PLANNING FOR OPTIMUM TRANSPORTATION SYSTEM IN PATNA CITY, BIHAR STATE

A DISSERTATION

Submitted in partial fulfillment of the
requirements for the award of the degree
of
MASTER OF URBAN AND RURAL PLANNING

By

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JUNE, 2012

CERTIFICATE

Certified that the report entitled **"PLANNING FOR OPTIMUM TRANSPORTATION SYSTEM OF PATNA CITY, BIHAR STATE"**, which has been submitted by **Mr. ANAND SAURABH,** for partial fulfilment of the requirement for the award of the degree of **Master of urban and Rural Planning,** submitted in the Department of Architecture and Planning, Indian Institute of Technology- Roorkee, is his own work done by him under my supervision and guidance. The matter embodied in this dissertation has not been submitted by him for the award of any other degree of this or any other institute.

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CANDIDATES DECLARATION

I hereby certify that this report entitled **"PLANNING FOR OPTIMUM TRANSPORTATION SYSTEM OF PATNA CITY, BIHAR STATE"**, which has been submitted in partial fulfilment of the requirement for the award of the degree of **Master of urban and Rural Planning,** submitted in the Department of Architecture and Planning, Indian Institute of Technology- Roorkee, is an authentic record of my own work carried out during the period from July 2011 to June 2012, under the supervision and guidance of **DR. V. DEVADAS ,** Department of Architecture and Planning, Indian Institute of Technology, Roorkee, India.

The matter embodied in this dissertation has not been submitted by me for the award of any other degree of this or any other institute.

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ABBREVIATIONS

APMS = Advance Parking management System
BRTS = Bus rapid transit system
BSRTC = Bihar State Road Transport corporation
CBD = Central Business District
CDP = city development plan
CMA = Chennai Metropolitan Area
CMDA = Chennai Metropolitan Development Authority
CMP = city mobility plan
CNG= Compressed Natural gas
CTTS = comprehensive Traffic and Transportation Study
GDP = Gross Domestic Product
IPT = Intermediate Transport System (like auto rickshaw)
IRC = Indian Road Congress
ITES = information-technology-enabled services
ITDP = Institute for Transportation and Development Policy
ITS = intelligent transport system
JNNURM = jawahar lal urban renewal mission
KSRTC = Kerala/ Karnataka State Road Transport Corporation
LPG= Liquid petroleum gas
MTC = Metropolitan Transport Corporation
NMT = Non Motorised Transport
NMV = Non Motorised Vehicles
NUTP = National Urban Transport Policy
PCU = Passenger Car Unit
SUTP = Sustainable Urban Transport Programme
UDPFI = Urban development plans formulation and implementation (Guidelines for urban development)
VMS = Variable message sign

EXECUTIVE SUMMARY

Introduction

Traffic problems are increasing in the cities and the situation is becoming complex especially in core areas of the city. It is projected that India's urban population would grow to about 473 million in 2021 and 820 million by 2051, as against only 285 million in 2001. Hence, cities must not only meet the mobility needs of the current population but also provide for the needs of those yet to join the urban population. . In India, City transportation system is quite different from developed countries transportation system, which are properly managed and monitored by related authority. Indian transportation system comprises of modes like auto rickshaw, Cycle rickshaw and other NMTs, which are generally not regulated and monitored by any authority. They are on their own and their livelihood depends upon these sectors, which further makes any planning decision difficult to implement.

City transportation of Patna is very ineffective and insufficient. People are based on road based transport due absence of other options. Railways are not effectively used due to its bad functioning. Patna is the linear city and situated along the river Ganges, but the river is not used for mode of transport.

Objective of study

1. To assess the existing condition in the study area.
2. To study the transport infrastructure and its associated problems in the system.
3. To forecast the demand & supply of transportation system in the system in 2031 A.D.
4. To analyze the feasibility of different mode of transportation system.
5. To evolve the set of policy guideline for optimum transport system for integrated development.

The investigator will limit his study to intra road transportation of Patna city for for a particular section of a road i.e. Ashok Rajpath. Based on this study, recommendation will be formulated for the city.

CASE STUDY

Chennai Autorickshaw :- In 1999, the government of Tamil Nadu banned the issue of permits for the new three-seater autos, leading to a huge demand-supply gap within the autorickshaw sector, inflating the price of the permit several folds. Although the cost of the permit is Rs 375, drivers are required to make payments in the range of Rs 70,000 to Rs 1,00,000. As a result, the removal of the ban, was not of much consequence.

In September, 2008, in which orders were issued for conversion of existing petrol driven autorickshaws in Chennai city into LPG mode with subsidy of Rs 2,000. Cost of installation of an LPG conversion kit entailed an expenditure of Rs 11,500 for a locally assembled kit to Rs 21,000 for the factory assembled model, which highlighted the stark inadequacy of the subsidy being provided. Lack of availability of LPG dispensing stations, LPG fuel restricts the speed limit of an autorickshaw to a maximum of 45 kmph.

ITDP improved auto rickshaw:- To date, over 12,000 of these modernized rickshaw have been manufactured and sold, which are 25 kg lighter, had twice speed, a strong integral frame. and much more comfortable passenger seat and they are highly visible in Vrindavan (where the entire fleet has been replaced), certain neighbourhoods of Delhi and Agra.

Advanced Parking Management System at Connaught Place:- After installation of APMS 16.3 % increase is shown in parking.

Congestion charges :- About 11 lakh vehicles enter New Delhi from other states on a daily basis adding to the existing traffic of the 70 lakhs vehicles owned by the city . In an effort to curb heavy traffic on city roads, the government plans to implement congestion charges on vehicles.

PROFILE OF STUDY AREA

Study area "Patna Urban Agglomeration Area(PUAA)" has a population of 16.97 lakhs (census 2001) and the total area of PUAA is 135.79 sq. km (CDP-2006). The projected population for the year 2021 is 28.01 lakhs (CDP-2006) and the area is 333.2 sq. Km. This city has its origin from 600 B.C. which has developed linearly along the Ganges, through centuries. In this unplanned and organic growth, land use percentage for transportation is 7 percent. 5 major roads can be identified, which carry the traffic of whole Patna city, mainly runs in east- west direction. Width of roads varies from 15' to 30' at major parts of Patna, only few roads have sufficient width, which are far less than the requirement for urban transportation. City traffic has increased tremendously in last two decade and presently more than 2.9 lakhs vehicles are registered in Patna city. The city transportation is dominated by shared Autorickshaws and cyclerickshaws as public transport, due to deteriorated condition of bus service for decades. Limited space of road is shared by all mode of transport, its either fast mode or slow. Fuel used by this IPTs sector is adulterated, which result into thrice the pollution in compare to petrol IPTs.

Within all arterial roads of Patna, Ashok Rajapth is most congested and polluted road of Patna. Private cars, Motorcycle, cyclerickshaw are generally parked along road, decreasing its effective width. There is no proper stop defined for autorickshaw, cyclerickshaw and bus. They park at road and drop n pick passenger from any point of road. This highly dense area of Patna has road crossing at every 20-30 m which further led to residential areas. Autorickshaw and buses pick commuter from every crossing, which means all these public transport stops at every 20-30 m of this narrow section of road. This character of traffic decreases overall average speed of all modes to 10-15 km/hr.

SURVEY UNDERTAKEN

The objectives of the present study are to understand the factors influencing the auto rickshaw, cycle rickshaw sector, commuters & overall traffic on road. It would help to find out the underlying reasons that bring about inefficient transportation system and its inter-linkages with the user and different modes.

Surveys undertaken are :-

- **Traffic volume count survey**
- **Auto rickshaw survey,**
- **Cycle rickshaw survey,**

- **Household survey**
- **Origin destination survey**

RESULTS AND FINDINGS

Auto rickshaw

Auto rickshaw dominates on other mode of transportation on this road. It runs west to east on Ashok Rajpath and while returning it divert route from mehandru. This high density area is filled with middle class family, service class people and students. They prefer Bicycle, Motor cycle, Auto rickshaw, buses as mode of their transport. The reason for auto rickshaw being famous in this road is because of city structure. High density unplanned residential area is connected with this road with 1-3 m concrete pathway, at every 30-50 m. Due to this character of city, passenger waits at every crossing which is at distance 30-50 m, and it is easy for autorickshaw to pick and drop those passenger than any other mode. Its small in size and allows 4 -5 passenger to sit at a time, at any stop its easy and take less time to pick and drop passenger. For more earning autorickshaw accommodates 2-3 more people with him in front seat. Around 85 percent auto rickshaws are rented, that majorly uses kerosene as fuel. They gave Rupees 100 for old auto rickshaw and Rupees 150 for new auto rickshaw as rent, and respondents are able to earn 500-600 per day by using kerosene which cost rupees 100-300 per day. This results in saving of 100-200 per day by using kerosene as fuel. By using of petrol they will not be able to earn enough to give rent and buy fuel. Due to this congestion they can't make enough trips to make sufficient money. Petrol is used by those respondents who owns auto rickshaw. Engine of kerosene used auto rickshaw generally breaks down in 6 month, which requires around Rupees 4000-5000 for maintenance. These are generally rented auto rickshaw, whose major expenses is bear by owner only. Despite of this expense, owner allows them to use kerosene because no one will rent it, if he wouldn't allow this.

Average Fuel Rate, which is used by respondent:-

Petrol+ mobil = Rs 75 per litre
Kerosene = Rs 25-30 per litre
Petrol+ mobil +kerosene = Rs. 40-50 per litre
Mileage = 15-16 km/l

Buses

Buses in this route are overcrowded. 15 buses per hour crosses through old part of city up to Gai ghat, whereas 30 buses per hours goes up to N.I.T. turning only, so around 45 buses per hour crosses the wider part of Ashok Rajpath. These buses don't affect auto rickshaw in term of commuters. Auto rickshaw gets their passengers easily, but this sector is affected due to traffic jam causes by bus. Buses are used as auto rickshaw by commuters, means buses pick and drop commuters at every 30-50 m. Since bus can accommodate more number of people, hence it stops at almost every junction. Due to which bus literally crawl at average speed of 10 km per hour. Its size and narrow road don't allow any vehicles to move simultaneously, all traffic has to move behind the bus. The situation becomes more pathetic when a cycle rickshaw and other NMT vehicles are in front of bus. Due to absence of bus stop, buses used to park at road only. Auto rickshaw from Gandhi Maidan runs up to Gai ghat or Malslami which is at distance 6.5 km and 14 km respectively. In a day they make 4-5 trips

(up-down) from Gai ghat and 2-3 trips(up-down) from Malslami, whereas they are able to make 7-8 trips(up-down) and 5-6 trips (up-down) respectively before introduction of city bus on this route. Bus causes congestion and increases travel time which result in less travelling speed.

Cycle rickshaw

Cycle rickshaw is predominantly used in wide section of Ashok rajpath. It is generally used by people for having short trips. Cycle rickshaw avoids moving on narrower section of Ashok Rajpat, because it jammed at most of the time.47 percent cycle rickshaw is registered with Municipal Corporation. 35000 registered cycle rickshaws exist in Patna. Another estimate puts the count of cycle rickshaws between 1.2 to 2 lakhs adding unregistered cycle rickshaw also. Authority has not any check on registration of cycle rickshaw, so it is increasing day by day. 22 percent owns cycle rickshaw which cost around Rupees 12000. 78 percent of respondents rent cycle rickshaw. They gave Rupees 35 as rent.

Registration fees

New Registration: Rupees 14.50 (They give Rs 80)
Renewal: - Rupees 7.50 (They give Rs 50)

Other modes

Motorcycle is used more, than cars due to availability of middle income groups in this area. Motorcycle is cheap in all the aspect than car and its can be transported easily in this congested road. Bicycle also contributes good percentage in traffic composition. This is due to low income group of people and student residing here. Good vehicles, NMT good vehicles (*thelas)* move in this road at any time of the day. NMT goods vehicles slows down the overall speed and affect the line of vision of overall traffic, and most of all they park and unload goods at the road only.

Household survey

40 percent household monthly expenditure on transportation is between Rupees 1000-2000.These people are middle class people and uses bus, auto rickshaw as mode of transportation. 20 percent household's monthly expenditure on transportation is more than 4000. These are upper middle class people comprise of lecturer, professor and doctors, which are 20 percent of population which owns car. 56 percent owns motorcycle/ scooter, 38 percent household owns bicycle. It is found that there is lack of parking space at C.B.D. area, so maximum of them park it at road. In case of home, they don't have garage so they park it at road.

Origin –destination survey

It is found that 22 percent respondent's uses bus, 8 percent uses car, 20 percent uses motorcycle/ scooter, 11 percent uses bicycle, 27 percent uses auto rickshaw and 12 percent uses cycle rickshaw as mode of transportation. Despite of inefficient public transport, 61 percent depend upon this only. 39 percent uses its own personal vehicles, in which bicycle also contribute up to 11 percent. 53 percent commuters travel up to 5 km, which are those people going to C.B.D. area or university area. 30 percent travel up to 15 km, which are boring road, secretariat and other government office. 17 percent travels up to 25 km. These are generally school student whose schools are in digha, danapur area.

Recommendation

1. Decentralization of small scale industry and wholesale market of old city should be done, which will decrease trips mainly as goods vehicles.
2. Buses up to gai ghat should be avoided but up to N.I.T turning it should be resumed.
3. 20 seater buses (yellow buses) should be scrapped out because it take the same width of raod as 40 seater bus, but allow half the passengers.
4. In present context, BRTS can be run on only two routes bailey road danapur road, due to road limited road width. These two routes are recommended with its integration with other mode of public transport.
5. A.C. buses are recommended to increase comfort and provide options to high class people against private cars.
6. Water transport can be developed as an option for people travelling along Ashok Rajpath whereas metro and ganga driveway will give commuters other option in future.
7. New IPT registration should be restricted and IPT older than 10 years should be scrapped out.
8. All petrol cum kerosene run auto rickshaw should be converted into CNG auto rickshaw and proper subsidy should be provided.
9. It is recommended that route of autorickshaw shouldn't be diverted while returning back from Malsalami. This will help in increasing its trip after expulsion of Buses, cycle rickshaw, good vehicles, and bicycle. This will help to increase their income and also results in decreasing fare and making it affordable for commuters.
10. Cycle rickshaw should be refrained from Ashok Rajpath and should be confined in the North-South routes between two major arterials.
11. River Ganges flow parallel to Ashok rajpath. Segregated bicycle tracks of 3 m and public bicycle programme can be part of river front development which will encourage people to use bicycle.
12. 1.5 to 2 m pedestrian way should be provided on roads whose right of way is around 7-8 meter like ashok rajpath by acquiring around 1 m from both sides.
13. Strict action should be taken against the shops along the road who display their goods at footpath, like book shops at ashok rajpath. Heavy fines should be imposed on defaulters.
14. Junction like Pather ki Masjid, N.I.T. turning, Khajanchi road turning are congested and accident prone junction. These junctions should be widened and geometry should be improved to avoid congestion and accident.
15. ITS based parking area should be provided at several locations (like Patna market, N.I.T more etc. in Ashok Rajpath) which would inform car owner about the parking space before reaching the destination.
16. Demand restrain measure should be taken to discourage private vehicles.
17. Road side parking should be avoided and heavy fine should be imposed upon defaulters.
18. "Traffic management authority" should be set up in order to manage, maintain, improve and control overall traffic and related infrastructure and it should be constituted of Public transport cell, IPT cell, NMV cell, informal sector cell and Private vehicle cell, which would deal with related issues. Traffic police should come under this authority, which will help this authority to enforce and enact these rules and regulation.

INTRODUCTION

IDENTIFICATION OF PROBLEM

AIMS AND OBJECTIVE OF STUDY

SCOPE AND LIMITATION OF STUDY

METHODOLOGY

1 INTRODUCTION

Good transportation system ensures proper flow of people and goods from its origin and destination, which helps in overall growth of Nation. In case of India, after economic liberalization, India has seen a rapid development in its economy. This led to requirement of related infrastructure for flow and growth of economy especially industrial and service sector, in which transportation play a important role. Since in urban areas these economic activities primarily take place, hence development of cities and towns are important for nation development. India's urban population is currently around 30% of its total population. As such, it is projected that India's urban population would grow to about 473 million in 2021 and 820 million by 2051, as against only 285 million in 2001[1]. Hence, cities has to be self sufficed to meet the mobility needs of the existing population and also provide the infrastructure for future projected population who would join the existing population of the city.

The skewed distribution of the urban population amongst a few cities is a matter of concern to the planners and administrators of urban infrastructure. Nearly seventy percent of the urban population is located in Class-I cities (population of one hundred thousand and more) in India. Medium cities (class 2 and 3) also suffering from population explosion, where people depends upon Auto rickshaw (IPT) and cycle rickshaw for their travel need.

In this heavy concentration of population in these few centres led to expansion of cities in density as well as area. Due to several fold increase in population and developing economic activities, travel demand has also increased in same proportion but transportation infrastructure and public transport has not been developed in same pace. Along with public transportation on the limited width of road, several fold increases in private vehicles has been seen due to easy availability of financing, results in traffic congestion in all the Indian cities. Travel pattern in city depends on its form and structure in term of land use, activities area and density of population. With modern and fast mode of transportation like metro, Bus rapid transit, private cars and motorcycles, urban area need more land for transportation purpose, which is scarce in present unplanned urban growth, especially in old city areas. Limited urban land, increasing ownership of private vehicles, population explosion etc. adds so many commuters to limited width of road which is shared by all other type of fast and slow mode of transport. All this outnumbered and unmanaged traffic has adverse affects in all the aspects like physically, economically, socially etc. on an individuals.

In other words the traffic problems are increasing in the cities in general and the situation is becoming complex especially in core areas of the city. This situation needs to be tackled for sustainable growth of a city.

[1] National urban transport policy
http://urbanindia.nic.in/policies/TransportPolicy.pdf

1.1 IDENTIFICATION OF PROBLEM

1.1.1 Transport Scenario of India

Transportation of a city is like veins in the body and if blood movement slows down or stops in these veins, heart can choke down. Similarly, nowadays city is suffering from this choke down, due to unmanaged and inefficient transportation system. After the economic liberalisation lot of development has been seen in countries infrastructure, now various mode of transport are available in reach by air, water and land. India's relatively low GDP shows that access to these modes of transport has not been uniform throughout the country. Motor vehicle penetration is low by international standards, with 13 million cars on the nation's roads, which is more than enough for its existing transportation infrastructure, but as well, the automobile industry in India is rapidly growing with an annual production of over 2.6 million vehicles, and this vehicle volume is expected to rise more in the future. [2]

At the same time, public transport still remains the primary mode of transport for most of the population, which are the most heavily, used public transport in the world. In metro cities buses and sub urban rails are used as public transport, which is not sufficient for existing urban population. Auto rickshaw and cycle rickshaw dominates as public transport in tier 2 and tier 3 cities.

Today cities are growing so the travel demand, in which motor vehicle travel demand are very high due to the size of city, which can't be covered by walk and bicycle . This travel demand can be catered by developing mass transit system, which has not been given consideration for long time from government and its development has been hampered. However, financing facilities for private vehicles and increased buying capacity of people has resulted in tremendous increase in the population of automobiles in the cities. Among the entire motorized vehicle motorcycle contributes 70 percent in all the cities. Urban areas have 90 percent of the automobiles, which makes these areas more congested. These are the following points which are the matter of concern for planner and policy maker.

- India to be world's largest car markets by 2030, behind just China ant US.[3]
- The number of total vehicles would grow at 8.70 percent per year, an increase from 49 million to 246 million between 2005 and 2025.[4]
- CO2 emissions from road transport would increase at 7.75 percent per year, which is higher than many other Asian countries, from 203 million tonne in 2005 to 905 million tonne by

  2025. Passenger transport represents 45 percent and freight transport represents 55 percent of total CO2 emissions from road transport in 2005; this ratio would remain approximately the same in 2025.[5]
- India is 7th largest country and about 17 % of world population spread over only 2.4 % percent of are:- Land is limited especially the urban land.[6]

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[2] http://en.wikipedia.org/wiki/Transport_in_India

[3] US-based consultancy Keystone-a subsidiary of LaSalle Consulting Associates report http://www.financialexpress.com/news/india-to-be-worlds-3rd-largest-car-market-by-2030-study/158001/

[4] http://www.earthtimes.org/articles/press/—case-study-india,1357164.htm

[5] http://www.earthtimes.org/articles/press/—case-study-india,1357164.htm

- Million plus cities accounts for more than third of the Indian urban population(29% of total population)[7]
- Migration from rural areas to urban areas.
- Lack of infrastructure, facilities, amenities.\Rate of urbanization = 2.4%of annual rate of change
- India has a road network of over 3.314 million kilometres (2.059 million miles) of roadway, making it the third largest road network in the world. At 0.66 km of highway per square kilometre of land the density of India's highway network is slightly higher than that of the United States (0.65) and far higher than that of China's (0.16) or Brazil's (0.20).[8]
- In 2009, 418 peoples dies everyday on Indian road, means in every 3 minutes one people dies in road accident.[9]
- Since India has only 2.7 percent of urban land, which contribute in its economic growth, which makes India as 4th largest economy of world after US, China & Japan. For boosting its productivity, expanding its economy & its employment growth efficient transportation system is required.

1.1.2 Transportation Scenario of Bihar

1.1.2.1 Roadways

29 National highways exists in state with total length of 2,910 km and state highways with total length of 3,766 km.[10] Cities in Bihar are congested, polluted and unmanaged. The transportation system mainly depends on auto rickshaw and cycle rickshaw as public mode of transport.

1.1.2.2 Railways

Bihar is well-connected by railway lines to the rest of India. Most of the towns are interconnected among themselves, and they also are directly connected to Kolkata Delhi and Mumbai. Patna, Muzaffarpur, Darbhanga, Katihar, Barauni, Chhapra, Bhagalpur and Gaya are Bihar's best connected railway stations. Indian Railways has created East Central Railway on October 1, 2002 with headquarter at Hajipur.[11]

1.1.2.3 Water transport

Bihar is connected by National Waterways No. 1 which established in October 1986. This National Waterways has fixed terminals at Haldia, BISN (Kolkata), Pakur, Farrakka and Patna.

1.1.2.4 Air transport

Lok Nayak Jayprakash Airport is domestic airport in Patna, which is also categorized as restricted International airport. Gaya Airport, airport is a small international airport connected to Colombo, Singapore, Bangkok and more.

