

Chapter 4

Base Year Passenger Traffic Flows: Railways, Highways and Airways

4.1 INTRODUCTION

In this chapter, base year (2007-08) passenger flows by Rail, Road Transport and Airways are reviewed. In the case of Railways, passenger flow assessment is based on computerized data obtained from the Zonal Railways and published statistics accompanying the Railways' annual budget. Passenger flow analysis in this case relates to non-suburban passengers only.

In the case of Road Transport, however, all-India level databank on passenger traffic flows does not exist. Generation of passenger flow data through physical surveys poses several handicaps. Unlike trucks, it is neither feasible nor advisable to stop buses at check-posts for eliciting O-D data. Looking to the massive spread of bus services, operated both by State Transport Undertakings and private agencies, it is not feasible to collect data through in-bus travel either. The only apparent alternative would be to obtain information from the management of State Transport Undertakings on a specific format and, through the active involvement of State Transport Departments and regional transport authorities, from private operators. However, not only would this approach be time consuming but also inhibitive owing to the need for supplementing the data through field visits for incorporating enroute passenger boarding/de-boarding pattern for various routes. Looking to the expanse of passenger bus operations in the country, an exercise of this nature for estimating O-D wise passenger movement at all-India level would involve prohibitive time and resources.

On pragmatic considerations, therefore, only sample passenger flow surveys on selected routes were found feasible. In this context, passenger traffic surveys have been undertaken with the help of State Transport Authorities in respect of major road routes linking 17 identified major cities/state capitals which include Ahmedabad, Mumbai, Nagpur, Raipur, Shimla, Surat, Kolkata, Ranchi, Chandigarh, Delhi, Patna, Vadodara, Pune, Thiruvananthapuram, Chennai, Vishakhapatnam and Panji (Goa). However, due to discrepancy in data collected from Thiruvananthapuram, it could not be included in the final analysis in this report.

During these surveys, study teams from RITES physically ascertained boarding/de-boarding pattern on different routes for arriving at passenger O-Ds. It will be observed that despite the constraints, it has been possible to capture sizeable information on passenger travel on major road routes.

In the case of Airways, the source of passenger flow data is DGCA (Directorate General of Civil Aviation) and AAI (Airport Authority of India).

The available modal passenger flow data is not amenable to O-D specific comparative analysis because of varying framework of flow data format. Accordingly, passenger flows by the three modes under study are dealt with separately.

4.2 PASSENGER TRAFFIC FLOWS BY RAILWAYS

Indian Railways (IR) with countrywide spread of its network and services is a major mode for movement of men and material across long distances in this vast country with a large population and an extensive industrial and commercial base. Passenger traffic is an important component of traffic handled by the Railways. Because of competitive tariffs, comfort and speed of movement, Railways are a preferred mode of travel for a large part of population undertaking journeys to meet business, social and religious obligations. Continuing broad based growth of national economy has also led to increasing demand for travel. In this context, this section presents, in the backdrop of a historical perspective, the base year (2007-08) assessment of passenger traffic and associated issue of demand satisfaction and adequacy of services particularly for medium and long lead second class passengers.

4.2.1 Historical Perspective

Growth in Passenger Traffic

Passenger traffic on IR is classified into two categories – suburban and non-suburban. Suburban traffic comprises passenger movements on nominated sections adjacent to the megapolises viz. Mumbai, Howrah, Chennai and Delhi and fall in the jurisdiction of Central, Western, Eastern, Southern and Northern Railways. Railway wise list of nominated suburban sections is given in Appendix 1. Passenger flows excluding suburban passengers constitute non-suburban component of passenger traffic.

Based on Indian Railways (IR) published data, trend of passenger traffic growth on IR for select years between 1950-51 and 2007-08 is presented in Table 4.1. Although the study aims at assessing non-suburban passenger flows, the table gives status of suburban traffic also for presenting a total picture of passenger traffic on IR.

TABLE 4.1: HISTORICAL GROWTH IN NUMBER OF ORIGINATING PASSENGERS ON IR

(Figures in Millions)

| YEAR | SUBURBAN | | NON-SUBURBAN | | | | | SUBURBAN + NON-SUBURBAN | |
|---------|-------------------|----------|--------------|---------------|-----------------------|-------|----------|-------------------------|----------|
| | Total All Classes | % Growth | Upper Class | Mail/ Express | Second Class Ordinary | Total | % Growth | Total | % Growth |
| 1950-51 | 412 | - | 25 | 52 | 795 | 872 | - | 1,284 | - |
| 1960-61 | 680 | 65.05 | 15 | 96 | 803 | 914 | 4.82 | 1,594 | 24.14 |
| 1970-71 | 1,219 | 79.26 | 16 | 155 | 1,041 | 1,212 | 32.60 | 2,431 | 52.51 |
| 1980-81 | 2,000 | 64.07 | 11 | 260 | 1,342 | 1,613 | 33.09 | 3,613 | 48.62 |
| 1990-91 | 2,259 | 12.95 | 19 | 357 | 1,223 | 1,599 | -0.87 | 3,858 | 6.78 |
| 2000-01 | 2,861 | 26.65 | 40 | 472 | 1,460 | 1,972 | 23.33 | 4,833 | 25.27 |
| 2002-03 | 2,934 | 2.55 | 42 | 513 | 1,482 | 2,037 | 3.30 | 4,971 | 2.86 |
| 2003-04 | 2,986 | 1.77 | 42 | 571 | 1,513 | 2,126 | 4.37 | 5,112 | 2.84 |
| 2004-05 | 3,178 | 6.43 | 44 | 609 | 1,547 | 2,200 | 3.48 | 5,378 | 5.20 |
| 2005-06 | 3,329 | 4.75 | 50 | 668 | 1,678 | 2,396 | 8.91 | 5,725 | 6.45 |
| 2006-07 | 3,514 | 5.56 | 58 | 713 | 1,934 | 2,705 | 12.90 | 6,219 | 8.63 |
| 2007-08 | 3,689 | 4.98 | 66 | 776 | 1,993 | 2,835 | 4.81 | 6,524 | 4.90 |

Source: Indian Railways Year Books of respective years

Total suburban and non-suburban passenger traffic has increased five times over a period of fifty eight years – from 1284 million originating passengers in 1950-51 to 6524 million in 2007-08. Till the nineteen-sixties, share of non-suburban passengers in total originating passengers was much higher than suburban passengers. However, from 1970-71 onwards, share of suburban component of passenger traffic has displayed continued trend of predominance vis-à-vis non-suburban traffic. Share of annual suburban passenger traffic in total traffic during the period between 2002-03 and 2007-08 has ranged between 56.55 % (2007-08) and 59.09 % (2004-05) of the total passenger traffic. There has, however, been no consistency in year on year growth in suburban traffic during the period which has ranged between 1.77 % (2003-04) and 6.43 % (2004-05).

The number of non-suburban originating passengers, on the other hand, has risen by about 39 % during past five years – from 2037 million in 2002-03 to 2.835 million in 2007-08. There has been a marked spurt in number of non-suburban passengers during 2006-07 and 2007-08 even though the annual rates of growth of 12.90 % achieved in 2006-07 came down to 4.81 in 2007-08. This substantial increase in non-suburban passenger traffic can be attributed to increase in number of passenger trains, particularly medium and long distance, increase in frequency of a number of trains and strengthening of number of trains to 24 coach rakes, leading to an overall increase in availability of seats and berths. The extent of increase in availability of seats/berths and resultant annual class wise capacity on the BG during the period between 2004-05 and 2007-08 is presented in Table 4.2.

TABLE 4.2: CLASS WISE AVAILABILITY OF SEATS/BERTHS - BG PASSENGER TRAINS

| CLASS / YEAR | NUMBER OF AVAILABLE SEATS / BERTHS | | | | ANNUAL CAPACITY OF SEATS/BERTHS | | | |
|----------------|------------------------------------|-----------|-----------|-----------|---------------------------------|------------|-------------|------------|
| | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2004-05 | 2005-06 | 2006-07 | 2007-08 |
| 1A | 3,010 | 3,244 | 3,200 | 3,394 | 1,098,650 | 1,184,060 | 1,168,000 | 1,238,810 |
| 2AC | 67,682 | 70,438 | 71,438 | 80,672 | 24,703,930 | 25,709,870 | 26,074,870 | 29,445,280 |
| 3AC | 115,564 | 135,200 | 152,904 | 183,177 | 42,180,860 | 49,348,000 | 55,809,960 | 66,859,605 |
| AC Chair | 37,801 | 36,054 | 42,581 | 49,801 | 13,797,365 | 13,159,710 | 155,42,065 | 18,177,365 |
| First | 8,851 | 7,721 | 7,095 | 7,346 | 3,230,615 | 2818,165 | 2,589,675 | 2,681,290 |
| Second Sleeper | 795,671 | 836,193 | 875,705 | 902,843 | 290,419,915 | 305,210,44 | 319,632,325 | 329,537,69 |
| Second | 1,211,810 | 1,219,694 | 1,279,619 | 1,323,909 | 442,310,650 | 445,166,31 | 467,060,935 | 483,226,78 |
| Total | 2,240,389 | 2,308,544 | 2,432,542 | 2,551,142 | 817,741,985 | 842,618,56 | 887,877,830 | 931,166,83 |
| Increase (%) | - | 3.0% | 5.4% | 4.9% | | | | |

Source: Statement 10 of Annual Statistical Statements of Indian Railways.

Increase in number of seats/berths amounted to 3 % in 2005-06, 5.4 % in 2006-07 and 4.9 % in 2007-08. Increase in annual capacity reflects similar pattern.

The impact of increased availability of seats and berths on number of passengers carried and the occupancy ratio of class wise seats/berths in respect of performance on BG during past four years is reflected in Tables 4.3.

TABLE 4.3: CLASS WISE PASSENGERS CARRIED & OCCUPANCY RATIO - BG PASSENGER TRAINS

| YEAR / CLASS | CLASS WISE NUMBER OF PASSENGERS CARRIED | | | | OCCUPATION RATIO | | | |
|----------------|---|---------------|--------------|--------------|------------------|---------|---------|---------|
| | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2004-05 | 2005-06 | 2006-07 | 2007-08 |
| 1A | 1,093,700 | 1,162,500 | 1,353,600 | 1,589,500 | 99.55 | 98.18 | 115.89 | 128.31 |
| 2AC | 11,439,200 | 12,051,700 | 13,375,000 | 14,077,400 | 46.31 | 46.88 | 51.29 | 47.81 |
| 3AC | 17,566,200 | 20,680,100 | 26,575,000 | 31,410,900 | 41.64 | 41.91 | 47.62 | 46.98 |
| AC Chair | 8,981,700 | 9,345,400 | 1,141,600 | 12,961,400 | 65.10 | 71.02 | 71.69 | 71.31 |
| First | 4,852,500 | 6,258,800 | 5,596,600 | 5,688,400 | 150.20 | 222.09 | 216.11 | 212.15 |
| Second Sleeper | 164,570,100 | 181,424,600 | 212,530,400 | 221,705,600 | 56.70 | 59.44 | 66.49 | 67.28 |
| Second | 1,811,938,90 | 2,004,375,300 | 2,288,534,20 | 2,413,341,00 | 409.65 | 450.23 | 489.99 | 499.42 |
| Total | 2,020,442,30 | 2,235,298,400 | 2,559,106,40 | 2,700,774,20 | 247.08 | 265.28 | 288.23 | 290.04 |
| Increase (%) | - | 10.6 % | 12.7 % | 5.5 | - | 7.4 % | 8.7 % | 1.3 % |

Source: Statement 12 of Indian Railways Annual Statistical Statements.

Overall occupancy ratio of seats is quite high, ranging between 247 and 290. Expectedly, the occupation ratio of Second Class seats is exceptionally high, ranging between 410 and 500, indicating persisting overcrowding of second class coaches. Next comes First Class with an occupancy ratio ranging between 150 and 222 during the same period. Barring 1AC class which reflects an occupancy ratio of around 100 and 128, occupancy ratio of other classes of travel including 2AC, 3AC, AC Chair and Second Sleeper are far below 100.

Average Lead

For the select years between 1950-51 and 2007-08 as above, average leads of suburban and non-suburban passengers are presented in Table 4.4. The average lead of suburban passengers has doubled-up from 15.9 kilometres in 1950-51 to 32.5 kilometres in 2007-08. During the same period, the average lead of non-suburban passengers has increased more than three times, from 68.8

kilometres in 1950-51 to 229.3 in 2007-08. During the last five years, the average lead has ranged between 209.4 kilometres in 2003-04 and 229.3 kilometres in 2007-08.

TABLE 4.4: AVERAGE LEAD OF PASSENGERS

(Kilometres)

| YEAR | SUBURBAN | NON-SUBURBAN | | | | SUBURBAN + NON-SUBURBAN |
|---------|----------------------|----------------|------------------|-----------------------------|-------|----------------------------|
| | Total All Classes | Upper Class | Mail/ Express | Second Class Ordinary | Total | Total |
| 1950-51 | 15.9 | 151.6 | 241.1 | 54.9 | 68.8 | 51.8 |
| 1960-61 | 17.3 | 203.3 | 232.4 | 50.0 | 72.1 | 48.7 |
| 1970-71 | 18.9 | 274.6 | 244.2 | 50.8 | 78.5 | 48.6 |
| 1980-81 | 20.5 | 484.0 | 333.3 | 56.4 | 103.9 | 57.7 |
| 1990-91 | 26.4 | 462.8 | 386.5 | 73.0 | 147.6 | 76.6 |
| 2000-01 | 31.1 | 659.3 | 471.3 | 81.7 | 186.7 | 94.6 |
| 2002-03 | 30.8 | 689.7 | 495.3 | 95.6 | 208.6 | 103.6 |
| 2003-04 | 32.1 | 676.2 | 456.4 | 103.2 | 209.4 | 105.9 |
| 2004-05 | 32.7 | 570.3 | 449.2 | 112.1 | 214.5 | 107.0 |
| 2005-06 | 32.0 | 558.9 | 437.9 | 112.7 | 212.6 | 107.5 |
| 2006-07 | 31.8 | 585.5 | 467.3 | 111.5 | 215.5 | 111.7 |
| 2007-08 | 32.5 | 624.7 | 495.5 | 112.6 | 229.3 | 118.0 |

Source: Indian Railways Year Books of respective years.

4.2.2 Base Year (2007-08) Passenger Traffic Flows by Rail

Data Base

Zonal Railways maintain separate records for un-reserved passengers and passengers booked under PRS (Passenger Reservation System). Data in the case of un-reserved passengers is maintained separately by way of different type of ticketing systems which include: ARTS (advanced railway ticketing system developed by CMS), BPT (blank paper tickets), PCT (printed card tickets) and UTS (computerised unreserved ticketing system). Railways also issue monthly season tickets, quarterly season tickets and single return journey tickets. Information pertaining to these tickets is included in the PCT and UTS data statements.

Data Limitations and Process Adopted for Filling Data Gaps

Whereas PRS and UTS data made available by Railways are complete, there are some deficiencies in data received in respect of other type of ticketing systems. For instance ARTS data are available only for KRCL (Konkan Railway Corporation Ltd.). It is understood that Railways have since discontinued this system of ticketing. In the case of PCT data, information with respect to the following months could not be had from the concerned Railways:

| Railway | Pct data not available | Railway | Pct data not available |
|------------------------|------------------------|-------------------|--------------------------|
| Southern Rly | March, 2008 | West Central Rly | February, March, 2008 |
| North Eastern Rly | March, 2008 | Northern Rly | February, March, 2008 |
| North Western Rly | March, 2008 | South Western Rly | February, 2008 |
| South Eastern Rly | March, 2008 | N.F. Rly | Only July 2007 Available |
| South East Central Rly | July, August, 2007 | | |

Similarly, in the case of BPT, Eastern Railway data are available only for September 2007 to January, 2008. In the case of Northern Railway, data are available only for the months of April and October, 2007. Central Railway data are available for three months i.e May, June and September 2007. For rest of the Railways, no data for BPT are available.

Sequel to above data limitations, the total number of non-suburban passengers during 2007-08 amounted to 1525.2 million constituting around 54 % of actual number of 2835 million as per IR's published data. While the presentations in the Draft Report related to this 54 % of passengers,

subsequent efforts at filling up data gaps have helped in building total picture of passenger movement on IR in the base year. The process adopted for the purpose is outlined below.

Our efforts at augmentation of data could give us access to:

- (i) Railway wise total number of originating passengers in 2007-08, and
- (ii) Class wise figures of total number of passengers for each zonal railway.

Based on the above information, the steps adopted for updating the available data were as under:

- (a) Since the PRS component of passenger traffic was fully available and incomplete data related to non-PRS passengers, the PRS figures were deducted from both data already available and the latest railway wise data subsequently obtained.
- (b) The resultant set of figures was compared to workout railway wise net differentials and to adjust totals.
- (c) Class wise and railway wise data was used for pro-rata distribution over different O-Ds for different railways in respect of both PRS and non-PRS passengers.

The emerging results, which may lack exactitude to some extent but nevertheless present the existing pattern of total passenger flows on IR, form the basis of passenger flow analysis presented in the following paragraphs.

4.2.3 Non-Suburban Originating Passengers

Share of PRS and Non-PRS Passengers

Passenger reservation on about 3000 trains is provided to around one million passengers daily, at 1372 locations across the country through 5473 terminals. However, out of 2835 million originating non-suburban passengers on IR during 2007-08, the number of passengers booked under PRS (passenger reservation system) amounted to about 276 million i.e. around 9.7 %. The balance i.e 2559 million passengers constituting 90.3 % of total originating passengers belonged to non-PRS category.

Share of Different Zonal Railways

Share of different zonal railways in total number of non-suburban originating passengers is given in Table 4.5.

TABLE 4.5: ZONAL RAILWAY SHARES IN TOTAL NON-SUBURBAN ORIGINATING PASSENGERS (2007-08)

| SN | Zonal Railway | Share in Total Number of Originating Passengers | Percentage Share (%) |
|----|----------------------------|---|----------------------|
| 1 | Central Railway | 184920501 | 6.52 |
| 2 | Eastern Railway | 124140402 | 4.38 |
| 3 | East Central Railway | 207187010 | 7.31 |
| 4 | East Coast Railway | 58073012 | 2.05 |
| 5 | Northern Railway | 542651303 | 19.14 |
| 6 | North Central Railway | 140121013 | 4.94 |
| 7 | Northeastern Railway | 182795404 | 6.45 |
| 8 | Northeast Frontier Railway | 35887305 | 1.27 |
| 9 | North Western Railway | 114510411 | 4.04 |
| 10 | Southern Railway | 296006206 | 10.44 |
| 11 | South Eastern Railway | 99239907 | 3.50 |
| 12 | South Central Railway | 260395809 | 9.19 |
| 13 | South East Central | 92697714 | 3.27 |
| 14 | South Western Railway | 115070415 | 4.06 |
| 15 | Western Railway | 282975308 | 9.98 |
| 16 | West Central Railway | 98283016 | 3.47 |
| | Total | 2834954736 | 100 |

Around 56 % of the total non-suburban passengers originate on five railways viz., Northern, Western, Southern, South Central and East Central Railways, with the Northern Railway topping the list with 19.14 % share. The share of remaining 11 zonal railways in total originating passengers ranges between 2.05 % (East Coast Railway) and 6.52 % (Central Railway).

With the Metre Gauge (MG) and Narrow Gauge (NG) systems shrinking in the wake of project uni-gauge, around 93.7 % of the passengers originate on the BG. The share of MG and NG amounted to 5.7 % and 0.6 %, respectively.

Class-wise Composition of Non-suburban Originating Passengers

Of the total 2835 million non-suburban originating passengers during 2007-08, the number of passengers booked by Second Class (Ordinary) amounted to 1993 million constituting 70.31 % of the total passengers booked by all classes. Share of Second Class Sleeper (Mail & Express) Passengers amounted to 19.55 %, followed by First Class Ordinary (7.57%) and 3 AC class (1.1 %). Rest of the classes of travel accounted for less than one per cent each of the total passengers.

Class wise distribution of passengers is presented in Table 4.6.

TABLE 4.6: CLASS COMPOSITION OF NON-SUBURBAN PASSENGERS - 2007-08

| Class | Number of Passengers | Percentage Share (%) |
|---------------------------------|----------------------|----------------------|
| 1 AC | 1,584,384 | 0.06 |
| 2 AC | 14,016,680 | 0.49 |
| 3 AC | 31320,808 | 1.10 |
| First Class (Mail/Express) | 1,105,322 | 0.04 |
| First Class (Ordinary) | 214,635,668 | 7.57 |
| Chair Car | 12,960,610 | 0.46 |
| Second Sleeper (Mail & Express) | 554,069,287 | 19.55 |
| Second Sleeper (Ordinary) | 7,785,836 | 0.27 |
| Second-Sitting (Mail & Express) | 4,594,069 | 0.16 |
| Second Class - Ordinary | 1,993,010,026 | 70.31 |
| Total | 2,834,664,940 | 100 |

Class-Wise Average Lead of Passengers

Class-wise average lead of passengers is given in Table 4.7.

