	315.0	51.0	20.2	71.2
2020-21	-	-	-	258.3	83.0	341.3	55.5	21.6	77.1

Note: * projection from 2010-11 and onwards

** projection from 2012-13 and onwards

Table 7.2
Projection of Passenger Traffic growth (% per year)

	Global market forecast, Airbus Industries, 2010 for All India*			NCAER Projection for All India**			NCAER Projection for Delhi**		
	Domestic	International	Total	Domestic	International	Total	Domestic	International	Total
2009-10	15.4	0.2	10.7	15.4	0.2	10.7	18.1	7.0	14.4
2010-11	12.8	9.8	11.9	18.1	10.3	15.9	16.0	11.6	14.6
2011-12	12.5	9.5	11.7	11.5	8.8	10.8	22.1	15.5	20.1
2012-13	12.5	9.5	11.7	9.6	9.0	9.4	9.6	9.0	9.4
2013-14	12.5	9.5	11.7	9.6	9.0	9.4	9.6	9.0	9.4
2014-15	12.5	9.5	11.7	9.6	9.0	9.4	9.6	9.0	9.4
2015-16	10.5	8.0	9.9	9.6	9.0	9.4	9.6	9.0	9.4
2016-17	10.5	8.0	9.9	8.8	9.0	8.9	8.8	9.0	8.9
2017-18	10.5	8.0	9.9	8.8	7.0	8.3	8.8	7.0	8.3
2018-19	10.5	8.0	9.9	8.8	7.0	8.3	8.8	7.0	8.3
2019-20	10.5	8.0	9.9	8.8	7.0	8.4	8.8	7.0	8.3
2020-21				8.8	7.0	8.4	8.8	7.0	8.3

Table 7.3**Mott McDonald traffic forecast for Delhi**

	Passenger (million)			Growth rate (% pre year)		
	Domestic	International	Total	Domestic	International	Total
2009	17.2	8.4	25.6	10.0	10.0	10.0
2010	19.3	9.4	28.7	12.0	12.0	12.0
2011	22.0	10.8	32.8	14.0	15.0	14.3
2012	24.6	12.1	36.7	12.0	12.0	12.0
2013	26.6	13.0	39.7	8.0	8.0	8.0
2014	28.7	14.1	42.8	8.0	8.0	8.0
2015	31.0	15.1	46.1	8.0	7.0	7.7
2016	33.4	16.1	49.5	7.5	7.0	7.3
2017	35.9	17.1	53.0	7.5	6.0	7.0
2018	38.5	18.1	56.7	7.5	6.0	7.0
2019	40.9	19.0	59.9	6.0	5.0	5.7
2020	43.3	20.0	63.3	6.0	5.0	5.7

Source: Mott. Delhi Airport Master Plan, 2006

7.2.2 Revenue forecast

Our next set up of forecast includes projection of DIAL's revenue for the next 10 years. We also project various components of total revenue. They are aeronautical, non-aeronautical, cargo and other income (comprises CPD and income from interest, investment etc.). Aeronautical revenue projection is based on average revenue per passenger for the latest two years. For 2012-13, we have assumed an increase of 341 per cent (334 per cent + 7 per cent CPI) and for 2013-14 CPI increase of 7 per cent in the aeronautical tariff based on the consultation paper issued by the Airports Economic Regulatory Authority of India². In addition, we have also taken into account the impact of passenger growth on revenue in the above two years. In case of non-aeronautical, the projections are also based on the ratio of non-aero revenue to per passenger for the last two years. In case of cargo, we have assumed 2 per cent growth rate from 2014-15 onwards based on the last few years' trend. Similarly, in case of other income, we assume 5 per cent growth from 2014-15 onwards based on past trend. Operating income is the sum of three components such as aero, non-aero and cargo. Total income is the sum of operating income and other income.

Aero revenue forecast for 2014-15 onwards is complex and dependent on number of factors. Hence an ad-hoc decrease of 50 per cent one time is assumed in aero charges which are not reflective of the actual charges that might be approved by the regulator.

The results of revenue projection are illustrated in **Table 7.4** below.