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[6] en.wikipedia.org/wiki/Demographics_of_India

[7] www.gisdevelopment.net/application/urban/products/mi03215pf.htm

[8] Web.worldbank.org

[9] National Crime Records Bureau's annual report, 2009

[10] en.wikipedia.org/wiki/Transport_in_Bihar

[11] en.wikipedia.org/wiki/Transport_in_Bihar

1.1.3 Transportation Scenario of Patna

Patna is capital of Bihar state which is the second largest city in eastern India. This city is growing linearly from East to West due to limiting factor of river Ganges in the North and low lying area of river Poonpoon in the South. The city is approximately 25 km long and 9-10 km wide and its corporation PMC (Patna Municipal Corporation) have an area of 109.218 sq. Kms and having a population of 16 lakhs (2011 census). PMC has an area of 109.218 sq. Km having population of 16 lakhs (2011 census). Patna is categorized in class 'B' town with 72 wards and 1,48,157 holdings in its municipal boundaries. [12]

1.1.3.1 Rail

The linear city of Patna has five major stations namely Patna Junction, Rajendranagar Terminal, Gulzarbag, Danapur Junction and Patna Sahib. Since it the busiest route, with lot of long route train running on this route, which results in inefficiency of railway as regional transportation.

1.1.3.2 Air

Lok Nayak Jayaprakash Airport, a restricted international airport, connects to different important cities of India .

1.1.3.3 Road

This city has 5.16 percent of land use under road transportation. Roads of this city is narrower and no hierarchy has been maintained. Number of Roads and street are 925 with 1421 km of pakka road and 346 km of kaccha road.

1.1.3.4 Water

Patna has fixed concrete terminal at Gai ghat on National waterway-1. This waterway is typical alluvial rivers with characteristics of braiding, meandering and large water level fluctuation (both horizontal and vertical) between summer and monsoon months. On these rivers, several shallow areas (shoals) come up during low water season and maintenance of 2 m Least Available Depth (LAD), is required. LAD of 1.8 to 2 m for about 300 days was maintained between Farakka and Patna (460 km). Concrete High level and low level jetty is constructed at Gai Ghat for inter city transport; Floating Jetty is also made at Gandhi Ghat for tourism purpose. However, none of the jetties are used for intra city transport.

1.1.4 Overview

City transportation is very ineffective and insufficient. People are based on road based transport due absence of other options. Railways are not effectively used due to its improper functioning. Patna is the linear city and situated along the river Ganges, but the river is not used for transportation.

Transportation through roads is the only possible way of movement. 5 major roads can be identified, which carry the traffic of whole Patna city, mainly runs in east- west direction. Width of roads varies from 15' to 30' at major parts of Patna, only few roads have sufficient width, which are far less than the requirement for urban transportation.

[12] www.patnanagarnigam.org/ContentPages/PMC_Administration.aspx

The total road length is about 1500 km (over1315 km in PMC area) .The city has only 7 percentage of land area under circulation.[13] The public transport is almost nonexistent in the city and most common mode of transport area non motorised/slow moving vehicles and auto rickshaw. City traffic has increased tremendously in last two decade and presently more than 2.9 lakhs vehicles are registered in Patna city.[14]

1.2 AIMS AND OBJECTIVE

Having above points in mind, the investigator frames a set of objective, and conducted the study through investigation, in this particular field in planning, in the study area.

1. To assess the existing condition in the study area.
2. To study the transport infrastructure and its associated problems in the system.
3. To forecast the demand & supply of transportation system in the system in 2031 A.D.
4. To analyze the feasibility of different mode of transportation system.
5.To evolve the set of policy guideline for optimum transport system for integrated development.

1.3 SCOPE OF THE STUDY

The roads in city are congested and encroached by other activity like various informal sectors. Hierarchy of road is absent here. Mixed traffic consists of bus, auto rickshaw, cycle rickshaw, bicycles, motorcycles, 4 wheelers all move on same road, whose capacity is far less than required. Bus services in particular have deteriorated, and their efficiency and quality of service have been declining thus force passengers to turn to personalized mode of transport and IPTs (intermediate public transport) like auto rickshaw, cycle rickshaw. This results into restricted traffic flow and road fatality. Pedestrian's death as a percentage of all road fatalities, are extremely high.

The investigator hopes that if the recommendation of this study is implemented systematically & scientifically in time, feasible transportation system can be anticipated in the system which would pave the way for integrated development in the system.

1.4 LIMITATION OF THE STUDY

In this short interval, it would be a huge task to study and analyze all mode of transport and its associated system with respect to whole city.

The investigator will limit his study to intra road transportation of Patna city for a particular section of a road i.e. Ashok Rajpath, studying different existing modes. Based on this study, recommendation will be formulated for as a whole for the city.

[13] Master plan of patna, 2006
[14] Cdp , patna

1.5 METHODOLOGY

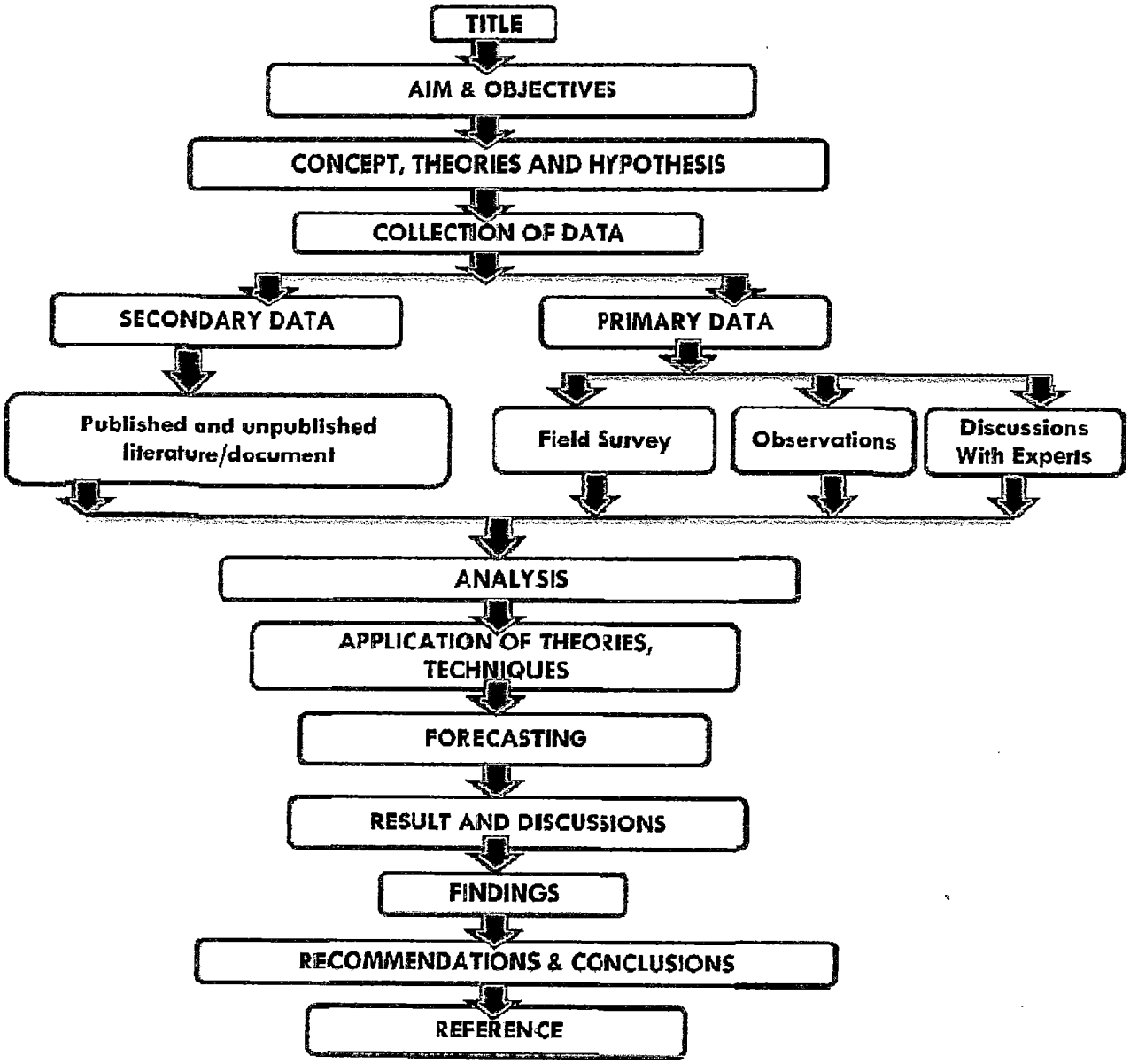


Figure 1-1 : flow chart of research methodology

1.5.1 Data

1.5.1.1 Secondary Data

- Various publications of central, state, local governments.
- Various publications of foreign, central, state, local transport and related organization/agency.
- Books, Journals and Newspaper.
- Technical Journals.
- Report prepared by research scholars, university etc. in different fields.
- Report published by various organizations.
- Public record, Statistics.

1.5.1.2 Primary Data

- Primary surveys have been conducted at the grass root level for collection of data by employing survey tools and techniques.
- There are some other techniques which are used like PCU count, origin and destination survey etc.

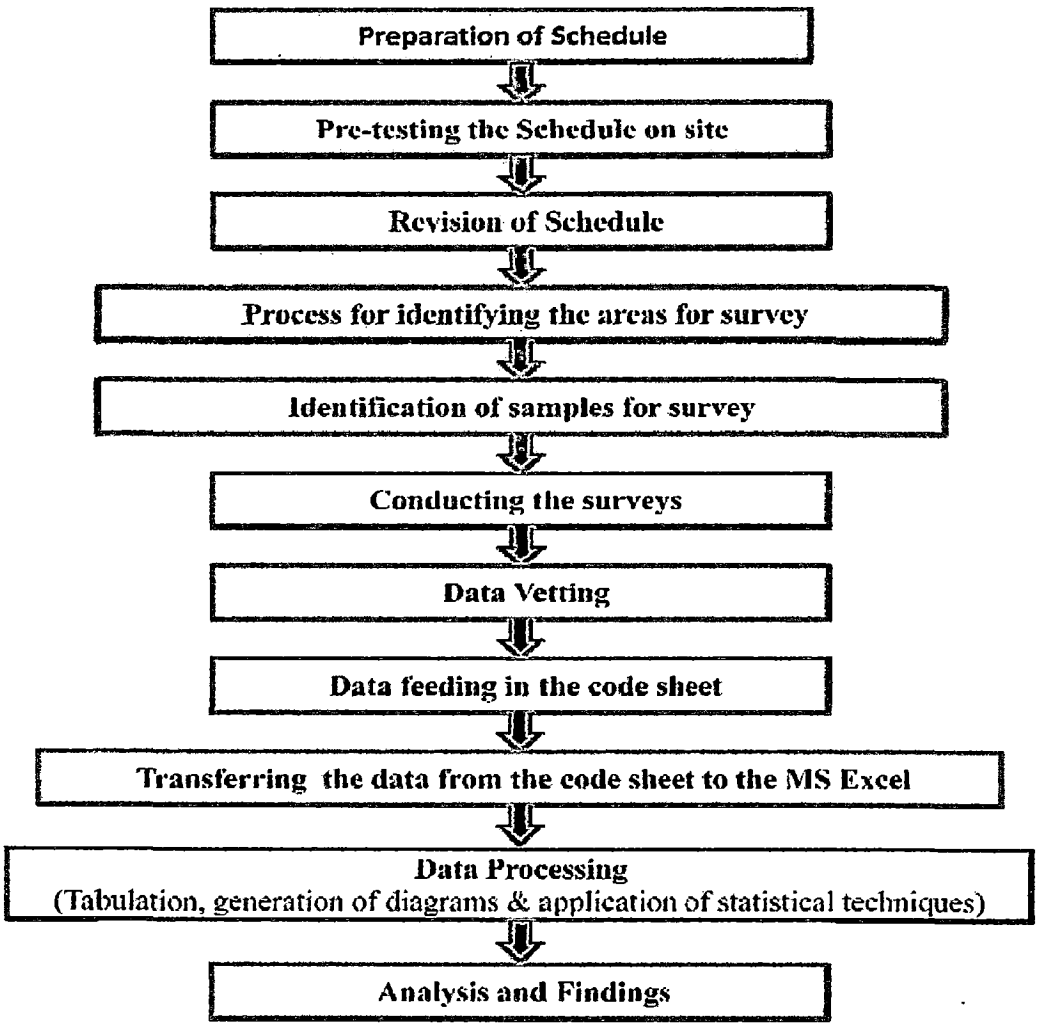


Figure 1-2 : methodology for primary survey

1.5.1.3 Tools and Techniques

Survey tools:

Relevant survey tools such as schedule, questionnaire would be employed.

Survey techniques:

Suitable sampling techniques will be employed for identifying household for conducting survey.

Analytical tools:

Relevant analytical tools, such as, code sheets, computer hardware, software (Microsoft Excel) would be used for data processing and analysis.

Analytical Techniques:

Relevant analytical techniques, such as, tabulation, co-relation etc., will be attempted based on the requirement.

1.5.2 Analysis

Comprehensive analysis has been done in the interactive manner to find out the feasibility using tools and employing techniques to identify the present problems, inadequacies, forecasting, probable solutions, requirements etc. for the future development.

1.5.3 Forecasting

- Projections have been done in order to arrive at the real situation in future, i.e. optimal and feasible solution for 2031 AD.
- Forecasting the demand and supply of resources finding the gaps for future has been done for sustainable development in the study area.

1.5.4 Application of theories/ techniques

- To understand the real life situation different theories have been implemented
- For this, all the required techniques have been applied.

1.5.5 Results and discussions

Results of all types of analysis, such as, literature review, household survey etc., have been discussed in detail to draw inferences.

1.5.6 Findings

Plausible findings have been drawn for evolving a set of policy guidelines and for developing a feasible sustainable development plan.

1.5.7 Recommendations and conclusion

- The study have been concluded with the plausible recommendations.

LITERATURE STUDY

MEANING, TYPES, NORMS & THEORIES

TRANSPORT SCENARIO OF INDIA

INSTITUTE INVOLVED

NUTP

2 LITERATURE STUDY

2.1 Meaning of Transport

Transport refers to the activity that facilitates physical movement of goods as well as individuals from one place to another.

2.2 Importance of Transport

Followings are the points of importance of transport.

a. Makes available raw materials to manufacturers or producers
b. Makes available goods to customers
c. Enhances standard of living
d. Helps during emergencies and natural calamities
e. Helps in creation of employment
f. Helps in labour mobility
g. Helps in bringing nations together

2.3 Modes of Transport

Generally transport is possible through land, air or water, which are refers as different modes of transport. The modes of transport can be broadly divided into three categories:

2.3.1 Land Transport:

This movement takes place on road, rail, rope or pipe. So land transport may further be divided into following categories.

a. Road Transport
Bullock carts, cycles, motorcycles, cars, truck, buses, etc. are different means of road transport. The means of road transport further divided into three types namely Man driven, motor driven and animal driven. Road transport is relatively cheaper for small distance with a flexibility of loading and unloading at any place. It is not economical for long distance transport.

b. Rail transport
Rail transport is quiet convenient for long distance for goods as well as people. It is faster than road transport but is not flexible as per user need.

c. Pipelines transport
Pipelines are used for transportation of water, petroleum and natural gas from one place to another. The cost of installation and maintenance requires large capital investment.

d. Ropeway transport
Ropeway refers to a mode of transport, which connects two places on the hills, or across a valley or river.

2.3.2 Water transport

Various means used for water transport are boats, steamers, launches, ships, etc. This mode of transport is relatively cheaper for bulky goods but not good for perishable goods. Cost and maintenance of routes are cheaper but for infrastructure it requires large investment and they are also affected by weather. Water transport done through ocean as well as river and canals.

2.3.3 Air transport

This is the fastest mode of transport and very useful for remote areas but it is pretty expensive in compare to another mode. It can also be affected by weather condition.

2.4 Norms and standard for transportation

2.4.1 Classification of Urban road (as per UDPFI)

The urban road can be classified as:

Arterial road: Road for intra-urban thorough traffic, with no frontage access, no standing vehicles and very little cross traffic and minimum roadways intersection spacing 500m.

Sub- Arterial Road: Road for intra-urban thorough traffic with frontage access but no standing vehicles having high cross traffic, high capacity intersection and minimum roadway intersection spacing 150 m.

Collector road: Street for collecting and distributing from and to local streets and also for providing access to arterial roads, having free fronted access but no parked vehicles and having heavy cross traffic and minimum roadway intersection spacing 150m.

Local Street: Street for access to residence, business or other abutting property, having necessary parking and pedestrian movement. Free access.

2.4.2 Design considerations of urban road (as per UDPFI)

Table 2-1 : Types of road

Type of road	**Space standards**	**Design speed**
Arterial	50-60 m	80 kph
Sub- Arterial	30-40 m	60 kph
Collector street	20-30 m	50 kph
Local street	10-20 m	30 kph

2.4.3 Carriageway width (as per UDPFI)

Table 2-2 : Carriageway width (as per UDPFI)

Sl. No.	Description	Width
1	Single lane without kerbs	3.5 m
2	2- lanes without kerbs	7.0 m
3	2- lanes with kerbs	7.5 m
4	3 lanes with/without kerbs	10.5 m / 11 m
5	4 lanes with/without kerbs	14 m
6	6 lanes with/without kerbs	21 m

The minimum width of footpath should be 1.5 m. The width should be increased by 1 m in business/shopping area to allow dead width.

2.4.4 Passenger Car Unit (PCU) (as per Indian road congress code)

1. Capacity of urban road is normally expressed in term of common unit, namely Passenger Car Unit (PCU). Each vehicle type is converted into equivalent PCU based on their relative interference values. Using multiple heuristic techniques, transportation engineers convert a mixed traffic stream into a hypothetical passenger-car stream. Recommended PCU factors for various types of vehicles on urban roads:

Table 2-3: Equivalent PCU factor (as per IRC)[15]

Equivalent PCU Factor		
Percentage composition of vehicle type in stream of traffic	5%	More than 10%
Fast vehicles		
Two wheeler, motorcycle or scooter	0.5	0.75
Passenger car pick up van	1.0	1.0
Auto rickshaw	1.2	2.0
Light commercial vehicle	1.4	2.0
Truck or bus	2.2	3.7
Agriculture Tractor	4.0	5.0
Slow vehicles		
Cycle	0.4	0.5
Cycle rickshaw	1.5	2.0
Tonga(Horse drawn vehicle)	1.5	2.0
Hand- cart	2.0	3.0

2.5 THEORIES TO EXPLAIN TRAFFIC[16]

The theory of traffic is called the four- stage theory- generation, distribution, modal-split, and assignment.

2.5.1 Trip generation

The theory says that trip generation by a traffic zone depends on- the land use and intensity of development in the zone, the social characteristics of the people performing the activities in the zone, the quality of transport system in the study area. Using this theory we can predict the trips produced by and attracted to every zone for trip purpose.

2.5.2 Trip Distribution

Trip distribution theories explain how the trips produces by one zone are distributed between attracting zones. The trips from one zone to another are called "interzonal transfers". There are two distribution theories in common use b transport planners- the gravity theory and the

[15] IRC code: 106-1990

[16] 'How city works written' by barrie Needham

opportunities theory. The gravity theory says that trips are distributed between destinations according to the attractions of the destinations and to the difficulty of travelling to the destinations. The opportunities theory says that the probability of a trip ending in the given zone can be predicted.

2.5.3 Modal split

The method of travel used for trip to reach destination from origion. Is it by public transport (bus or train) or by private transport (car).

The theory says that the choice depends on three things-

On the properties of the journey (eg- the purpose of the journey ; trip from home to school are more commonly by public transport)

On the properties of the traveller – Depends upon socio economic status.

On the properties of transport system – Travel time for any mode of transport. Comfort, expenses incurred in travelling.

2.5.4 Trip Assignment

This theory explain the preferred route in which trip be made. The 'minimum time path' from one zone to another can be calculated from knowledge of the travel speed on each link of the network, when no other traffic is using that link. Travel speed depends not only the physical properties of a link , but also on the amount of traffic using the link.

2.6 Transport scenario of India

Transportation of a city is like veins in the body and if blood movement slows down or stops in these veins, heart can choke down. Similarly, nowadays city is suffering from this choke down, due to unmanaged and inefficient transportation system. After the economic liberalisation lot of development has been seen in countries infrastructure, now various mode of transport are available in reach by air, water and land. Motor vehicle penetration is low by international standards, with only 13 million cars on the nation's roads[17]. Around 10% of Indian households own a motorcycle[18]. At the same time, the automobile industry in India is rapidly growing with an annual production of over 2.6 million vehicles[19], and vehicle volume is expected to rise greatly in the future. In the interim however, public transport still remains the primary mode of transport for most of the population, and India's public transport systems are among the most heavily used in the world.[20] India's rail network is the longest and fourth most heavily used system in the world, transporting over 6 billion passengers and over 350 million tons of freight annually. [21]

The demand for transport infrastructure and services has been rising by around 10% a year with the current infrastructure being unable to meet these growing demands. According to recent estimates by Goldman Sachs, India will need to spend US$1.7 trillion on infrastructure projects over the next decade to boost economic growth, of which US$500 billion is budgeted to be spent during the Eleventh Five-Year Plan.[22]From 1981 to 2001, population increased in six major metropolises by 1.9 times but motor vehicles increased by 7.75 times[23]

2.6.1 MODE OF SHORT RANGE TRANSPORT

- **Walking**
- **Palanquin**
- **Bullock carts and horse carriages**
- **Bicycles**
- **Hand-pulled rickshaw**
- **Cycle rickshaw**
- **Trams**
- **Public transport**
- **Taxi**
- **Auto Rickshaws**
- **Sub urban Rail**
- **Two-wheelers**
- **Automobiles**

[17] Randeep Ramesh (11 January 2008). "India gears up for mass motoring revolution with £1,260 car" (http://www.guardian.co.uk/world/2008/jan/11/india.carbonemissions) . *The Guardian* (London).

[18] "Bicycle Ownership in India" (http://www.bike-eu.com/news/1573/bicycle-ownership-in-india.html) .

[19] "World Motor Vehicle Production by Country: 2008-2009" (http://oica.net/category/production-statistics/)

[20] "India Transport Sector" (http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/EXTSARREGTOPTRANSPORT/0,,contentMDK:20703625~menuPK:868822~pagePK:34004173~piPK:34003707~theSitePK:579598,00.html) . World Bank.

[21] "Salient Features of Indian Railways" (http://web.archive.org/web/20070430005127/http://www.indianrail.gov.in/abir.html) . Indian Railways. Archived from the original (http://www.indianrail.gov.in/abir.html) on 30 April 2007.

[22] Shobana Chandra (17 September 2009). "U.S. Pension Funds May Invest in India Road Projects, Nath Says" (http://www.bloomberg.com/apps/news?pid=20601091&sid=aRSTVq.5UVt8) .