TABLE 4.7: CLASS-WISE AVERAGE LEAD OF PASSENGERS - 2007-08

| Class | Average Lead (Kms) |
|---------------------------------|--------------------|
| 1 AC | 611 |
| 2 AC | 740 |
| 3 AC | 714 |
| First Class (Mail/Express) | 924 |
| First Class (Ordinary): | 36 |
| Chair Car | 426 |
| Second Sleeper (Mail & Express) | 720 |
| Second Sleeper (Ordinary) | 345 |
| Second-Sitting (Mail & Express) | 404 |
| Second Class - Ordinary | 60 |
| All Classes | 118 |

First Class (Mail & Express) passengers have the highest average lead of 924 kilometres, followed by 2 AC passengers (740 kms), Second Class (Mail & Express) passengers (720 kms), 3 AC passengers (714 kms) and First Class AC passengers (611 kms), in that order. Rest of the passengers traveling by other classes reflect average leads ranging between 36 km (First Class Ordinary) and 426 km (Chair Car). The overall lead of passengers of all classes is 118 kilometres.

4.2.4 Origin-Destination (O-D) Wise Passenger Flows

PRS passenger flows relate to over 4,64,610 pairs of origins and destinations. Non-PRS passenger flows encompass 6,54,733 pairs of stations. Illustratively, O-D wise passenger flows between top-100 pairs of stations, separately for PRS, non-PRS and both PRS & non-PRS passengers are given in Annexure 4.1.1 to 4.1.3 (contained in Annexure Volume-1).

Drawn from the detailed passenger flow tabulations, PRS passenger flows between top twenty five pairs of stations are given in Table 4.8.

TABLE 4.8: PASSENGER FLOWS BETWEEN TOP 25 PAIRS OF STATIONS – PRS

| SN | Origin | Destination | No. of Passengers |
|--------------|--------------------|--------------------|-------------------|
| 1 | CHENNAI CENTRAL | BANGALORE | 1,773,203 |
| 2 | BANGALORE | CHENNAI CENTRAL | 1,696,782 |
| 3 | LUCKNOW JN. | DELHI/NEW DELHI | 1,152,189 |
| 4 | CHENNAI CENTRAL | MADURAI JN | 1,081,093 |
| 5 | CHENNAI CENTRAL | COIMBATORE JN. | 1,047,806 |
| 6 | JAMMU TAWI | DELHI/NEW DELHI | 1,037,117 |
| 7 | MADURAI JN | CHENNAI CENTRAL | 1,032,897 |
| 8 | COIMBATORE JN. | CHENNAI CENTRAL | 1,011,702 |
| 9 | TIRUCHIRAPALLI JN. | CHENNAI CENTRAL | 769,497 |
| 10 | DELHI/NEW DELHI | KANPUR CENTRAL | 764,263 |
| 11 | AHEMDABAD JN | MUMBAI CENTRAL | 744,732 |
| 12 | DELHI/NEW DELHI | HOWRAH | 716,259 |
| 13 | KANPUR CENTRAL | DELHI/NEW DELHI | 703,512 |
| 14 | HOWRAH | DELHI/NEW DELHI | 658,811 |
| 15 | PUNE JN. | MUMBAI CST | 653,581 |
| 16 | AMRITSAR JN. | DELHI/NEW DELHI | 647,585 |
| 17 | DELHI/NEW DELHI | ALLAHABAD | 635,049 |
| 18 | CHANDIGARH | DELHI/NEW DELHI | 596,538 |
| 19 | PURI | HOWRAH | 595,665 |
| 20 | ALLAHABAD | DELHI/NEW DELHI | 573,269 |
| 21 | PATNA JN. | DELHI/NEW DELHI | 570,848 |
| 22 | SEALDAH | NEW JALPAIGURI JN. | 533,149 |
| 23 | CHENNAI CENTRAL | HOWRAH | 483,367 |
| 24 | NEW JALPAIGURI JN. | SEALDAH | 474,921 |
| 25 | HOWRAH | MUMBAI CST | 474,383 |
| Total | | | 20,428,218 |

Similarly, passenger flows between top twenty five pairs of stations in respect of non-PRS passengers are given in Table 4.9.

TABLE 4.9: PASSENGER FLOWS BETWEEN TOP 25 PAIRS OF STATIONS - NON-PRS

| SN | Origin | Destination | No. of Passengers |
|----|-----------------|-----------------|-------------------|
| 1 | GORAKHPUR | DELHI/NEW DELHI | 2,588,061 |
| 2 | KANPUR CENTRAL | DELHI/NEW DELHI | 1,872,027 |
| 3 | DELHI/NEW DELHI | KANPUR CENTRAL | 1,852,228 |
| 4 | ALLAHABAD | KANPUR CENTRAL | 1,618,356 |
| 5 | KANPUR CENTRAL | ALLAHABAD | 1,450,609 |
| 6 | DELHI/NEW DELHI | ALLAHABAD | 1,258,267 |
| 7 | DELHI/NEW DELHI | GORAKHPUR | 978,922 |
| 8 | ALLAHABAD | DELHI/NEW DELHI | 966,383 |
| 9 | CHENNAI CENTRAL | BANGALORE | 781,293 |
| 10 | BANGALORE | CHENNAI CENTRAL | 755,791 |
| 11 | COIMBATORE JN. | CHENNAI CENTRAL | 722,070 |
| 12 | CHENNAI CENTRAL | MADURAI JN | 708,050 |
| 13 | MADURAI JN | CHENNAI CENTRAL | 634,073 |
| 14 | CHENNAI CENTRAL | COIMBATORE JN. | 622,576 |

| SN | Origin | Destination | No. of Passengers |
|--------------|-----------------|----------------|-------------------|
| 15 | DELHI/NEW DELHI | HOWRAH | 428,271 |
| 16 | MUMBAI CENTRAL | MUMBAI CST | 420,764 |
| 17 | GORAKHPUR | ALLAHABAD | 394,130 |
| 18 | GORAKHPUR | KANPUR CENTRAL | 387,587 |
| 19 | DELHI/NEW DELHI | MUMBAI CENTRAL | 357,608 |
| 20 | GORAKHPUR | BANGALORE | 284,805 |
| 21 | ERNAKULAM | COIMBATORE JN. | 202,354 |
| 22 | DELHI/NEW DELHI | NAGPUR | 187,744 |
| 23 | COIMBATORE JN. | ERNAKULAM | 186,061 |
| 24 | COIMBATORE JN. | BANGALORE | 182,305 |
| 25 | GORAKHPUR | HOWRAH | 174,836 |
| Total | | | 20,015,171 |

In case both PRS and non-PRS passengers are considered together, the following pairs of stations emerge as 25 top ranking pairs (Table 4.10).

TABLE 4.10: PASSENGER FLOWS BETWEEN TOP 25 PAIRS OF STATIONS – PRS & NON-PRS

| SN | Origin | Destination | No. of Passengers |
|--------------|--------------------|-----------------|-------------------|
| 1 | GORAKHPUR | DELHI/NEW DELHI | 2,995,857 |
| 2 | DELHI/NEW DELHI | KANPUR CENTRAL | 2,616,491 |
| 3 | KANPUR CENTRAL | DELHI/NEW DELHI | 2,575,539 |
| 4 | CHENNAI CENTRAL | BANGALORE | 2,554,496 |
| 5 | BANGALORE | CHENNAI CENTRAL | 2,452,573 |
| 6 | DELHI/NEW DELHI | ALLAHABAD | 1,893,316 |
| 7 | CHENNAI CENTRAL | MADURAI JN | 1,789,143 |
| 8 | COIMBATORE JN. | CHENNAI CENTRAL | 1,733,772 |
| 9 | CHENNAI CENTRAL | COIMBATORE JN. | 1,670,382 |
| 10 | MADURAI JN | CHENNAI CENTRAL | 1,666,970 |
| 11 | ALLAHABAD | KANPUR CENTRAL | 1,618,356 |
| 12 | ALLAHABAD | DELHI/NEW DELHI | 1,539,652 |
| 13 | KANPUR CENTRAL | ALLAHABAD | 1,450,609 |
| 14 | DELHI/NEW DELHI | GORAKHPUR | 1,375,712 |
| 15 | LUCKNOW JN. | DELHI/NEW DELHI | 1,152,189 |
| 16 | DELHI/NEW DELHI | HOWRAH | 1,144,530 |
| 17 | JAMMU TAWI | DELHI/NEW DELHI | 1,037,117 |
| 18 | TIRUCHIRAPALLI JN. | CHENNAI CENTRAL | 769,497 |
| 19 | DELHI/NEW DELHI | MUMBAI CENTRAL | 747,414 |
| 20 | AHMEDABAD JN | MUMBAI CENTRAL | 744,732 |
| 21 | HOWRAH | DELHI/NEW DELHI | 700,073 |
| 22 | PUNE JN. | MUMBAI CST | 653,581 |
| 23 | AMRITSAR JN. | DELHI/NEW DELHI | 647,585 |
| 24 | CHENNAI CENTRAL | HOWRAH | 631,213 |
| 25 | MUMBAI CST | HOWRAH | 602,610 |
| Total | | | 36,763,409 |

4.2.5 Passenger Travel Demand and its Fulfillment

Rail Travel Demand

Assessing passenger travel demand is a difficult task. There is an element of transferability of passenger transport demand between modes. Rail travel demand has, therefore, to be seen as a part of overall demand encompassing all the modes viz., Railways, Highways and Airways. Comprehensive data for this purpose, particularly for Highways, are just not available and generation of requisite data on passenger traffic flows including user preferences is a daunting task requiring extended period of studies entailing huge resources.

However, based on past trend for the period 2000-01 to 2007-08, an attempt has been made to project likely growth in number of suburban and non-suburban passengers in future years, up to the horizon year 2025-26. For this purpose, CAGR as well as time trend has been worked out. Although, there is a marginal difference between the resultant rates of growth, the latter method is considered more appropriate and has been adopted in projecting likely growth of passengers.

TABLE 4.11: PAST GROWTH OF PASSENGERS & PROJECTIONS OF LIKELY GROWTH IN FUTURE

(Millions)

| Year | Suburban Passengers | | Non-Suburban Passengers | |
|--------------------------------------|---------------------|----------|-------------------------|----------|
| | Total all Classes | % Growth | Total all Classes | % Growth |
| 2000-01 | 2861 | | 1972 | |
| 2001-02 | 2999 | 4.82% | 2094 | 6.19% |
| 2002-03 | 2934 | -2.17% | 2037 | -2.72% |
| 2003-04 | 2986 | 1.77% | 2126 | 4.37% |
| 2004-05 | 3178 | 6.43% | 2200 | 3.48% |
| 2005-06 | 3329 | 4.75% | 2396 | 8.91% |
| 2006-07 | 3514 | 5.56% | 2705 | 12.90% |
| 2007-08 | 3689 | 4.98% | 2835 | 4.81% |
| CAGR | 3.70% | | 5.32% | |
| R= Growth based on Time Trend | 3.65% | | 5.31% | |

PROJECTED NUMBER OF PASSENGERS BASED ON R

(Millions)

| Year | Suburban | Non-Suburban | Total |
|---------|----------|--------------|-------|
| 2012-13 | 4414 | 3671 | 8085 |
| 2017-18 | 5281 | 4754 | 10035 |
| 2022-23 | 6318 | 6156 | 12474 |
| 2025-26 | 7036 | 7189 | 14225 |

Demand fulfillment

Assessment of unsatisfied rail travel demand is a difficult task. Waiting lists for various trains are only indicative of unsatisfied demand to an extent because, after certain point, even wait-listing of passengers is stopped. IR on its own does not have as elaborate a system of assessment of passenger transport demand as in the case of freight traffic which is the main source of its revenue. Nevertheless, Railways do take cognizance of representations of passenger associations, public representatives and departmental recommendations for considering the introduction of new services and extension of existing services for meeting their demands.

Line capacity and financial constraints have been the impeding factors in augmentation of passenger train services on IR. Passenger trains have to share the available capacity with freight traffic which is main revenue earning source of IR and also provides for cross subsidization of passenger services which, because of low tariffs, are hardly able to cover the expenditure. Nevertheless, with the earlier practice of placing a limit on growth of passenger traffic while planning for services no longer in vogue, there is major change in approach to augmentation of passenger transport capacity. Notwithstanding the constraints, IR has managed to introduce, during the past couple of years, a number of new trains and extended the run of some trains on heavy demand routes. As a result, IR today is far more passenger service oriented than a decade back. In the existing situation passenger transport demand fulfillment by IR is broadly reviewed below.

The burgeoning travel demand of suburban passengers is met by frequent services on suburban sections around Bombay, Kolkata, Chennai and Delhi. Railways have generally risen to the occasion for meeting the demands of this vociferous segment of passengers by strengthening rake sizes, increasing frequency of services and providing additional tracks to meet the ever increasing traffic demand. Nevertheless, overcrowding on suburban trains on almost all sections persists which the Railways are endeavoring to address. Apart from the suburban sections, sizeable numbers of passengers undertake short and medium lead journeys by trains on non-trunk routes and branch lines of IR. However, the critical area is medium and long lead passenger travel demand on the trunk routes. This segment of passenger traffic has been showing continuing substantial increase in demand. The demand particularly peaks during holidays and festivals when Railways organize special trains to meet the rush of passengers. However, the extent of traditional distinction between busy and slack demand seasons is fast diminishing with the so called slack season displaying increasing levels of travel demand. Consistently long waiting lists for all important trains on major routes all through the year are a pointer to this fact although there are low demand patches in respect of certain classes of travel like 2AC, 3AC, AC Chair and Second Sleeper where occupancy ratios on annual basis are far below 100.

Rail travel conditions in terms of comfort, amenities and speed have considerably improved over time. However, the major beneficiaries are the passengers traveling in reserved accommodation. This component of passenger traffic constitutes around 9 % of total originating passengers. Amongst the remaining passengers, the worst affected segment comprises medium and long lead Second Mail & Express passengers traveling without reservation in limited number of heavily crowded general second class coaches (around 3) provided on each of the long distance mail and express trains run on the trunk routes. The number of passengers in this category is sizeable. During 2007-08, 4.59 million passengers in this category, with an average lead of 404 km, were carried by the Railways. The miserable condition in which these passengers travel in overcrowded coaches cannot be overstressed and there is need for improving their travel conditions. This could be achieved by selective running of long distance mail and express trains comprising only Second Class unreserved coaches, based on route wise review of the travel demand of passengers in this category.

4.3 PASSENGER FLOWS - HIGHWAYS

4.3.1 Introduction

Unlike the other modes, although passenger services are offered from well defined bus terminals, it offers en-route boarding/de-boarding facility at unauthorized locations, which is not offered by other modes of transport. Further, unlike the goods sector which is predominantly under the control of unorganized private single-vehicle operators, the public sector plays a vital role in passenger operations. Nearly all the states offer passenger services through their State Transport Undertakings (STUs). The STUs normally maintain large fleets of buses with the objective of extending services to areas not served by private operators for whom the inclination is only to operate in a sector which gives profit.

Estimation of total transport demand and O-D flows in the road sector in a manner similar to freight traffic suffers from several constraints. Firstly, for a country like India, the expanse of organised passenger operations itself is rather huge to be addressed in a comprehensive manner within the limited scope of a holistic and aggregate study of the total transport system. Although the movement of buses is fully controlled by government agencies through the issue of route permits, information available is limited to the number of routes and class of service, which cannot provide any basis for generating O-D flows. The present system of issuing denomination tickets instead of destination tickets resorted to by most of the undertakings further aggravates the problem. Secondly, estimation of passenger movement would necessarily include huge magnitude of travel through personalized vehicles i.e. hired cars, taxis, etc. which is rather impossible to ascertain considering the extensive

canvass of operation, increase in the number of such vehicles, lack of reliable data and of course, the constraint of conducting even sample surveys on a nation wide basis.

4.3.2 Coverage

Keeping in view the above constraints, the focus was to generate comprehensive bus passenger O-D flows from 17 selected cities drawing representative samples of select metro cities and state capitals as indicate in the Table 4.12:

TABLE 4.12: CITIES CONSIDERED FOR BUS PASSENGER FLOWS

| SN | State | Name of the City | Type of City (State Capital/Metro) | Population (2001 Census) |
|----|------------------|---------------------|------------------------------------|--------------------------|
| 1 | Himachal Pradesh | Shimla | State Capital | 722,502 |
| 2 | Union Territory | Chandigarh | State Capital | 900,914 |
| 3 | Delhi | Delhi | State Capital & Metro | 13,850,507 |
| 4 | Bihar | Patna | State Capital & Metro | 4,718,592 |
| 5 | West Bengal | Kolkata | State Capital & Metro | 4,572,876 |
| 6 | Jharkhand | Ranchi | State Capital | 2,785,064 |
| 7 | Chhatisgarh | Raipur | State Capital | 3,016,930 |
| 8 | Gujarat | Surat | Metro | 4,274,540 |
| 9 | Gujarat | Vadodara | Metro | 3,641,802 |
| 10 | Gujarat | Ahmedabad | State Capital & Metro | 5,816,519 |
| 11 | Maharashtra | Mumbai | State Capital & Metro | 11,978,450 |
| 12 | Maharashtra | Nagpur | Metro | 4,067,637 |
| 13 | Maharashtra | Pune | Metro | 7,232,555 |
| 14 | Kerala | Thiruvananthapuram* | State Capital | 3,234,707 |
| 15 | Tamil Nadu | Chennai | State Capital & Metro | 4,343,645 |
| 16 | Andhra Pradesh | Vishakhapatnam | Metro | 3,789,823 |
| 17 | Goa | Panji | State Capital | 1,343,998 |

* Due to data discrepancy it could not be included in the final analysis in this Report.

The above table shows that out of the 17 cities, 5 are Metros, 6 are State Capitals and the remaining 6 are both State Capitals as well as Metro Cities. It may be mentioned here that passenger traffic generation has been related to route-specific movement of buses only, excluding passenger movement by cars, taxis, tempos, etc. It also excludes intra-city movement of passengers as well as inter-city movement by chartered and contract buses. Further, all inter-city routes operated from various authorised bus terminals as well as established private locations in the selected cities have been considered. However, satellite towns adjacent to the metro cities which form a part of metro cities and offer intra-city type bus services e.g. Delhi to Ghaziabad/Faridabad/Gurgaon, etc. do not form a part of inter-city passenger flows, although a small number of passengers who travelled through sample long-distance buses may have been reflected in the flows.

4.3.3 Methodology for Traffic Estimation

For estimation of the base year passenger flows an approach similar to the one adopted for goods flows i.e. way-side check-post method of stopping the vehicles and elicit the requisite information through interview with the crew members, is neither advisable nor feasible because of objections by the passengers due to unnecessary delay and harassment involved.

Hence, a different approach has been adopted. To begin with, all the state transport authorities were requested to provide information on all the inter-city bus routes that are sanctioned/approved and are operational in the base year (2007-08), in a specially designed schedule. Since it required

consolidation of information from different regional transport offices (RTOs) to arrive at the state level figures, even after repeated requests and visits, in majority of the cases no information was made available by the concerned agencies. In the absence of information on scheduled bus routes, a direct interaction approach was adopted.

For detailed analysis, the concerned transport authorities were approached to collect the requisite information, using the format canvassed for state level routes (**Annexure 4.2.1** in Annexure Volume-1), limited to the cities under study. Since there is always a gap between the number of schedules approved and the actual number of buses operated, on a particular route 7-day bus-count survey was conducted at the exit gates of relevant bus terminals in each city. In addition to the route information, visual data were also collected to assess the number of passengers on board the bus.

Based on the 7-day bus flow data, average number of schedules operated on each route was worked out and using the information collected through visual survey, all the schedules on a particular corridor were divided into peak, normal and lean traffic periods.

4.3.4 Boarding/de-boarding Pattern Survey

Since passenger O-D flows cannot be generated strictly on the basis of bus flows, relevant information on passenger boarding and de-boarding pattern was collected through personal interviews with the bus crew (conductor) just after completion of the trip, by using a specially designed questionnaire (**Annexure 4.2.2** in Annexure Volume-1). Although, denomination tickets are issued by the conductor, on completion of a trip the crew is required to deposit a trip-sheet, through which the conductor is able to calculate the number of passengers who traveled on different combinations of stations on that trip. In certain cases, passengers were also issued consolidated tickets that reflected the actual origin-destination, distance of travel, via and fare charged. In some of the cases, predominantly in private sector, consolidated tickets are issued, wherein O-D is hand written by the conductor, which in majority of the cases is not readable.