2. See <http://aera.gov.in/writereaddata/consultation/116.pdf>

Table 7.4**Revenue Projection for DIAL from 2011-12 to 2020-21 (Rs Million)**

	Aero	Non-Aero	Cargo	Operating Income	Other income*	Total Income
2009-10	4172	5144	1753	11069	650	11719
2010-11	4597	5658	1386	11641	986	12627
2011-12	5316	6969	1318	13603	860	14463
2012-13**	26481	7812	1301	35594	900	36494
2013-14	32210	8600	1326	42136	960	43096
2014-15	20908	9312	1353	31572	1008	32580
2015-16	24210	10189	1380	35779	1058	36837
2016-17	29106	11092	1407	41605	1111	42716
2017-18	34706	12009	1435	48150	1167	49317
2018-19	42026	13003	1464	56493	1225	57718
2019-20	46229	14080	1493	61802	1286	63089
2020-21	50851	15247	1523	67622	1351	68973

Source: Actual data for 2009-10 and 2010-11 are taken from DIAL.

Note: * includes CPD and other income from investment, interest etc.

** As per one time increase in aero revenue.

7.2.3 Direct and Indirect and total Impact of Delhi airport Operation

Projection of direct and indirect and induced contribution of Delhi airport to the output and employment to the national and regional economies is a difficult proposition due to the multidimensional impacts that airport generates and difficulty in quantifying those benefits. Nevertheless, we make an attempt here to project the direct, indirect and induced contribution of Delhi airport to the national and regional economies in terms of value added for the next 10 years. In order to make the projection, first of all it is important to project the output of airport operation sector of Delhi airport for the next 10 years. For this, we have used the output per passenger norm for each of the components of airport operation. It is important to note here that we have taken into account the revenue sharing of Delhi Airport with AAI as a part of expenditure of Delhi Airport. The major reason for this additional value is that AAI is spending this revenue for the development of other airports in India. This calculation is carried out using the actual data available for the latest year 2009-10. We have used this as 'base year' for our analysis. For the next 10 years, we have used output per passenger and the projected traffic numbers to get the projected values of output. The results of direct and indirect contribution of Delhi airport's operations to the national and Delhi's GDP are reported in Tables 7.5, 7.6 and 7.7.

Table 7.5**Projection of Direct Contribution of Delhi Airport Operations to the National and Relative to Delhi's Economy from 2011-12 to 2020-21**

Year	Value added of Airport operation (Rs billion)	% of India GDP	% Relative to Delhi GSDP
2009-10	42.90	0.07	1.97
2010-11	51.22	0.07	2.17
2011-12	61.29	0.08	2.42
2012-13	72.77	0.09	2.70
2013-14	80.50	0.09	2.80
2014-15	83.90	0.09	2.74
2015-16	92.15	0.09	2.83
2016-17	101.06	0.10	2.91
2017-18	110.28	0.10	3.00
2018-19	120.62	0.10	3.10
2019-20	130.80	0.11	3.17
2020-21	141.84	0.11	3.24

Table 7.6**Projection of Direct and Indirect Contribution of Delhi Airport Operations to the National and in Relation to Delhi's Economy from 2011-12 to 2020-21**

Year	Value added of Airport operation (Rs billion)	% of India GDP	% Relative to Delhi GSDP
2009-10	120.1	0.183	5.51
2010-11	143.4	0.202	6.07
2011-12	171.6	0.225	6.78
2012-13	203.8	0.251	7.56
2013-14	225.4	0.261	7.85
2014-15	234.9	0.255	7.68
2015-16	258.0	0.263	7.92
2016-17	283.0	0.271	8.16
2017-18	308.8	0.279	8.40
2018-19	337.7	0.288	8.67
2019-20	366.2	0.295	8.87
2020-21	397.2	0.302	9.07

Table 7.7**Projection of Total (Direct, Indirect and Induced) Contribution of Delhi Airport Operations to the National and Relative to Delhi's Economy from 2011-12 to 2020-21**