[23] National urban transport policy, India(http://www.urbanindia.nic.in/policies/TransportPolicy.pdf)

2.6.2 MODE OF LONG DISTANCE TRANSPORT

2.6.2.1 *Railway*

Indian Railways transport over 18 million passengers and more than 2 million tonnes of freight daily across one of the largest and busiest rail networks in the world.[24]

ORGANIZATIONS AT THE NATIONAL LEVEL

Table 2-4: Indian organization for railways

Organizations	Functions	Relevant acts
Railways		
Ministry of Railways	Planning and development of railway infrastructure.	Railway Act, 1989

2.6.2.2 *Road*

India has a network of National Highways connecting all the major cities and state capitals, forming the economic backbone of the country. As per 2009 estimates, the total road length in India is 3,320,410 km (2,063,210 mi); [25] making the Indian road network the third largest road network in the world. In India cities have been organically developed, so roads widths of cities are not so wide. Unplanned city leads to unplanned road network, so hierarchy of roads is absent here in cities.

ORGANIZATIONS AT THE NATIONAL LEVEL

Table 2-5: Indian organization for road transport

Organizations	Functions	Relevant acts
Roads		
Ministry of Road Transport and Highways	Development of road transport infrastructure and national highways, and overall regulation of freight road transport in the country	Motor Vehicles Act 1988 , Central Motor Vehicle Rules 1989
National Highway Authority of India Roads department, state government	Development and maintenance of national highways in the country Development and maintenance of state highways in the country	National Highways Act 1995 VII Schedule of the Indian Constitution (Article 246),List II (State List), Item 13

[24] *Indian Railways Year Book (2006-2007)* (http://www.indianrailways.gov.in/deptts/stateco/YearBook_06_07.htm) . Ministry of Railways, Government of India. 2007.

[25] Nandini Lakshman. "The Trouble With India: Crumbling roads, jammed airports, and power blackouts could hobble growth" (http://www.businessweek.com/magazine/content/07_12/b4026001.htm) .

2.6.2.3 *Water and sea transport*

Shipping Corporation of India owns and operates about 35% of Indian tonnage and operates in practically all areas of shipping business servicing both national and international trades.[26]

PORTS

The ports are the main centres of trade. In India about 95% of the foreign trade by quantity and 70% by value takes place through the ports. Mumbai Port & JNPT(Navi Mumbai) handles 70% of maritime trade in India[27].

WATERWAYS

India blessed with inland waterways in the form of rivers, canals, backwaters and creeks with a total navigable length is 14,500 kilometers.[28] The total cargo moved by inland waterways is just 0.15% of the total inland traffic in India, compared to the corresponding figures of 20% for Germany and 32% for Bangladesh.[29]

The following waterways have been declared as National Waterways:[30]

National Waterway 1 - Allahabad - Haldia stretch of the Ganges - Bhagirathi - Hooghly river system
National Waterway 2 - Saidiya - Dhubri stretch of the Brahmaputra river system National
National Waterway 3 - Kollam - Kottapuram stretch of the West Coast Canal
National Waterway 4 - Bhadrachalam - Rajahmundry and Wazirabad - Vijaywada stretch of the Krishna - Godavari river system.
National Waterway 5 - *Mangalgadi* - Paradeep and Talcher - *Dhamara* stretch of the Mahanadi Brahmani river.

[26] "Boeing Gets 68 Plane Order from Air-India" (http://www.foxnews.com/story/0,2933,181290,00.html) .

[27] "Discover Opportunity: Infrastructure in India" (http://www.ibef.org/download/Infra_Brochure_Spread.pdf) (PDF). India Brand Equity Foundation (IBEF), An initiative of the Ministry of Commerce & Industry,

[28] "High fives with $3bn Kingfisher order" (http://www.flightglobal.com/articles/2005/06/16/199660/highfives-with-3bn-kingfisher-order.html)

[29] "Mumbai airport's traffic control tower design bags award" (http://www.thaindian.com/newsportal/business/mumbai-airports-traffic-control-tower-design-bagsaward_100221024.html)

[30] "CIA — The World Factbook – India" (https://www.cia.gov/library/publications/the-worldfactbook/geos/in.html)

ORGANIZATIONS AT THE NATIONAL LEVEL

Table 2-6: Organization for Indian water transport

Organizations	Functions	Relevant acts
Ports, shipping and inland water transport		
Ministry of Shipping	Coordination of various activities related to ports, shipping and inland water transport	
National Shipping Board	Advisory body to the Ministry	Merchant Shipping Act,1958
Director General, Shipping	Implementation of various provisions of the Merchant Shipping Act,1958, of various international conventions relating to safety, and mandatory requirements under the International Maritime Organization	Merchant Shipping Act,1958
Port Trusts	Managing daily activities of the individual major ports in the country	Major Ports Trust Act,1963
Inland Water Way Authority of India	Regulation and development of national water ways for the purposes of shipping nd navigation	Inland Waterways Authority of India Act, 1985
Transport Department, state government	Regulation and development of water ways other than national waterways for the purposes of shipping and navigation	VII Schedule of the Indian Constitution (Article 246), List II (State List), Item 13
Tariff Authority for Major Ports	Independent regulation of tariff setting in Major Ports	Major Ports Trust Act,1963

2.6.2.4 *Aviation*

Airlines connect more than 80 cities across India and also operate overseas routes after the liberalisation of Indian aviation. There are 335 civilian airports, 20 international airports and 30 heliports in India.

Table 2-7: Indian Organization for aviation

Organizations	Functions	Relevant acts
Civil aviation		
Ministry of Civil Aviation	Planning and development of infrastructure for regulating air traffic. Responsible for Airport Authority of India, Director General of Air Corporation Act, 1953	Air Corporation Act, 1953
Airport Authority of India (AAI)	Infrastructure and facility for Air traffic is provided by AAI. It is also responsible for maintaining domestic and international airports and civil enclaves at defence airports in country.	Airport Authority of India Act, 1995
Director General of Civil Aviation/Bureau of Civil Aviation Security	Perform regulatory functions.	

2.6.2.5 *Pipelines*

Up to 2008, there were 20,000 km pipeline for crude oil, 268 km for petroleum and 1700 km for Natural gas.

2.7 Institutions involved with urban transport in India

Table 2-8: Institute involved in urban transport in India

Organizations	Functions	Relevant acts
Urban transport planning		
Ministry of Urban Development Land Development Authority, State government	Overall responsibility for urban transport policy and planning Land-use allocation and planning	State Development Acts
Roads		
Transport Department, State government	Licences and controls all road vehicles, inspection of vehicles, fixing motor vehicle tax rates	Motor Vehicles Act ,1988
Ministry of Surface Transport	Administer the Motor Vehicles Act and notify vehicle specifications as well as emission norms	Motor Vehicles Act ,1988

State Transport Undertaking, State government	Operation of bus services	Road Transport Corporations Act 1950
Public Works Department, State government	Construction and repair of state roads	VII Schedule of the Indian Constitution (Article 246), List II (State List), Item 13
Local municipality	Construction and repair of smaller roads, road signage, traffic lights, licencing and control of non-motorized vehicles, clearing of encroachments and land-use planning.	Constitution (Seventy-Fourth Amendment) Act, 1992
Police	Enforcement of traffic laws and prosecuting violators	State Police Acts
Railways		
Ministry of Railways	Own and operate urban rail transit systems wherever they exist	Railway Act, 1989

2.8 National Urban Transport Policy

National Urban Transport Policy is issued by Ministry of Urban development to emphasise primarily, the public transport and traffic management to increase the efficiency of road capacity. They efficiency can be also achieved by restrain measure for use of private vehicles, providing pedestrian friendly environment, public bicycle programme and providing different pricing option public transport for different class of society.

KEY POINTS FROM THE NATIONAL URBAN TRANSPORT POLICY [31]

- **Public vs personal transport – modal split**
- **In-street traffic and parking**
- **Public transport services**
- **Vehicular technologies**
- **Metro systems**
- **Coordination**

[31] Ministry of urban Development www.urbanindia.nic.in/policies/TransportPolicy.pdf

CASE STUDY

CHENNAI AUTORICKSHAW SECTOR

ITDP IMPROVED CYCLERICKSHAW

DELHI ADVANCE PARKING MANAGEMENT

MYSORE ITS ENABLED BUS SERVICE

CONGESTION CHARGE

JUDICIAL INTERVENTION

3 CASE STUDY

3.1 CHENNAI AUTORICKSHAW

A study conducted by Civitas Consultancies Pvt Ltd for City Connect Foundation Chennai (CCCF), December 2010

Chennai, the capital of the Indian state of Tamil Nadu, with a **population of 4.34 million** in the 2001 census.The **city has a share of 29.95 per cent of the total autorickshaws** in Tamil Nadu, which stood at 172,305 as on August 1, 2010. **Autorickshaw caters to roughly 20 families of Chennai city,** reinforcing the fact that they play a central role in the paratransit system of the city. Currently, there are 61,999 auto rickshaws plying in CMA region, of which 24,101 run on LPG, the remaining being run on petrol. They are the second largest movers of commuters in Chennai and help to move around 1.5 million commuters daily. **Autorickshaws produce lower emissions compared to private cars, due to their smaller engines. Their three-wheeled design makes them easily manoeuvrable in traffic, and reduces the probability of road accidents.**

Problems faced by Chennai Autorickshaw Sector

This sector has been plagued with these problems for the past few years. **In 1999, the government of Tamil Nadu banned the issue of permits for the new three-seater autos, leading to a huge demand-supply gap within the autorickshaw sector,** inflating the price of the permit several folds. **Although the cost of the permit is Rs 375, drivers are required to make payments in the range of Rs 70,000 to Rs 1,00,000.** As a result, the removal of the ban, as was done in April, was not of much consequence. The open permit system, which has been announced, will hopefully be more instrumental in turning the sector around.

In addition to the basic problems of livelihood of autorickshaw drivers, other **problems like availability of parking spaces, autorickshaw stands and LPG stations need to be dealt with.** They need to be provided formal training and knowledge about driving rules, so that they can save money spent on fines and penalties.

In September, 2008, in which orders were issued for conversion of existing petrol driven autorickshaws in Chennai city into LPG mode with subsidy of Rs 2,000. Cost of installation of an LPG conversion kit entailed an expenditure of Rs 11,500 for a locally assembled kit to Rs 21,000 for the factory assembled model, which highlighted the stark inadequacy of the subsidy being provided. Lack of availability of LPG dispensing stations, LPG fuel restricts the speed limit of an autorickshaw to a maximum of 45 kmph and it require high maintenance also.

Unlike petrol, LPG cannot be filled in a bottle due to its gaseous nature. Because the nature of the Chennai sector is skewed towards the rental system, wherein the drivers rent the autorickshaw for a particular duration of time and then return it to its owner, a by-product of this is that the drivers work on a shift basis. What follows is that whereas in case of a petrol autorickshaw the driver is able to empty out the extra petrol in a bottle after his shift is over, in the case of an LPG autorickshaw, the extra LPG cannot be emptied out, and is used up by the next driver. This puts the first driver at a financial disadvantage, which makes the fuel unattractive despite the cost savings involved in the larger picture.

3.2 ITDP's improved Rickshaw- technology in India[32]

The informal transportation sector in India is one of the most important economic activities in which the urban poverty is concentrated. In lot of cities cycle rickshaw were banned, which has not have much of consequence of urban transport but this step takes up valuable job from poor people and forces people to walk long distances or use polluting motorised vehicles.

A recent ITDP project is commenced to improvement of traditional Indian cycle Rickshaw For over 20 years, many of designs have been made but none of them are commercially accepted. The reason behind is the strategy adopted by the developer; they just concentrated on design not on the marketing. In 1997, ITDP and IIT put together a team of US and Indian human-powered vehicle designers working directly with the cycle rickshaw manufacturer as partners. they developed and commercially testes over 20 designs, one of which proved to be commercially accepted. **This design was 25 kg lighter, had twice speed, a strong integral frame, and much more comfortable passenger seat and permanent canopy. Operators of the new vehicle saw their incomes increases from 20% to 50%**.

Ultimately, the new design won commercial acceptance because ITDP spent over $25,000 into public relation, advertising and promotional events with the potential buyers and political leaders. The commercial viability was based on the fact that customers preferred the new designs because they were more comfortable, while the vehicle itself cost less to manufacture than the original vehicle.

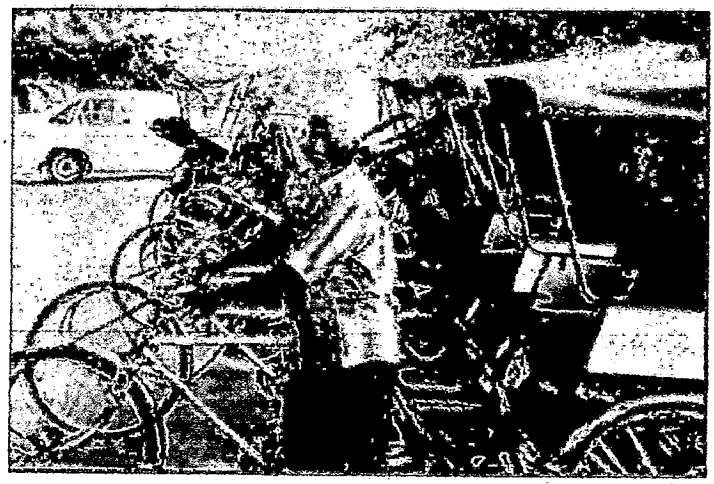


Figure 3-1: cycle rickshaw at Agra (source: NMT, Walterhook)

[32] "Training course Non motorized Transport" by 'Walter hook'
(http://www.thepep.org/ClearingHouse/docfiles/GTZ%20TrainingNonMotorisedTransportation.pdf)

3.3 Design of Advanced Parking Management System at Connaught Place[33]

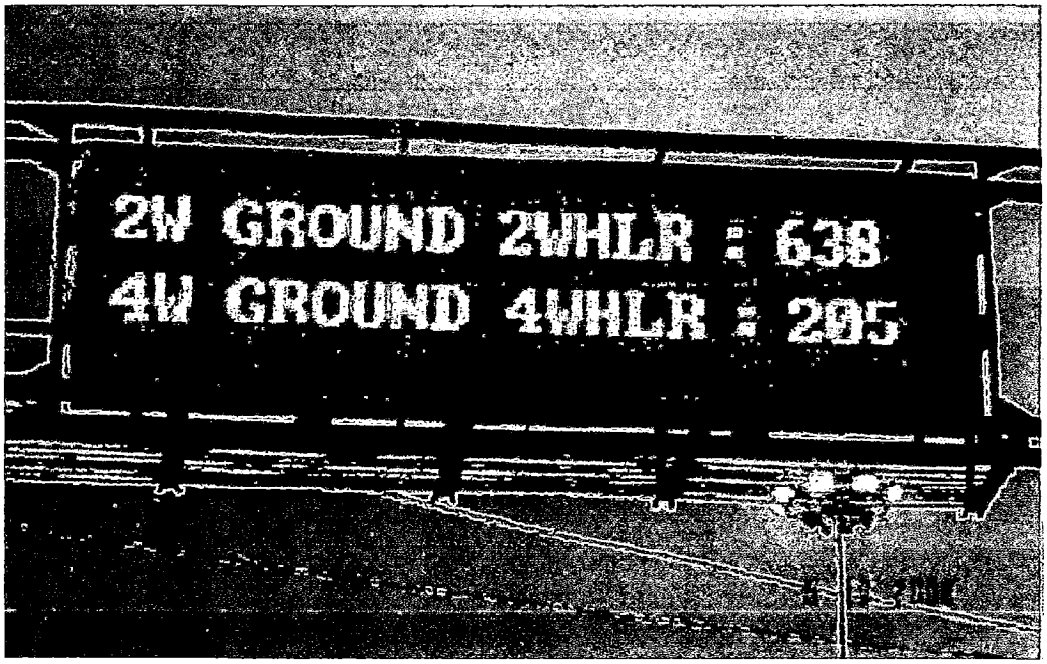


Figure 3-2: Lot VMS(variable message sign) (source: CRRI)

Figure 3-3 : Level VMS (source: CRRI)

[33] CRRI report (http://www.crridom.gov.in/technofest10.pdf)

Figure 3-4: before installation of APMS (advance Parking management system) (source: CRRI)

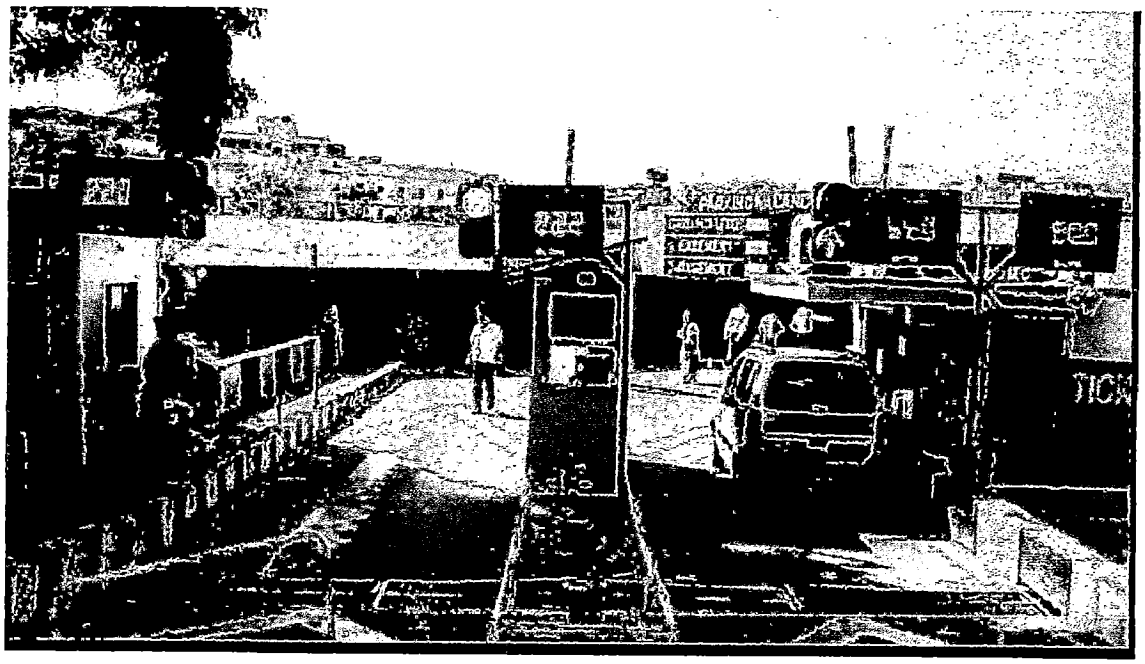


Figure 3-5: After installation of APMS (source: CRRI)

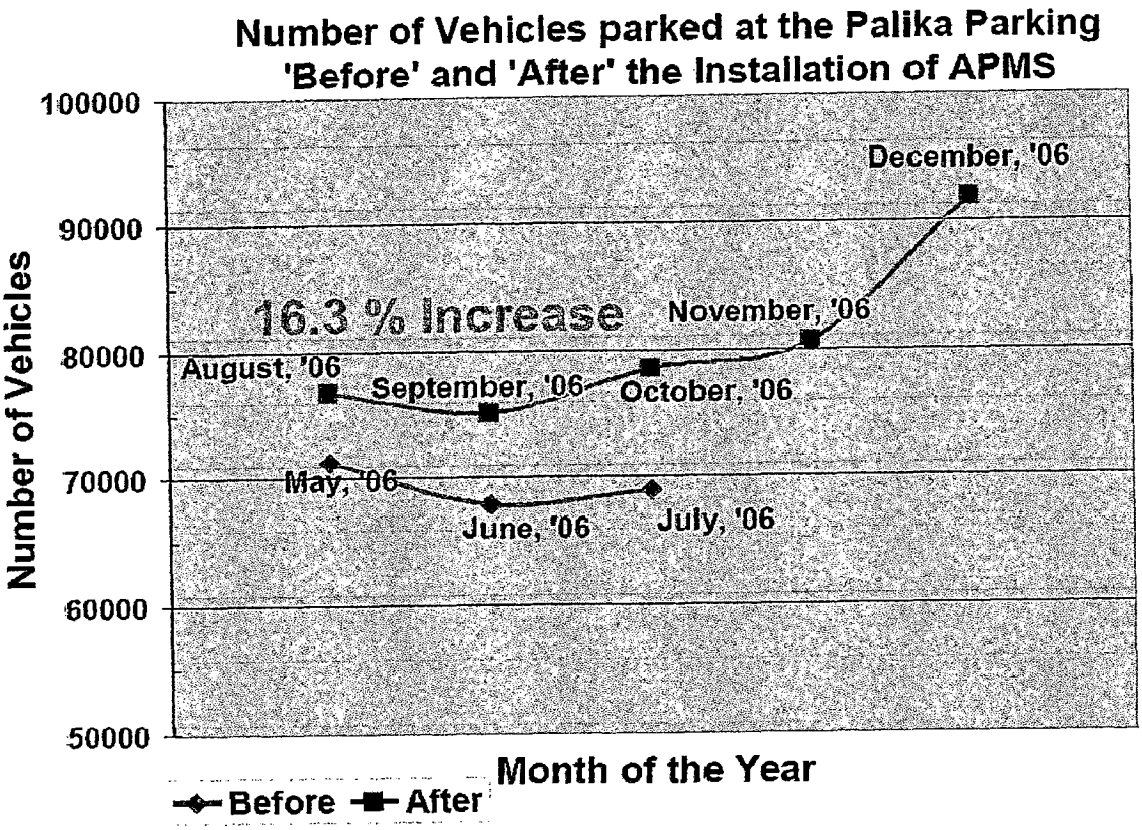


Figure 3-6 : Graph showing increment in parking after installation of APMS (source: CRRI)

3.4 Mysore ITS enabled Bus stop[34]

KSRTC (Karnataka State Road Transport Corporation) will soon be implementing the intelligent transport system (ITS) for Mysore city under GEF (Global Environment Fund) – SUTP (Sustainable Urban Transport Programme), the initiative by World Bank.

The project plan covers 500 buses, 80 bus stops, and 10 bus terminals. It will have several components including vehicle tracking system, central control station, passenger information management system, communication sub system, travel demand management,
incident and emergency management system, operational and maintenance specification and fleet management system.

Core technologies include geographical positioning system (GPS), electronic display systems, and information & communication technologies.

ITS in Mysore aims to bring about a synergetic transformation in the commuter experience, through a convergence of technologies. It has many benefits, including the reduction of commuter waiting time, fuel consumption, emissions, traffic congestion, and operational costs. It will increase the accessibility of the system, safety of users, and improve traffic efficiency, environmental quality, energy efficiency, and economic productivity.