Keeping in view the number of daily schedules operated between a particular pair of points of various types of bus services, such as; ordinary, semi deluxe, deluxe, air conditioned, etc. a sample has been drawn to represent the peak, normal and lean periods of passenger traffic demand. Efforts have been made to cover all the routes operated from the city as well as to represent peak, lean or normal periods of daily traffic. To fill the data gaps, if any, nearest best passenger flow pattern has been adopted. In certain cases, where any specific route remained un-covered, the schedules of the route are amalgamated with the nearest applicable route studied. Accuracy of the information provided by the bus crew has been assessed through extensive on-board surveys on various routes.

Using the information collected through sample boarding-de-boarding pattern surveys on specific routes and class of travel for peak, lean or normal periods, all relevant trips have been assigned to work out the daily passenger O-D flows. Since many other routes may also serve the common cities/towns/stations en-route, in such cases the passenger has an option to choose any of the buses passing through their desired stations. For estimating overall number of passengers on each O-D pair, all the routes originating from the place of survey have been aggregated. For example Delhi-Panipat O-D is served by all the buses originating from Delhi and going towards the states of Punjab, Himachal, J&K and Chandigarh (UT) that are routed through Kurukshetra, Ambala, Yamunanagar, etc.

The passenger flows thus generated reflect not only the passengers boarding at the place of origin/start but also include the number of passengers boarding en-route. **Table 4.13** brings out the details of passenger boarding pattern on a Delhi-Chandigarh route.

TABLE 4.13: PASSENGER TRAVEL PATTERN ON DELHI-CHANDIGARH ROUTE

| SN | FromTo | Delhi | Panipat | Karnal Bye-pass | Nilokheri | Pipli | Shahbad Markanda | Ambala | SAS Nagar | Chandigarh | Total |
|--------------|------------------|----------|----------|-----------------|-----------|----------|------------------|-----------|-----------|------------|------------|
| 1 | Delhi | X | 4 | 5 | 2 | 1 | 2 | 7 | 5 | 23 | 49 |
| 2 | Panipat | | X | 1 | 3 | 1 | 0 | 5 | 0 | 5 | 15 |
| 3 | Karnal Bye-Pass | | | X | 0 | 0 | 0 | 3 | 0 | 4 | 7 |
| 4 | Nilokheri | | | | X | 0 | 0 | 4 | 1 | 2 | 7 |
| 5 | Pipli | | | | | X | 0 | 3 | 1 | 3 | 7 |
| 6 | Shahbad Markanda | | | | | | X | 2 | 0 | 4 | 6 |
| 7 | Ambala | | | | | | | X | 2 | 9 | 11 |
| 8 | SAS Nagar | | | | | | | | X | 0 | 0 |
| 9 | Chandigarh | | | | | | | | | X | 0 |
| Total | | 0 | 4 | 6 | 5 | 2 | 2 | 24 | 9 | 50 | 102 |

The above table brings out that buses plying between Delhi and Chandigarh also cater to passengers originating from en-route stations, such as; Panipat, Karnal Bye-pass, Nilokheri, Pipili, Shahbad Markanda, Ambala and SAS Nagar. Since en-route stations would also be served by buses originating from cities/towns other than the city under study, the total number of such combination of stations will be partly covered. The above table shows that from Panipat there is one passenger to Karnal Bye-pass, 3 to Nilokheri, 1 to Pipili, 5 to Ambala and another 5 to Chandigarh who traveled by Delhi-Chandigarh bus. Similarly, there may be other routes such as Meerut-Chandigarh via Panipat or buses originating from Panipat itself towards Chandigarh that would also cater to above referred passenger O-Ds

It is important to note that the total number of passengers estimated on the basis of boarding/de-boarding pattern surveys would reflect the factual position of passengers only from the City of survey, whereas the same passenger O-D pair served by buses from other towns and cities remains uncovered. Summed up total number of passengers on each O-D pair has been raised to arrive at annual flows. The flows thus estimated, capture the week day variations observed on different routes, but any seasonal or festive effect on passenger demand on a particular route remains uncovered. Moreover, there are regular daily or weekly services to the adjoining countries from some of the cities like Delhi and Kolkata, which would also, remain uncovered under the present study.

Broad description of the cities under study and the estimated inter-city passenger traffic from each is given in the following paragraphs.

4.3.5 RANCHI

Ranchi is considered for detailed passenger transport analysis as it is the Capital of Jharkhand State. The state spread over an area of 74,677 km², shares its border with the states of Bihar in the north, Uttar Pradesh and Chhattisgarh in the west, Orissa in the south, and West Bengal in the east. The state was formed with 18 districts, which were formerly part of south Bihar. Some of these districts have been reorganized to form 6 new districts, namely, Latehar, Saraikela Kharswan, Jamtara, Sahebgunj, Khunti and Ramgarh. Presently, the state has 24 districts. All the districts are well connected with the state capital by all-weather road network.

Ranchi has a total population of 27,85,064 (2001 Census) of which 977821 live in urban areas. The city is well connected by road network, NH-23 and NH-33 provides the main linkage with rest of the country. To facilitate inter-city passenger movement, the city has four major bus terminals, namely; BSRTC bus stand near Railway Station, ITI Bus Stand, Khadgarha Bus Stand at Kantatoli and Dhurva Bus Stand. All the State Road Transport Undertaking buses are operated from BSRTC Bus Stand, whereas the other three bus stands are used by private operators. Private operators play an important role in handling the major share of traffic, nearly all the authorized routes are operated by them from the city.

Based on the bus route-count surveys it has been observed that on an average 426 bus schedules are operated daily from Ranchi. Maximum numbers are on Ranchi-Hazaribagh route (75 each-way) followed by Jamshedpur (60). Top-ten O-Ds in terms of number of schedules operated daily from Ranchi can be gleaned from Table 4.14.

TABLE 4.14: TOP-TEN BUS SCHEDULES OPERATED FROM RANCHI

| SN | From | To | Service Category | No. of Schedules |
|----|--------|------------|------------------|------------------|
| 1 | Ranchi | Hazaribag | Ordinary | 75 |
| 2 | Ranchi | Jamshedpur | Ordinary | 60 |
| 3 | Ranchi | Simdega | Ordinary | 30 |
| 4 | Ranchi | Patna | Ord.+AC/Delux | 27 |
| 5 | Ranchi | Gumla | Ordinary | 25 |
| 6 | Ranchi | Daltelganj | Ordinary | 22 |
| 7 | Ranchi | Chaibasa | Ord.+Delux | 20 |
| 8 | Ranchi | Dhanbad | Ord.+Delux | 20 |
| 9 | Ranchi | Lohardaga | Ordinary | 20 |
| 10 | Ranchi | Gaya | Ord.+Delux | 19 |

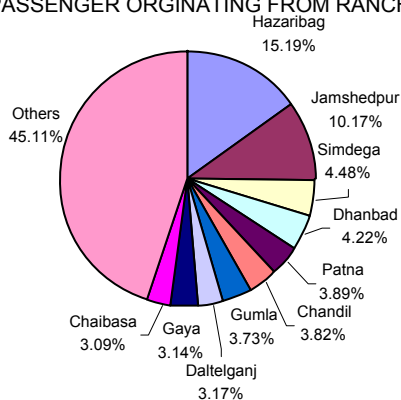
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Ranchi handled on an average 25698 passenger per day comprising 19430 passengers originating from Ranchi and the remaining 6268 passenger from en-route locations/stations. Since, en-route boarding & de-boarding passengers are partly covered they have not been considered for further processing.

Among the total passenges originating from Ranchi, maximum number are destined for Hazaribag (2951 per day), followed by Jamshedpur (1977). Top-ten destinations observed from Ranchi are given in Table 4.15.

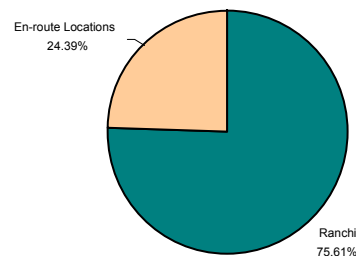
TABLE 4.15: TOP-TEN PASSENGER DESTINATIONS FROM RANCHI

| SN | Origin | Destination | Daily No of Passenger |
|--------------|--------|-------------|-----------------------|
| 1 | Ranchi | Hazaribag | 2951 |
| 2 | Ranchi | Jamshedpur | 1977 |
| 3 | Ranchi | Simdega | 870 |
| 4 | Ranchi | Dhanbad | 819 |
| 5 | Ranchi | Patna | 756 |
| 6 | Ranchi | Chandil | 742 |
| 7 | Ranchi | Gumla | 725 |
| 8 | Ranchi | Daltelganj | 616 |
| 9 | Ranchi | Gaya | 610 |
| 10 | Ranchi | Chaibasa | 600 |
| 11 | Ranchi | Others | 8764 |
| Total | | | 19430 |

DISTRIBUTION OF PASSENGER ORIGINATING FROM RANCHI



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN-RANCHI



Origin-destination wise number of daily bus schedules and annualized passenger traffic from Ranchi are given in Annexure 4.2/3 A & B, respectively in Annexure Volume-1. Proportionate shares of top-

ten and other remaining destinations as well as passengers originating from Ranchi and other en-route locations are indicated in the graphs below:

4.3.6 SHIMLA

Shimla, the Capital of Himachal Pradesh, is spread over 21,629 sq miles (56,019 km²), and is bordered by the Indian states of Jammu and Kashmir in the north, Punjab in the west and south-west, Haryana and Uttar Pradesh in the south, Uttarakhand in the south-east and by Tibet in the east. Himachal Pradesh is divided into 12 districts namely Shimla, Kangra, Hamirpur, Mandi, Bilaspur, Una, Chamba, Lahul and Spiti, Sirmaur, Kinnaur, Kullu and Solan. Shimla was formerly the British India's summer capital under the name Simla.

Road is the major mode of transport in the hilly terrains of Himachal Pradesh. Railway track is accessible only up to a few places. The Pathankot–Joginder Nagar line connects Punjab with Himachal Pradesh. The other railway track connects Shimla with Kalka by a narrow gauge railway line. On air sector, there are three domestic airports in the state - Shimla Airport, Bhuntar Airport serving Kullu and Manali, and Gaggal Airport serving Kangra and Dharamsala. The air routes connect the state with Delhi and Chandigarh.

The state has a road network of 28,208 km including 8 National Highways (NH) that constitute 1234 km. Some roads get closed during the winter and monsoon seasons due to snowfall and landslides.

Shimla city has a total population of 7, 21,745 (2001 Census) of which 1,66,833 live in urban areas. Shimla is also a major tourist attraction in the state. The city is well connected by road net-work; NH-22 provides the main linkage with rest of the country. To facilitate inter-city passenger movement, the city has two major bus terminals, namely; Inter State Bus Terminal near Victory Tunnel and another bus terminal in Lakkar Bazar. Buses destined for upper Shimla originate from Lakkar Bazar. The entire Inter-state bus services are nationalized, except a few buses plying on Tourist Permit operating on a regular basis, whereas the intra-state and inter-city services are jointly offered by Himachal Pradesh State Road Transport Corporation and private operators.

Based on bus route-count surveys it has been established that on an average 263 bus schedules are operated daily from Shimla. Maximum number of daily schedules are operated on Shimla-Delhi route (each-way - 51) followed by Chandigarh (44). Top-ten daily schedules operated from Shimla can be gleaned from Table 4.16.

TABLE 4.16: TOP-TEN BUS SCHEDULES OPERATED FROM SHIMLA

| SN | From | To | Service Category | No. of Schedules |
|----|--------|-------------|------------------|------------------|
| 1 | Shimla | Delhi | Ord.+Delux | 51 |
| 2 | Shimla | Chandigarh | Ord.+Delux | 44 |
| 3 | Shimla | Mandi | Ordinary | 9 |
| 4 | Shimla | Dharamshala | Ordinary | 8 |
| 5 | Shimla | Karsog | Ordinary | 7 |
| 6 | Shimla | Palampur | Ordinary | 7 |
| 7 | Shimla | Patiala | Ordinary | 7 |
| 8 | Shimla | Ambala | Ordinary | 6 |
| 9 | Shimla | Haridwar | Ordinary | 6 |
| 10 | Shimla | Ludhiana | Ordinary | 6 |

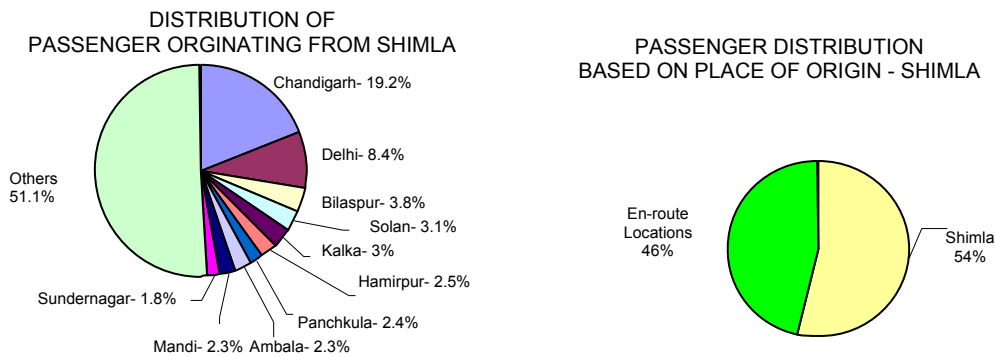
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Shimla handled on an average 21190 passengers per day comprising 11368 passengers originating from Shimla and remaining 9822 passengers from en-route locations/stations. Since, en-route boarding & de-boarding passengers are partly covered they have not been considered for further analysis.

Among the total passengers originating from Shimla, maximum are destined for Chandigarh (2177 per day), followed by Delhi (960). Top-ten destinations observed from Shimla are given in Table 4.17.

TABLE 4.17: TOP-TEN PASSENGER DESTINATIONS FROM SHIMLA

| SN | Origin | Destination | Daily No of Passenger |
|--------------|--------|-------------|-----------------------|
| 1 | Shimla | Chandigarh | 2177 |
| 2 | Shimla | Delhi | 960 |
| 3 | Shimla | Bilaspur | 432 |
| 4 | Shimla | Solan | 352 |
| 5 | Shimla | Kalka | 343 |
| 6 | Shimla | Hamirpur | 283 |
| 7 | Shimla | Panchkula | 268 |
| 8 | Shimla | Ambala | 266 |
| 9 | Shimla | Mandi | 263 |
| 10 | Shimla | Sundernagar | 210 |
| 11 | Shimla | Others | 5814 |
| Total | | | 11368 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Shimla are given in Annexure 4.2/4 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Shimla and other en-route locations are indicated in the graphs below:



4.3.7 PATNA

Patna, the Capital of Bihar, is the 12th largest state in terms of area (38,202 sq mi - 99,200 km²) and the 3rd largest by population. Nearly 85 per cent population lives in the rural areas. It is bordered by **West Bengal** in the east, **Uttar Pradesh** in the west, **Nepal** in the north and by **Jharkhand** in the south. The state has a total population of 82,998,509 (43,243,795 males and 39,754,714 females) as per 2001 Census. Patna city has a total population of 18,66,444 (2001 Census). The city is well connected by road network and NH-30 & NH-31 provides the main linkages with the rest of the country. To facilitate inter-city passenger movement, the city has two major bus terminals, namely; Main Bus Stand near Gandhi Maidan and Mithapur Bus Terminal. Gandhi Maidan Bus Stand caters mainly to Government buses whereas private buses are operated through Mithapur Bus Stand. The number of schedules operated on different routes is mainly by private bus operators.

Based on bus route-count surveys it has been estimated that on an average 504 bus schedules are operated daily from Patna, maximum being on Patna–Muzaffarpur route (60 each-way). Other important routes from Patna are; Darbhanga, Bihar Sharif and Hajipur. Top-ten O-Ds in terms of number of schedules operated daily from Patna can be gleaned from in Table 4.18.

TABLE 4.18: TOP-TEN BUS SCHEDULES OPERATED FROM PATNA

| SN | From | To | Service Category | No. of Schedules |
|----|-------|--------------|------------------|------------------|
| 1 | Patna | | Ordinary | 60 |
| 2 | Patna | Bihar Sharif | Ordinary | 52 |
| 3 | Patna | Darbhanga | Ordinary | 52 |
| 4 | Patna | Samstipur | Ordinary | 40 |
| 5 | Patna | Siwan | Ordinary | 25 |
| 6 | Patna | Sasaram | Ordinary | 20 |
| 7 | Patna | Ranchi | Ordinary | 18 |
| 8 | Patna | Aurangabad | Ordinary | 16 |
| 9 | Patna | Jahanabad | Ordinary | 16 |
| 10 | Patna | Betia | Ordinary | 15 |

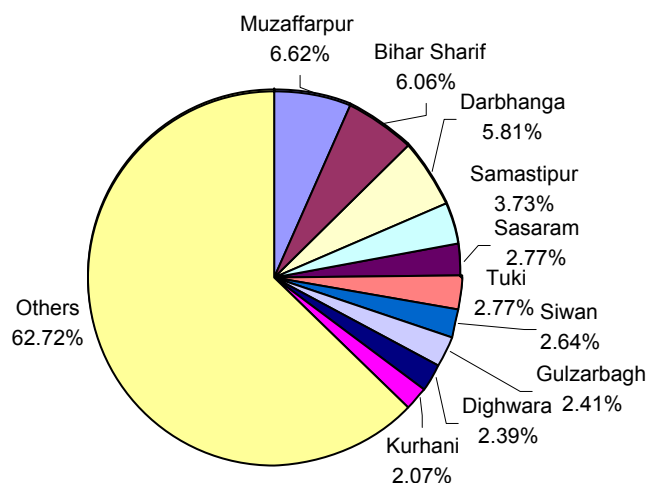
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Patna on an average handled 47082 passengers per day comprising 24654 passengers originating from Patna and the remaining 22428 passengers from en-route locations/stations. Since en-route boarding & de-boarding passengers are partly covered they have not been considered for further analysis of passenger traffic. Among the total passengers originating from Patna maximum were destined for Muzaffarpur (1632 per day), followed by Bihar Sharif (1494). Top-ten destinations observed from Patna are given in Table 4.19.

TABLE- 4.19: TOP-TEN PASSENGER DESTINATIONS FROM PATNA

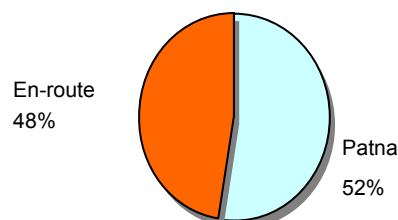
| SN | Origin | Destination | Daily No. of Passenger |
|-------|--------|--------------|------------------------|
| 1 | Patna | Muzaffarpur | 1632 |
| 2 | Patna | Bihar Sharif | 1494 |
| 3 | Patna | Darbhanga | 1432 |
| 4 | Patna | Samastipur | 920 |
| 5 | Patna | Sasaram | 684 |
| 6 | Patna | Tuki | 684 |
| 7 | Patna | Siwan | 650 |
| 8 | Patna | Gulzarbagh | 595 |
| 9 | Patna | Dighwara | 589 |
| 10 | Patna | Kurhani | 510 |
| 11 | Patna | Others | 15464 |
| Total | | | 24654 |

Origin-destination-wise number of daily bus schedules and annualized passenger traffic from Patna are given as Annexure 4.2/5 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Patna and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM PATNA



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - PATNA



4.3.8 AHMEDABAD

Ahmedabad is a Metro City as well as a commercial centre in the State of Gujarat and it also covers the State Capital of Gandhinagar. Gujarat is bordered by Pakistan in the north-west, Rajasthan in the north and north-east, Madhya Pradesh in the east and Maharashtra and the Union Territories of, Daman & Diu, Dadra & Nagar Haveli in the south. The Arabian Sea makes up the state's western coast. The state is spread over an area of 75,686 sq mi (196,077 km²).

Ahmedabad is the largest city of Gujarat and one of the largest urban agglomerations in India, with a population of approximately 52 lakhs (5.2 million). Located on the banks of the River Sabarmati, the city is the administrative centre of Ahmedabad district and was the capital of Gujarat from 1960 to 1970; the capital was shifted to Gandhinagar thereafter. In colloquial Gujarati, it is commonly called Amdavad. Ahmedabad is spread over 205 sq.km and has a total population of 45,25,013 (2001 Census). National Highway 8, linking Delhi to Mumbai, passes through Ahmedabad which is connected to Vadodara through the National Expressway 1, a 93.3 km long highway with only two exits at Nadiad and Anand. This Expressway is a part of the Golden Quadrilateral project. Ahmedabad is directly connected by Highways to Bhavnagar, Nadiad, Mehsana, Surendranagar, Bhuj, Rajkot and Gandhinagar.

Based on bus route-count surveys it is estimated that on an average 453 bus schedules are operated daily from Ahmedabad. Maximum number of daily schedules are operated on Ahmedabad-Mumbai route (each-way 52), other important routes from Ahmedabad are; Vadodara, Surat, Bhavnagar, etc. Top-ten O-Ds in terms of number of schedules operated daily from Ahmedabad can be seen from Table 4.20.