Year	Value added of Airport operation (Rs billion)	% of India GDP	% Relative to Delhi GSDP
2009-10	294.3	0.4	13.5
2010-11	344.2	0.5	14.9
2011-12	411.9	0.6	16.6
2012-13	499.2	0.6	18.5
2013-14	552.2	0.6	19.2
2014-15	563.8	0.6	18.8
2015-16	619.2	0.6	19.4
2016-17	679.1	0.7	20.0
2017-18	741.1	0.7	20.6
2018-19	810.6	0.7	21.2
2019-20	838.7	0.7	21.7
2020-21	909.5	0.7	22.2

7.3 Growth Strategies

IATA (2011), CAPA (2011), ICAO (2011) & ACI (2011) traffic reveals that Asia Pacific region's air traffic is growing significantly and it is projected that the region may surpass the world's largest contributor (North American Region). The major influencing factor is the emerging economies economic growth influencing air travel to grow. Emerging countries like China & India is going to be the market leaders in the air travel industry in the years to come. The report also suggests that increasing personal disposable income would add more demand for travel by air. So in parallel with the Asia Pacific growth, it is very clear that Indian airports would also become major growth poles in the Asian region.

Delhi airport leads the country in terms of traffic volume, and the airport would attract more traffic at least in the next few years and surpass Kuala Lumpur airport in 2012-13. Our traffic forecast shows that Delhi's passenger traffic would cross the landmark of 60 million by 2017-18. It is necessary that the increased traffic volume should not hamper the hassle-free travel. Appropriate strategy is required on the part of the airport operator to utilize the airport resources efficiently. For business growth strategies, a variety of options would be available. CPD is one of the emerging areas to generate revenues. Cargo services also need to be improved to make air freight competitive for the relevant segment of the market. The survey of cargo forwarders suggests that the existing infrastructure and quality of services should be improved further to strengthen the business and make the Delhi cargo terminal as a world class business hub.



Chapter 8

Passenger Profile

In this chapter we discuss the profile of passengers at Delhi airport. A structured questionnaire was canvassed among the passengers to capture their gender, age, education and occupation. We also collected information on passengers' personal monthly income, expenditure pattern during their Delhi visit, purpose of visit, frequency of air travel and most importantly their opinion on the quality of services offered at Delhi airport. The prime objective of the survey was to capture the economic impact of Delhi airport on the regional economy in terms of spending activities of visitors/tourists or those directly using the services at Delhi airport.

8.1 Profile of Passengers

The survey results on passenger profiles are reported in Tables 8.1 to 8.4. The following are main findings of the passenger profile:

- 4,747 passengers were surveyed, out of which 3,278 (69.1 per cent) were domestic and 1,468 (30.9 per cent) were international passengers.
- Among the domestic passengers interviewed 87.3 per cent were male and 12.7 per cent were female. In case of international passengers 84.0 per cent were male and 16.0 per cent were female.
- A majority of 38.7 per cent of the passengers were in the age group of 25-34 years, followed by 25.1 per cent in the 35-44 years age group. In other words, 63.8 per cent of the passengers were from the 25-44 years age group.
- Qualification wise, about one-third of the passengers were post-graduates and another one-third were graduates; engineers formed 10.0 per cent and doctors 4.8 per cent of the total. Passengers with intermediate and less education were about 17.0 per cent.
- From the occupational distribution of respondents it was found that 63.0 per cent were from the salaried class. Self-employed (business/trade) were 19.2 per cent. This clearly indicates that about 80 per cent of the passengers were travelling on official visits or for business purposes. It was also found that students formed 7.7 per cent of the total number of passengers surveyed.

8.2 Income and Expenditure

The results of income and expenditure of passengers are given in Tables 8.5 to 8.11. Some of the main findings are:

- Among the Indian residents travelling by international flights, the top 20 per cent enjoyed

an average monthly income to the extent of Rs 4.2 lakh per month and the bottom 20 per cent had a monthly income of Rs15,525 per month.