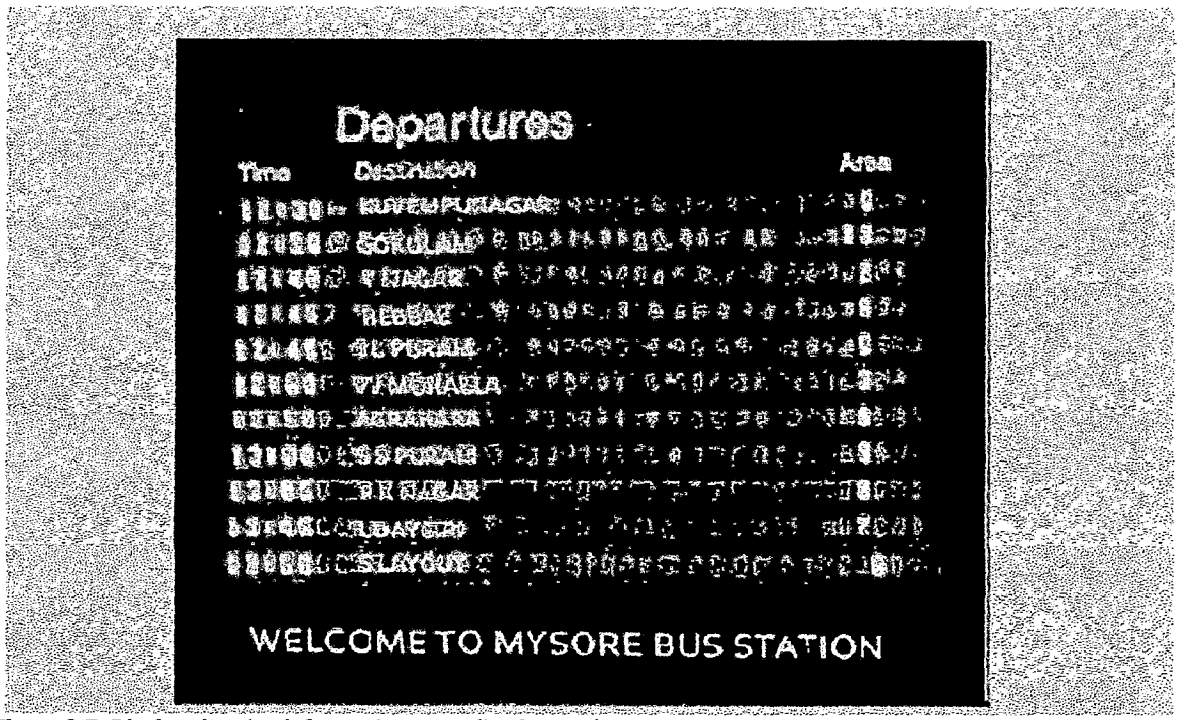


Figure 3-7: Display showing information regarding buses. (Source: www.masthmysore.com)

[34] (http://www.masthmysore.com/mysore-to-have-indias-first-intelligent-transport-system) dated 19th may 2010

3.5 Mumbai Waterways

Maharashtra State Road Development Corporation (MSRDC) has been appointed as nodal agency to develop the terminal facilities at different locations in Mumbai and navi Mumbai region, as well as operate Hovercraft and Catamaran service between them. It will have stops at Boravali, Marve, Versova, Juhu, Bandra, Nariman Point along West coast and along the east cost terminal will be Radio club, New Ferry Wharf which will be further connected to Navi Mumbai, Borivali, vashi etc. CIDCO had taken initiative for providing infrastructure facilities required for the operation of high-speed hovercraft, which is expected to start in June,2014.

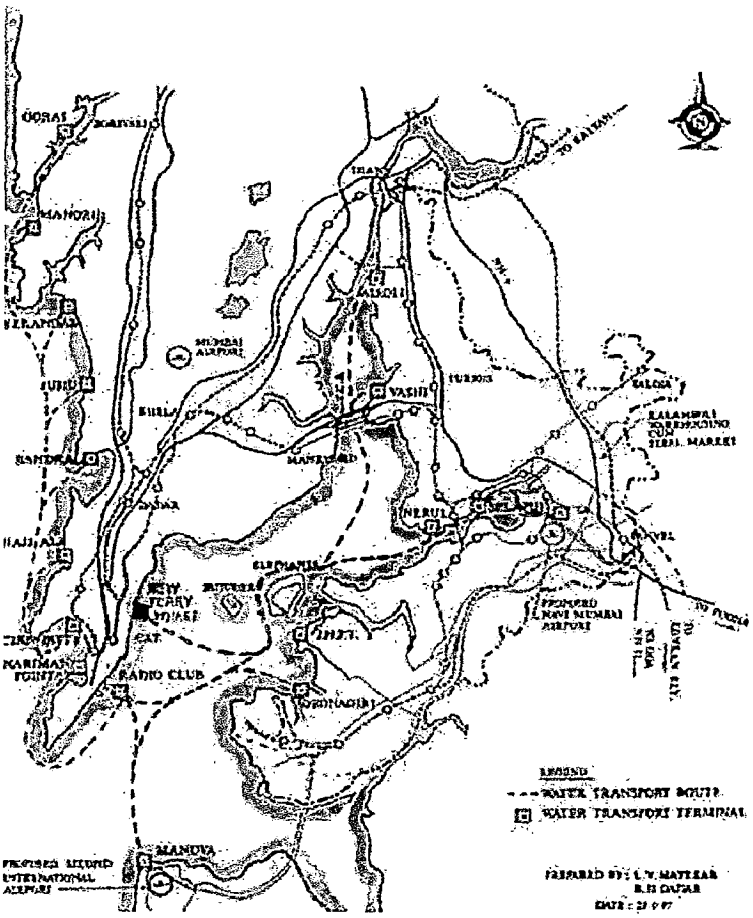


Figure 3-8: Water transport map of Mumbai(source: CIDCO)

Table 3-1: Landing Facilities at Navi Mumbai
(Source: CIDCO)

Sr. No.	Location	Type of Craft
1	Airoli	Hovercraft
2	Vashi	Hovercraft
3	Nerul	Hovercraft & Catamaran
4	Belapur	Hovercraft
5	Koppar	Hovercraft
6	JNPT	Hovercraft
7	Dronagiri	Hovercraft

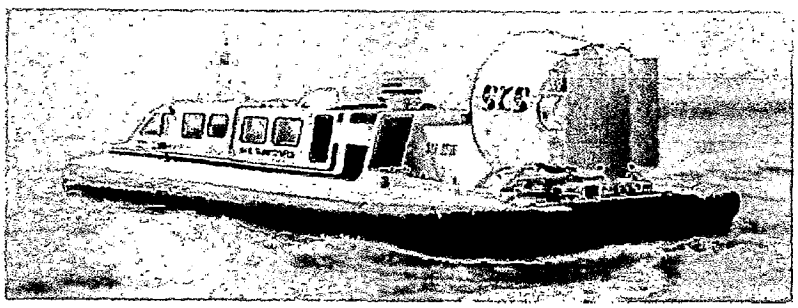


Figure 3-9: Hovercraft used for transportation (source: CIDCO)

3.6 Congestion Charges In Indian cities[35]

In an effort to curb heavy traffic on city roads, the government plans to implement **congestion charges on vehicles.** The first city to start imposing the congestion tax on its vehicles would be the capital of **India, New Delhi** with the cities of Pune, Bangalore and Mumbai to follow soon. About 11 lakh vehicles enter New Delhi from other states on a daily basis adding to the existing traffic of the 70 lakhs vehicles owned by the city and on an average, 1,300 vehicles are added to Delhi roads. The net result is traffic crawling at an average speed of 12 kms per hour, increased pollution and a high cost of travel in terms of both time and money.

The congestion charge is aimed to discourage people from using private means of travel and encourage them to use public transport to commute. Based on the congestion pricing concept which postulates that people should be penalised for the problems they contribute to, the new charges hope to curb the number of vehicles on the roads thereby reducing the emission of greenhouse gases and the impact on the environment.

3.7 Policy and Judicial Intervention [36]

3.7.1 Transport policy post -1992Economic liberalization

- Introduction of a number of small and fuel -efficient cars Improvement in vehicle emission norms
- Certificate of fitness for in use vehicles introduced – it is now mandatory for every motor vehicle to obtain a certificate of pollution under control (PUC) every three months.
- Vehicular emissions standards progressively tightened.
- A CNG pilot programme launched in 1993 in Delhi, Mumbai , Surat and Vadodara aimed at conversion of petrol vehicles into vehicles using CNG as a fuel.
- LPG is now permitted as a transport fuel.
- Use of battery operated vehicles/electric vehicles for IPT and buses on a trial basis.
- Pre-mixed fuel (petrol and lubricating oil) for use in two-stroke engines of two- and three-wheelers has been introduced at filling stations in Delhi to optimize the oil-fuel mix. Improvements in fuel quality
- Unleaded petrol introduced into the entire country
- Diesel sulphur content was reduced from 1% to 0.05% in the four metros and to 0.25% in the rest of the country

3.7.2 Judicial interventions in Delhi

- 1995 – Convert all Government of India vehicles into CNG.
- Restrict plying of commercial vehicles older than 15 years from 15 October 1998.
- No eight -year old bus to ply except on clean fuels by 31 March, 2000.
- Replacement of all pre-1990 taxis with new vehicles on CNG or other clean fuels (like CNG) by 31 March 2000.
- Gradual transformation of the entire city's bus fleet into a single mode on CNG by 30 September 2001.
- Financial incentives for the replacement of all post-1990 autos and taxis with new vehicles on clean fuels by 31 March 2001.
- Augment public transport by increasing the number of public buses to 10000 by the 1 April 2001.

[35] "Congestion tax to ease road mess, parking fee to go up" Hindustan time report dated Nov. 29, 2011 (http://www.hindustantimes.com/India-news/NewDelhi/Congestion-tax-to-ease-road-mess-parking-fee-to-go-up/Article1-775799.aspx)

[36] (http://envfor.nic.in/divisions/ic/wssd/doc2/ch5.pdf)

PROFILE OF STUDY AREA

HISTORICAL BACKGROUND

PRESENT TRANSPORT SCENARIO

MAJOR DEVELOPMENT IN THIS SECTOR

INITIATIVES BY THE STATE GOVERNMENT

INSTITUTE INVOLVED

4 PROFILE OF THE CITY

Patna is capital of Bihar state is a linear city of approximately 25 km long and 9-10 km wide and its corporation. "Patna Urban Agglomeration Area(PUAA)" comprises of the Patna Municipal Corporation(PMC), Patliputra Housing colony, Digha-Mainpura, Sabazpura, Khalipura, Badalpura, Phulwarisharif Nagar Palika Parishad,Danapur Nagarpalika Parishad, Danapur cantonment area, Khagaul Nagarpalika Parishadand Sadipra. The total population of PUAA is 20 lakhs (census 2011) and the total area of PUAA is 135.79 sq. km (CDP-2006). The projected population for the year 2021 is 28.01 lakhs (CDP-2006) and the area is 333.2 sq. km (Master Plan 2006).

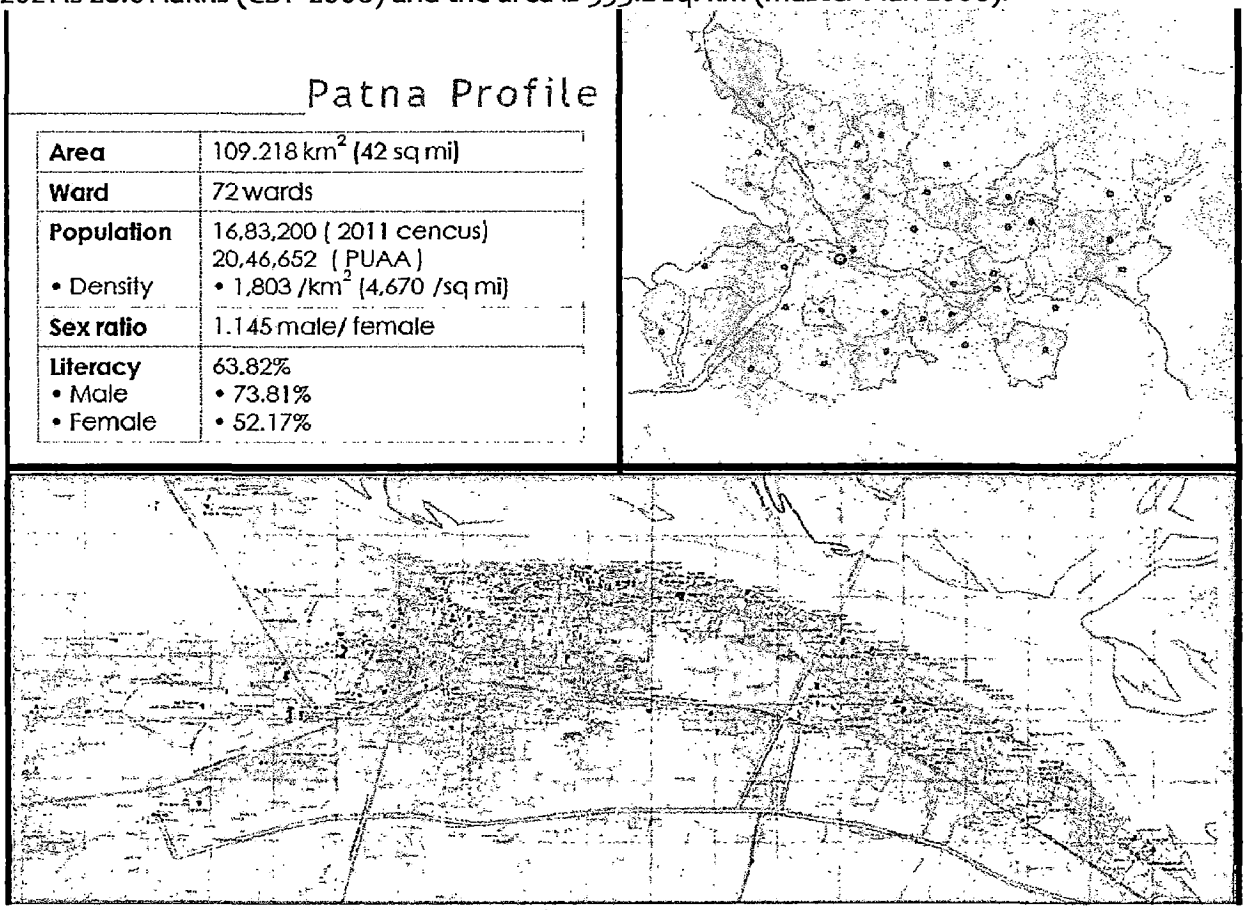


Figure 4-1 : Bihar and Patna map (source: Wikipedia)

The overall road network in the city is not adequate and connectivity of road network is poor due to hapahazard development of residential/commercial localities. City traffic has increased tremendously in last two decade and presently more than 2.9 lakhs vehicles are registered in Patna city. The major corridors are Ashok Rajpath, Patna Danapur road, Bailey road, Harding road, Old bye Pass Road, New bye pass road and Kankarbagh road. Due to absence of road hierarchy, sufficient width and poor traffic management, the whole transportation system chokes down.

The location of wholesale market within patna city and transport nagar on south in the outskirt, leads to heavy movement of the LCVs and other small good carriages for to and fro transportation of goods and commodities from wholesale area namely Kankarbagh, Ashok Rajpath and Meethapur.

The public transport is almost nonexistent in the city and most common mode of transport is auto rickshaw and cyclerickshaw. Patna was one of the first places in India to use horse-drawn trams for public transport but today situation is pathetic.

4.1 Historical Background

The original name of Patna was Patliputra or Patalipattan and its history start from 600 B.C. Ancient Pataliputra, was the capital of the Magadha Empire under the Haryanka, Nanda, Mauryan, Sunga, Gupta, Pala and Suri dynasties. The city has gone through number of changes in its name like Patligram, Kusumpur, Pushpapur, Patliputra and Azeemabad. The city had been ruled by some of the most famous rulers for 1000 years, like Ajatshatru, Chandragupta Maurya, Ashok, the Guptas, the Palas, Shershah Suri and Azimush-Shan, the grandson of the Mughal emperor Aurangzeb, who renamed it Azeemabad.

Patna being located on the confluence of four rivers provided unique conditions for trade to different parts of the country. It became a major exchange centre that controlled trade as far as Nepal via Gandak and East- west trade links via Ganga. Before 17th century trade and commerce in Patna was largely agro based. It provided rich hinterland for opium, saltpeter, indigo, salt, textile, sugar, carpet, betel nut and pepper. In 1765 the English East India Company establishes its monopoly over trade and cotton production in Patna(sinha,1989)[37].It led to 'godowns' as a typology. But this led to a gradual decline of Indian skills, Labor and Craftsmanship. During the second half of the 18th century saltpeter became the most important commodity of trade which was sent to Calcutta in boats. Towards the beginning of 19th century Patna traded in rice, Cotton, Tobacco etc. Thus the city happened to be an important centre of trade. It would be important. City grows and completes its life span and then tries to renew itself under different circumstance. Changes in the built form can be natural and hence can be seen growing and maturing over a period of time. Yet sometimes cities are not fortunate enough to carry on its glory throughout its evolution. It remains in the hands of its physical setting to attract, thrive and decay over a period of time.

The city of Patna has seen a series of such administrative decisions as well as natural circumstance e.g. floods which has led to several layers of improvisation in itself to answer the need of the time. What is important to see here is that the built form is changing over a period of time. New buildings are demolished and built over the same plot. Hence this city would be difficult to be seen from art factual point of view but rather like an organism.

The road of the core city has never been widened except during the governorship of Jahangir Quli Khan and more or less represents the earlier width. New streets have been added to the existing urban fabric; sometimes adding to the quality of the older ones yet at times overtly narrow lanes allowing one person at a time. After the decline of the trade, the city lost its charm and started decaying. As one moved across the parts of the city till the colonial period , one could barely differentiate between a stretch of 10 kmts of development.

Bishop Haber an English traveller came to Patna as a guest to opium trader Sir Charles. He attempted to beautify the city. The present day *Gandhi Maidan* was initially a race course. The then Commissioner of Patna Sir Metcalf finally made it to a *maidan*.

[37] Sinha Ranjan, (1989), *Aspects of Society and Economy of Bihar 1765-1856*, Janaki Prakashan , Patna

4.1.1 Evolution of City through ages

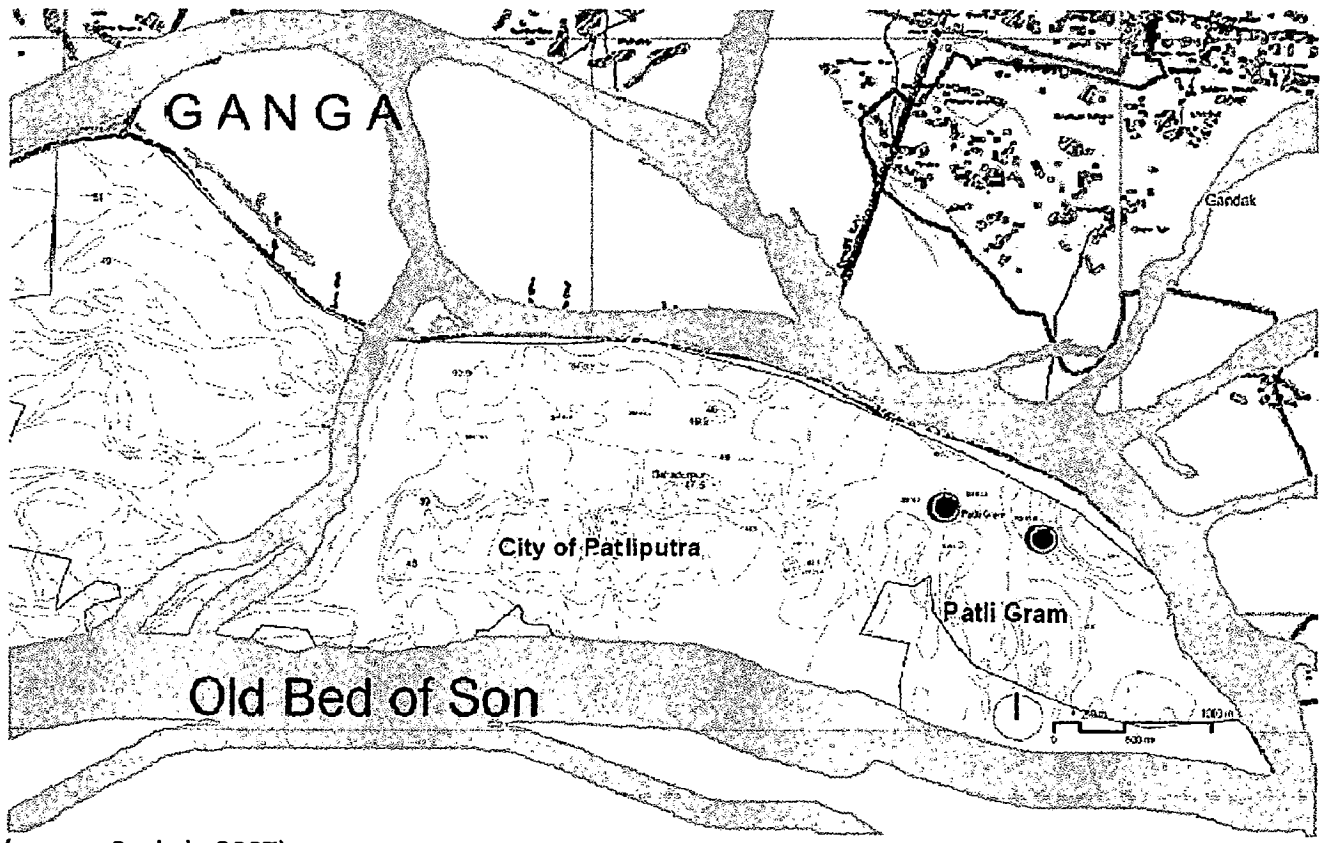
Legend ascribes the origin of Patna to a mythological King Putraka who created Patna by magic for his queen Patali, literally "trumpet flower", which gives it its ancient name Pataligrama. It is said that in honour of the queen's first-born, the city was named Pataliputra. *Gram* is Sanskrit for village and *Putra* means son. Legend also says that the Emerald Buddha was created in Patna (then Pataliputra) by Nagasena in 43 BC.

The city is referred to in ancient Indian texts such as the Vedas, the Puranas, the Ramayana and the Mahabharata. The first references to the ancient region of Patna are found about 2,500 years ago in Jain and Buddhist scriptures.

Patna became significant around the year 490 BCE when Ajatashatru, the king of Magadha, wanted to shift his capital from the hilly Rajagaha to a more strategically located place to combat the Licchavis of Vaishali. He chose the site on the bank of the Ganga and fortified the area.

Patna is located on the south bank of the Ganga River. A characteristic of the geography of Patna is its confluence of rivers. The Ganga River is joined by four other rivers: Ghaghara, Gandak, Punpun and Sone. Patna is unique in having four large rivers in its vicinity.