TABLE 4.20: TOP-TEN BUS SCHEDULES OPERATED FROM AHMEDABAD

| SN | From | To | Service Category | No. of Schedules |
|----|-----------|---------------|------------------|------------------|
| 1 | Ahmedabad | Mumbai | Ord+Ac | 52 |
| 2 | Ahmedabad | Vadodara | Ord | 52 |
| 3 | Ahmedabad | Surat | Ord+Ac | 47 |
| 4 | Ahmedabad | Bhavnagar | Ord+Ac | 41 |
| 5 | Ahmedabad | Dahod | Ord+Ac | 30 |
| 6 | Ahmedabad | Bhuj | Ord+Ac | 25 |
| 7 | Ahmedabad | Morbi | Ord+Ac | 24 |
| 8 | Ahmedabad | Pune | Ord+Ac | 22 |
| 9 | Ahmedabad | Jamnagar | Ord+Ac | 21 |
| 10 | Ahmedabad | Surendranagar | Ord+Ac | 19 |

Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Ahmedabad handled on an average 26776 passengers per day comprising 17338 passengers originating from Ahmedabad and the remaining 9438 passengers from en-route locations/stations. Since en-route boarding & de-boarding passengers are partly covered they have not been considered for further processing.

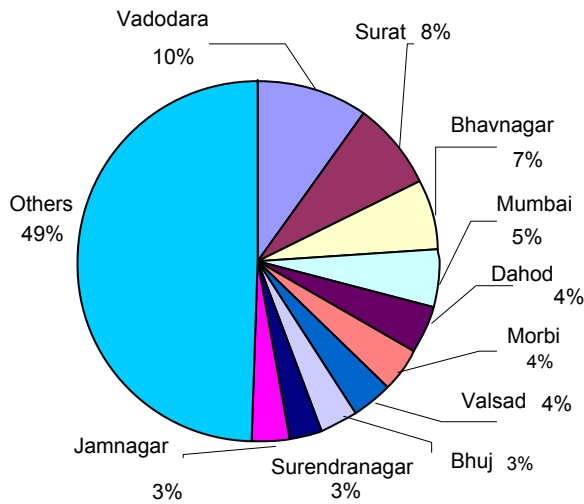
Based on boarding/de-boarding surveys it is estimated that the city disperses about 17338 inter-city passengers per day. Maximum number of passengers (1749) handled daily are on Ahmedabad-Vadodara route. Top-ten destinations in terms of number of daily passengers from Ahmedabad are given in Table 4.21.

TABLE 4.21: TOP-TEN PASSENGER DESTINATIONS FROM AHMEDABAD

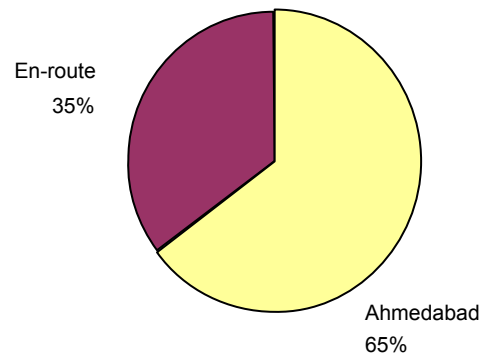
| SN | Origin | Destination | Daily No. of Passenger |
|--------------|-----------|---------------|------------------------|
| 1 | Ahmedabad | Vadodara | 1749 |
| 2 | Ahmedabad | Surat | 1315 |
| 3 | Ahmedabad | Bhavnagar | 1146 |
| 4 | Ahmedabad | Mumbai | 832 |
| 5 | Ahmedabad | Dahod | 754 |
| 6 | Ahmedabad | Morbi | 652 |
| 7 | Ahmedabad | Valsad | 634 |
| 8 | Ahmedabad | Bhuj | 577 |
| 9 | Ahmedabad | Surendranagar | 522 |
| 10 | Ahmedabad | Jamnagar | 517 |
| 11 | Ahmedabad | Others | 8640 |
| Total | | | 17338 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Ahmedabad are presented in Annexure 4.2/6 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Ahmedabad and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM AHMEDABAD



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - AHMEDABAD



4.3.9 SURAT

Like Ahmedabad, Surat is also a Metropolitan City as well as a commercial centre of Gujarat and is spread over an area of 326.515 sq km. It has a total population 45,23,022 as per 2001 Census and is the second largest city of Gujarat and tenth largest in India. The city is situated on the left bank of the Tapi River, 14 miles from its mouth. A moat divides the older parts of the city, with its narrow streets, handsome houses and the newer suburbs.

The city is largely recognized for its textile and diamond business. It is also known as the diamond city of Gujarat. Ninety-two percent of the world's diamonds are cut and polished here. Surat is also considered a relatively clean city of India. It has one of the highest GDP growth rates in India (16.5% as of 2008). The city was the primary port of India during the Mughal Era, the distinction it lost to Bombay during the British Raj.

The Golden Quadrilateral highway system passes through Surat. The city is connected to the National Highway 8 through a 16-km connector National Highway 6, also known as Surat-Kolkata Highway, that takes off from Hazira and connects the city to Dhule, Nagpur, Raipur, Sambalpur, Kharagpur and Kolkata. Surat is expected to get Bus Rapid Transit System (BRTS), by 2010. It has its own port which is used for shipping freight. A plan to connect Surat with Mumbai, Goa, Dubai and Bhavnagar through ferry services is moving forward.

Surat-Bhavnagar ferry service is much awaited by the citizens. This would connect Surat with Saurashtra region thereby reducing the commuting time by at least 6 hours.

Based on bus route-count surveys it is estimated that on an average 295 bus schedules are operated daily. Maximum number of daily schedules is operated on Surat-Ahmedabad route (each-way 47). Other important routes from Surat are Vadodara, Mumbai, Pune, etc. Top-ten O-Ds in terms of number of schedules operated daily from Surat can be seen from in Table 4.22.

TABLE 4.22: TOP-TEN BUS SCHEDULES OPERATED FROM SURAT

| SN | From | To | Service Category | No. of Schedules |
|----|-------|-----------|------------------|------------------|
| 1 | Surat | Ahmedabad | Ord+Ac | 47 |
| 2 | Surat | Vadodara | Ord+Ac | 37 |
| 3 | Surat | Mumbai | Ord+Ac | 36 |
| 4 | Surat | Pune | Ord+Ac | 23 |
| 5 | Surat | Patan | Ord. | 15 |
| 6 | Surat | Zalod | Ord+Ac | 14 |
| 7 | Surat | Palanpur | Ord+Ac | 10 |
| 8 | Surat | Diyodar | Ord. | 8 |
| 9 | Surat | Amreli | Ord+Ac | 7 |
| 10 | Surat | Nandurbar | Ord. | 7 |

Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Surat handled on an average 21976 passengers per day comprising 13721 originating from Surat and the remaining 8255 from en-route locations/stations. Since, en-route boarding & de-boarding passengers are partly covered they have not been considered for further analysis.

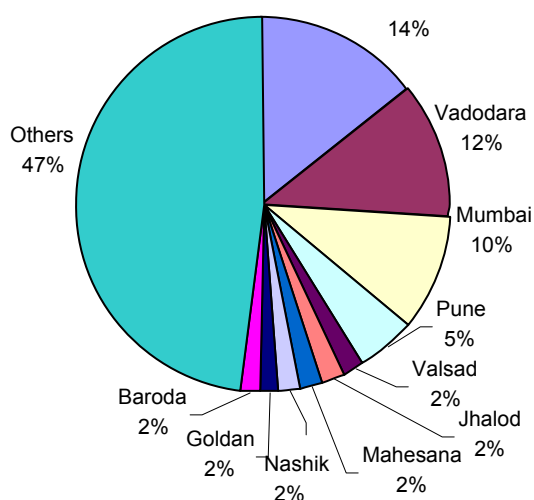
Based on the boarding/de-boarding surveys it is estimated that the city disperses about 13721 inter city passengers per day. Maximum number of passengers (1963) is handled daily on Surat-Ahmedabad route. Top-ten destinations from Surat in terms of number of daily passengers are given in Table 4.23.

TABLE 4.23: TOP-TEN PASSENGER DESTINATIONS FROM SURAT

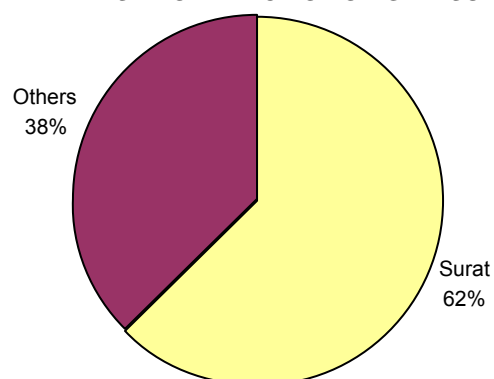
| SN | Origin | Destination | Daily No. of Passenger |
|--------------|--------|-------------|------------------------|
| 1 | Surat | Ahmedabad | 1963 |
| 2 | Surat | Vadodara | 1637 |
| 3 | Surat | Mumbai | 1372 |
| 4 | Surat | Pune | 667 |
| 5 | Surat | Valsad | 267 |
| 6 | Surat | Jhalod | 264 |
| 7 | Surat | Mahesana | 262 |
| 8 | Surat | Nashik | 243 |
| 9 | Surat | Goldan | 236 |
| 10 | Surat | Baroda | 235 |
| 11 | Surat | Others | 6575 |
| Total | | | 11121 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Surat are given as Annexure 4.2/7 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Surat and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM SURAT



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - SURAT



4.3.10 VADODARA

Vadodara, formerly known as Baroda, is the third most-populated city of Gujarat, after Ahmedabad and Surat. It is also known as the Sayaji Nagari. Vadodara or Baroda, formerly the capital city of the Gaekwad State, is situated on the banks of Vishwamitri, a river whose name was derived from the great saint Rishi Vishwamitra. It is located in the south-east of Ahmedabad. Vadodara, spread over an area of 148.95 sq km, has a population 16,41,566 (2001 Census). National Highway 8, connecting Delhi & Ahmedabad to Mumbai, passes through the city. Vadodara is also connected with Ahmedabad through National Expressway 1, a stretch of 93.3 km with exits at Anand, Nadiad and finally at Ahmedabad.

Based on bus route-count surveys it is estimated that on an average 364 bus schedules are operated daily. Maximum number of daily schedules is operated on Vadodara-Surat route (each-way 37). Other important routes from Vadodara are; Ahmedabad, Khambhat, Pune, etc. Top-ten O-Ds in terms of number of schedules operated daily from Vadodara can be seen from Table 4.24.

TABLE 4.24: TOP TOP-TEN BUS SCHEDULES OPERATED FROM VADODARA

| SN | From | To | Service Category | No. of Schedules |
|----|----------|-----------|------------------|------------------|
| 1 | Vadodara | Surat | Ord+Ac | 37 |
| 2 | Vadodara | Ahmedabad | Ord. | 30 |
| 3 | Vadodara | Khamhat | Ord. | 28 |
| 4 | Vadodara | Pune | Ord+Ac | 28 |
| 5 | Vadodara | Godhra | Ord+Ac | 23 |
| 6 | Vadodara | Pawagadh | Ord+Ac | 17 |
| 7 | Vadodara | Patan | Ord. | 16 |
| 8 | Vadodara | Palanpur | Ord+Ac | 15 |
| 9 | Vadodara | Bhavnagar | Ord+Ac | 14 |
| 10 | Vadodara | Shirdi | Ord+Ac | 13 |

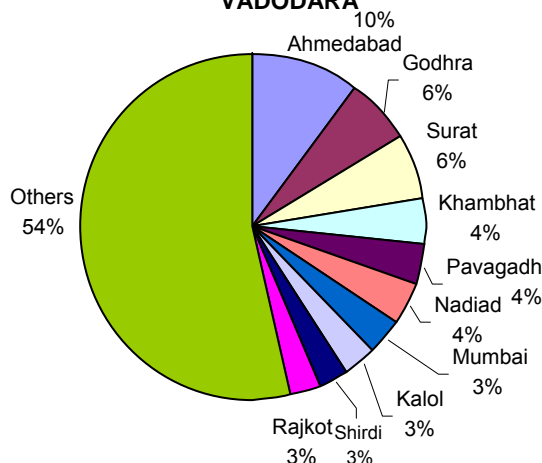
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Vadodara handled on an average 25158 passengers per day comprising 17514 passengers originating from Vadodara and the remaining 7644 from en-route locations/stations. Since, en-route boarding & de-boarding passengers are partly covered they have not been considered for further processing. Based on boarding/de-boarding surveys it is estimated that the city disperses about 17514 inter-city passengers per day. Maximum numbers of passengers (1780) are handled daily on Vadodara-Ahmedabad route. Top-ten destinations from Vadodara in terms of number of daily passengers are given in Table 4.25.

TABLE 4.25: TOP-TEN PASSENGER DESTINATIONS FROM VADODARA

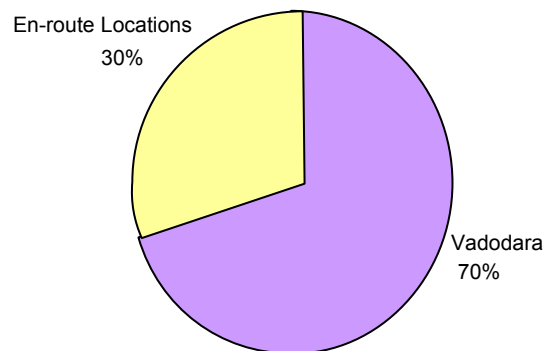
| SN | Origin | Destination | Daily No. of Passenger |
|--------------|----------|-------------|------------------------|
| 1 | Vadodara | Ahmedabad | 1780 |
| 2 | Vadodara | Godhra | 1103 |
| 3 | Vadodara | Surat | 1075 |
| 4 | Vadodara | Khambhat | 717 |
| 5 | Vadodara | Pavagadh | 690 |
| 6 | Vadodara | Nadiad | 688 |
| 7 | Vadodara | Mumbai | 581 |
| 8 | Vadodara | Kalol | 503 |
| 9 | Vadodara | Shirdi | 500 |
| 10 | Vadodara | Rajkot | 482 |
| 11 | Vadodara | Others | 9395 |
| Total | | | 17514 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Vadodara are given as Annexure 4.2/8 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Vadodara and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM VADODARA



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - VADODARA



4.3.11 KOLKATA

Kolkata is the state capital as well as a Metropolitan City in West Bengal. The state is located on the eastern bottleneck of India, stretching from the Himalayas in the north to the Bay of Bengal in the south. The state has a total area of 88,752 square kilometers (34,267 sq mi). There are 19 districts in West Bengal - Bankura, Bardhaman, Birbhum, Cooch Behar, Darjeeling, East Midnapore, Hooghly, Howrah, Jalpaiguri, Kolkata, Malda, Murshidabad, Nadia, North 24-Parganas, North Dinajpur, Purulia, South 24-Parganas, Dakshin Dinajpur and West Midnapore.

Kolkata is the largest city of the state, the third-largest urban agglomeration (world's 14th largest metropolitan area) and the fourth-largest city of India. It is located in the eastern part of the country, on the east bank of River Hooghly. Kolkata is spread over an area of 185 sq km and has a population of 77,80,544 (2008 estimates). The state has a well developed road transport system with a length of over 92,023 km; NH comprise 2,377 km and State Highways 2,393 km. The road density of the state is 103.69 km per 100 km², higher than the national average of 74.7 km. Several government-owned organizations operate bus services in the state, including the Calcutta State Transport Corporation, the North Bengal State Transport Corporation, the South Bengal State Transport Corporation, the West Bengal Surface Transport Corporation, and the Calcutta Tramways Company. There are also private bus companies.

Kolkata is the main business, commercial and financial hub of eastern India and the north-eastern states. It is also a major commercial and military port, and the only city in the region to have an international airport. The east-to-west dimension of the proper city is narrow, stretching from the Hooghly River in the west to roughly the Eastern Metropolitan Bypass in the east, a span of barely 5 km. The north-south expansion is roughly divided into North, Central and South Kolkata. North Kolkata locality is the oldest part of the city.

The city is connected with the rest of the country by NH-6, NH-2 and NH-34. Kolkata public transport is provided by the Kolkata Suburban Railway network, the Kolkata Metro Train, trams and buses. The suburban railway network is very extensive and extends into the distant suburbs. Inter-city traffic is served both by government as well as private buses. There are 4 major bus stands from where inter-city buses operate. These are Deegha Bus Stand, Esplanade Bus Stand, Babu Ghat Bus stand and CSTC Dharamtalla Bus Stand. Private buses are mainly operated from Deegha, Esplanade and Babu Ghat bus stands.

Based on bus route-count surveys it is estimated that on an average 403 bus schedules are operated daily from Kolkata, maximum being on Kolkata-Deegha (each-way - 127) route. Other important routes from Kolkata are; Burhanpur, Arambagh and Durgapur. Top-ten O-Ds in terms of number of schedules operated daily from Kolkata are given in Table 4.26.

TABLE 4.26: TOP-TEN BUS SCHEDULES OPERATED FROM KOLKATA

| SN | From | To | Service Category | No. of Schedules |
|----|---------|-----------|------------------|------------------|
| 1 | Kolkata | Deegha | Ordinary | 127 |
| 2 | Kolkata | Burhanpur | Ord+Delux | 50 |
| 3 | Kolkata | Durgapur | Ord.+Delux | 28 |
| 4 | Kolkata | Arambagh | Ordinary | 27 |
| 5 | Kolkata | Siliguri | Ord.+Delux | 27 |
| 6 | Kolkata | Ranchi | Ord.+Delux | 14 |
| 7 | Kolkata | Kakdwip | Ordinary | 13 |
| 8 | Kolkata | Maldah | Ordinary | 11 |
| 9 | Kolkata | Goraghat | Ord.+Delux | 8 |
| 10 | Kolkata | Patna | Ord.+Delux | 7 |

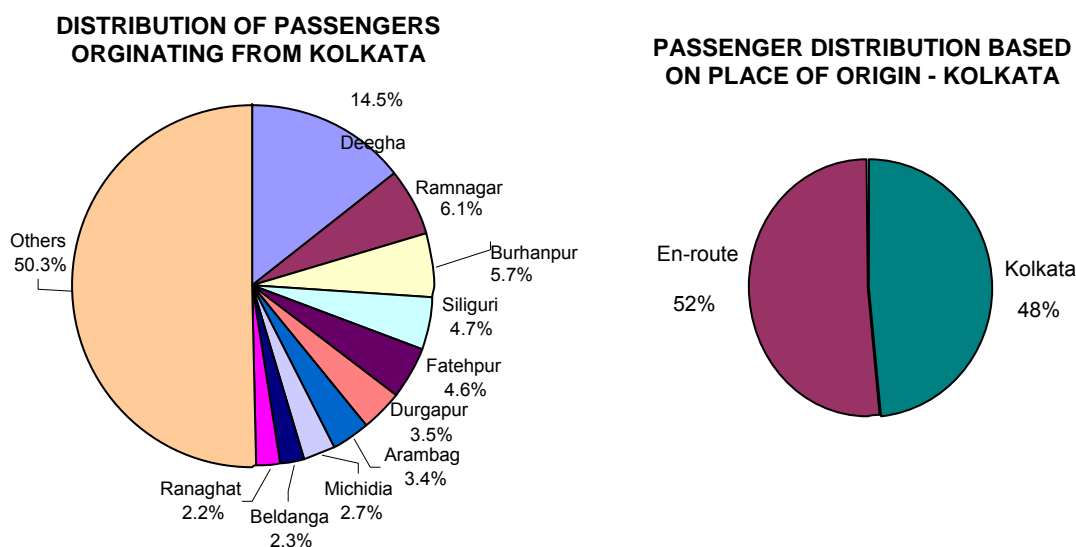
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Kolkata handled on an average 39906 passengers per day comprising 19291 passengers originating from Kolkata and the remaining 20615 passengers from en-route locations/stations. Since en-route boarding and de-boarding passengers are partly covered they have not been considered for further processing.

Based on boarding/de-boarding surveys it is estimated that the city disperses about 19291 inter city passengers per day. Maximum numbers of passengers handled daily are 2794 on Kolkata-Deegha route. Top-ten destinations from Kolkata in terms of number of daily passengers are given in Table 4.27.