- Among non-Indian residents travelling by international flights, the top one-fifth or the top 20 per cent had a monthly income to the extent of US\$ 18.7 thousand per month. The monthly income reported by the 1st quintile group (or bottom 20 per cent) was US\$ 712 per month (or Rs 32,052).
- Across the 5 income quintiles, the composition of the salaried group varied between 62.6 per cent in the bottom income quintile to 71.7 per cent in the top income quintile. Similarly self-employed persons were 20.2 per cent in the bottom income quintile and 24.1 per cent in the top income quintile. It was thus found that across all income quintiles 80-90 per cent of the passengers were from salaried or self-employed classes.
- From the occupational distribution of non-Indian resident passengers by income quintiles, it was found that salaried passengers constituted 65.8 per cent of the total passengers varying between 55.7 per cent in the bottom and 67.7 per cent in the top income quintile. Self-employed (business/trade) persons formed 24.8 per cent across all income levels varying between 26.2 per cent in the bottom income quintile and 29.0 per cent in the top income quintile. Like Indian resident passengers, salaried and self-employed (business/trade) non-Indian residents formed between 80-90 per cent of the total passengers across income quintiles.
- The spending activities of air passengers in Delhi suggested that about 70 per cent of those who had come on business purposes spent more than Rs 5,000 on hotels. Similarly, about 80 per cent of the passengers who had come for tourism purposes spent more than Rs 5,000 on hotels. About 70 per cent of the passengers in these two categories spent between Rs 1,001-10,000 on transportation. In other expenditure like shopping, watching movies, etc., more than 60 per cent of the passengers who had come for business and vacation/tourism purposes spent between Rs 1,001-10,000 on these activities during their visit.

8.3: Purpose of visit and frequency of travel by air

The results on purpose of visit and frequency of travel by air are given in Figures 8.1 and 8.2. Some of the findings are:

- Distribution of respondent passengers by purpose of visit suggested that a majority of 33.4 per cent had come for business purpose, followed by 20.2 per cent for visiting friends and relatives; travelling during vacations for tourism purposes formed 18.7 per cent of the total respondents. Attending conferences or coming for education and medical purpose formed 6.0, 2.7 and 1.3 per cent respectively.
- When asked 'how frequently did they travel by air?' 21.6 per cent of the passengers said that they travelled once in a week, 27.7 per cent once in a month and 29.5 per cent once in six months. Only 12 per cent of the passengers rarely travelled by air.

8.4 Quality of airport services

The responses of passengers on the quality of services are given in Table 8.12. The main findings are:

- On the check-in process, about 70 per cent of the passengers said it was 'good', while 18.0 per cent found these services 'excellent'. Only 1.5 per cent of the passengers felt that the service was 'poor'.
- About 61.4 per cent of the passengers said that cleanliness/sanitation services at Delhi airport were 'good' while 29.4 per cent found them 'excellent'. Only 0.8 per cent of the passengers that they were 'poor'.
- Regarding services related to boarding facilities, 66 per cent said that they were 'good,' 27 per cent found them 'excellent' and only 0.6 per cent said they were 'poor'.

Table 8.1

Distribution of Passengers by Category and Sex at Delhi Airport

Sl. No	Category	Male	Female	Total
1	Domestic	2,862 (87.3)	416 (12.7)	3,278 (100.0)
2	International	1,233 (84.0)	235 (16.0)	1,468 (100.0)
3	All	4,095 (86.0)	651 (13.7)	4,746 (100.0)

Note: figures in parenthesis are percentage distribution of passengers by row totals.

Table 8.2

Percentage Distribution of Passengers by Age Group

Sl. No	Age Group	Male	Female	Total
1	Under 15	0.3	0.6	0.4
2	15 to 24	9.4	20.2	10.9
3	25 to 34	37.9	43.3	38.7
4	35 to 44	26.6	15.5	25.1
5	45 to 54	15.1	10.7	14.5
6	55 to 64	7.9	7.4	7.9
7	Above 65	2.7	2.3	2.6
	Total	100.0	100.0	100.0

Table 8.3

Percentage Distribution of Passengers by Qualification and Gender

Sl. No	Qualification	Male	Female	Total
1	High school or less	6.8	4.2	6.5
2	Intermediate	11.2	5.3	10.4
3	Graduate	30.8	40.0	32.0
4	Post-graduate	30.7	35.8	31.4
5	Diploma	2.0	2.8	2.1
6	Doctor	4.6	6.4	4.8
7	Engineer	11.0	3.6	10.0
8	Others	2.9	1.9	2.8
	Total	100.0	100.0	100.0