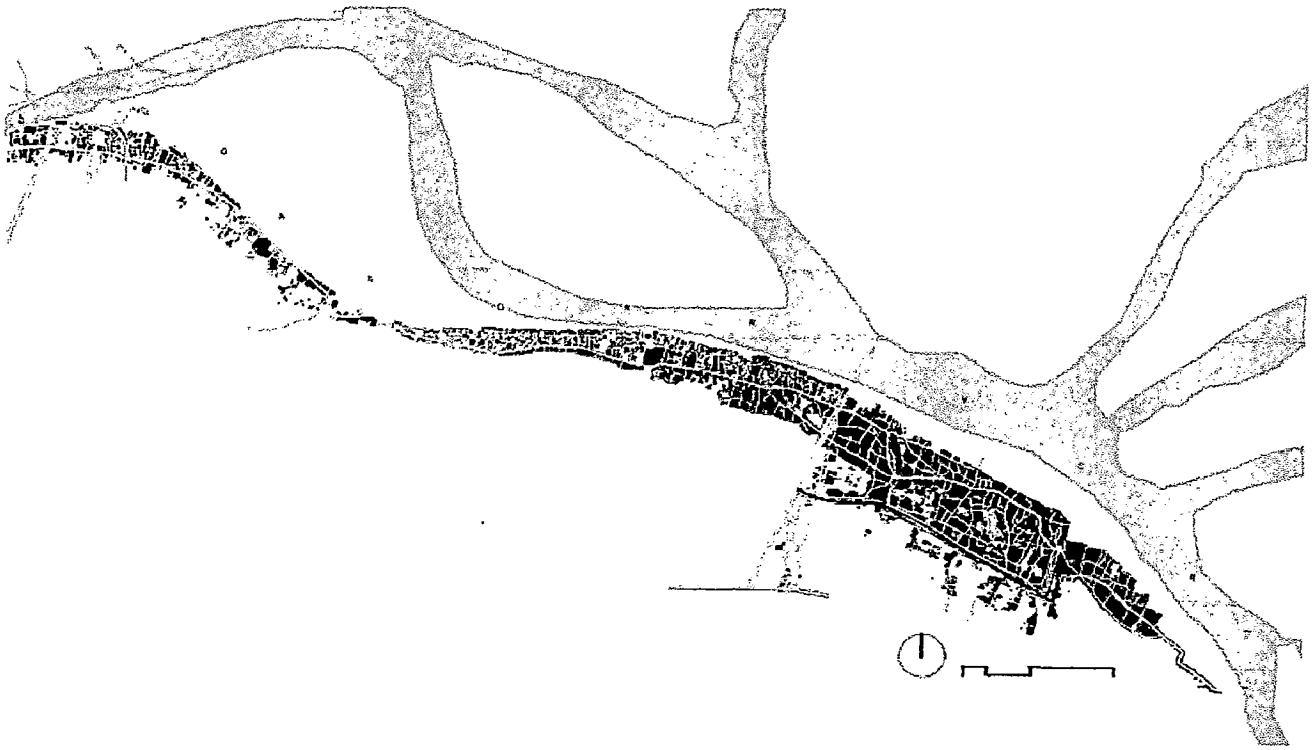
4.1.1.1 Patliputra under Ajatshatru (5th century B.C.)



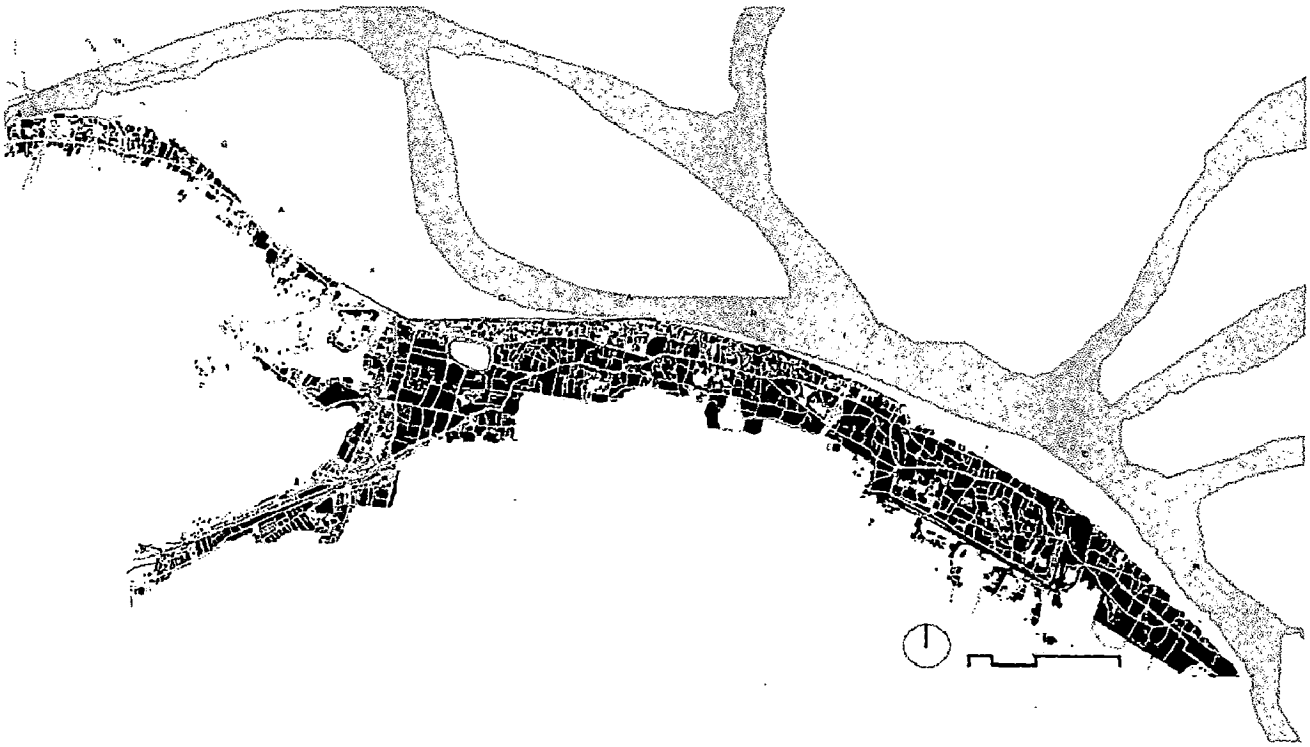
(source: Sankalp,2007)

4.1.1.2 Conjectural Sketch of the city under Sher Shah Suri (1545)

4.1.1.3 Patna as Azimabad (1705)

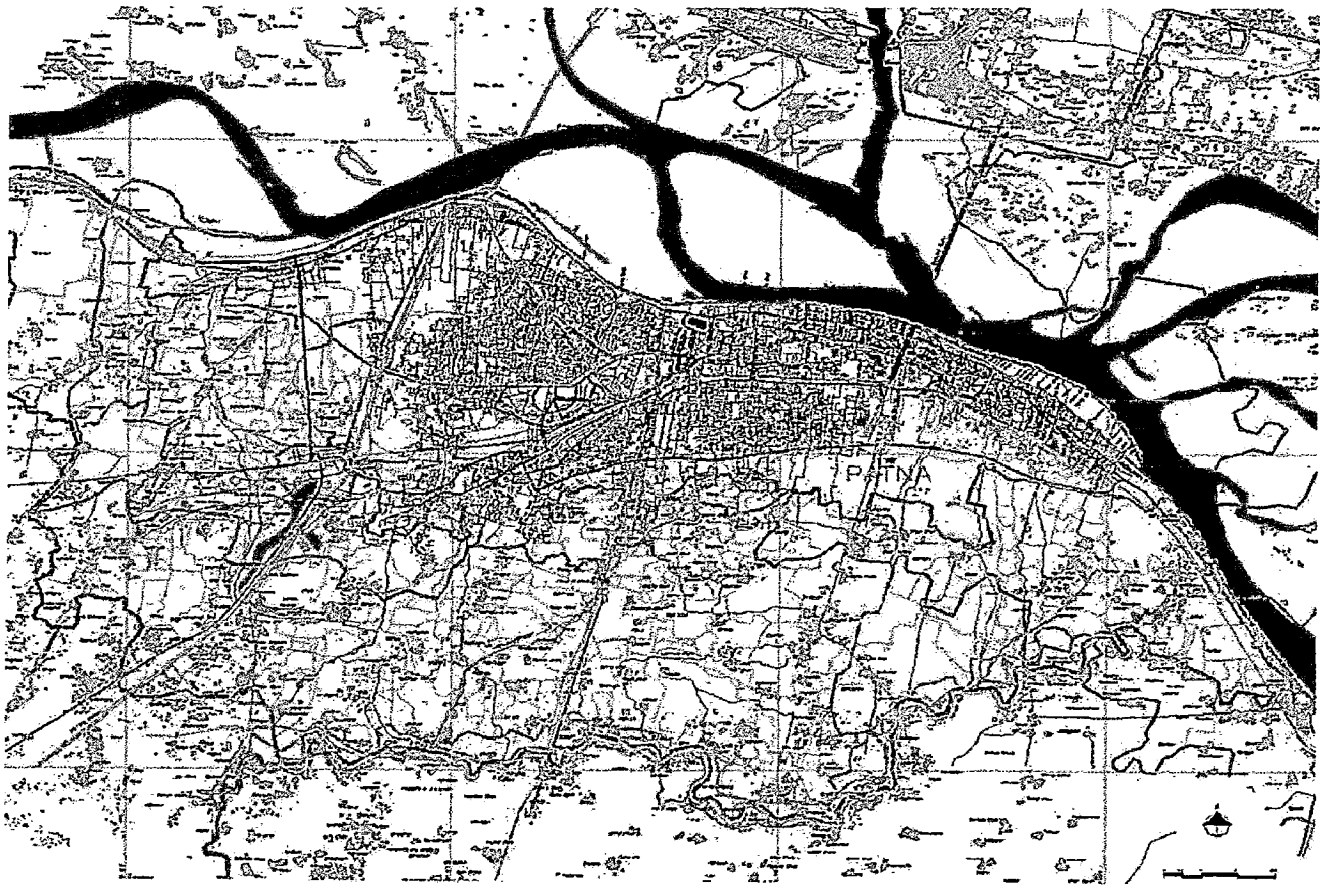


4.1.1.4 Colonial Patna, 1811



4.1.1.5 Patna, 1960

4.1.1.6 Patna as today



Source: Master plan, 2006

4.1.2 Effect on Urban Structure and its Characteristics

There are two important phases of this part of the city. The city being a trading town and a province during medieval period and the city after the decline of trade during colonial period till what we see today. The sense of market as an institution still remains today. The sense of placing market along the primary route and placement of major institution like the church, mosque or temple itself shows two major institutions sharing the power of each and their mutual dependence, which attract lots of trips.

4.1.2.1 Urban Roads

The major roads were laid during the time of Sher Shah Suri and Mughals after which a general level of understanding led to the development of tertiary streets as community and caste played a major role. The association and function defined the road width. The hierarchy of road became the outcome of same. Therefore after laying down of the major network, the parts were allowed to develop on their own based on residential, commercial or religious intentions. Such a system worked for the earlier society but today with over densification urban life at many section remains in the state of decay. One of those roads is Ashok Rajpath.

Figure 4-2 : what city takes from her history

Ashok Rajpath is one of the most important and congested road which connect old city to new developed area. From old city area to Mehndru , a 10 km stretch is of around 6 m width.
These roads were designed for horse cart, horses, and bullock cart during those empires but now the same road is shared by car, motorcycle, cycle, motorbike, tractor, auto rickshaw, buses and pedestrians.

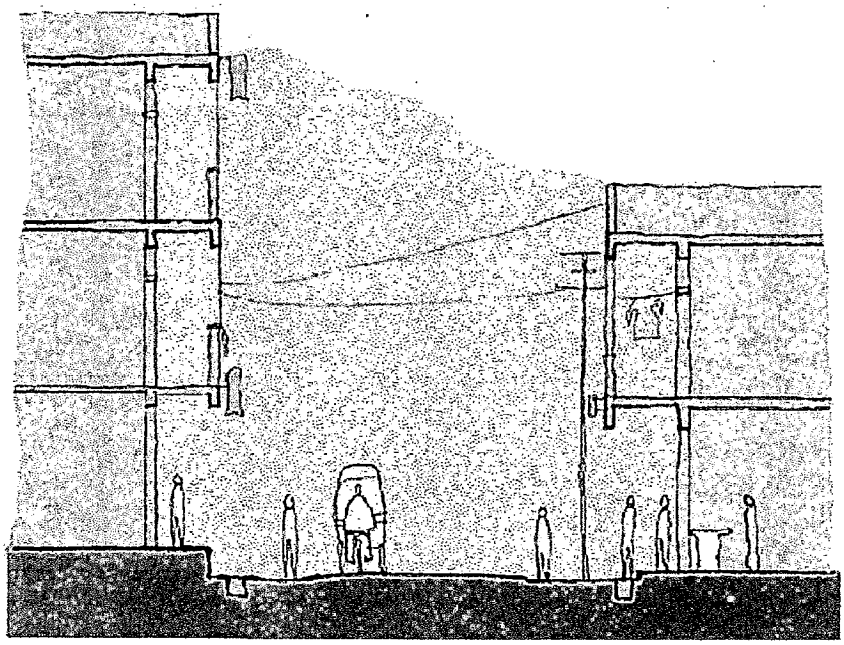


Figure 4-3 : Typical section old area of Ashok Rajpath(source: Sankalp,2007)

4.1.2.2 Urban Structure

Development along this stretch is mainly residential with commercial on ground floor. The method of control of the city is based on the mutual negotiations of its inhabitants. Majority of the houses have two faces with hundred percent plot coverage. Average depth of plot varies from 10 to 20 m and avg. width of plot is around 3-5 m and most of the houses are G+2.The local bylaws allows a front setback of 1.5 to 1.8 and rear setback of 1.5 meters. But the new guidelines are hardly followed and the buildings are built right on the edge in many cases, which force pedestrian to move on the same right of way and their approach enter to commercial area is directly through main road itself.

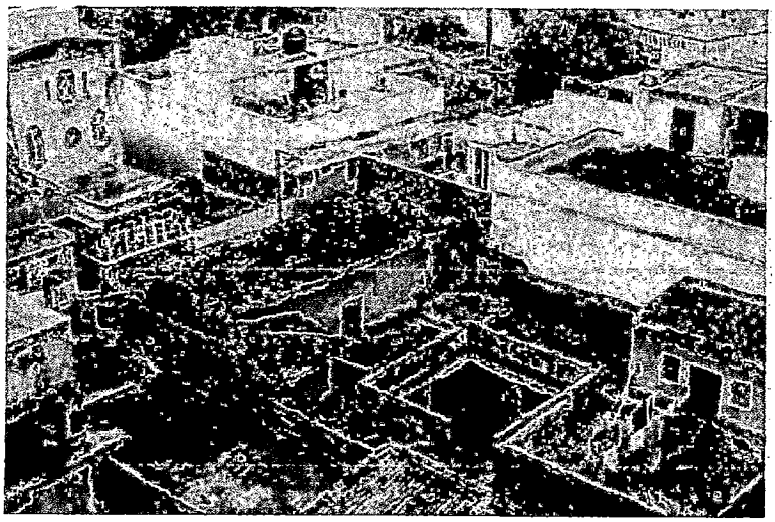


Figure 4-4: Highly densified Residential areas (Source: Author)

The development around this road is highly densified residential area, which has access through 1-4 m width pathway. This type of pathway connects to Ashok Rajpath at every 15-20 m, which led to travel demand at every 15-20 m.

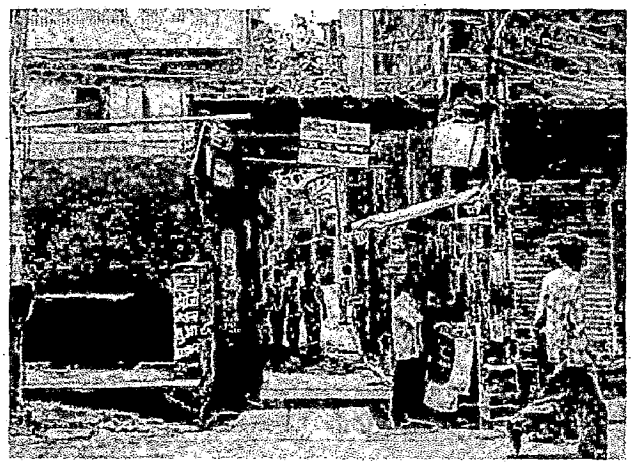


Figure 4-5: Narrow pathway connecting to Ashok Rajpath (Source: Author)

4.2 PRESENT TRANSPORT SCENARIO

4.2.1 Present Land use and growth

City has grown in natural form linearly along east west. The boundary at west side is Danapur , S-W side is Khagul and eastern side is old city. City has grown organically along the river Ganges with predominate land use as residential. 90 percent residential areas are unplanned. Planned residential areas are shown in yellow. Commercial areas are along arterial and sub arterial roads. Industrial activities are distributed mostly in the old city area, and a on the Gaya road, while a few are located on along the railway track to Danapur.

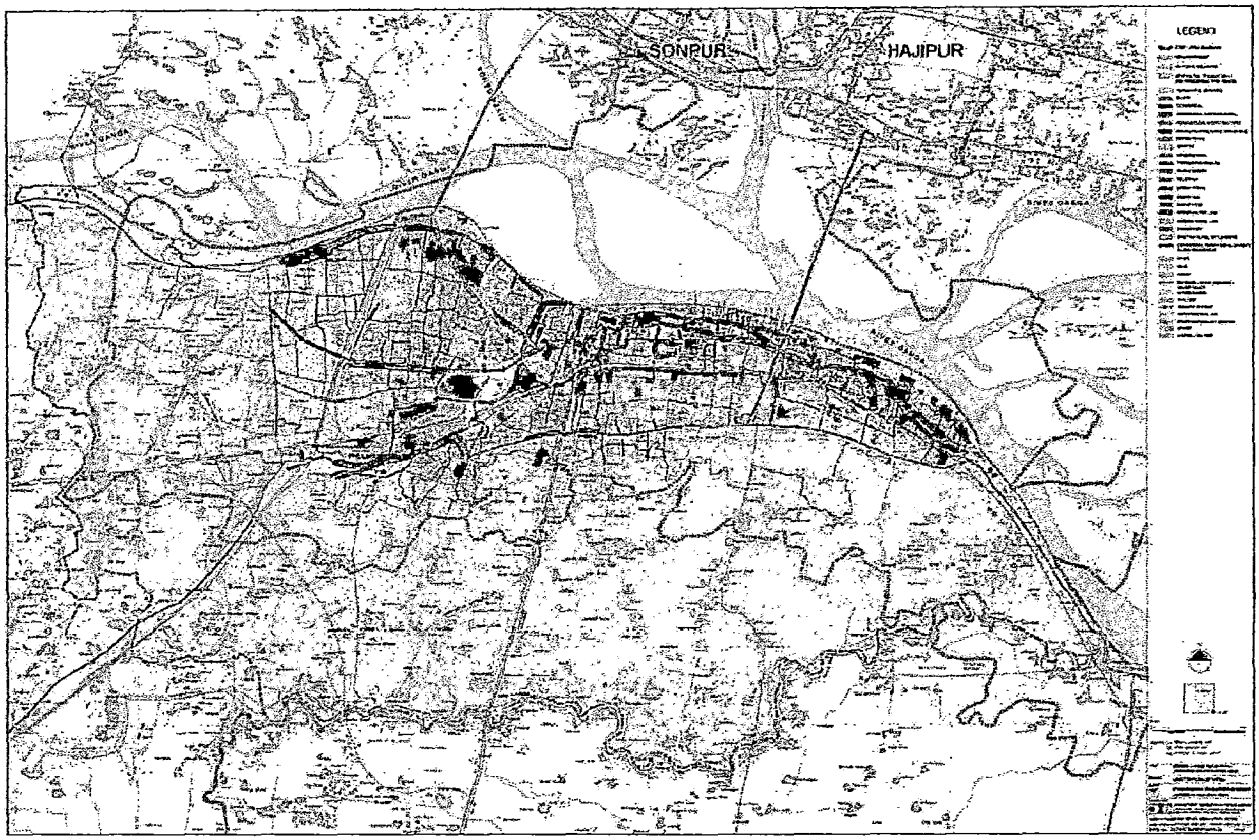


Figure 4-6 : Present land use map of Patna (source Master Plan, 2006)

Table 4-1 : Land use Break up (source Master Plan, 2006)

Sl. No.	Land Use	Area (in Ha)	Percentage
1	Residential	8722	59.82
2	Commercial	720	4.93
3	Public- Semi Public	691	4.79
4	Industrial	238	1.63
5	Recreational	224	1.53
6	Transportation	1110	7.61
7	Water Bodies	301	2.06
8	Agriculture	2439	16.72
9	Vacant land	134	0.91
10	Total	14579	100

It is clearly indicated above that 7.6 percent of land of total area is used for transportation, whereas standard land use breakup for transportation is 21%. Urban road in land use break-up is just 5.16.

4.2.2 Population Density

The density ranges from 45 persons/ ha to 650 persons/ ha. This density map clearly shows the highly dense old city area to east; the area newly developed between the new and old bypass in the south; the area on both sides around the railway station. This figure also indicate that Ashok Rajpath is running through most densely populated area of Patna.

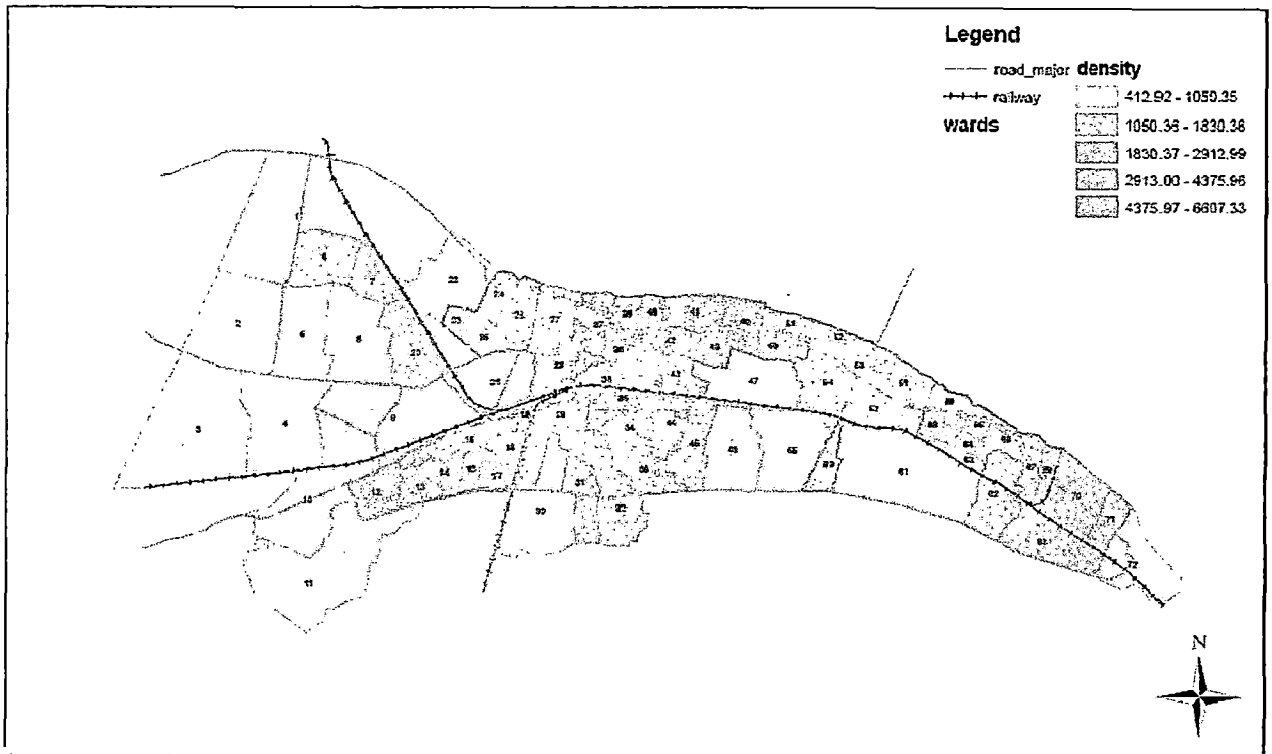


Figure 4-7: Population density map (source Master Plan, 2006)

4.2.3 Road Network: Pattern, Length and Distribution

The existing circulation pattern of Patna is of linear type. The most important factor determining the form of road network system is the presence of river Ganga in the North and low lying area of river Punpun in the south. The liner type of urbanization has given rise to dominant East-West orientation of roads.