TABLE 4.27: TOP-TEN PASSENGER DESTINATIONS FROM KOLKATA

| SN | Origin | Destination | Daily No. of Passenger |
|--------------|---------|-------------|------------------------|
| 1 | Kolkata | Deegha | 2794 |
| 2 | Kolkata | Ramnagar | 1173 |
| 3 | Kolkata | Burhanpur | 1094 |
| 4 | Kolkata | Siliguri | 905 |
| 5 | Kolkata | Fatehpur | 889 |
| 6 | Kolkata | Durgapur | 677 |
| 7 | Kolkata | Arambag | 664 |
| 8 | Kolkata | Michidia | 518 |
| 9 | Kolkata | Beldanga | 450 |
| 10 | Kolkata | Ranaghat | 417 |
| 11 | Kolkata | Others | 9710 |
| Total | | | 19291 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Kolkata are given as Annexure 4.2/9 A & B, respectively in Annexure Volume I. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Vadodara and other en-route locations are indicated in the graphs below:



4.3.12 RAIPUR

Raipur is the state capital and a major metropolitan city in Chhattisgarh. The state is comparatively new and carved out of Madhya Pradesh state. Raipur is primarily a commercial city, spread over an area of 456 sq.km.

The total population of the district is 605,131 (2001 Census). The city is located centrally in the state of Chhattisgarh, and now serves as a regional hub for trade and commerce for a variety of local agricultural and forest products. Apart from a number of Iron & Steel units, there are several small-scale industries, which include oil milling, soap manufacturing and electrical welding.

Raipur is well connected with the rest of the country with rail, road & airways. National Highway 6 (Mumbai-Kolkata) passes through the city of Raipur, and National Highway 12A links the city with the major cities like Vishakhapatnam, Bilaspur and Jabalpur. It is well connected by road to all important places of India. Recently a 4-Lane Expressway has been built between Raipur-Bhilai-Durg. Local transport is provided by the Raipur City Transport Services Limited. Inter-city buses are generally operated from Pandri Bus Stand.

Based on bus route-count surveys it is estimated that on an average 257 schedules are operated daily from Raipur. Maximum number of daily schedules are operated on Raipur-Mahasamund route (each-way – 52), other important routes from Raipur are; Saraipali, Dhamteri, Jagdalpur, etc. Top-ten routes operated from Raipur are given in Table 4.28.

TABLE 4.28: TOP-TEN BUS SCHEDULES OPERATED FROM RAIPUR

| SN | From | To | Service Category | No. of Schedules |
|----|--------|------------|------------------|------------------|
| 1 | Raipur | Mahasamund | Ordinary | 52 |
| 2 | Raipur | Saraipali | Ordinary | 35 |
| 3 | Raipur | Dhamteri | Ordinary | 30 |
| 4 | Raipur | Jagdalpur | Ordinary | 26 |
| 5 | Raipur | Karavdha | Ordinary | 22 |
| 6 | Raipur | Bilaspur | Ordinary | 16 |
| 7 | Raipur | Nagpur | Ord.+Delux | 13 |
| 8 | Raipur | Ambikapur | Ordinary | 9 |
| 9 | Raipur | Devbhog | Ordinary | 9 |
| 10 | Raipur | Durg | Ordinary | 9 |

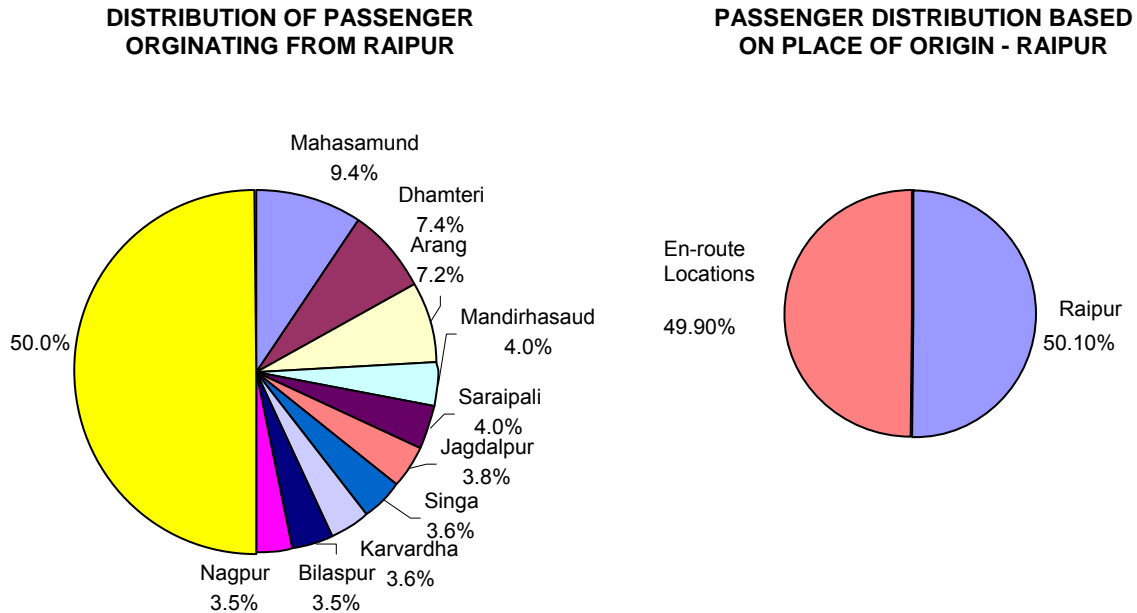
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Raipur handled on an average 23153 passengers per day comprising 11599 originating from Raipur and remaining 11554 from en-route locations/stations. Since, en-route boarding and de-boarding passengers are partly covered they have not been considered for further processing.

Maximum numbers of passengers handled daily are 1092 on Raipur-Mahasamund route. Top-ten destinations from Raipur in terms of number of daily passengers are given in Table 4.29.

TABLE 4.29: TOP-TEN PASSENGER DESTINATIONS FROM RAIPUR

| SN | Origin | Destination | Daily No. of Passenger |
|--------------|--------|--------------|------------------------|
| 1 | Raipur | Mahasamund | 1092 |
| 2 | Raipur | Dhamteri | 862 |
| 3 | Raipur | Arang | 833 |
| 4 | Raipur | Mandirhasaud | 468 |
| 5 | Raipur | Saraipali | 464 |
| 6 | Raipur | Jagdalpur | 436 |
| 7 | Raipur | Singa | 421 |
| 8 | Raipur | Karvardha | 418 |
| 9 | Raipur | Bilaspur | 407 |
| 10 | Raipur | Nagpur | 401 |
| 11 | Raipur | Others | 5797 |
| Total | | | 11599 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Raipur are given as Annexure 4.2/10 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Raipur and other en-route locations are indicated in the graphs below:



4.3.13 NAGPUR

Nagpur, spread over an area of 218 sq km, is the third largest city by population of Maharashtra, 13th largest urban conglomeration in India and 114th largest city in the world. It ranks as 143rd largest urban area in the world in terms of population. As per 2001 Census, Nagpur had a population of about 2.42 million. It lies in central India with Zero mile marker, (indicating the geographical center) located here.

The city is the commercial and political center of the state and is strategically important as it is situated at the cross-roads of North-South and East-West routes by road, rail and air. In 2001, the urban population was 2,129,500, and there were around 410,000 households in the city. Total 7,26,664 people lived in slums making Nagpur the second most slum-populated city in Maharashtra after Mumbai. Scheduled Castes and Scheduled Tribes accounted for around 25 % of the population. The sex ratio was 936 females per 1000 males.

Currently Nagpur is witnessing an economic boom as "Multi-modal International Cargo Hub and Airport at Nagpur (MIHAN)" is being developed. MIHAN will be used for handling heavy cargo coming from Southeast Asia and Middleeast Asia. Project will also include Rs 10,000 crore (US\$ 2.01 billion) Special Economic Zone (SEZ) for Information Technology (IT) companies. Persistent Systems has one of the software development centers at Nagpur. Due to its central location in India, Nagpur Railway Station is an important railway junction and a transit route for trains that connect the country lengthwise and breadth wise, especially trains connecting India's four major metropolises (Mumbai, Delhi, Chennai and Kolkata) located in the four corners of the country.

Nagpur is also a major junction for roadways as India's two major National Highways (Kanyakumari-Varanasi (NH 7) and Hajira-Kolkata (NH-6)) pass through the city. NH 69 connects Nagpur to Obaidullaganj near Bhopal. Nagpur is at the junction of two Asian Highways namely AH 43 Agra to Matara, Sri Lanka and AH 46 connecting Kharagpur, India to Dhule, India. Auto rickshaws operate in most parts of Nagpur and are the main form of hired transport within the city. Nagpur's Air Traffic Control (ATC) is the busiest in India, with more than 300 international flights

flying over the city every day in 2004. In October 2005, Nagpur's erstwhile Sonegaon Airport was declared an international airport and was renamed Dr. Babasaheb Ambedkar International Airport. Country's first ever international cargo hub, MIHAN is planned on the outskirts of the city.

Based on bus route-count surveys it is estimated that on an average 253 bus schedules are operated daily from Nagpur. Maximum daily schedules are operated on Nagpur-Bhandara route (each way - 77), other important routes from Nagpur are; Wardha, Gadchiroli, Chandrapur, etc. Top-ten O-Ds in terms of number of schedules operated daily from Raipur are given in Table 4.30.

TABLE 4.30: TOP-TEN BUS SCHEDULES OPERATED FROM NAGPUR

| SN | From | To | Service Category | No. of Schedules |
|----|--------|-------------|------------------|------------------|
| 1 | Nagpur | Bhandara | Ordinary | 77 |
| 2 | Nagpur | Wardha | Ordinary | 34 |
| 3 | Nagpur | Gadhchiroli | Ordinary | 29 |
| 4 | Nagpur | Chandrapur | Ordinary | 28 |
| 5 | Nagpur | Yavatmal | Ordinary | 21 |
| 6 | Nagpur | Gondia | Ordinary | 15 |
| 7 | Nagpur | Hyderabad | Ord.+Delux | 12 |
| 8 | Nagpur | Amravati | Ordinary | 11 |
| 9 | Nagpur | Akola | Ordinary | 5 |
| 10 | Nagpur | Buldhana | Ordinary | 4 |

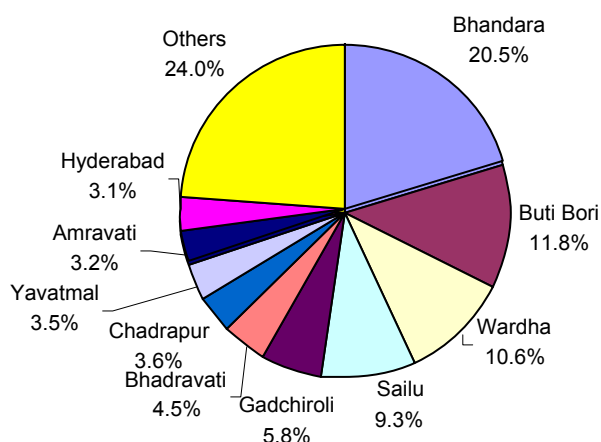
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Nagpur handled on an average 19653 passengers per day comprising 12752 originating from Nagpur and the remaining 6901 r from en-route locations/stations. Since, en-route boarding and de-boarding passengers are partly covered they have not been considered for further processing. Maximum daily numbers of passengers are destined for Bhandara (2618). Top-ten destinations from Nagpur are given in Table 4.31.

TABLE 4.31: TOP-TEN PASSENGER DESTINATIONS FROM NAGPUR

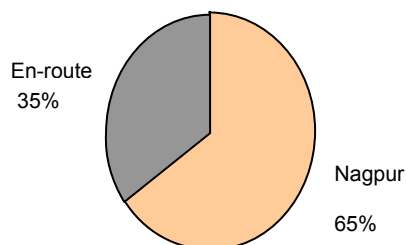
| SN | Origin | Destination | Daily No. of Passenger |
|--------------|--------|-------------|------------------------|
| 1 | Nagpur | Bhandara | 2618 |
| 2 | Nagpur | Buti Bori | 1511 |
| 3 | Nagpur | Wardha | 1346 |
| 4 | Nagpur | Sailu | 1188 |
| 5 | Nagpur | Gadchiroli | 739 |
| 6 | Nagpur | Bhadravati | 572 |
| 7 | Nagpur | Chadrapur | 462 |
| 8 | Nagpur | Yavatmal | 448 |
| 9 | Nagpur | Amravati | 412 |
| 10 | Nagpur | Hyderabad | 400 |
| 11 | Nagpur | Others | 3056 |
| Total | | | 12752 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Nagpur are given as Annexure 4.2/II A & B, passenger respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Nagpur and other en-route locations are indicated in the following graphs:

DISTRIBUTION OF PASSENGER ORIGINATING FROM NAGPUR



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - NAGPUR



4.3.14 PANJI (GOA)

Panji is the capital of the state of Goa, India's smallest state in terms of area and the fourth smallest in terms of population. Goa is located on the west coast of India in the region known as Konkan, it is bounded by the state of Maharashtra to the north and by Karnataka to the east and south, while the Arabian Sea forms its western coast. Goa, being in the tropical zone and near the Arabian Sea, has a hot and humid climate for most of the year.

Panaji lies on the banks of the Mandovi estuary. It became capital on Goa's elevation to statehood in May 1987. Between 1961 and 1987, it was the capital of the Union Territory of Goa, Daman and Diu. As per 2001 Census, Panji had a population of 58,785. Males constitute 51 % of the population and females 49 %. Including its sub-urban areas its population stands at 100,000 (2001 Census). The city has main tourist attraction (both domestic and international) because of about 125 km of the coastline dotted with number of beaches which also supports economy of the state. Mormugao Port is another major activity in the state effecting goods and passenger traffic to the state.

Based on bus route-count surveys it is estimated that on an average 162 bus schedules are operated daily. Maximum number of daily schedules are operated on Panji-Mumbai route (each-way 47), other important routes from Panji are; Belgaum, Hubli, Sawantwadi, etc. Top-ten O-Ds in terms of number of schedules operated daily from Panji are given in Table 4.32.

TABLE 4.32: TOP-TEN BUS SCHEDULES OPERATED FROM PANJI

| SN | From | To | Service Category | No. of Schedules |
|----|--------|------------|------------------|------------------|
| 1 | Panji | Mumbai | Ord.+Delux | 47 |
| 2 | Vasco | Belgaum | Ord.+Delux | 21 |
| 3 | Panji | Hubli | Ordinary | 14 |
| 4 | Panji | Sawantwadi | Ordinary | 13 |
| 5 | Panji | Bangalore | Ord.+Delux | 10 |
| 6 | Margao | Karwar | Ordinary | 10 |
| 7 | Panji | Mangalore | Ord.+Delux | 9 |
| 8 | Panji | Pune | Ord.+Delux | 8 |
| 9 | Margao | Kolahapur | Ordinary | 6 |
| 10 | Vasco | Malwan | Ordinary | 3 |

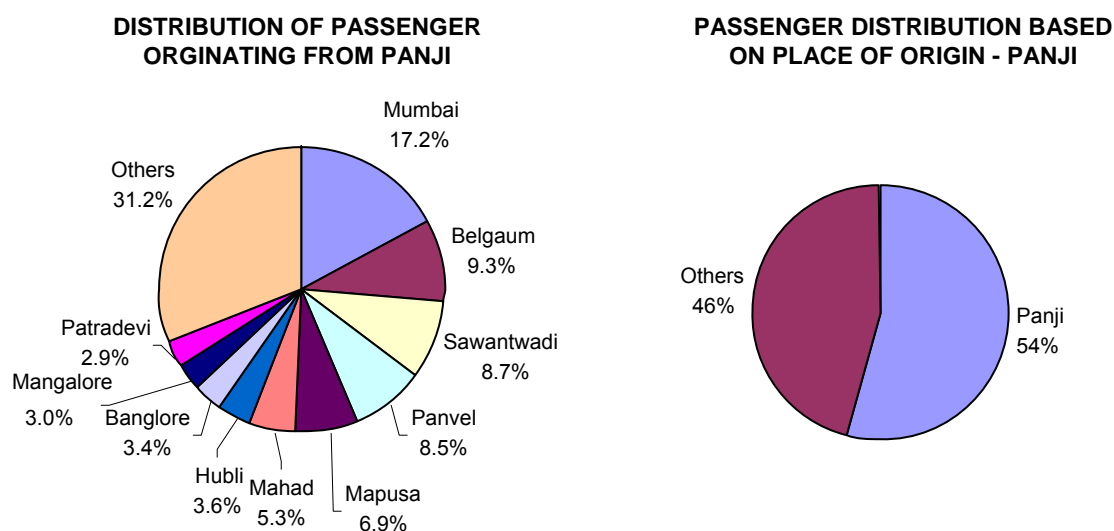
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Panji handled on an average 13505 passengers per day comprising 7317 passengers originating from Panji and the remaining 6188 from en-route locations/stations. Since en-route boarding & de-boarding passengers are partly covered they have not been considered for further processing.

Maximum daily numbers of passengers are destined for Mumbai (1262). Top-ten destinations from Panji are given in Table 4.33.

TABLE 4.33: TOP-TEN PASSENGER DESTINATIONS FROM PANJI

| SN | Origin | Destination | Daily No. of Passenger |
|--------------|--------|-------------|------------------------|
| 1 | Panji | Mumbai | 1262 |
| 2 | Panji | Belgaum | 677 |
| 3 | Panji | Sawantwadi | 633 |
| 4 | Panji | Panvel | 620 |
| 5 | Panji | Mapusa | 508 |
| 6 | Panji | Mahad | 385 |
| 7 | Panji | Hubli | 261 |
| 8 | Panji | Banglore | 252 |
| 9 | Panji | Mangalore | 222 |
| 10 | Panji | Patradevi | 215 |
| 11 | Panji | Others | 2282 |
| Total | | | 7317 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Panji are given as Annexure 4.2/12 A & B, respectively in Annexure Volume-I. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Panji and other en-route locations are indicated in the graphs below:



4.3.15 CHENNAI

Chennai, formerly known as Madras, the fourth largest city in India by area and the capital of Tamil Nadu is located on the Coromandel Coast of the Bay of Bengal.

As of 2001, Chennai city had a population of 4.34 million, while the total metropolitan population was 7.04 million. The estimated metropolitan population in 2006 is 4.5 million. In 2001, the population density in the city was 24,682 per km² (63,926 per mi²), while the population density of

the metropolitan area was 5,922 per km² (15,337 per mi²), making it one of the most densely populated cities in the world.

It has a diversified economic base anchored by the automobile, software services, hardware manufacturing, healthcare and financial service industries. In 2001, the total workforce in the city was about 1.5 million, which was 31.79 % of its population.

Chennai serves as a major gateway to South India and the Chennai International Airport, is the third busiest airport in India. The city is connected to major hubs in South Asia, South East Asia, East Asia, the Middle East, Europe and North America through more than 30 national and international carriers. The airport is the second busiest cargo terminus in the country.

The city is well connected to other parts of India by road and rail. The Chennai Mofussil Bus Terminus (CMBT), the terminus for all inter-city buses from Chennai, is the largest bus station in Asia. Seven government-owned transport corporations operate inter-city and inter-state bus services. Many private inter-city and inter-state bus companies also operate services to and from Chennai.

The city is the headquarters of Southern Railways and has two main railway terminals. Chennai Central station, the city's largest, provides access to trains to major cities like Mumbai, Kolkata, Bangalore, Delhi, Hyderabad, Kochi, Coimbatore, Thiruvananthapuram as well as to smaller towns across India. Chennai Egmore is a terminus for trains operated primarily within Tamil Nadu; it also handles a few inter-state trains. Buses, trains, and auto rickshaws are the most common modes of public transport within the city.

The suburban railway network of Chennai is one of the oldest in the country and consists of four broad gauge rail sectors terminating at two locations in the city, namely Chennai Central and Chennai Beach.

The Metropolitan Transport Corporation (MTC) runs an extensive city bus system consisting of 3262 buses on 627 routes and transports an estimated 5 million passengers daily. Vans, popularly known as *Maxi Cabs* and 'share' auto-rickshaws ply many routes in the city and provide an alternative to buses. Metered call taxis, tourist taxis and auto-rickshaws are also available on hire. Chennai's transportation infrastructure provides coverage and connectivity.

The construction of the mega Deep Water Container Trans-shipment Port at Vizhinjam was expected to begin in 2007. But a dispute over the tenders has stalled the project for the time being. It is to be built in three phases, and expected to be a key competitor in the ports business (especially for container trans-shipments), with the international shipping lanes between Europe and the Far East very close to the port, and also with major ports like Colombo, Kochi and Tuticorin in close proximity.

The exponential growth of the services and IT-based sectors coupled with its prominence as the state capital and tourist centre has caused considerable strain on the transport infrastructure of the city. To ease the strain, several multi-million dollar construction projects are now underway including the construction of several new underpasses and flyovers, scheduled to be completed by early 2007. In the first phase, 42 km of six-lane and four-lane dual-carriage ways are being built.

Based on bus route-count surveys it is estimated that on an average 659 bus schedules are operated daily. Maximum number of daily schedules are operated on Chennai-Pondicherry route (each-way - 65), other important routes from Chennai are; Pondicherry, Trichy, Kanchipuram, etc. Top-ten O-Ds in terms of number of schedules operated daily from Chennai are given in **Table 4.34**.