Table 8.4

Percentage Distribution of Passengers by Occupation and Gender

Sl. No	Occupation	Male	Female	Total
1	Salaried	66.3	43.4	63.0
2	Self-employed(business/trade)	20.8	8.5	19.2
3	Self-employed (arts and crafts)	2.6	1.0	2.4
4	Retired	2.5	1.8	2.4
5	Housewives	0.0	3.5	3.5
6	Students	5.9	19.2	7.7
7	Others	1.5	1.8	1.5
8	Total	100.0	100.0	100.0

Table 8.5

Average Personal Monthly Income of Indian Resident Passengers Travelling by International Airlines

	Income Quintile	In Rs
1	First	15,525
2	Second	20,957
3	Third	26,343
4	Fourth	50,228
5	Fifth	4,21,914
	Average	1,04,652

Table 8.6**Average Personal Monthly Income of Non-Indian Resident Passengers Travelling by International Airlines**

	Income Quintile	In US\$
1	First	712
2	Second	1,688
3	Third	3,626
4	Fourth	8,248
5	Fifth	18,685
	Average	6492.5

Note: Exchange rate: Rs 45.0 = 1 US\$.

Table 8.7**Occupational Distribution of Indian resident passengers by Income Quintiles (%)**

Sl. No.	Occupation/Income Quintiles	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile	Total
1	Salaried	62.6	70.3	72.2	74.6	71.7	70.2
2	Self-employed (business/trade)	20.2	19.9	22.8	22.1	24.1	21.6
3	Self-employed (artisans and craftspeople)	7.8	4.6	1.4	0.5	1.0	3.2
4	Retired	2.6	2.7	0.6	1.6	1.8	1.9
5	Housewives	1.5	0.3	1.0	0.5	0.3	0.7
6	Students	3.1	1.0	0.8	0.0	0.3	1.1
7	Others	2.2	1.2	1.2	0.5	1.0	1.2
8	Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 8.8**Occupational Distribution of Non-Indian resident passengers by Income Quintiles**

Sl. No.	(%) Occupation/Income class	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile	Total
1	Salaried	55.7	77.6	68.8	58.5	67.7	65.8
2	Self-employed (business/trade)	26.2	10.3	25.0	34.0	29.0	24.8
3	Self-employed (artisans and craftspeople)	4.9	5.2	1.6	1.9	0.0	2.7
4	Retired	0.0	5.2	1.6	1.9	1.6	2.0
5	Housewives	1.6	0.0	0.0	3.8	0.0	1.0
6	Students	4.9	0.0	0.0	0.0	0.0	1.0
7	Others	6.6	1.7	3.1	0.0	1.6	2.7
8	Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 8.9

Distribution of Passengers by Hotel Expenses incurred for various purposes during visit to Delhi

Sl. No.	Hotel Expenses (Rs)	Business	Vacation/ tourism	Visit friends/ relatives	conferences	Education	Medical/ Health	Others
1.	<1,000	5.2	7.7	56.7	29.7	58.1	22.6	56.3
2.	1,001-5,000	25.4	13.1	17.7	25.4	18.6	25.8	23.6
3	5,001-10,000	31.0	39.4	16.7	25.4	16.3	25.8	8.3
4	Above 10,000	38.3	39.7	8.9	19.6	7.0	25.8	11.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 8.10

Distribution of Passengers by Transportation Expenses incurred for various purposes during visit to Delhi

Expenditure Class	Business	Vacation/ tourism	Visit friends/ relatives	conferences	Education	Medical/ Health	Others
<1,000	12.4	13.4	61.2	49.0	63.3	41.9	72.6
1,001-5,000	37.3	34.5	22.7	38.6	26.7	35.5	18.8
5,001-10,000	43.0	42.6	9.9	9.7	8.3	9.7	6.4
Above 10,000	7.2	9.5	6.2	2.8	1.7	12.9	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 8.11

Distribution of passengers by Other expenses for various purposes during visit to Delhi

Sl. No.	Expenditure Class	Business	Vacation/ tourism	Visit friends/ relatives	conferences	Education	Medical/ Health	Others
1	<1,000	13.5	16.3	56.9	56.0	57.8	31.0	78.1
2	1,001-5,000	29.8	25.1	20.1	23.1	22.2	24.1	13.1
3	5,001-10,000	45.1	35.6	10.8	12.7	11.1	17.2	4.4
4	Above 10,000	11.5	23.0	12.2	8.2	8.9	27.6	4.4
5	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 8.12