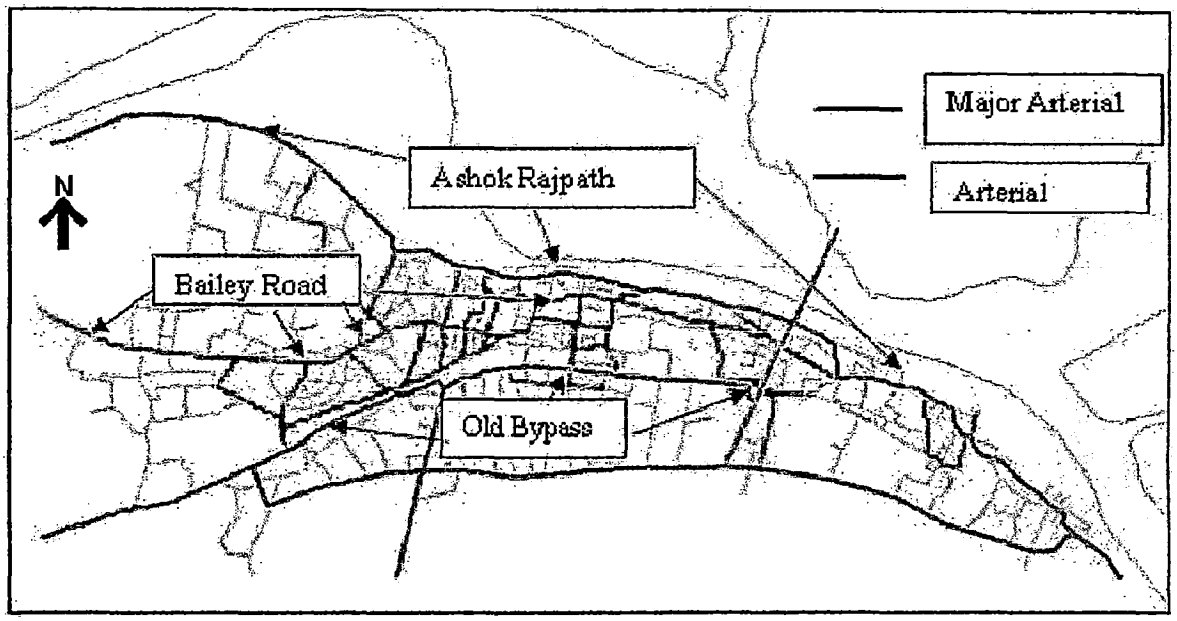


Figure 4-8: Major roads of Patna (source Master Plan, 2006)

The following four corridors are observed as per city mobility plan 2009, to be the most important arterial in the Patna Urban Agglomeration Area:

i. Bailey Road
ii. Ashok Rajpath
iii. Old Bypass road
iv. Railway station to Gandhi Maidan through Dakbunglow chowk.

Among the Right of Way (ROW) of major roads, the Bailey road and the Old Bypass road has ROW greater than 30 meters barring few stretches. While the other important roads like the Ashok Rajpath, Dakbunglaw road, Fraser road have Right of Way varying from 10 meters to 30 meters.
Among the ROW of major roads, the Bailey road and the Old Bypass road has ROW greater than 30 meters barring a few stretches. While the other important roads like the Ashok Rajpath, Dak bungalow road, Fraser road have Right of Way varying from 10 meters to 30 meters (Source Master Plan 2021).

Table 4-2 : carriageway width in Patna (CMP 2009)

Sl. No.	Road Width(m)	Length (km)	Percentage
1	Less than 5	103.7	36%
2	5-7.5	107.5	37%
3	7.5-10	14.9	5%
4	10-14	20.8	7%
5	14-18	29.9	10%
6	More than 18	11.3	4%
7	Total	290	

Most of the roads in the CBD area and the Ashok Rajpath are congested (v/c >1) and constrained widths varying from 10-15m. The following table gives the lengths of the major corridors identified.

4.2.4 Regional Road Network

Patna city has historically been the longest inhabited capital. Being administrative head-quarters for a long time, it is well connected to other cities within Bihar and also adjoining states. The city is connected by road, rail and air and also to some extent by waterways.

This area is predominantly the Patna Regional Development Area (PRDA) which includes urban outgrowths and nearby settlements like:

1. Khagaul
2. Phulwari Sharif
3. Danapur
4. Hajipur
5. Sonpur

The following figure gives the map of the city along with the settlements in its immediate vicinity.

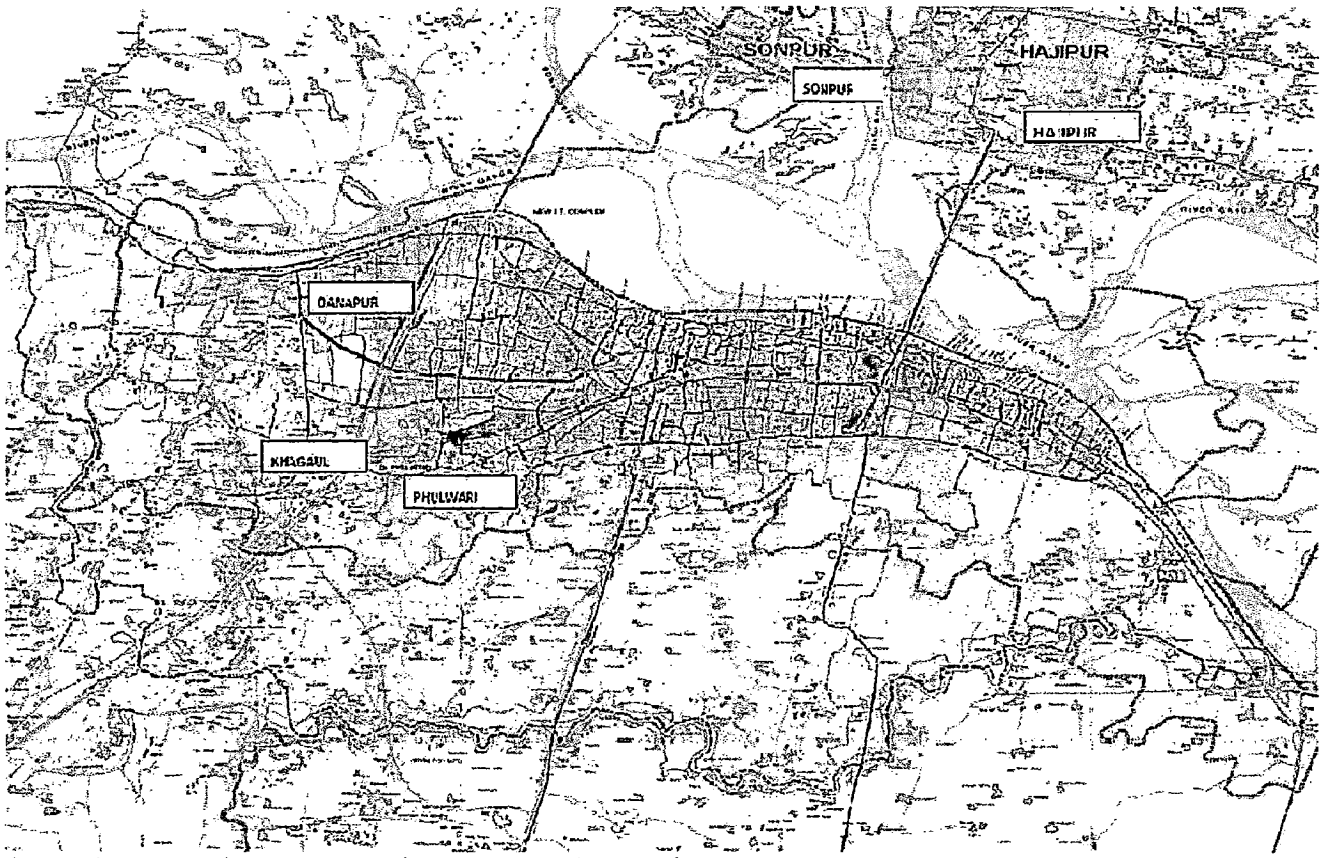


Figure 4-9 : Patna agglomeration area (source Master Plan, 2006)

4.2.5 Vehicular Composition

As per city mobility plan 2009, Patna registered a 67 fold increase in number of vehicles in the previous two decades (1981- 2001) i.e. till the last census. In 1981 the number of registered motor vehicles were 4384 and it increased to 2, 94,164 in 2001. From 1996 to 2009, vehicular population in Patna grew at an average annual rate of around 5%, whereas for period from 1981 to 2001, annual growth rate was 23%. In the registered vehicles the total number of cars and two wheelers adds up to around 73-81%. Along with these vehicles presence of a high volume of cycle rickshaws as evident in modal split of the primary surveys.

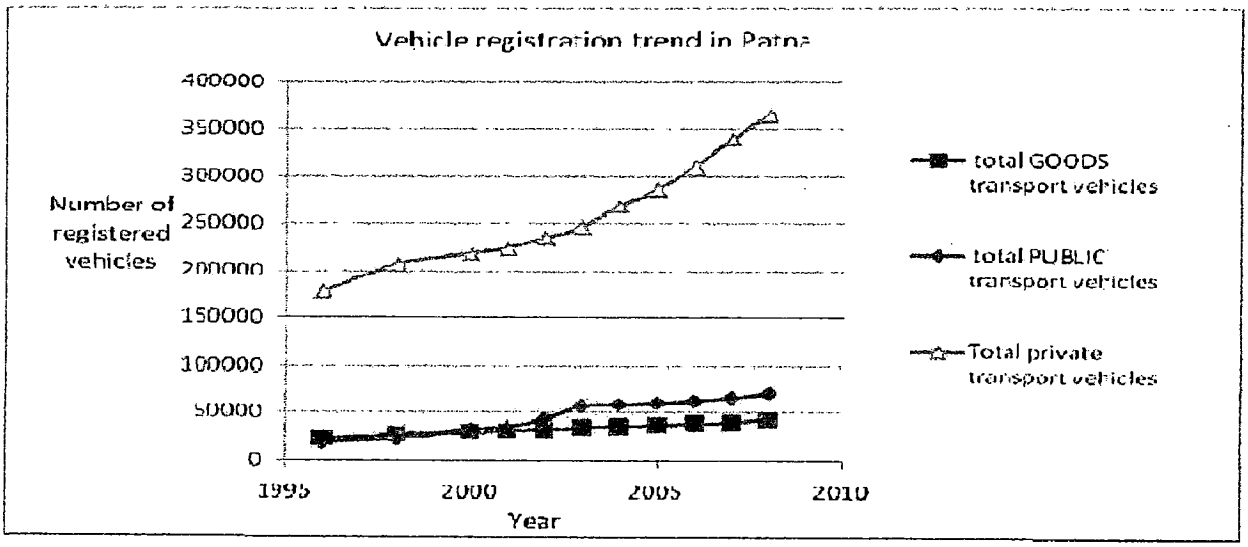


Figure 4-10: Registration Data of Vehicles from 1996-2009 (source: cmp,2009)

The number of external to internal (E-I) and internal to internal (I-I) trips inside the PMC and its outgrowths, during the morning peak hour is 2.1 lakhs including walk trip. Out of these 1.8 lakh trips are I-I trips. Out of a total of I-I trips around 27% are walk trips and 37% are NMV trips. The share of public transport trips including IPT is 18%. The volume/ capacity (v/c) ratio of all the major arterials and arterials is more than 1. In Old Bypass the v/c ratio is more than 2 in a few stretches. **The average trip length of all the modes is 5.83 km.**

Table 4-3 : Vehicles registration data of vehicles in Patna (CMP, 2009)

Year	PUBLIC transport						GOODS transport					PRIVATE transport				Total Vehicles
	Bus	Minibus	Jeep	Taxi	Auto-Rickshaw	Total	Truck	Other Goods vehicle	Tractor	Trailer	Total	Car	2-w	Others	Total	
1996	2410	897	1051	2341	11782	18481	11541	1275	5403	4691	22910	20818	156982	715	178515	219906
1998	2668	1045	2203	2468	13979	22363	13373	1606	6419	5595	26993	25548	180892	495	206935	256291
2000	2730	1055	11777	2854	14466	32882	14426	2065	6862	5968	29321	28670	189440	475	218585	280788
2001	2938	1077	12116	2945	15540	34616	14733	2296	7235	6213	30477	31290	192971	490	224751	289844
2002	3057	1117	19761	3083	16426	43444	15470	2583	7669	6573	32295	33950	201076	454	235480	311219
2003	3180	1158	32231	3228	17362	57159	16243	2906	8129	6955	34233	36835	209521	421	246777	338170
2004	3220	1159	32852	3331	16327	58889	17020	3269	8493	6970	35752	39782	228517	390	268690	363331
2005	3231	1171	33179	3425	19436	60442	17473	3678	8682	7113	36946	41842	244142	362	286346	383734
2006	3361	1248	34000	3521	20705	62835	18149	4137	8892	7166	38344	46724	263630	335	310690	411869
2007	3400	1440	35096	3843	22745	66524	18810	4655	9209	7229	39903	52840	286151	311	339302	445729
2008	3411	1459	37277	4595	24276	71018	19979	5891	9735	7412	43017	53403	311183	288	364875	478910

All motorized forms of public transport constitute to 12% of the total motorized form of traffic in the city. In addition to the motorized public transport, there exist 35000 registered cycle rickshaws. Another estimate puts the count of cycle rickshaws between 1.2 to 2 lakhs (Source: Master Plan). Within the modes of public transport, auto rickshaw has increased at the rate of 6% from 1996 to 2001. Buses and mini buses forms 1.4% of the total traffic.

4.2.6 Accessibility to arterial road

Accessibility levels are usually expressed in order to develop MRTS, BRTS corridors. A service or a corridor is considered highly accessible when it is within a walking distance of 10 min assuming a walking speed usually taken to be 5-6 km/hr. At this speed a 10 min distance would approximate to 1 km. In the following figure, as per city mobility plan 2009, major roads in Patna are under influence of 1 km on both sides of these corridors. Patna being a linear city and three corridors, namely Ashok Rajpath, Old and New bypass, already spreading along the length of the city, a 1 km influence zone covers almost whole of the city. The present land use and spatial location of corridors indicate high levels of accessibility to major arterial roads, but these arterial road is not sufficient for traffic load of these population.

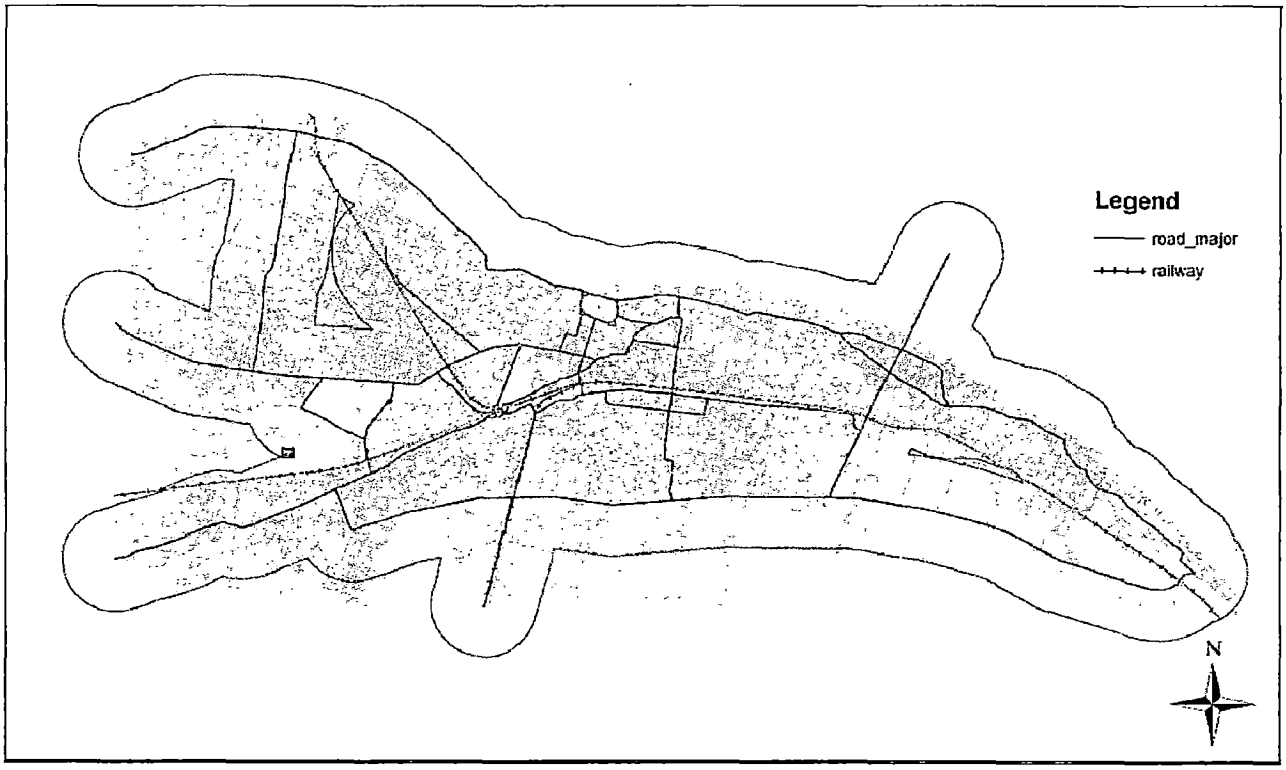


Figure 4-11 : Accessibility to major roads (source-cmp,2009)

4.2.7 Bus routes

At present there is an existing city bus service, which is operational in 12 routes of the Patna Urban Agglomeration region. This service is provided by a contract between the local government and private bus operators. These services are however not well organized in terms of scheduling and reliability. The present bus service is insufficient. In the mini buses the average occupancy indifferent routes varied from 19.2 to 46.2 as per seating capacity of 15-20. With collaboration with Eden transport private limited, a kolkota based company, RCD, patna has started city bus services on PPP basis from June 2011. Up to February 2012, 78 ERP and GPS enabled buses run on roads of Patna. This GPS enabled buses are monitored through bus traffic centre of Eden transport private ltd. Eden has also started numbers of Normal and AC buses for different city of Bihar. Eden group runs bigger buses of capacity 45 passenger.