TABLE 4.34: TOP-TEN BUS SCHEDULES OPERATED FROM CHENNAI

| SN | From | To | Service Category | No. of Schedules |
|----|---------|----------------|------------------|------------------|
| 1 | Chennai | Pondicherry | Ord. | 65 |
| 2 | Chennai | Trichy | Ord+Ac | 57 |
| 3 | Chennai | Kanchipuram | Ord. | 53 |
| 4 | Chennai | Banglore | Ord+Ac | 49 |
| 5 | Chennai | Vellore | Ord. | 41 |
| 6 | Chennai | Tiruppattur | Ord. | 39 |
| 7 | Chennai | Chidambaram | Ord. | 38 |
| 8 | Chennai | Tirupati | Ord. | 37 |
| 9 | Chennai | Madurai | Ord. | 30 |
| 10 | Chennai | Tiruvannamalai | Ord | 28 |

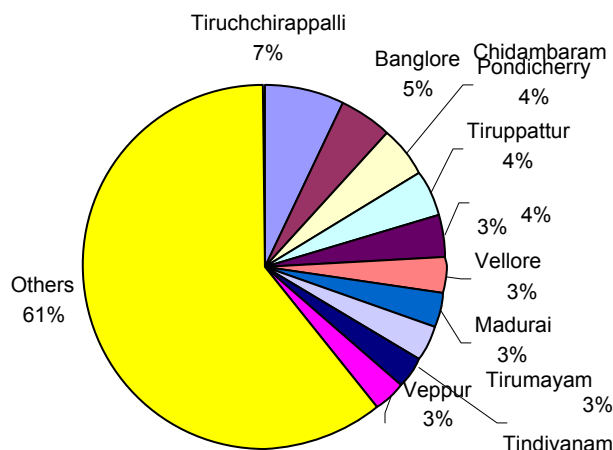
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Chennai handled on an average 72314 passengers per day comprising 35796 originating from Chennai and the remaining 36518 from en-route locations/stations. Since, en-route boarding and de-boarding passengers are partly covered they have not been considered for further processing. Maximum daily numbers of passengers are destined for Tiruchirappalli (2528). Top-ten destinations from Chennai are given in Table 4.35.

TABLE 4.35: TOP-TEN PASSENGER DESTINATIONS FROM CHENNAI

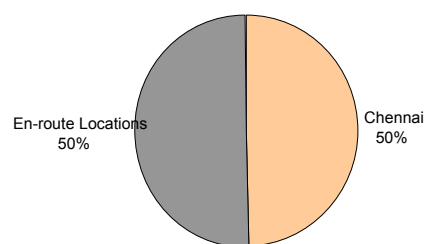
| SN | Or igin | Destination | Daily No. of Passenger |
|--------------|---------|-------------------|------------------------|
| 1 | Chennai | Tiruchchirappalli | 2528 |
| 2 | Chennai | Bangalore | 1721 |
| 3 | Chennai | Pondicherry | 1486 |
| 4 | Chennai | Tiruppattur | 1486 |
| 5 | Chennai | Chidambaram | 1321 |
| 6 | Chennai | Vellore | 1164 |
| 7 | Chennai | Madurai | 1122 |
| 8 | Chennai | Tirumayam | 1064 |
| 9 | Chennai | Veppur | 958 |
| 10 | Chennai | Tindivanam | 930 |
| 11 | Chennai | Others | 21512 |
| Total | | | 39292 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Chennai are given as Annexure 4.2/13 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Chennai and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM CHENNAI



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - CHENNAI



4.3.16 MUMBAI

Mumbai, formerly known as Bombay, is the capital of Maharashtra. Along with the neighbouring suburbs of Navi Mumbai and Thane, Mumbai forms the world's 4th largest urban agglomeration with around 19 million people. It lies on the west coast of India and has a deep natural harbour. This port handles over half of India's maritime cargo.

According to the 2001 Census, the population of the city was 11,914,398. According to extrapolations carried out by the *World Gazetteer* in 2008, Mumbai has a population of 13,662,885 and the Mumbai Metropolitan Area has a population of 20,870,764. The population density is estimated to be about 22,000 persons per square kilometre. As per 2001 Census, Greater Mumbai, the area under the administration of BMC, has literacy rate of 77.45 %, higher than the national average of 64.8 %. The sex ratio was 774 (females per 1,000 males) in the island city, 826 in the suburbs, and 811 as a whole in the Greater Mumbai, all numbers are lower than the national average of 933 females per 1,000 males.

Being the commercial and entertainment centre of India, Mumbai generates 5 % of India's GDP, and accounting for 25 % of industrial output, 40 % of maritime trade and 70 % of capital transactions to India's economy. As the largest city of India it is considered the financial capital of the country. It serves as an important economic hub of India. Mumbai's per-capita income is Rs. 48,954 which is almost three times the national average.

State and central government employees make up a large percentage of the city's workforce. Mumbai also has a large unskilled and semi-skilled self employed population, who primarily earn their livelihood as hawkers, taxi drivers, mechanics and other such blue collar professions. The port and shipping industry is well established with Mumbai Port being one of the oldest and major ports in India.

Public transport systems in Mumbai include the Mumbai Suburban Railway, BEST buses, taxis, auto-rickshaws, ferries, and aeroplanes. Black and yellow-metered, taxis traverse most of the metropolis. Auto-rickshaws operate in the suburban areas of Mumbai. Taxis and Auto-rickshaws which run on Compressed Natural Gas are the most common mode of hired transport.

Mumbai is the headquarters of two railway zones: the Central Railway (CR) headquartered at Chhatrapati Shivaji Terminus and the Western Railway (WR) headquartered near Churchgate. The backbone of the city's transport, the Mumbai Suburban Railway, consists of three separate networks running the length of the city, in a north-south direction.

The Chhatrapati Shivaji Terminus, formerly known as Victoria Terminus, headquarters of the Central Railway, is a UNESCO World Heritage Site.

The Mumbai Metro, an underground and elevated rapid transit system, is currently under construction. The Mumbai Monorail will run from Jacob Circle to Wadala when it is completed. Mumbai is well connected to most parts of India by the Indian Railways. Trains originate from Chhatrapati Shivaji Terminus, Dadar, Lokmanya Tilak Terminus, Mumbai Central, Bandra terminus and Andheri. Mumbai's suburban rail systems carry a total of 6.3 million passengers every day.

Public buses run by BEST cover almost all parts of the metropolis, as well as parts of Navi Mumbai and Thane. Buses are used for commuting short to medium distances, while train fares are more economical for long distance commutes. The BEST runs a total of 3,408 buses, ferrying 4.5 million passengers daily over 340 routes. Its fleet consists of single-decker, double-decker, vestibule, low-floor, disabled-friendly, air-conditioned and the Euro III compliant Compressed Natural Gas powered buses. MSRTC buses provide inter-city transport and connect Mumbai with other major cities of Maharashtra and India. The Mumbai Darshan is a tourist bus service which explores

numerous tourist attractions in Mumbai. BRTS lanes have been planned throughout Mumbai, with buses running on seven routes as of March 2009.

Mumbai's Chhatrapati Shivaji International Airport is the main aviation hub in the city and the busiest airport in South Asia. The Juhu aerodrome was India's first airport, and now hosts a flying club and a heliport. The proposed Navi Mumbai International Airport which is to be built in the Kopra-Panvel area, has been sanctioned by the Government and would help relieve the increasing traffic burden on the existing airport. With its unique topography, Mumbai has one of the best natural harbours in the world, handling 50 % of the country's passenger traffic, and much of India's cargo. It is also an important base for the Indian Navy and the headquarters of the Western Naval Command is located here. Ferries from Ferry Wharf allow access to islands and beaches in the area.

Based on bus route-count surveys it is estimated that on an average 522 bus schedules are operated daily from Mumbai. Maximum numbers of daily schedules are operated on Mumbai-Pune route (each-way - 91). Other important routes from Mumbai are; Ahmedabad, Surat, Hyderabad, etc. Top-ten O-Ds in terms of number of schedules operated daily from Mumbai are given in Table 4.36.

TABLE-4.36: TOP-TEN BUS SCHEDULES OPERATED FROM MUMBAI

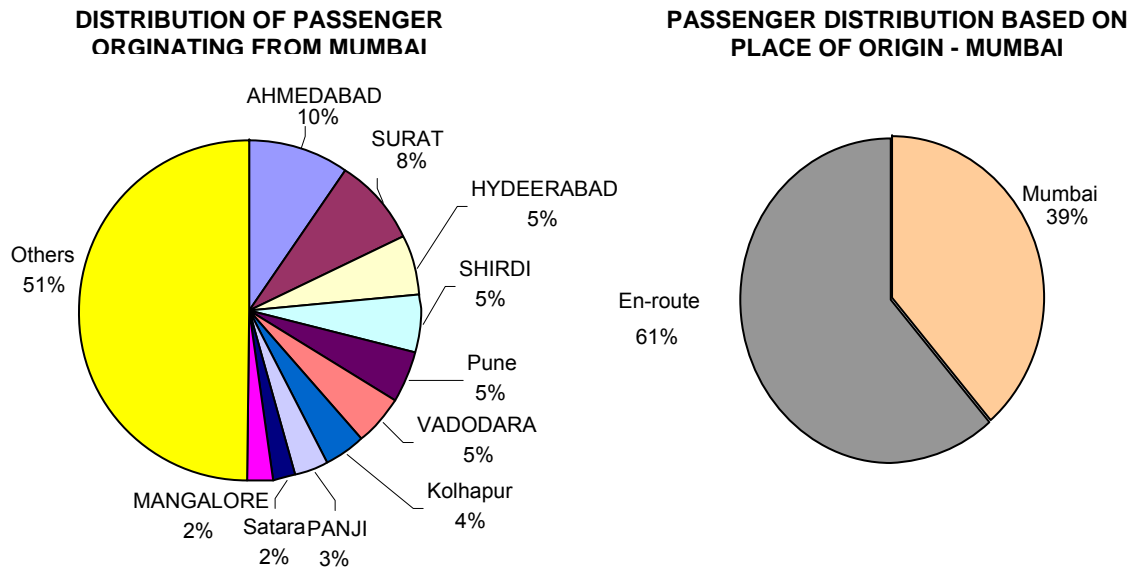
| SN | From | To | Service Category | No. of Schedules |
|----|----------|-----------|------------------|------------------|
| 1 | Borivali | Pune | Ord+Ac | 91 |
| 2 | Mumbai | Ahemdabad | Ord+Ac | 52 |
| 3 | Mumbai | Surat | Ord+Ac | 36 |
| 4 | Mumbai | Hyderabad | Ord+Ac | 34 |
| 5 | Mumbai | Shirdi | Ord+Ac | 34 |
| 6 | Mumbai | Hubli | Ord. | 22 |
| 7 | Mumbai | Panji | Ord. | 18 |
| 8 | Mumbai | Mangalore | Ord. | 17 |
| 9 | Parel | Alibag | Ord. | 16 |
| 10 | Borivali | Kolhapur | Ord+Ac | 15 |

Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Mumbai handled on an average 41398 passengers per day comprising 16017 originating from Mumbai and the remaining 25381 from en-route locations/stations. Since, en-route boarding and de-boarding passengers are partly covered. They have not been considered for further analysis. Maximum daily numbers of passengers are destined for Ahmedabad (1568). Top-ten destinations from Mumbai are given in Table 4.37.

TABLE 4.37: TOP-TEN PASSENGER DESTINATIONS FROM MUMBAI

| SN | Origin | Destination | Daily No. of Passenger |
|--------------|--------|-------------|------------------------|
| 1 | Mumbai | Ahmedabad | 1568 |
| 2 | Mumbai | Surat | 1324 |
| 3 | Mumbai | Hyderabad | 878 |
| 4 | Mumbai | Shirdi | 840 |
| 5 | Mumbai | Pune | 825 |
| 6 | Mumbai | Vadodara | 735 |
| 7 | Mumbai | Kolhapur | 656 |
| 8 | Mumbai | Panji | 476 |
| 9 | Mumbai | Satara | 364 |
| 10 | Mumbai | Mangalore | 362 |
| 11 | Mumbai | Others | 7989 |
| Total | | | 16017 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Mumbai are given as Annexure 4.2/14 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Mumbai and other en-route locations are indicated in the graphs below:



4.3.17 PUNE

Pune, formerly known as Poona, the eighth largest city in India and the second largest in the state of Maharashtra after Mumbai, is situated 560 metres above sea level on the Deccan Plateau.

As per 2001 Census of India, the population of Pune urban agglomeration is 3,529,900. This includes the towns of Khadki, Pimpri-Chinchwad and Dehu. Growth in the software and education sectors has led to an influx of skilled labour from across India. The migrating population rose from 43,900 in 2001 to 88,200 in 2005.

As one of the largest cities in India, and as a result of its many colleges and universities, Pune is emerging as a prominent location for IT and manufacturing companies to expand to.

The automotive sector is particularly prominent in Pune and all sectors of the automotive industry are represented in the city.

Both public transport (auto-rickshaws and buses) and private transport (cars, motorcycles and scooters) are popular in Pune. According to one study, there were then 400,000 cars and 1.7 million two-wheelers in Pune in 2007. More than 200,000 vehicles are added to the traffic in the city every year.

Public buses within the city and its suburbs are operated by the Pune Mahanagar Parivahan Mahamandal Limited (PMPML). A Pune Bus Rapid Transit system has been proposed. Buses to towns within Pune district surrounding Pune, as well as cities throughout Maharashtra are run by the Maharashtra State Road Transport Corporation. Private bus companies also run buses to major cities throughout India, especially Mumbai.

Pune is well-connected to other cities by National Highways and State Highways. National Highway 4 (NH 4) connects it to Mumbai and Bangalore, NH 9 to Solapur and Hyderabad, and NH 50 to Nashik. State Highways connect it to Ahmednagar, Aurangabad and Alandi.

Since 2002, Pune has been connected to Mumbai via the Mumbai-Pune Expressway, India's first six-lane high-speed Expressway. Both pre-paid air-conditioned "cool" cabs and private bus companies ply on this route, connecting Mumbai and Pune in three hours. Out of the total distance of 165 km from Mumbai to Pune, the Express Highway part is 96 km. A ring road is being planned to be constructed for the convenience of traffic.

A rapid transit system has been proposed in Pune, from past 5 years and is scheduled to begin operations in 2010. Three routes have been identified thus far:

- Warje-Chinchwad, via Karve road, Jangli Maharaj road, Shivajinagar, and the Pune-Mumbai road (22 km, elevated)
- Shivajinagar-Kalyaninagar, via Raja Bahadur Mill road and the Pune-Ahmednagar road (13 km, elevated)
- Agriculture College-Swargate, via Shivaji road (10 km, underground)

The city has two railway stations, one in the city and the other at Shivajinagar. Both stations are administrated by the Pune division of the Central Railways, which extends from after Lonavala (which is administered by the Mumbai CSTM division) to before Daund (which is under the Solapur division), to Baramati and to Hubli (via Miraj). All the railway lines to Pune are broad gauge, with double electrified lines (1500 volt DC traction) to Lonavala, a double non-electrified line to Daund, and single non-electrified lines to Kolhapur via Miraj and Baramati via Daund. The city has Pune-Miraj-Hubli-Bangalore rail track which is one of the most important track in Maharashtra.

Local trains (EMUs) connect Pune to the industrial town of Pimpri-Chinchwad and the hill station of Lonavala, while daily express trains connect Pune to Mumbai, Howrah, Delhi, Jammu Tawi, Chennai, Hyderabad, Bangalore, and so on.

Pune International Airport is an international airport at Lohegaon, managed by the Airports Authority of India. New airport at Chakan is opening shortly.

Based on bus route-count surveys it is estimated that on an average 468 bus schedules are operated daily. Maximum number of daily schedules are operated on Pune-Dadar route (each way - 82). Other important routes from Pune are; Aurangabad, Nasik, Satara, etc. Top-ten O-Ds in terms of number of schedules operated daily from Pune are given in Table 4.38.

TABLE-4.38: TOP-TEN BUS SCHEDULES OPERATED FROM PANJI

| SN | From | To | Service Category | No. of Schedules |
|----|------|-------------|------------------|------------------|
| 1 | Pune | Dadar | Ord+Ac | 82 |
| 2 | Pune | Aurang abad | Ord. | 39 |
| 3 | Pune | Nasik | Ord+Ac | 35 |
| 4 | Pune | Satara | Ord. | 34 |
| 5 | Pune | Kolhapur | A/C | 32 |
| 6 | Pune | Vadodara | A/C | 28 |
| 7 | Pune | Mumbai | Ord. | 26 |
| 8 | Pune | Thane | A/C | 24 |
| 9 | Pune | Surat | A/C | 23 |
| 10 | Pune | Boriwali | Ord+Ac | 18 |

Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Pune handled on an average 27596 passengers per day comprising 20801 originating from Pune and the remaining 6795 from en-route locations/stations. Since, en-route boarding & de-boarding passengers are partly covered. They have not been considered for further processing.

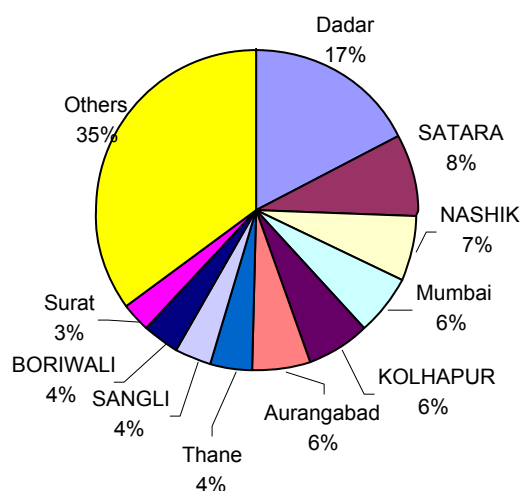
Maximum daily numbers of passengers are destined for Dadar (3632). Top-ten destinations from Pune are given in Table 4.39.

TABLE 4.39: TOP-TEN PASSENGER DESTINATIONS FROM PUNE

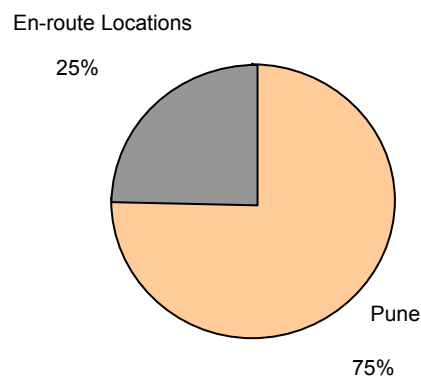
| SN | Origin | Destination | Daily No. of Passenger |
|--------------|--------|-------------|------------------------|
| 1 | Pune | Dadar | 3632 |
| 2 | Pune | Satara | 1686 |
| 3 | Pune | Nashik | 1380 |
| 4 | Pune | Mumbai | 1274 |
| 5 | Pune | Kolhapur | 1269 |
| 6 | Pune | Aurangabad | 1229 |
| 7 | Pune | Thane | 864 |
| 8 | Pune | Sangli | 747 |
| 9 | Pune | Boriwali | 732 |
| 10 | Pune | Surat | 628 |
| 11 | Pune | Others | 7360 |
| Total | | | 20801 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Pune are given as Annexure 4.2/15 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Pune and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM PUNE



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - PUNE



4.3.18 VISHAKHAPATNAM

Vishakhapatnam also called Visag is a coastal, port city, often called "The Jewel of the East Coast". It is situated in Andhra Pradesh and located on the eastern shore of India. It is the administrative headquarters of Vishakhapatnam District and is also home of the Eastern Naval Command of the Indian Navy. As of 2001 [update] India Census, Vishakhapatnam had a population of 2,845,938. Males constitute 50 % of the population and females 50 %. The city has an average literacy rate of 69 %, higher than the national average of 59.5 %. Male literacy is 74% and female literacy is 63 %. 10 % of the population is younger than six. Vishakhapatnam is listed as one of the Ten Fastest Growing Cities of the World.

The city has developed into a hub for many heavy industries. The Vishakhapatnam Port, the largest in the country, was the ideal gateway contributing to the development of petroleum, steel and fertilizer industries. The Vishakhapatnam Steel Plant and the Hindustan Petroleum Corporation Ltd. were the two multi-billion dollar investments which put Vizag on the country's industrial map. The city also has two N.T.P.C. power plants to satisfy the huge power needs of the industries. Vishakhapatnam also houses the headquarters of the Dredging Corporation of India. Other heavy industries include Hindustan Zinc Limited, Synergies Castings Ltd., Rain Calcining Limited, Coromandel Fertilizers, Hindustan Ship Yard and Bharat Heavy Plate and Vessels Limited

(B.H.P.V.). These industries provide employment to hundreds of thousands of people and pump billions of dollars into the state's economy.