Distribution of Passengers by their comments on quality of services provided at the airport

Sl. No	Service	Poor	Fair	Average	Good	Excellent	All
1	Check-in process	1.5	2.5	8.7	69.8	17.5	100.0
2	Cleanliness/sanitation within the airport	0.8	2	6.4	61.4	29.4	100.0
3	Boarding facilities	0.6	0.9	5.8	65.8	26.9	100.0

Figure 8.1

Distributions of Passengers by Purpose of Visit to Delhi (%)

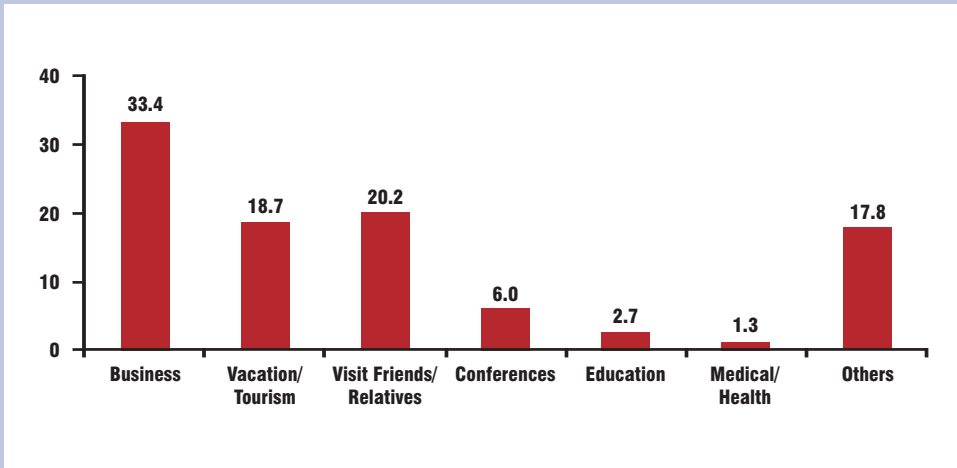
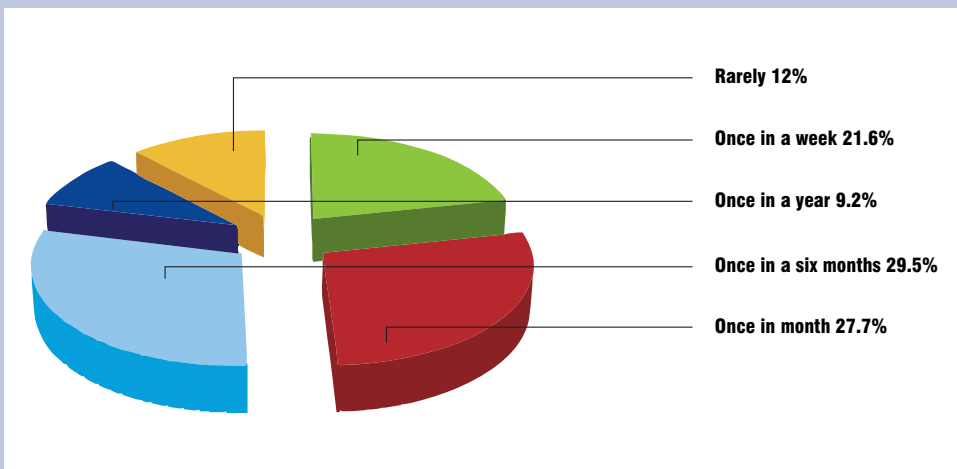


Figure 8.2

Frequency of travelling by air (%)





Chapter 9

Summary and Conclusions

Aviation sector brings a variety of benefits to communities and economies around the globe. It is a key enabler of economic growth, promoting development and tourism by connecting different regions and providing market access for trade and investments. The recent study carried out by ATAG, reveals that considering direct, indirect and induced aviation industry supports worldwide 56.6 million jobs and over US \$2.2 trillion of GDP. It is a strategic contributor to economic growth and development.