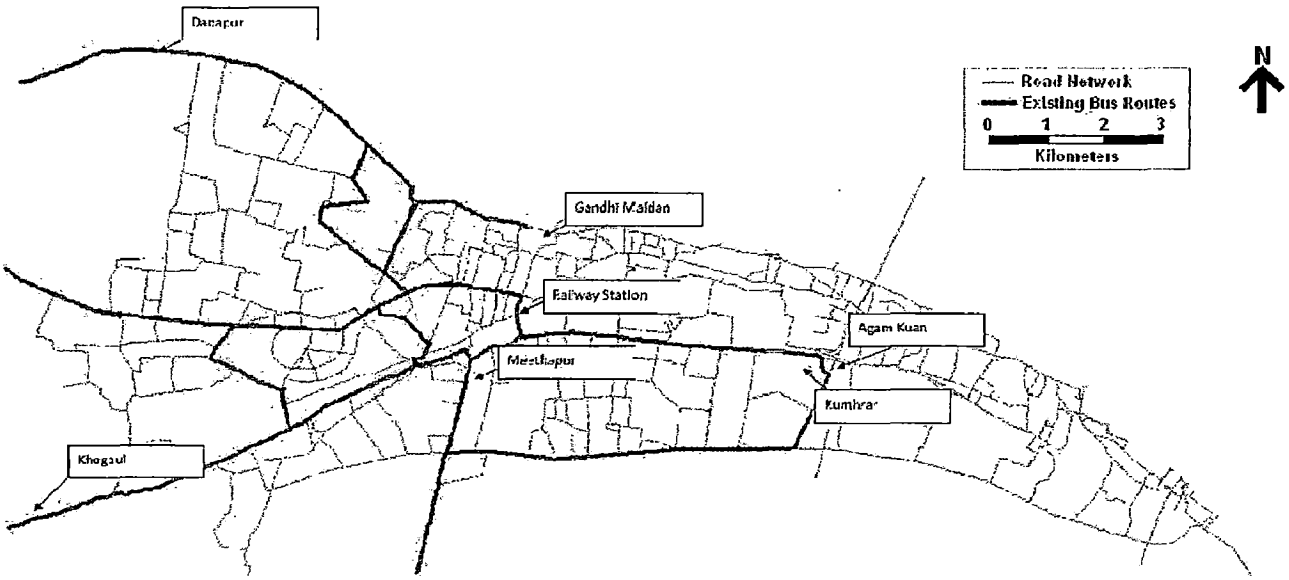


Figure 4-12 : Patna bus routes (source: cmp,2009)

Route Number	Route Name
1	Danapur Bus Stand to Gandhi Maidan via Digha, Kurji, Bansgharh
2	Danapur Bus Stand to Pantna Junction via Bailey Road, Serpentine
3	Danapur Bus Stand to Khagaul
4	Gandhi Maidan to Maner via Bansghath, Kurji, Digha and Danapur
5	Gandhi Maidan to khagaul, via patna Junction, Harding Road, Anisabad and Phulwari Sharif
6	Mithapur Bus Stand to Agamkuan via akarbigahia Junction and Old Byepass
7	Mithapur Bus Stand to Agamkuan via New Byepass anad Paheri
8	Mithapur Bus Stand to Patna junction via Anisabad
9	Patna Junction to Kurji Road via R-Bloack, Beerchand Patel Path, High Court Mod and Boring Road
10	Patna Junction to Patel Nagar Baba Chowk via R-Bloack,Hanuman Mandir,Rajvanshinagar
11	Patna Junction to Hanuman Nagar via Rajender Path, Nala Road
12	Bhoothnath Road (Amarnath Mandir) to Gandhi Maidan via Bahadurpur, Munna chak, Nala Road, Bhattachariya Road, Exhibition Road
13	Gandhhi Maidan to Naubatpur Piplavan via Kurji, Danapur, Khagaul
14	Meethapur Bus Stand to Punpun via Karbigahia gaya Gumti
15	Meethapur Bus Stand to Gaighath via Old Bye Pass, Kumhrar Gumti, Biscoman Golambar
16	Meethapur Bus Stand to Hanuman Namgar via Karbigahia, Kankarbagh colony Mod, Kankarbagh, Tempo Stand, Malahi Pakdi
17	Malsalami to Fatuha

4.2.8 IPT routes

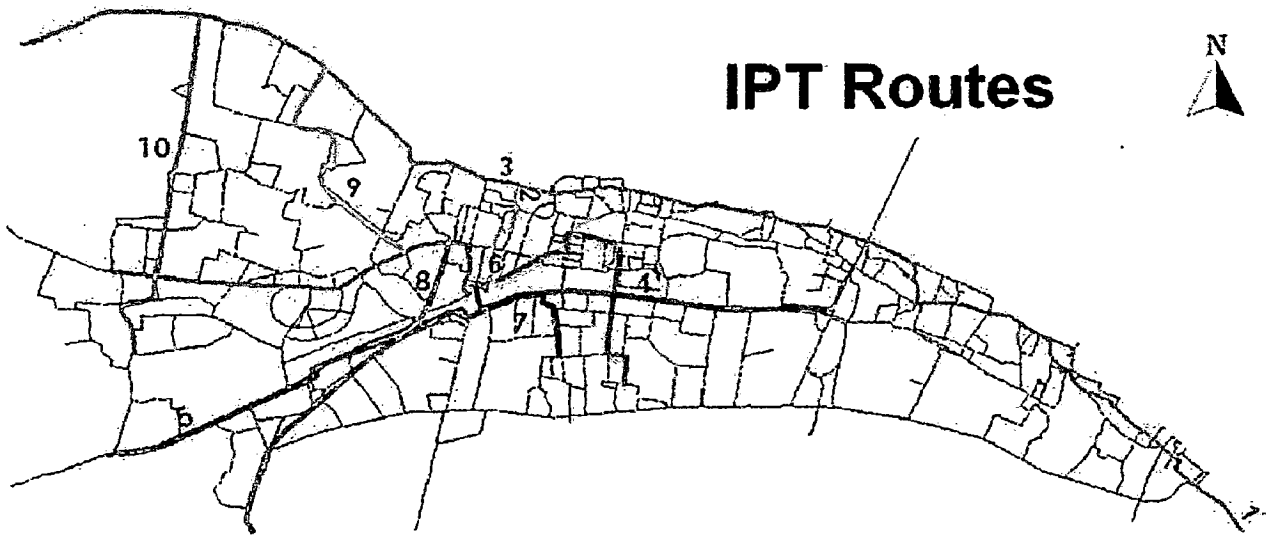


Figure 4-13 : Patna IPT Routes (source: author, cmp 2009)

Table 4-4: Patna IPT routes (source: Author)

Route Number	Route Name
1	Malsalmi(old city) to Gandhi Maidan
2	Gandhi Miadan to patna Junction
3	Gandhi Maidan to Digha via kurji and rajapul
4	patna Junction to Hanuman Nagar via Rajendar nagar over bridge
5	Ganhi setu (Agam kuwa) to Mithapur bus stand Via old bye pass and patna Junction
6	patna Junction to Danapur via IT golambar, Bailey road, high court, rajapur, Saguna more
7	patna Junction to kankarbagh auto stand
8	patna Junction to Phulwari Sharif via Harding Road, Anisabad and
9	Patna Junction to Kurji Road via boring road and patliputra colony.
10	Danapur to Khagual via Saguna more.

Intermediate public transport(IPT) like autorickshaws are predominant carrier of commuters in city. The IPT in Patna includes 4-seater auto-rickshaws, which runs inside the city as major public transport.6-8 seater *tuk-tuk's*, are used for regional transport between different muncipalitiesand satellite cities.

4.3 Major development and upcoming project in Transport sector

4.3.1 City bus

With collaboration with Eden transport private limited, a kolkota based company, RCD, patna has started city bus serives on PPP basis. Presently 78 ERP and GPS enabled buses run on roads of Patna. This GPS enabled buses are monitored through bus traffic centre of Eden transport private ltd. Eden has also started numbers of Normal and AC buses for different city of Bihar.

4.3.2 Inter and Intra-state luxury AC buses

Bihar State Road Transport Corporation (BSRTC) rolls out 92 AC luxury buses in 17 different routes within the state. These inter-city buses will run across the state. While 10 of these routes would connect Patna with other district headquarters, four other routes will be connecting Patna with district headquarters in the neighbouring state of Jharkhand.

4.3.3 Patna Metro

The Planning Commission of India has given nod to Patna Metro recently which will run on two routes- Dak bunglow Square to Saguna Morh and Danapur to Patna city. Furthermore, a layout for a more feasible monorail has been submitted and is awaiting approval. It will be less costly and less time consuming.[38]

4.3.4 Ganga Driveway[39]

Ganga Driveway, a 20.5- km-long four-lane road that would provide hassle-free connectivity between West and East Patna, will be constructed in near future. It will allow connectivity with the existing road (Ashok Rajpath) that runs parallel to the proposed driveway with the western end of the road would be near Digha Ghat, its eastern tip would be at Didarganj.
The driveway would have an elevated stretch (7.6-km-long) between Collectorate Ghat and Gai Ghat so that important existing structures such as the collectorate building, court building, Patna Medical College and Hospital (PMCH) and Darbhanga House are not disturbed due to construction of the road.

4.4 Initiatives by the State Government[40]

The main mission of Transport Department of the state government is to ensure strict compliance of the Motor Vehicles Act, 1988, using modern technology for promoting transport facilities and meet the expectations of the citizens. To achieve this aim, the state government has taken the following initiatives in the recent past :

- Scheme for construction of District Transport Offices cum District Transport Facilitation Centres in 19 districts at a cost of Rs. 18.41 crore.
- One time tax payment facility extended to commercial tractor trailers and three wheelers to facilitate small entrepreneurs engaged in transport business.
- 50 percent concession in vehicle tax to newly registered public transport vehicles to promote public transport in cities.
- Green Tax on vehicles older than 12 years to effectively control rising pollution from vehicles.
- Dealer Point Registration to facilitate easy registration of new vehicles. Constitution of Special Flying Squads to effectively check overloading of vehicles and the gangs engaged in such practices.

[38] http://www.rediff.com/business/report/rites-begins-ground-survey-for-monorail-in-patna/20111021.htm
[39] "East & West, twain shall meet"-.a report on gang driveway in "the telegraph on 20 aug, 2011
[40] Economic survey of bihar-2011

- Process of opening of Fitness Centres by private entrepreneurs simplified to facilitate easy availability of Vehicle Fitness Certificates.
- Selection of land for establishing Driving Training School for training of heavy Commercial Vehicle Drivers under PPP mode in Aurangabad district.
- Bilateral transport agreements with Jharkhand and Chhattisgarh to facilitate public transport.
- Scheme to provide free helpline service to citizens.
- Authorisation to State Bank of India to facilitate payment of vehicle tax through e-payment system for vehicle owners.

4.5 Institute involved in transport in Bihar

Table 4-5 : department involves in transportation

Organizations	Functions
Road Construction Department,Bihar	❖ Planning and designing road network to provide optimized connectivity to rural and urban areas. ❖ To achieve goal of socio-economic development through proper management of road communication. ❖ Construction, Upgradation and Maintenance of roads and bridges.
Bihar State Road development Corporation Ltd.	Road Construction Department, Govt. of Bihar vide Resolution No. 1014(S) WE dt. 17.02.2009 has established Bihar State Road Development Corporation Limited (BSRDC Ltd.) having its registered office at RCD Mechanical Workshop Campus (near Patna Airport), Sheikhpura, Patna-800014. ❖ To construct, execute, carryout, improve, work, develop, administer, manage, control or maintain in Bihar and elsewhere all types of roads, highways, express routes, paths, streets, bridges, sideways, tunnels and other infrastructure , works and conveniences, approach road, sheds, temporary dwelling huts in case of calamity or any emergency pertaining to all departments of Government of Bihar or any other department, agency, organization or body through Road Construction Department or directly. ❖ To undertake projects under PPP (Public Private Partnership) including arranging finances for such projects. ❖ To take up above works through private construction agencies or departmentally or through government bodies including using the manpower of the Road Construction Department or entering into a public private partnership as per a Model. ❖ To raise financial resources from banks, institutions, mutual funds, individuals etc. ❖ To commercially develop and exploit land along side the roads/bridges. ❖ To take up works entrusted to it by Road Construction Department, Govt. of Bihar or other departments/agencies/Organizations of State/Central Government. ❖ To undertake projects outside Bihar either in Joint Venture or alone.

District Transport Office	❖ Issuing of driving licences and vehicle registration numbers to people.
Bihar State Bridge Construction Corporation Limited (Bihar rajya pul nirman nigam ltd.)	❖ Construction of Bridges/Roads ❖ Maintenance of Bridges ❖ Toll Collection
Central Circle Office, Road construction Department, Patna	❖ Works related to different circle
New capital Division Road Construction Department, Patna	❖ Road works related to capital city Patna
Regional Transport Authority(RTA) and State Transport Authority(STA)	❖ Issuing permit to Autorickshaw, Buses and other commercial vehicles.
Public Work Department , Gov. Of Bihar	❖ Construction & repair of State road
Bihar Urban development Authority	❖ Town and Country Planning. ❖ Environmental planning and co-ordination. ❖ Slum Development scheme. ❖ Control of Bihar State Water-Supply and Sewerage Board. ❖ Jawaharlal Nehru National Urban Renewal Mission (JNNURM)
Bihar Urban Infrastructure Development Corporation Limited.	❖ Accelerate Infrastructure Development activities across all ULBs and has been mandated to construct, execute, carry out, improve, work, develop, administer, manage, control or maintain in Bihar and/or elsewhere for all types of buildings, roads, parks highways, express routes, paths, streets, bridges, sideways, tunnels, infrastructure for transport, drinking water, sanitation and other infrastructure,
Traffic police, patna	❖ Enforcement of traffic laws and prosecuting violators

SURVEY

STUDY AREA

SURVEYS UNDERTAKEN

5 SURVEY

5.1 Study Area

Planning for transportation system for whole Patna city will be a herculean task to complete with in limited time and limited man power. So, the investigator has taken strategically located points on a particular section of Ashok Rajpath for investigation, and based on secondary data and the primary survey of this section, recommendation will be formulated.

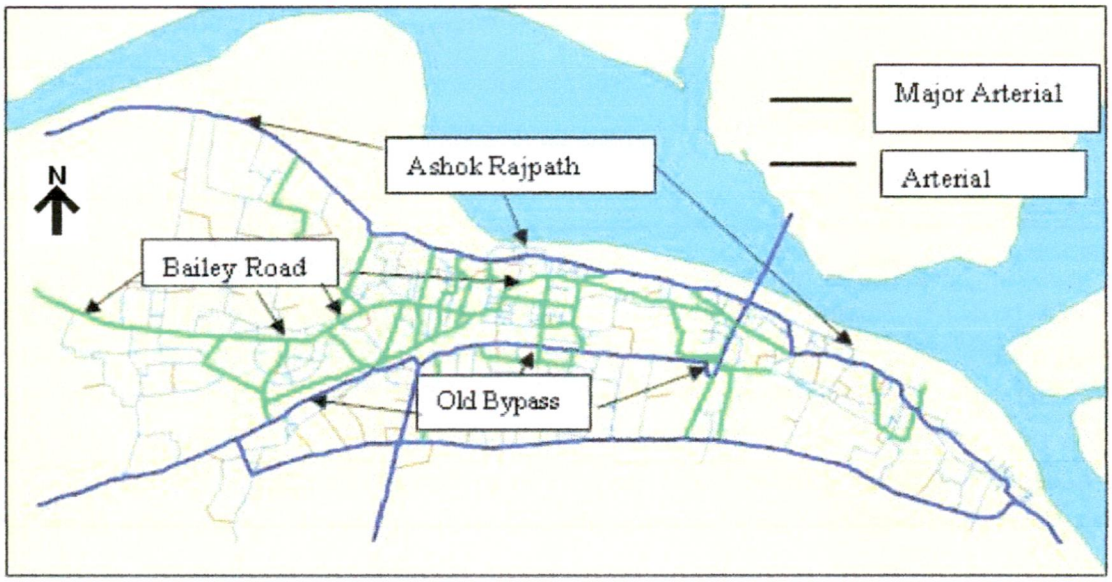


Figure 5-1: major arterial roads of Patna (cmp,2009)

Within all arterial roads of Patna, Ashok Rajapth is most congested and polluted road of Patna. Private cars, Motorcycle, cyclerickshaw are generally parked along road, decreasing its effective width. There is no proper stop defined for autorickshaw, cyclerickshaw and bus. They park at road and drop n pick passenger from any point of road.

This highly dense area of Patna has road crossing at every 20-30 m which further led to residential areas. Autorickshaw and buses pick commuter from every crossing, which means all these public transport stops at every 20-30 m of this narrow section of road. This character of traffic decreases overall average speed of all modes to 10-15 km/hr.

5.1.1 Section of Ashok Rajpath

Ashok Rajpath can be divided in 4 sections as per their character:-

- **Malsalami to Gai Ghat :-** 8 km. Of this section has maximum width 10.20m and minimum width of 7.62 m and average width of 8.53 m. Metalled width of this section of road is 4.27 m, with no pavement on either side. This section of road crosses through maximum densely populated area of old city. There are small scale industries, wholesale market along this road which attracts lot of trips. Autorickshaw and cyclerickshaw is used for public transportation in this section. Shared autorickshaw runs in this route from Gandhi Maidan to malsalami.

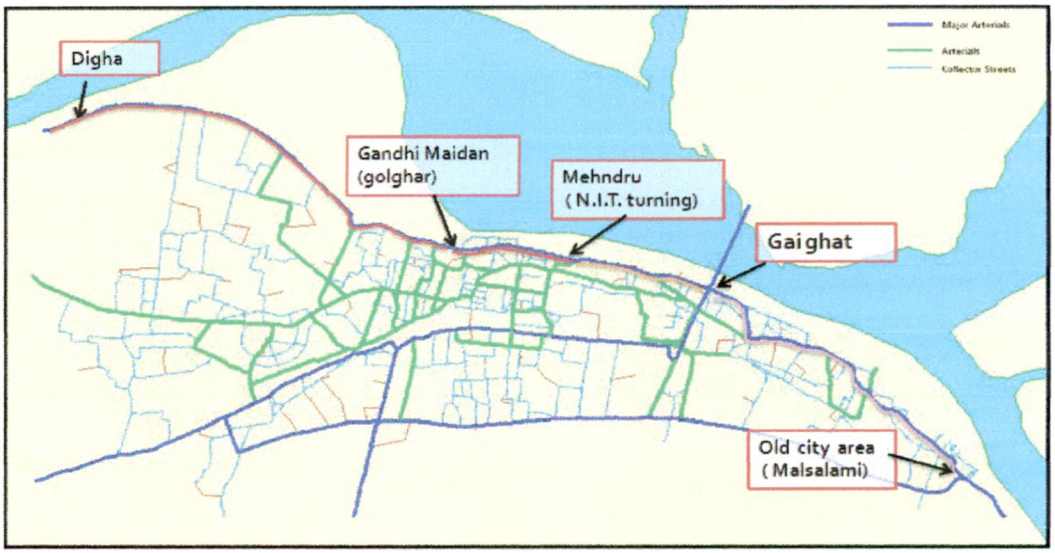


Figure 5-2 : Important points on Ashok Rajpath (Source Author, CMP 2009)

- **Gai Ghat to N.I.T. Turning:** - 3 km. Of this section has maximum width 13.56 m and minimum width of 7.62 and average width of 10 m. Metalled width of this section of road is 6.34 m, with no pavement on either side. This section of road also crosses through densely populated area of old city, with mixed development along its length on both side. It is accessed by small pathway of 1 to 3 m from densely populated residential area. Residential area along this road is of generally G+2 with commercial sector(service shops, hotels, service shops etc.) at ground floor. Autorickshaw, cyclerickshaw and buses are used for public transportation in this section. Shared autorickshaw runs in this route from Gandhi Maidan to malsalami. 10 buses are running in this route, which creates traffic jam, due to limited width of road.

- **N.I.T. Turning to Golghar(Gandhi Maidan) :-** 3.5 km of this section has maximum width 25 m and minimum width of 13.81 m and average width of 21.23 m. Metalled width of this section of road is 12.73 m, with 4.57 and 4.27 pavement on right and left side respectively. This section is predominantly used by students, who are preparing for various competition examinations. One side of road is predominantly commercial area, mostly selling books, medicines. Books and eatables are sold on pedestrian way, decreasing the effective width of pedestrian way. Institute like Patna science college, N.I.T. Patna, Patna college, B. N. College, P.M.C.H.(Patna Medical college), Khuda Baksh library and some commercial complex are on the other side of road mostly developed during British era. So this road is wide with pedestrian way and lot of open space in Patna university area with colonial architectural university buildings. Autorickshaw, cyclerickshaw and buses are used for public transportation in this section. Shared autorickshaw runs in this route from Gandhi Maidan to malsalami. While returning from Malsalami or Gai ghat, route is diverted before N.I.T more towards Machua toil. Autorickshaw traffic is one way in this section of road. Around 30 Private buses are running in this route, 20 buses runs upto N.I. T. Turning and other 10 runs upto Gai Ghat.

- **Golghar(Gandhi Maidan) to Digha:-** Around 10 km of this section has maximum width 39.47 m and minimum width of 11.58 m and average width of 20.73 m. Metalled width of

this section of road is 7.21 m, with almost no pavement on either side .This area is mainly developed in post independence era. This section comprises of some administrative buildings, schools, hospitals, planned housing area etc. Shared autorickshaw, buses , cylerickshaw are the mode of public transport in this section.

5.2 Surveys Undertaken

It will be a very tough job to survey the whole 25 km stretch of Ashok Rajpath. So, investigator has taken 3 strategic points on this road, to get the characteristics of existing traffic.

Traffic at this road is dominated by Auto rickshaws and cycle rickshaws, whose life and livelihood will be affected by any planning decision made for traffic improvement. Their interest should be taken care of before planning, because they are the back bone of existing traffic and their participation would also be required for successfully implementing any planning scheme. Above all we have to consider commuters who are using this transportation system.

The objectives of the present study are to understand the factors influencing the auto rickshaw, cycle rickshaw sector, commuters & overall traffic on road. It would help to find out the underlying reasons that bring about inefficient transportation system and its inter-linkages with the user and different modes. Lastly, it aims to draw parallels with other competitive modes of transport along with elucidating the supply chain management to bring together various factors to reach a policy solution.

So, Investigator has undertaken 4 type of surveys, which are listed below:-

Traffic volume Surveys are conducted to understand the traffic composition of particular road. Surveys are conducted during peak hours around 10 A.M. and 5 p.m for all the three locations for 10 minutes, which are later, converted into numbers of mode per hour. ***(Refer Annexure 1: Traffic Volume Count Surve)***. Three Strategic points where this survey is conducted are:-

This location lies between section 'gaighat to N.I.T. turning' of Ashok Rajpath. Here road narrow down to minimum width. This road perpendicularly bisects by secondary road leading to old bye-pass. Mosque is at the corner of road which can't be demolished to increase the width. Limited width, with the crossing creates a huge traffic jam at this location.

This location lies near N.I.T. more were autorickshaw coming from Gandhi Maidan, (west to east) conflux with autorickshaw going towards Gandhi maidan, (east to west) and with other traffic also. At this location also width of road is near to minimum of 7 m.

This location lies between section ' N.I.T. turning to Golghar' with the average width of 20 m. This is the important section where traffic from Khazanchi road mixes with main traffic, which is the major wholesale market of stationeries. At this point only all the major traffic from south mixes with existing traffic.

24,276 Autorickshaw were registered in Patna D.T.O. till 2008 .Autorickshaw are backbone of Patna city transport. This IPT mode of transport acts as full time public transport. In Patna, Autorickshaw runs on shared basis like buses. It picks up and drops off passenger on their fixed route. In absence of bus and other mode of public transport in Ashok Rajpath, Autorickshaw dominated this route as public transport for decades. Within the modes of public transport, autorickshaw has increased at the rate of 6% in period from 1996 to 2001.

The purpose of this Study is to understand the ecosystem of auto rickshaws and the nature of their drivers. For this, primary data was collected from the respondents through the interview method. (***Refer Annexure 2: Questionnaire for Auto Rickshaw drivers Survey***)Sample size of 40 is taken for survey purpose on a personal interview basis. This data is feeded in excel sheet for further analysis (***Refer***

Annexure 3: Guidelines for Data Analysis for Auto Rickshaw Survey ***and Annexure 4: Data sheet for Auto Rickshaw drivers Survey)*** .The purpose of the survey is to provide scientifically gathered facts and materials to set up the conclusion.

35000 registered cycle rickshaws exist in Patna. Another estimate puts the count of cycle rickshaws between 1.2 to 2 lakhs (Source: Master Plan) adding unregistered cycle rickshaw also.

Generally they park their rickshaw at junction, road side. While moving in slow pace, it slows down the whole traffic in congested areas. The purpose of this Study is to understand the ecosystem of cycle rickshaws and their impact on study area. For this, primary data was collected from the respondents through the interview method (***Refer Annexure 5: Questionnaire for Cycle Rickshaw rider Survey)*** with a sample size of 40. This data is feeded in excel sheet for further analysis (***Refer Annexure 6: Guidelines for Data Analysis for CycleRickshaw Survey and Annexure 7: Data sheet for Cycle Rickshaw drivers Survey)***. The purpose of the survey is to provide scientifically gathered facts and materials to set up the conclusion.

For better understanding of transport system, users need, their aspiration, their expense on transportation etc. are required to be studied. So investigator has conducted a household survey in above mentioned location to understand the socio-economic condition of the household and society as a whole. Such socio-economic conditions help to explain the travel characteristics of the people.