Vishakhapatnam is the second largest city of Andhra Pradesh with an area of 550 km², it is primarily an industrial city, apart from being a tourist destination. The city is home to several state owned heavy industries, one of the most advanced steel plants and has one of the country's largest ports and its oldest shipyard. It has the only natural harbour on the eastern coast of India. Vishakhapatnam is well connected with daily flights from Hyderabad, Chennai, Delhi, Mumbai, Bengaluru, Tirupati and Kolkata. Vishakhapatnam Airport has recently received permission to operate night flights.

Vishakhapatnam is one of the cities on the east coast of India connected by NH5, a major national highway and a part of the Golden Quadrilateral system of Indian Highways connecting Chennai and Kolkata. The highway is an important route for transporting cargo and people from these cities to and from Vizag. Vishakhapatnam has a good network of roads. There are frequent buses to Vizianagaram, Srikakulam, Araku and Rajahmundry. There are even bus services to Hyderabad, Vijayawada, Tirupati, Bengaluru, Chennai, Kolkata and few other parts of Orissa and Karnataka. The APSRTC complex at Asilametta is the hub for most of these buses causing major traffic jams during rush hours on the heavily populated, congested Asilametta Junction.

A Bus Rapid Transit System (BRTS) was approved for the city. This will make use of dedicated lanes for buses allowing for an efficient and high speed mode of transport for the public and significantly reduce traffic congestion, improving safety. This project is under construction.

Based on bus route-count surveys it is estimated that on an average 514 bus schedules are operated daily. Maximum number of daily schedules are operated on Vishakhapatnam-Srikakulam route (each-way - 72) Other important routes from Vishakhapatnam are; Narsipatanam, Cuddapah, Nellore, etc. Top-ten O-Ds in terms of number of schedules operated daily from Vishakhapatnam are given in Table 4.40.

TABLE 4.40: TOP-TEN BUS SCHEDULES OPERATED FROM VISHAKHAPATNAM

| SN | From | To | Service Category | No. of Schedules |
|----|----------------|--------------|------------------|------------------|
| 1 | Vishakhapatnam | Srikakulam | Ord+Ac | 72 |
| 2 | Vishakhapatnam | Narsipatanam | Ord+Ac | 65 |
| 3 | Vishakhapatnam | Palakonda | Ord | 28 |
| 4 | Vishakhapatnam | Cuddapah | Ord+Ac | 23 |
| 5 | Vishakhapatnam | Palasa | AC | 22 |
| 6 | Vishakhapatnam | Nellore | Ord+Ac | 20 |
| 7 | Vishakhapatnam | Vizianagaram | Ord. | 20 |
| 8 | Vishakhapatnam | Medak | Ord+Ac | 19 |
| 9 | Vishakhapatnam | Warangal | Ord. | 19 |
| 10 | Vishakhapatnam | Guntur | Ord+Ac | 17 |

Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Vishakhapatnam handled on an average 39108 passengers per day comprising 24212 originating from Vishakhapatnam and the remaining 14896 from en-route locations/stations. Since, en-route boarding and de-boarding passengers are partly covered they have not been considered for further processing.

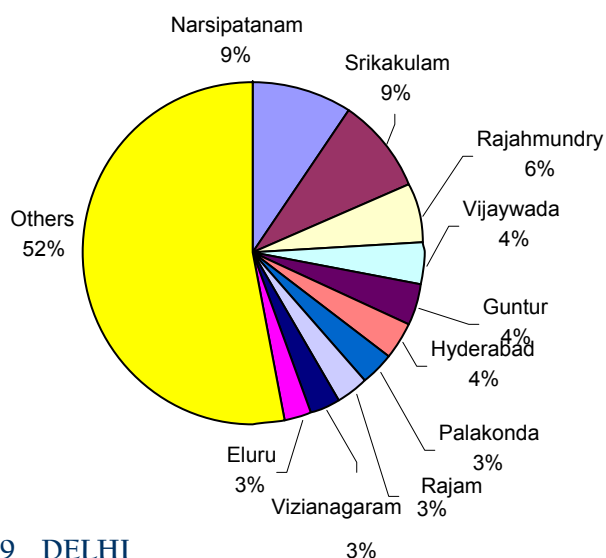
Maximum daily numbers of passengers destined are for Narsipatanam (2285). Top-ten destinations from Vishakhapatnam are given in Table 4.41.

TABLE 4.41: TOP-TEN PASSENGER DESTINATIONS FROM VISHAKHAPATNAM

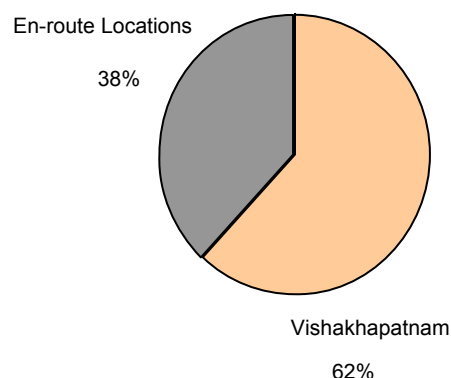
| SN | Origin | Destination | Daily No. of Passenger |
|--------------|----------------|--------------|------------------------|
| 1 | Vishakhapatnam | Narsipatanam | 2285 |
| 2 | Vishakhapatnam | Srikakulam | 2226 |
| 3 | Vishakhapatnam | Rajahmundry | 1357 |
| 4 | Vishakhapatnam | Vijaywada | 954 |
| 5 | Vishakhapatnam | Guntur | 943 |
| 6 | Vishakhapatnam | Hyderabad | 852 |
| 7 | Vishakhapatnam | Palakonda | 728 |
| 8 | Vishakhapatnam | Rajam | 728 |
| 9 | Vishakhapatnam | Vizianagaram | 664 |
| 10 | Vishakhapatnam | Eluru | 643 |
| 11 | Vishakhapatnam | Others | 12832 |
| Total | | | 24212 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Vishakhapatnam are given as Annexure 4.2/16 A & B, respectively in Annexure Volume-I. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Vishakhapatnam and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM VISHAKHAPATNAM



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN - VISHAKHAPATNAM



4.3.19 DELHI

Delhi is located at 28°37'N 77°14'E / 28.61°N 77.23°E, and lies in northern India. It borders the states of Uttar Pradesh on East and Haryana on West, North and South. Delhi lies almost entirely in the Gangetic plains. Known locally as Dilli, and also by the official name National Capital Territory of Delhi (NCT), is the second-largest metropolis in India. With over 15.9 million residents (Census 2001), it is the eighth largest metropolis in the world by population. When India gained independence from British rule in 1947, New Delhi was declared its capital and seat of government. As such, New Delhi houses important offices of the federal government, including the Parliament of India.

According to the 2001 Census of India, the population of Delhi was 13,782,976. The corresponding population density was 9,294 persons per km², with a sex ratio of 821 women per 1000 men, and a literacy rate of 81.82 %. Currently the city's municipal population is expected to be 17 million, making it the world's most populous city (but not the most populous metropolitan region, that being Tokyo). By the year 2015, Delhi is expected to be the second largest agglomeration in the world after Tokyo.

The National Capital Territory of Delhi is spread over an area of 1,484 km² (573 sq mi), of which 783 km² is designated rural and 700 km² urban. In 2007 the National Capital Territory of Delhi comprises nine districts, 27 tehsils, 59 census towns, 165 villages and three statutory towns – the Municipal Corporation of Delhi (MCD); the New Delhi Municipal Committee (NDMC); and the Delhi Cantonment Board (DCB).

Delhi has four major satellite cities which lie outside the National Capital Territory of Delhi. These are Gurgaon and Faridabad (in Haryana) and NOIDA and Ghaziabad in Uttar Pradesh. Administratively, Delhi is divided into nine districts. Economically, with an estimated net State Domestic Product (FY 2007) of Rs. 1,182 billion in nominal terms and Rs. 3,364 billion in PPP terms, Delhi is the largest commercial center in northern India. In 2007, Delhi had a per capita income of Rs. 66,728 at current prices, the third highest in India after Chandigarh and Goa.

Public transport in Delhi is provided by buses, auto-rickshaws and a Metro rail system. Buses are the most popular means of transport catering to about 60 % of the total demand. The state-owned Delhi Transport Corporation (DTC) is a major bus service provider for the city that operates the world's largest fleet of environment-friendly CNG buses. A Bus Rapid Transit (BRT) network runs between Ambedkar Nagar and Delhi Gate.

The Delhi Metro, a mass rapid transit system built and operated by Delhi Metro Rail Corporation (DMRC), serves many parts of Delhi. As of 2007, the metro consists of three lines with a total length of 65 km and 59 stations while several other lines are under construction. Line 1 runs between Rithala and Shahdara, Line 2 runs underground between Jahangirpuri and Central Secretariat and Line 3 runs between Indraprastha, Barakhamba Road, and Dwarka Sub-City.

Phase-II of the network is under construction and will have a total length of 128 km. It is expected to be completed by 2010. Phase-III and IV will be completed by 2015 and 2020, respectively, creating a network spanning 413.8 km, longer than that of the London Underground.

Auto-rickshaws are a popular means of public transportation in Delhi, as they charge a lower fare than taxis. Most of them run on Compressed Natural Gas (CNG). Taxis are not an integral part of Delhi public transport, though they are easily available. Private operators operate most of the taxis. In addition, air-conditioned radio taxis, which can be ordered by calling a central number, have become increasingly popular. Delhi is a major junction in the rail map of India and is the headquarters of the Northern Railway. The four main railway stations are Old Delhi, Nizamuddin Railway Station, Sarai Rohilla and New Delhi Railway Station.

Delhi is connected to other cities through many highways and expressways. It currently has three expressways and three are under construction to connect it with its prosperous and commercial suburbs. The Delhi-Gurgaon Expressway connects Delhi with Gurgaon and the international airport. The DND Flyway and Noida-Greater Noida Expressway connect Delhi with two prosperous suburbs. Greater Noida is to have the new airport while Noida is to have the Indian Grand Prix.

Indira Gandhi International Airport (DEL) is situated in the southwestern corner of Delhi and serves as the main gateway for the city's domestic and international civilian air traffic. In 2006-07, the airport recorded a traffic of more than 23 million passengers, making it one of the busiest airports in South Asia. A new US\$1.93 billion Terminal-3 is currently under construction and will handle an additional 34 million passengers annually by 2010. Private vehicles account for 30 % of the total demand for transport. At 1922.32 km of road length per 100 km², Delhi has one of the highest road densities in India. It is well connected to other parts of India by five National Highways: NH 1, 2, 8, 10 and 24.

Delhi's high population growth rate, coupled with high economic growth rate has resulted in an ever increasing demand for transport creating excessive pressure on the city's existent transport infrastructure. As of 2008 the number of vehicles in the metropolitan region, i.e., Delhi NCR (National Capital Region (India)) is 112 lakhs (11.2 million). In 2008, there were 85 cars in Delhi for every 1,000 of its residents.

In order to meet the transport demand in Delhi, the State and Union government started the construction of a mass rapid transit system, including the Delhi Metro. In 1998, the Supreme Court of India ordered all public transport vehicles to use compressed natural gas (CNG) as fuel instead of diesel and other hydro-carbons. Although, the city is well connected to all major cities of the country through rail network, road plays an important role in handling passenger traffic sector. Delhi acts as a hub of passenger movement in the Northern part of the country. There are regular stage carriage bus services operated by STUs to all important cities and towns of all the north Indian States namely: Jammu & Kashmir, Punjab, Himachal, Chandigarh, Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh and Uttra Khand. In addition a sizeable number of buses are also operated by private bus operators by obtaining composite tourist permits. These buses also have scheduled operation on selected pairs of points. To attract and facilitate passenger movement, all types of buses, such as; Air Conditioned, Deluxe, Semi Deluxe and Ordinary, are in operation.

For inter-state/city services, there are three bus terminals, i.e. Maharana Pratap Inter state Bus Terminous, Kashmere Gate, Anand Vihar Inter State Bus Terminous and Sarai Kale Khan Inter state Bus Terminous. A number of Luxury Coaches are operated by Rajasthan State Transport Authority from Bikaner House. In addition private bus operators have also developed a number bus boarding areas within the city.

Based on bus route-count surveys it is estimated that on an average 2493 bus schedules are operated daily from Delhi. Maximum number of daily schedules are operated from designated Inter State Bus Terminal (excluding number of buses from various locations within the NCR) on Delhi-Meerut route (each-way - 167). Other important routes from Delhi are; Panipat, Chandigarh, Jaipur, etc. Top-ten O-Ds in terms of number of schedules operated daily from Delhi are given in Table 4.42.

TABLE 4.42: TOP-TEN BUS SCHEDULES OPERATED FROM DELHI

| SN | From | To | Service Category | No. of Schedules |
|----|-------|-------------|------------------|------------------|
| 1 | Delhi | Meerut | Ord+Ac | 167 |
| 2 | Delhi | Panipat | Ord+Ac | 158 |
| 3 | Delhi | Jaipur | Ord+Ac | 92 |
| 4 | Delhi | Gurgaon | Ord. | 90 |
| 5 | Delhi | Haridwar | Ord+Ac | 77 |
| 6 | Delhi | Kurukshetra | Ord. | 76 |
| 7 | Delhi | Ludhiana | Ord+Ac | 72 |
| 8 | Delhi | Bhiwani | Ord+Ac | 65 |
| 9 | Delhi | Jind | Ord+Ac | 64 |
| 10 | Delhi | Hisar | Ord+Ac | 60 |

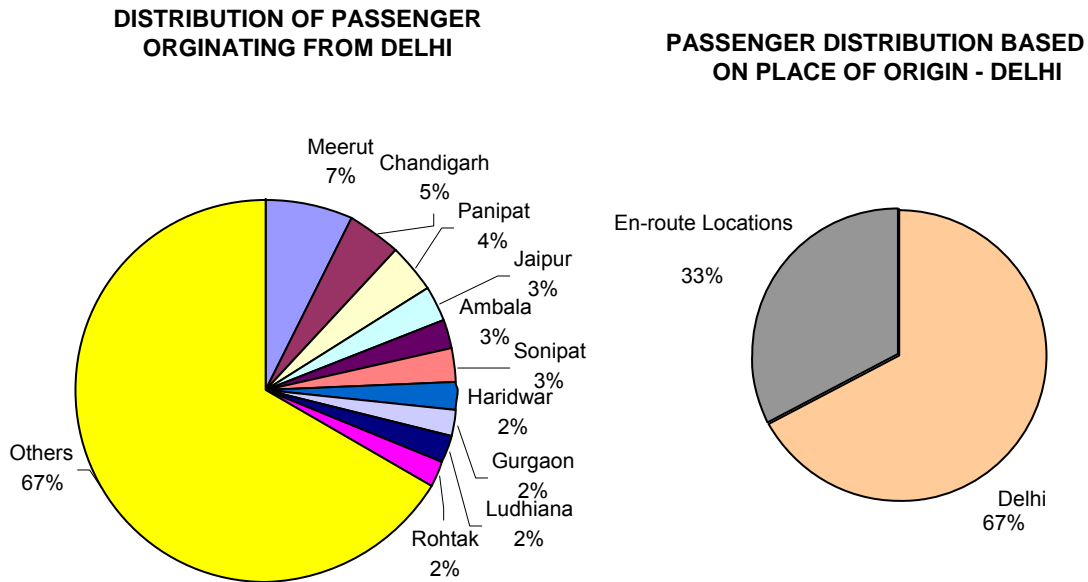
Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Delhi handled on an average 178434 passengers per day comprising 119451 originating from Delhi and the remaining 58983 from en-route locations/stations. Since, en-route boarding and de-boarding passengers are partly covered, they have not been considered for further processing.

Maximum daily numbers of passengers are destined for Meerut (8846). Top-ten destinations from Delhi are given in Table 4.43. It is important to note that the buses originating from various locations (other than stated earlier) in Delhi for destination in NCR remain unattended in this excersice. In other words the traffic of Meerut remains partly covered, as buses originating from places other than the three designated bus stands are not covered.

TABLE 4.43: TOP-TEN PASSENGER DESTINATIONS FROM DELHI

| SN | Origin | Destination | Daily No. of Passenger |
|--------------|--------|-------------|------------------------|
| 1 | Delhi | Meerut | 8846 |
| 2 | Delhi | Chandigarh | 5451 |
| 3 | Delhi | Panipat | 5051 |
| 4 | Delhi | Jaipur | 3474 |
| 5 | Delhi | Ambala | 3121 |
| 6 | Delhi | Sonipat | 3091 |
| 7 | Delhi | Haridwar | 2837 |
| 8 | Delhi | Gurgaon | 2757 |
| 9 | Delhi | Ludhiana | 2682 |
| 10 | Delhi | Rohtak | 2626 |
| 11 | Delhi | Others | 79515 |
| Total | | | 119451 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Delhi are given as Annexure 4.2/17 A & B, respectively in Annexure Volume-I. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Delhi and other en-route locations are indicated in the graphs below:



4.3.20 CHANDIGARH

Chandigarh, called 'The City Beautiful', is the only city in India that serves as the capital of two states, Punjab and Haryana, and is a Union Territory of India also. Internationally known for its architecture and urban planning it is the first planned city of India. The city tops the list of Indian States and Union Territories with the highest per capita income in the country (Rs. 110,676/year which was Rs. 44,502 in 2000).

Chandigarh is located near the foothills of the Shivalik range of the Himalayas in Northwest India. It covers an area of approximately 114 km² and shares its borders with the states of Haryana in the east and Punjab in the north, west and south. The surrounding districts are of Mohali, Patiala and Ropar in Punjab and Panchkula and Ambala in Haryana. The boundary of the state of Himachal Pradesh is not too far from its north.

Chandigarh had a population of 900,635 as per 2001 Census, having a density of about 7900 persons per square kilometre. Males constitute 56 % of the population and females 44 %.

The government is a major employer in Chandigarh with three governments having their base here. The majority of Chandigarh's population hence consists of people who are either working for one of these governments or have retired. For this reason, Chandigarh is often called a "Pensioner's Paradise".

There are about 15 medium to large industrial units and over 2500 units under small scale sector. The important industries are paper manufacturing, basic metals and alloys and machinery. Other industries are relating to food products, sanitary ware, auto parts, machine tools, pharmaceuticals and electrical appliances. Yet, with a Per Capita Income of Rs. 99,262, Chandigarh is the richest city in India and its gross state domestic product for 2004 is estimated at \$2.2 billion at current prices.

Chandigarh IT Park (also Chandigarh Technology Park) is the city's attempt to break into the IT world. Chandigarh's infrastructure, proximity to Delhi, Punjab and Haryana, and the IT talent pool attracts IT businesses looking for office space in the area.

Chandigarh provides direct bus services to all the district headquarters of Punjab and Haryana as well as other important cities and town. Although it is well connected by rail network, bus transport is the more adapted mode of transport. Keeping in view the importance of the city, bus services even from various cities of Rajasthan and Madhya Pradesh states are operated. Chandigarh also has an airport.

Based on bus route-count surveys it is estimated that on an average 471 bus schedules are operated daily from Chandigarh. Maximum numbers of daily schedules are operated on Chandigarh-Delhi route (each-way - 110). Other important routes from Chandigarh are; Ambala Cantt, Hisar, Karnal, etc. Top-ten O-Ds in terms of number of schedules operated daily from Chandigarh are given in Table 4.44.

TABLE 4.44: TOP-TEN BUS SCHEDULES OPERATED FROM CHANDIGARH

| SN | From | To | Service Category | Total |
|----|------------|--------------|------------------|-------|
| 1 | Chandigarh | Delhi | Ord+Ac | 110 |
| 2 | Chandigarh | Ambala Cantt | Ord. | 41 |
| 3 | Chandigarh | Hisar | Ord | 33 |
| 4 | Chandigarh | Karnal | Ord | 21 |
| 5 | Chandigarh | Rohtak | Ord | 20 |
| 6 | Chandigarh | Yamuna Nagar | Ord | 16 |
| 7 | Chandigarh | Naraingarh | Ord | 15 |
| 8 | Chandigarh | Amritsar | Ord. | 14 |
| 9 | Chandigarh | Sirsa | Ord | 14 |
| 10 | Chandigarh | Gurgaon | Ord | 13 |

Based on the boarding/de-boarding pattern surveys it has been estimated that the buses originating from Chandigarh handled on an average 38812 passengers per day comprising 23755 originating from Chandigarh and the remaining 15057 from en-route locations/stations. Since, en-route boarding and de-boarding passengers are partly covered, they have not been considered for further processing.

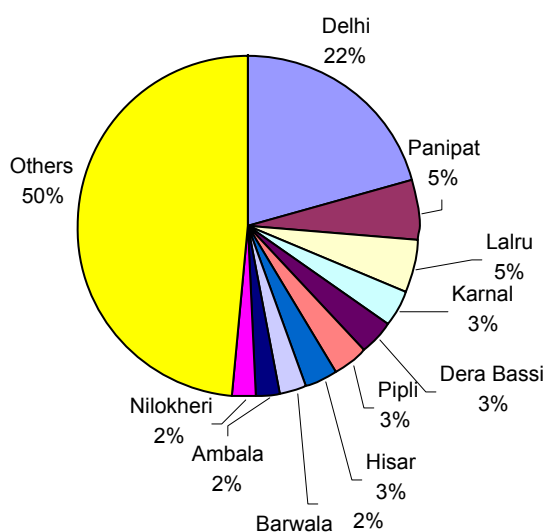
Maximum daily numbers of passengers are destined for Delhi (4960). Top-ten destinations from Chandigarh are given in Table 4.45.