The Aviation Industry in India has experienced remarkable transformation during the post economic reforms period. During 2010-11, the total traffic handled by Indian airports was 143.43 million with a growth of 16.0 per cent, which discloses a major growth in the industry. As the economy experienced changes in policies from a highly regulated regime to a more market oriented structure, there were also significant changes in the policies and demand for air travel. As the Indian economy moved towards becoming more outward oriented, rising per capita incomes, changes in the structure of the economy meant greater demand for mobility to meet business and personal needs. Thus, there was an increase in demand for physical infrastructure in general and transportation in particular. Air travel is now becoming an affordable mode of transportation for a much broader segment of the population than before.

Therefore in this context, the study would support in understanding the importance of aviation in the growth and development of the national and regional economies in terms of output, value added (income) and employment. This has been analysed through using the Input-Output model and information from primary and secondary sources. The essence of the study findings is outlined below.

Delhi airport's operations contributed Rs 294.7 billion (0.45 per cent) to the national GDP in 2009-10. However, the contribution relative to Delhi's GSDP is 13.53 per cent. This total impact comprises of:

- Rs 42.9 billion directly contributed through value added (air transport and airport services)
- Rs 77.2 billion indirectly contributed through supply chain (multipliers impact).
- Rs 174.6 billion in induced impact through tourism and investment.

Delhi airport's construction sector contributed INR 68.23 billion (0.104 per cent) to the national GDP (in 2009-10) and its contribution relative to Delhi's GSDP is 3.13 per cent. It

is important here that this is a one-time impact which includes one-third of the total project cost. The total impact of the construction phase would, therefore, be three times this estimate but spread over three years. This total impact of construction phase in a year comprises of:

- INR 25.7 billion directly contributed through value added.
- INR 42.6 billion indirectly contributed through supply chain (multipliers impact).

In terms of employment opportunities, Delhi airport's operation sector contributes 1578 thousand jobs (0.34 per cent of national employment) and this represents as a ratio to Delhi's employment a significant 25.9 per cent. The total comprises of:

- 64 thousand directly contributed jobs
- 452 thousand indirectly contributed jobs through supply chain (multiplier impact).
- 1062 thousand jobs in induced impact through tourism and investment.

Delhi airport's construction activities contributed total 614 thousand jobs in each of the three years of construction phase. This total comprises of:

- 35 thousand directly contributed jobs
- 579 thousand indirectly contributed jobs through multiplier effects.

To sum up, this study has provided an assessment of the significant linkages of the civil aviation sector with the rest of the economy, particularly as it relates to Delhi Airport. It has highlighted the importance of catalytic role the sector plays in supporting economic growth of the region and the country. We should also note that the linkages of the national and regional economies are also multifaceted and accurate estimation of these effects is also difficult. The study uses different combination of approaches and assumptions to come up with the estimates of the economic impact, given the complexity of the sector. We believe that the insights from this study would be of significant value in understanding the role of the sector in the economy and in framing policies to enhance the positive effects of infrastructure development.

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Appendix - A

A. Airport Service Providers

Table A2.1

List of Airport Service Providers in the Airport

Sl. No.	Agency
1	Airlines
2	Concessionaires
3	Retailers
4	Duty Free Shops
5	Ground Handling Agencies
6	IT Service Providers
7	Cargo Agents
8	Money Exchange Counters
9	Car Parking Vendors
10	DIAL Joint Ventures-Airside Services
11	Cargo Ground Handling Agents
12	Air Side Security
13	Car Rental Agencies
14	Celebi Cargo Services
15	Raxa Airport Security Services
16	Immigration
17	Customs
18	Plant Quarantine
19	BCAS
20	BDDS
21	Airport Health
22	CISF
23	ATC
24	Revenue Intelligence-(IB)
25	Tourism Authority
26	Railway Reservation Centre
27	DGCA
28	DTC
29	Metro
30	Oil Companies - ONGC, HPCL, BPCL

B. The I-O Table³

An input-output (I-O) table provides a comprehensive accounting of the linkages across production sectors and consuming sectors in the economy. A simplified overview of the I-O table is presented in **Table A2.2**.