TABLE 4.45: TOP-TEN PASSENGER DESTINATIONS FROM CHANDIGARH

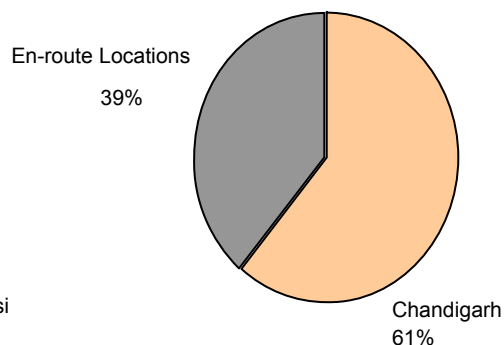
| SN | Origin | Destination | Daily No. of Passenger |
|--------------|------------|-------------|------------------------|
| 1 | Chandigarh | Delhi | 4960 |
| 2 | Chandigarh | Panipat | 1289 |
| 3 | Chandigarh | Lalru | 1209 |
| 4 | Chandigarh | Karnal | 817 |
| 5 | Chandigarh | Dera Bassi | 794 |
| 6 | Chandigarh | Pipli | 778 |
| 7 | Chandigarh | Hisar | 705 |
| 8 | Chandigarh | Barwala | 581 |
| 9 | Chandigarh | Ambala | 579 |
| 10 | Chandigarh | Nilokheri | 508 |
| 11 | Chandigarh | Others | 11535 |
| Total | | | 23755 |

Origin-destination wise number of daily bus schedules and annualized passenger traffic from Chandigarh are given as Annexure 4.2/18 A & B, respectively in Annexure Volume-1. Proportionate shares of top-ten and other remaining destinations as well as passengers originating from Chandigarh and other en-route locations are indicated in the graphs below:

DISTRIBUTION OF PASSENGER ORIGINATING FROM CHANDIGARH



PASSENGER DISTRIBUTION BASED ON PLACE OF ORIGIN



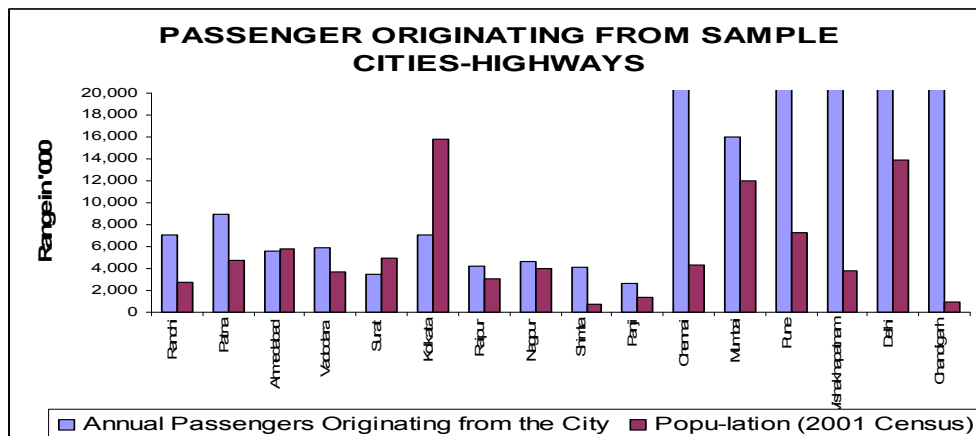
4.3.21 Summary Results

Based on the foregoing details, a summary table has been drawn to derive a correlation between population and the total number of originating passengers. Amongst the 17 cities under study, while maximum bus traffic demand is reflected by Shimla where the passenger demand is nearly six times of population of the city and the lowest in the case of Kolkata where the traffic demand is less than 50 % of population. These results confirm the real world situation wherein Shimla being a hilly region of the country the road transport is prime mode for passengers, whereas in Kolkata on the other hand because of its well established rail connectivity which takes away a major volume of passenger traffic, thereby reducing the dependence on road transport. Comparative position of other cities studied is given in Table 4.46.

TABLE 4.46: PASSENGERS ORIGINATING FROM SAMPLE CITIES - HIGHWAYS

(Figures in '000)

| SN | State | City | Population | Annual Passengers Originating from the City | Annual en-route Passengers | Total Annual Passengers | Overall Passenger Demand |
|----|------------------|----------------|---------------|---|----------------------------|-------------------------|--------------------------|
| | | | (2001 Census) | | | | |
| 1 | Jharkhand | Ranchi | 2,784 | 7,026 | 2,354 | 9,380 | 2.52 |
| 2 | Bihar | Patna | 4,710 | 8,999 | 8,186 | 17,185 | 1.91 |
| 3 | Gujrat | Ahmedabad | 5,808 | 5,598 | 2,647 | 8,245 | 0.96 |
| 4 | Gujrat | Vadodara | 3,640 | 5,909 | 2,644 | 8,553 | 1.62 |
| 5 | Gujrat | Surat | 4,996 | 3,458 | 3,643 | 7,101 | 0.69 |
| 6 | West Bengal | Kolkata | 15,764 | 7,041 | 7,524 | 14,566 | 0.45 |
| 7 | Chatisgarh | Raipur | 3,009 | 4,230 | 4,221 | 8,451 | 1.41 |
| 8 | Maharashtra | Nagpur | 4,051 | 4,654 | 2,519 | 7,173 | 1.15 |
| 9 | Himachal Pradesh | Shimla | 722 | 4,149 | 3,585 | 7,734 | 5.75 |
| 10 | Goa | Panji | 1,344 | 2,671 | 2,259 | 4,929 | 1.99 |
| 11 | Tamil Nadu | Chennai | 4,343,645 | 35,796 | 36,518 | 72,314 | 0.01 |
| 12 | Maharashtra | Mumbai | 11,978,450 | 16017 | 25381 | 41,398 | 0.00 |
| 13 | Maharashtra | Pune | 7,232,555 | 20801 | 6795 | 27,596 | 0.00 |
| 14 | Andhra Pradesh | Vishakhapatnam | 3,789,823 | 24212 | 14896 | 39,108 | 0.01 |
| 15 | Delhi | Delhi | 13,850,507 | 119451 | 50867 | 170,318 | 0.01 |
| 16 | Chandigarh | Chandigarh | 900,914 | 58983 | 15057 | 74,040 | 0.07 |

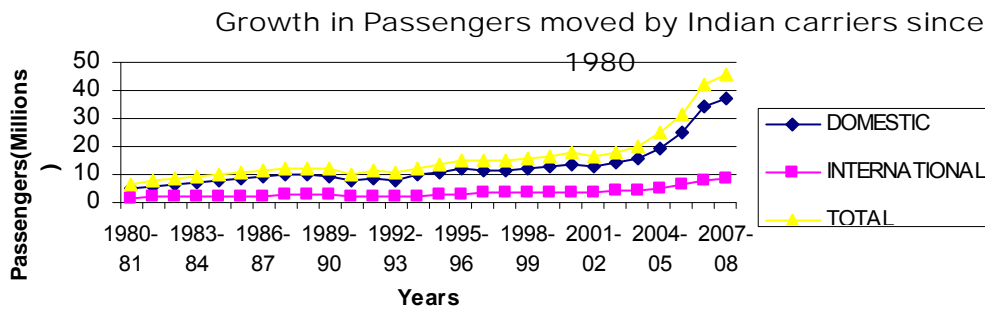


4.4 PASSENGER FLOWS BY AIRWAYS

4.4.1 Growth of Passengers by All-Indian Carriers since 1980

In a span of 28 years from 1980-81 to 2007-08, number of air passengers has increased by almost seven times. In 2006-07, domestic passengers increased by around 36 % compared with the traffic in the preceding year. In 2007-08, however, the growth in number of passengers came down to 8 %.

The number of domestic passengers increased from 4.85 million in 1980 to 34.37 million in 2006-07 and 37.21 million in 2007-08. The following graph indicates the trend in total, domestic and international passengers moved by Indian carriers since 1980.

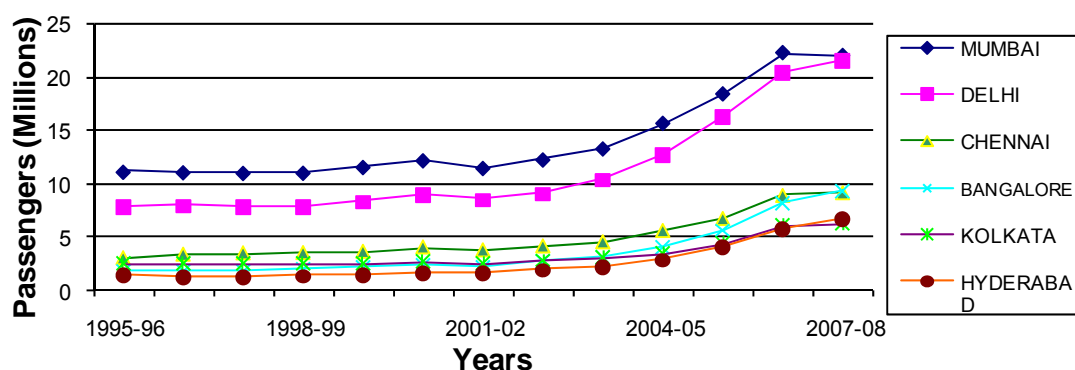


The years from 2002-03 onwards witnessed a spurt in the domestic air traffic in passengers, coupled with a quantum increase in the number of private carriers.

Trend in Total Passengers for Six Metro Airports since 1995-96:

Total passengers handled at the six metro cities (Mumbai, Delhi, Chennai, Bangalore, Kolkata, and Hyderabad) also increased from 27.82 million in 1995-96 to 71.53 million in 2006-07 and 84.16 million in 2007-08. The domestic traffic of the above cities in this period increased from 17.88 to 51.35 to 52.88 million in 2007-08. The metro cities have constantly remained the cities handling the maximum amount of traffic together contributing 75 % and 71 % of the total traffic in 2006-07 and 2007-08, respectively, with Mumbai and Delhi consistently remaining as the two heaviest loaded airports. But it can be observed that there has been a decline in the percentage of traffic between the metro cities by about 4 % and consequently the total traffic plying between the non-metro cities has increased.

Trend in Passengers for the Six Metros



An overview of the historical growth of domestic and international passenger is presented in Table 4.47:

TABLE 4.47: GROWTH IN DOMESTIC AND INTERNATIONAL PASSENGERS

| Year | Passenger | | |
|---------|-----------|---------------|-------|
| | Domestic | International | Total |
| 1980-81 | 4.85 | 1.67 | 6.52 |
| 1981-82 | 5.62 | 1.94 | 7.57 |
| 1982-83 | 6.22 | 2.14 | 8.36 |
| 1983-84 | 6.92 | 2.23 | 9.15 |
| 1984-85 | 8.06 | 2.22 | 10.28 |
| 1985-86 | 8.83 | 2.21 | 11.03 |
| 1986-87 | 9.47 | 2.31 | 11.77 |
| 1987-88 | 9.79 | 2.55 | 12.33 |
| 1988-89 | 9.72 | 2.71 | 12.43 |
| 1989-90 | 9.53 | 2.68 | 12.21 |
| 1990-91 | 7.92 | 2.43 | 10.34 |
| 1991-92 | 8.99 | 2.23 | 11.15 |
| 1992-93 | 8.21 | 2.32 | 10.53 |
| 1993-94 | 9.94 | 2.32 | 12.26 |
| 1994-95 | 11.06 | 2.59 | 13.65 |
| 1995-96 | 12.19 | 3.09 | 15.28 |
| 1996-97 | 11.70 | 3.30 | 15.00 |
| 1997-98 | 11.55 | 3.44 | 14.98 |
| 1998-99 | 12.03 | 3.52 | 15.55 |
| 1999-00 | 12.71 | 3.66 | 16.37 |
| 2000-01 | 13.71 | 3.83 | 17.54 |
| 2001-02 | 12.85 | 3.70 | 16.55 |
| 2002-03 | 13.95 | 4.20 | 18.15 |
| 2003-04 | 15.68 | 4.49 | 20.17 |
| 2004-05 | 19.45 | 5.33 | 24.77 |
| 2005-06 | 25.25 | 6.55 | 31.75 |
| 2006-07 | 34.34 | 7.57 | 41.91 |

Source: Directorate General of Civil Aviation

4.4.3 Air Traffic Flows (Passenger): 2007-2008

4.4.3.1 Originating Passenger Traffic and O-D Flow

During the year 2007-08, all operational airports together handled 116.87 million passengers, including 87.05 million of domestic and 29.81 million international passengers. The share of domestic passengers was 74 % and international traffic was 26 %. The above figure indicates the handling of passengers by the airports and roughly amounts to twice the actual originating traffic.

During 2007-08, the originating domestic passengers were 37.21 million and the associated PKM i.e., the Passenger Kilometres estimated were 34.17 billion and the average lead was 918.13 kms. List of

O-D traffic flows for domestic sector is enclosed in Annexure 4.3. Top-ten O-D pairs are given in Table 4.48:

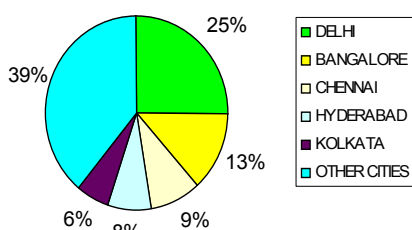
TABLE 4.48: TOP-TEN ORIGIN DESTINATION PAIRS PASSENGER TRAFFIC (2007-08)

| Origin | Destination | Passengers (millions) |
|--------------|-------------|-----------------------|
| Mumbai | Delhi | 1.80 |
| Delhi | Mumbai | 1.80 |
| Mumbai | Bangalore | 0.92 |
| Bangalore | Mumbai | 0.90 |
| Delhi | Bangalore | 0.85 |
| Bangalore | Delhi | 0.81 |
| Mumbai | Chennai | 0.64 |
| Delhi | Hyderabad | 0.58 |
| Hyderabad | Delhi | 0.55 |
| Delhi | Kolkata | 0.55 |
| Total | | 9.40 |

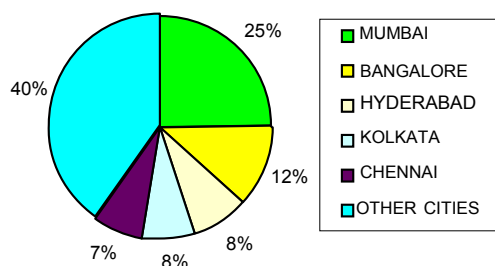
4.4.3.2 In terms of origin-destination, 46 per cent of the domestic passengers travelled between the six metro cities (Mumbai, Kolkata, Chennai, Hyderabad, Delhi and Bangalore). Another 49.32 per cent travelled from the six metro cities to other places. Only 4.3 per cent of passengers travelled between places other than the six metro cities.

Mumbai and Delhi have featured as the airports having the highest number of passenger originating and terminating traffic accounting for 1.80 million passengers in each direction. The pie chart below indicates the details of major destinations from these two cities:

Passenger Traffic from Mumbai to Other Cities



Passenger Traffic from Delhi to Other Cities



4.4.4 Inter City Passenger Traffic Flow

Distribution of passengers travelling between different cities is summarized below. 16 city pairs had more than 5 lakh passengers moving and accounted for 34 per cent of the total domestic passengers, while 444 city pairs had less than 1 lakh passengers and accounted for 23 % of traffic.

TABLE- 4.49: PASSENGER SLAB AND O-D PAIR-WISE PERCENTAGE OF TRAFFIC

| Passengers (lakh) | O-D Pairs | %age of passenger Traffic |
|-------------------|-----------|---------------------------|
| Above 5 | 16 | 34 |
| 1-5 | 77 | 43 |
| Below 1 | 444 | 23 |

4.4.5 Distance Slab wise Distribution of Passenger Traffic

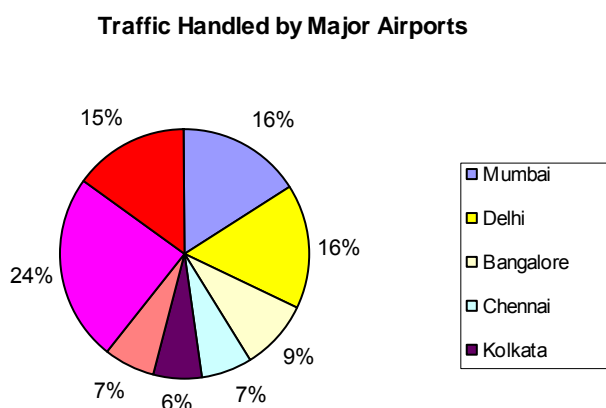
The Distance-slab wise movement of passengers is given in Table 4.50. It shows the that 32 % of the domestic passengers travelled in 401-800 km distance range, 13 % travelled in less than 400 km range and nearly 10 % travelled more than 1600 km.

TABLE- 4.50: DISTANCE-SLAB WISE DISTRIBUTION OF PASSENGERS

| Distance (kms) | Passengers (million) | %age share |
|----------------|----------------------|------------|
| 0-400 | 4.6 | 13.5 |
| 401-800 | 11.0 | 32.1 |
| 801-1200 | 10.9 | 31.8 |
| 1201-1600 | 4.4 | 12.8 |
| Above 1600 | 3.3 | 9.6 |

4.4.6 Airport-wise Passenger Traffic Profile

Total traffic handled by the six cities (Mumbai, Delhi, Bangalore, Chennai, Kolkata, and Hyderabad) is shown graphically in the following pie chart.



Appendix-1 Chapter 4

LIST OF SUBURBAN SECTIONS ON IR

| RAILWAY | SUBURBAN SECTIONS | ROUTE LENGTH (Kms) |
|--------------------|---|--------------------|
| CENTRAL | MUMBAI(CST)-KALYAN- KASARA | 121 |
| | KALYAN-KARJAT-LONAVALA-PUNE | 192 |
| | KARJAT-KHOPOLI | 15 |
| | THANE-VASHI | 18 |
| | MUMBAI(CST)-KURLA- PANVEL | 49 |
| | TOTAL | 395 |
| EASTERN | SEALDAH-KALYANI | 48 |
| | KALYANI-RANAGHAT | 25 |
| | KALYANI-KALYANI SAMANTA | 5 |
| | RANAGHAT-SHANTIPUR JUNCTION | 20 |
| | RANAGHAT-KRISHNANAGAR CITY | 26 |
| | RANAGHAT-GEDE | 43 |
| | RANAGHAT-BANGAON | 33 |
| | DUMDUM-BANGAON | 69 |
| | DUMDUM-DANKUNI | 15 |
| | DUMDUM-TALA-RISEPGHAT-MAJERHAT | 18 |
| | SEALDAH- BARUIPUR | 25 |
| | BARUIPUR-LAKSHMIKANTPUR | 37 |
| | LAKSHMIKANTPUR-KULPI | 9 |
| | KULPI-NISCHINDAPUR | 13 |
| | NIDCHINDAPUR-KASHINAGAR FLAG | 8 |
| | KASHINAGAR FLAG-KAKDWIP | 3 |
| | KAKDWIP-NAMKHANA | 13 |
| | BARUIPUR-DAIMIND HARBOUR | 35 |
| | BALLYGUNGE-BUDGE BUDGE | 26 |
| | SONARPUR-CANNING | 40 |
| | BARSAT JUNCTION-HASNABAD | 49 |
| | DUM DUM CANTT-BIMANBANDER | 4 |
| | HOWRAH-BURDWAN | 107 |
| | HOWRAH-BURDWAN(CHORD LINE) | 74 |
| | BANDEL- NAIHATI | 9 |
| | SEORAPHULLI-TARAKESHWAR | 35 |
| | BANDEL-KATWA | 105 |
| | TOTAL | 894 |
| NORTHERN | NIZAMUDDIN- NIZAMUDDIN (RING RAILWAY) | 35 |
| | TOTAL | 35 |
| WESTERN | CHURCHGATE-VIRAR | 60 |
| | TOTAL | 60 |
| SOUTHERN | CHENNAI BEACH- CHENNAI CENTRAL | 3 |
| | CHENNAI CENTRAL-AVADI-TIRVALLUR-ARAKKONAM | 68 |
| | CHENNAI CENTRAL –GUMMIDIPUNDI | 44 |
| | CHENNAI BEACH-THIRUMAYLAI-THIRUVANMIYUR | 15 |
| | CHENNAI BEACH-TAMBARAM-CHENGALPATTU | 60 |
| | TOTAL | 190 |
| GRAND TOTAL | | 1574 |