Table A2.2

An Overview of an Input-Output Table

	Sectors	Final demand Sectors	Total
Sectors	Block A Inter-sectoral transactions	Block B Final demand (sales to households, government, investment and net trade)	Total sector output (sales)
Final Payment Sectors	Block C Primary payments (payments for labour, capital, land, Subsidies, taxes)		Total payments
Total	Total sector input (purchases)	Total expenditures	

Source: NCAER (2006)

3. Two relevant references to the analysis are 'Input-Output tables and analysis for Jharkhand, Karnataka and Uttarakhand', NCAER (2006) and Pradhan, B. K et al, (2006).

C. Sectors in the I-O Table

Table A2.3
Mapping of 35-sector I-O Model with 130-sector I-O Model

Sl. No.	Commodity Sectors in the Aggregate Model	Original I-O Sectors
1	Agriculture	1-26
2	Mining and Quarrying	27-37
3	Food Beverage and Tobacco	38-45
4	Textiles and R MG	46-54
5	Wood & W Prod; Furniture & Fix.	55-56
6	Paper & Paper Products	57
7	Printing and Publishing	58
8	Leather & Plastic; and Products	59-62
9	Petroleum Products	63
10	Paints, Burnishes, Lacquers	69
11	Other Chemicals	64-68,70-73
12	Non-Metallic Mineral Products	74-76
13	Basic Metal & Metal Products	77-82
14	Non-Electrical Machinery & Parts	83-87
15	Electrical Machinery	88-94
16	Transport Equipment & Parts	95-100
17	Other Miscellaneous Manufacturing	101-105
18	Other Construction	Part 106
19	Airport Construction	Part 106
20	Electricity	107
21	Water	108
22	Railway	109
23	Land Transport	110
24	Water Transport	111
25	Air Transport	112
26	Airport Services	Part 113
27	Supporting & Aux. land & wtr tpt activities	Part 113
28	Storage and Warehousing	114
29	Communication	115
30	Trade	116
31	Hotels & Restaurants	117
32	Banking	118
33	Insurance	119
34	Computer Related	124
35	Rest of the Services	120-123, 125-130

Source: Original I-O sectors are indicated in the I-O Table 2006-07, CSO, Government of India.

Appendix - B

Table A6.1

Direct and Indirect Output and Employment Multipliers

Sr No	Sectors	Output Multipliers	Employment Multipliers
1	Agriculture	1.616	5.317
2	Mining and Quarrying	1.540	0.372
3	Food Beverage and Tobacco	2.474	3.435
4	Textiles and R MG	2.553	2.083
5	Wood & W Prod; Furniture & Fix.	2.046	3.715
6	Paper & Paper Products	2.556	1.300
7	Printing and Publishing	2.425	1.367
8	Leather & Plastic; and Products	2.649	1.427
9	Petroleum Products	2.268	0.360
10	Paints, Barnishes, Lacquers	2.597	0.806
11	Other Chemicals	2.524	0.820
12	Non-Metallic Mineral Products	2.328	1.295
13	Basic Metal & Metal Products	2.555	0.761
14	Non-Electrical Machinery & Parts	2.652	1.376
15	Electrical Machinery	2.988	0.907
16	Transport Equipment & Parts	2.625	0.685
17	Oth Miscellaneous Manufacturing	2.512	1.021
18	Other Construction	2.342	1.331
19	Airport Construction	2.655	1.433
20	Electricity	2.731	0.587
21	Water	1.719	0.507
22	Railway	2.187	0.700
23	Land Transport	2.294	1.043
24	Water Transport	1.857	0.463
25	Air Transport	2.177	0.575
26	Airport Services	2.075	0.700
27	Support & aux. land & wtr tpt activities	1.953	0.637
28	Storage and Warehousing	1.920	0.889
29	Communication	1.560	0.582
30	Trade	1.296	1.207
31	Hotels & Restaurants	2.219	2.932
32	Banking	1.376	0.265
33	Insurance	1.603	0.494
34	Computer Related	1.501	0.284
35	Rest of the Services	1.299	0.584

Source: Original I-O sectors are indicated in the I-O Table 2006-07, CSO, Government of India.



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