A average household comprises of 3-4 people of different travel need like children going to school, grown up going to work place, housewife for shopping, teenagers to coaching, college etc. so, the investigator attached some origin destination survey questionnaire based on size and travel need of the family, with the household survey. (***Refer:- Annexure 8: Questionnaire for Household and origin destination Survey***)

Sample size of 25 is taken for household survey. Every household have averagely 80 percent daily commuters. This gives 121 samples for origin destination survey. The data from this survey is feeded in excel sheet for further analysis. (***Refer:-Annexure 9: Guidelines for data analysis for Household and origin destination Survey and Annexure 10: Data Sheet for Household and origin destination Survey***

RESULT, ANALYSIS AND FINDINGS

TRAFFIC VOLUME COUNT SURVEY

AUTORICKSHAW SURVEY

CYCLERICKSHAW SURVEY

HOUSEHOLD SURVEY

ORIGIN-DESTINATION SURVEY

EVALUATION OF CMP & MASTERPLAN

PROJECTION FOR YEAR 2031 A.D.

6 RESULT, ANALYSIS AND FINDING

6.1 Traffic Volume Count Survey

Surveys are conducted at peak hours 10 A.M. and 5 P.M. for the whole week to get a real figure of numbers of vehicles ***(Refer Annexure 1: Traffic Volume Count Surve)***. Average of weekdays and weekend traffic are taken in terms of vehicles per hour for the analysis.

6.1.1 Pathar ki masjid

As shown below in satellite image, It is a crossroad with a mosque on the corner of road, which doesn't allow this section of road to be widened.

Figure 6-1 : Pather ki Masjid satellite image (Source: Author, Google earth)

Table 6-1 : Average vehicular composition at 10 A.M. on weekdays and weekends, of Pather ki Masjid

Sl. No.	Pathar ki Masjid (10 A.M.)	WEEKDAYS	WEEKENDS
1	Autorickshaw	866	621
2	Motorcycle	392	285
3	Bus	14	12
4	Private car	46	63
5	Bicycle	472	111
6	Cyclerickshaw	36	39
7	Autorickshaw(goods vehicles)	31	9
8	Tractor/goods vehicle	2	3
9	NMT good vehicles/thelas/bullock cart	106	135
10	Pedestrians	202	138

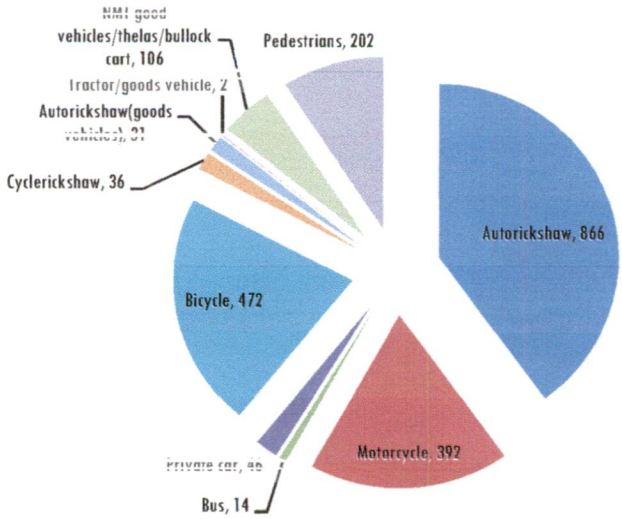


Figure 6-2: Percentage Vehicular composition on weekdays at 10A.M., of Pather ki masjid

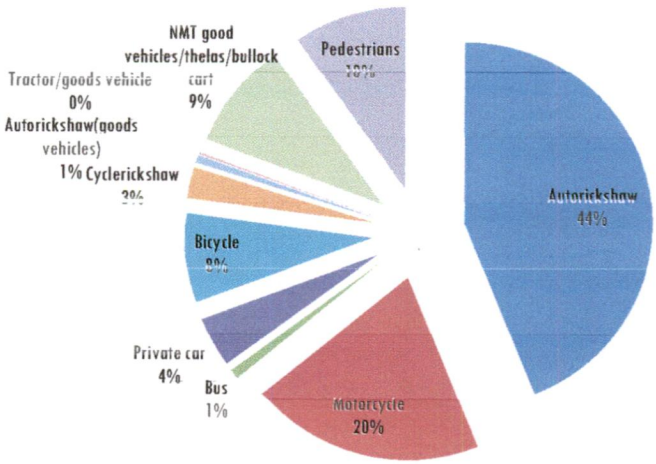


Figure 6-3: Percentage Vehicular composition on weekends at 10A.M., of Pather ki masjid

Pathar ki masjid is a cross road, and lot of traffic coming from all the sides. It was found that percentage of auto rickshaw is pretty high in this traffic composition, since it acts as the main public transportation mode for people. At morning time, It comprises of 40 percent in weekdays whereas despite of decrease in number from 866/ hour to 621/hour, its percentage has increase to 44 on weekend. This is due to decrease in number of other mode of transport. At evening time it contributes 27 and 30

Figure 6-4 : Pather ki Masjid Intersection (Source: Author)

percent respectively on weekdays and weekend. This spot is used for auto rickshaw stop for search of passenger. Crossroad, less width main road, other mode of transportation on move and above all this auto rickshaw stop, forces the traffic to slow down and hence creates traffic jam.

Motorcycle constitute of around 20 percent both on weekdays and weekend in morning hours, though it has decreased from 392 to 285, whereas percentage of car has increased from 2 percent to 4 percent. In evening hours it contributes 16 and 12 percent on weekdays and weekend respectively. This area mainly constitute of middle class unplanned residential area. People generally use IPT or motorcycle for transportation purpose. Car is rarely used, because maximum of high income people has left this place and taken home somewhere else.

Table 6-2: Average vehicular composition at 5 P.M. on weekdays and weekends, of Pather ki Masjid

Sl. No.	Pathar ki Masjid (5 P.M.)	WEEKDAYS	WEEKENDS
1	Autorickshaw	470	429
2	Motorcycle	270	168
3	Bus	16	12
4	Private car	68	54
5	Bicycle	268	186
6	Cyclerickshaw	42	33
7	Autorickshaw(goods vehicles)	12	12
8	Tractor/goods vehicle	1	3
9	NMT good vehicles/thelas/bullock cart	85	111
10	Pedestrians	473	414

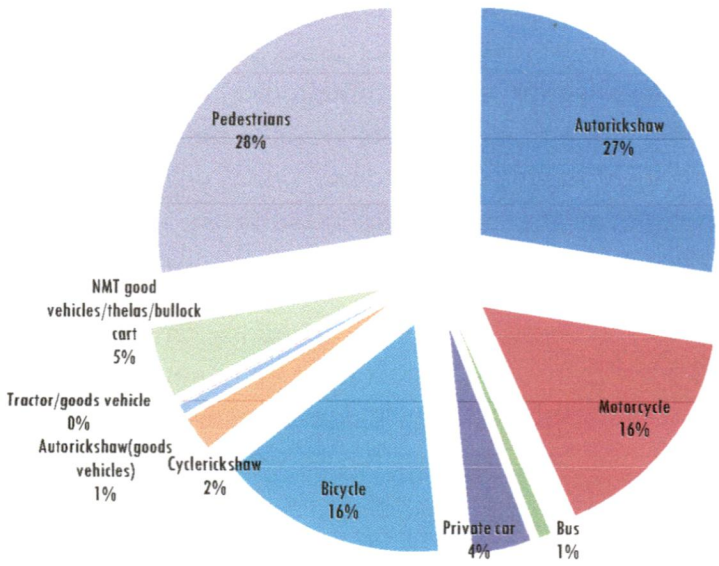


Figure 6-5: Percentage Vehicular composition on weekdays at 5 P.M., of Pather ki masjid

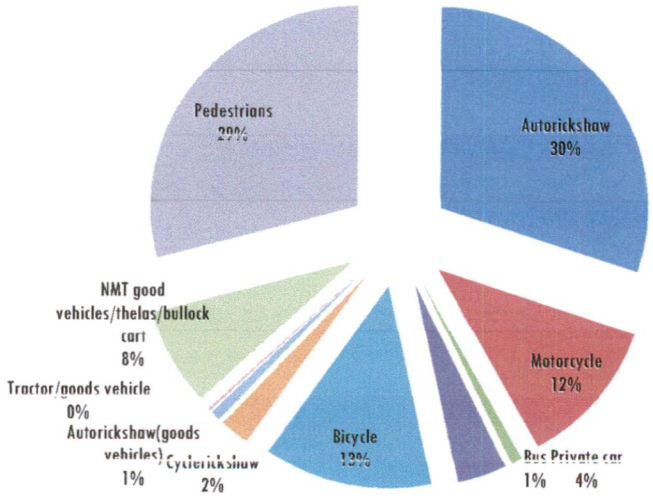


Figure 6-6: Percentage Vehicular composition on weekends at 5 P.M., of Pather ki masjid

Bicycle contributes 22 percent of traffic on weekdays and 8 percent on weekend, means lot of people go for work on bicycle, whereas cycle rickshaw contributes around 2-3 percent of traffic during morning hours. In evening hours bicycle composes of 16 percent on weekdays and 13 percent on weekend whereas cycle rickshaw composes of 2 percent of traffic on both weekdays and weekends. In evening people are generally returning from work. Bicycles are also used by student going for coaching classes. Around 200-300 bicycle per hour crosses this street along with 400 auto rickshaw and pedestrian per hour. Cycle rickshaw are less in percentage, around 30-40 cycle rickshaw crosses the street but it plays vital role in this traffic. In case of less width of road and vehicular traffic load, cycle rickshaw and bicycle slows down the speed of whole traffic.

NMT goods vehicles contribute 5 percent on weekdays and 9 percent on weekend in morning time. At evening hours its constitute of 5 percent and 8 percent during weekdays and weekends respectively. This traffic is due to Small scale industry and wholesale market at Patna city, due to which all this goods vehicles crosses through this section of road coming or going mainly from east side of city area. Due to mixed land use along the road, there are lot of commercial areas all along the road, where good vehicles are used for loading and unloading. Goods vehicles used to parks on the road and unload goods anytime of the day, which is sufficient for creating congestion in this traffic load and less effective width of road.

Buses contribute 1 percent of traffic but it creates more congestion especially on this part of road. Due to small effective road width and lot of traffic, it is almost jammed at any time of the day. Due to its size it covers more than half of metalled road. Which doesn't allow any traffic to overtake, and if other buses come from other direction, that bus has to wait until road is not clear. Above all this, if a cycle rickshaw is ahead of bus, then bus has to move on speed of cycle rickshaw. Overtaking of motorcycle, bicycles and other good vehicles didn't leave space for bus to move. Overall it's become a chaos due to unorganized and uncivilized traffic.

Pedestrians contribute around 10 percent on both weekend and weekdays during morning time, whereas its increases around 30 percent in evening. Pedestrian generally move for purpose of short trip like taking ration, buying vegetables, having street foods etc. Due to lack of sideways, pedestrians are forced to share same right of way with other vehicles.

Figure 6-7 : Traffic jam due to bus at Pather ki Masjid (Source: Author)

6.1.2 Mehandru

This location lies near N.I.T. tuurning were autorickshaw (coming from Gandhi Maidan, west to east) conflux with autorickshaw going towards Gandhi maidan, (east to west) and other traffic. At this location width of road is near to minimum of 7 m.

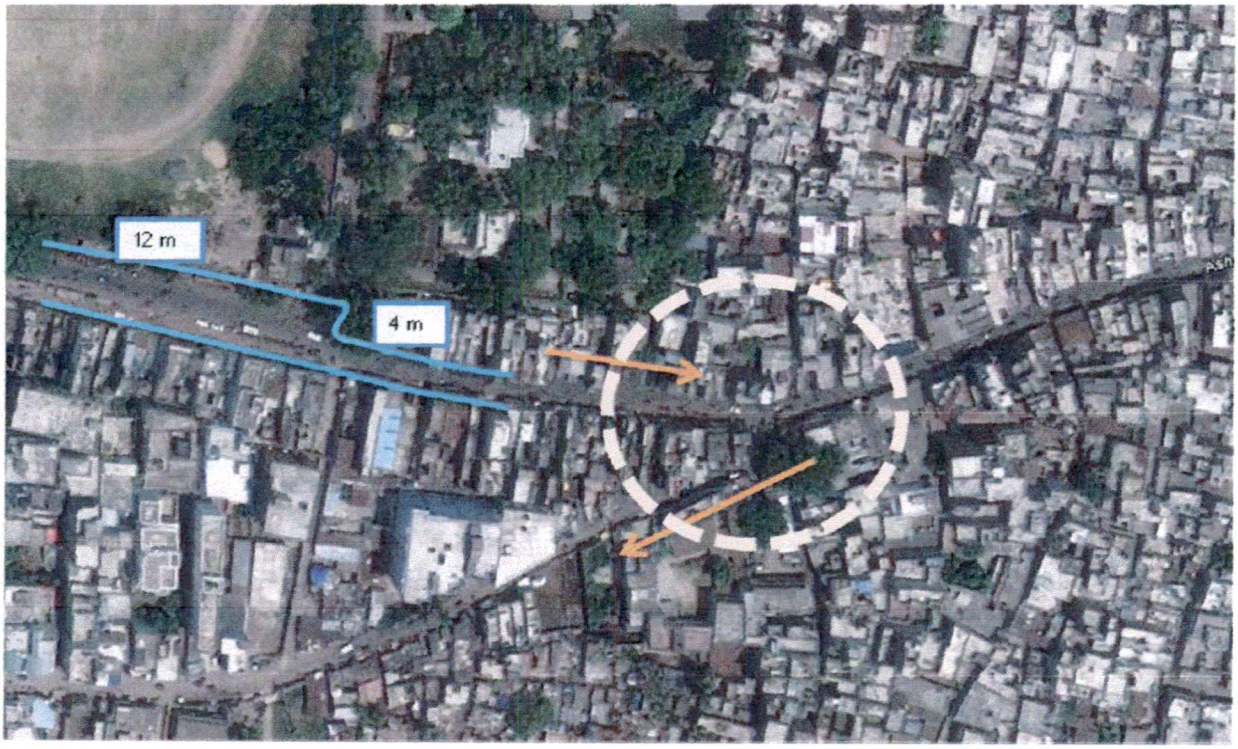


Figure 6-8: Satellite image of Mehndru (Source: Author, Google earth)

Table 6-3 : Vehicular composition of Mehandru at 10 A.M. on weekdays and weekends.

Sl. No.	Mehandru (10 A.M.)	WEEKDAYS	WEEKENDS
1	Autorickshaw	961	525
2	Motorcycle	332	294
3	Bus	17	15
4	Private car	67	87
5	Bicycle	617	264
6	Cyclerickshaw	67	33
7	Autorickshaw(goods vehicles)	7	18
8	Tractor/goods vehicle	2	3
9	NMT good vehicles/thelas/bullock cart	79	87
10	Pedestrians	1205	1149

Mehandru is a road junction, where another road Bari path merges this road which acts as alternate route for Ashok Rajpath. From this junction auto rickshaw divert its route which is coming from city (east side). From this point Ashok rajpath is one way till Gandhi maidan for auto rickshaw. Due to merging of auto rickshaw and other traffic and less width of road, this part of road becomes more congested.

It was found that percentage of auto rickshaw is pretty high in this traffic composition, since it acts as the main public transportation mode for people. At morning time, it comprises of 29 percent in weekdays and 21 percent on weekends whereas at evening time it contributes 21 and 22 percent respectively on weekdays and weekend. This spot is also used for auto rickshaw stop for search of passenger. Junction, less width main road, other mode of transportation on move or turning and above all this auto rickshaw stop, cycle rickshaw and its stop forces the traffic to slow down and hence creates traffic jam.

Motorcycle constitutes of around 10 percent and 12 percent on weekdays and weekend in morning hours, whereas percentage of contributes 2 percent and 3 percent respectively. In evening hours it contributes 12 and 7 percent on weekdays and weekend respectively, whereas car contributes 2 to 3 percent. This area mainly constitute of middle class unplanned residential area and students who rent those houses. People generally use IPT or motorcycle for transportation purpose. Car is rarely used, because maximum of high income people has left this place, or rented it to the students and taken home somewhere else. Motorcycles are generally used by students who go to colleges like N.I.T. Patna and Patna University and by middle class people, who go for work.

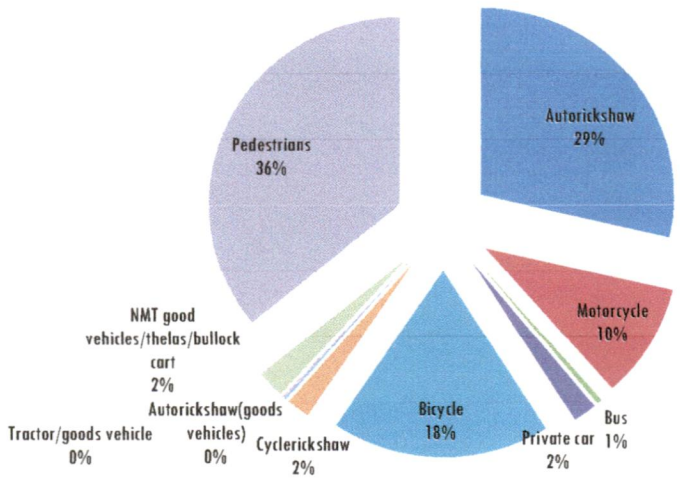


Figure 6-9: Percentage Vehicular composition on weekdays at 10 A.M., of Mehandru

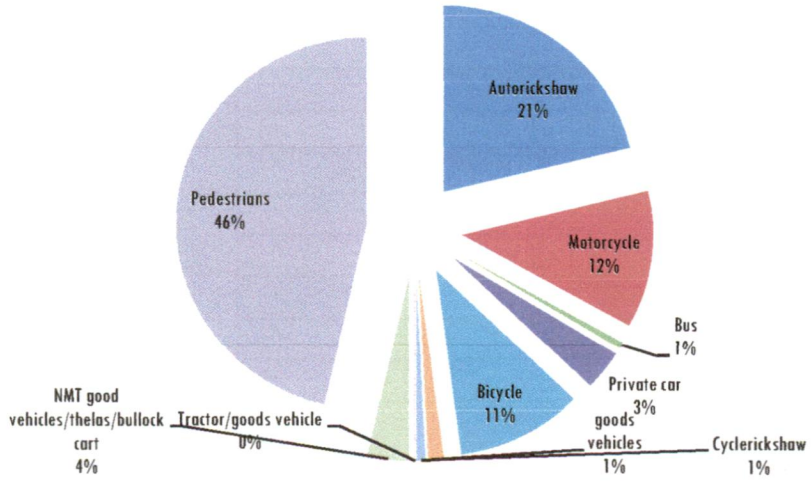


Figure 6-10: Percentage vehicular composition on weekends at 10 A.M., of Mehandru

Bicycle contributes 18 percent of traffic on weekdays and 11 percent on weekend, means lot of people go for work on bicycle or students go to college and coaching, whereas cycle rickshaw contributes around 2 percent of traffic during morning hours. In evening hours bicycle composes of 12 percent on weekdays and 10 percent on weekend whereas cycle rickshaw composes of 2 percent and 3 percent of traffic on weekdays and weekends respectively. In evening people are generally returning from work. Around 300 bicycles per hour crosses this street along with around 700 auto rickshaw and 1000 pedestrian per hour. Cycle rickshaw are less in percentage, around 70 cycle rickshaw crosses the street but it plays vital role in this traffic. In case of less width of road, vehicular traffic load, junction, cycle rickshaw and bicycle slows down the speed of whole traffic.

NMT goods vehicles contribute 2 percent on weekdays and 4 percent on weekend in morning time. At evening hours it's constitute of 2 percent and 3 percent during weekdays and weekends respectively. This traffic is due to Small scale industry and wholesale market at Patna city, due to which all this goods vehicles crosses through this section of road coming or going mainly from east side of city area. Due to mixed land use along the road, there are lot of commercial areas all along this road also, where good vehicles are used for loading and unloading. Goods vehicles used to parks on the road and unload goods anytime of the day, which is sufficient for creating congestion in this traffic load and less effective width of road. NMT vehicles contribution is less in this junction than pather ki masjid, because the goods going to patna city (east) comes from different route also to avoid congestion.

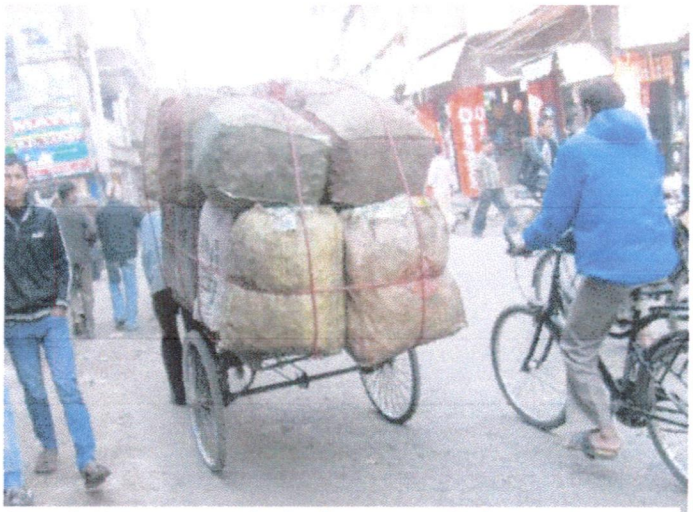


Figure 6-11 : NMV at mehndru (Source: Author)

Table 6-4 : Vehicular composition of mehndru at 5 P.M. on weekdays and weekends

Sl. No.	Mehandru (5 P.M.)	WEEKDAYS	WEEKENDS
1	Autorickshaw	781	600
2	Motorcycle	440	195
3	Bus	17	15
4	Private car	88	75
5	Bicycle	444	267
6	Cyclerickshaw	88	72
7	Autorickshaw(goods vehicles)	10	12
8	Tractor/goods vehicle	4	3
9	NMT good vehicles/thelas/bullock cart	82	87
10	Pedestrians	1812	1404

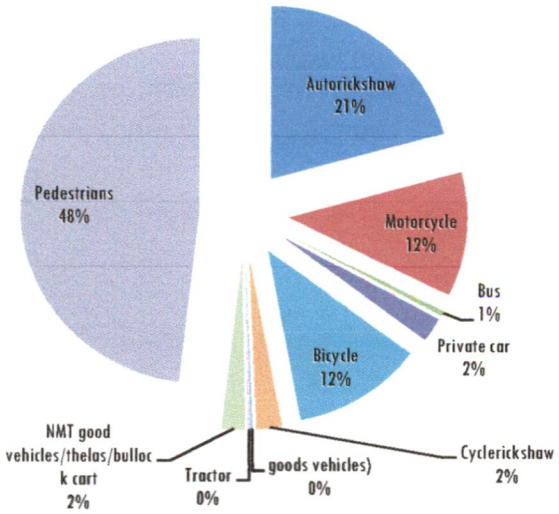


Figure 6-12: Percentage vehicular composition on weekdays at 5 P.M., of Mehandru

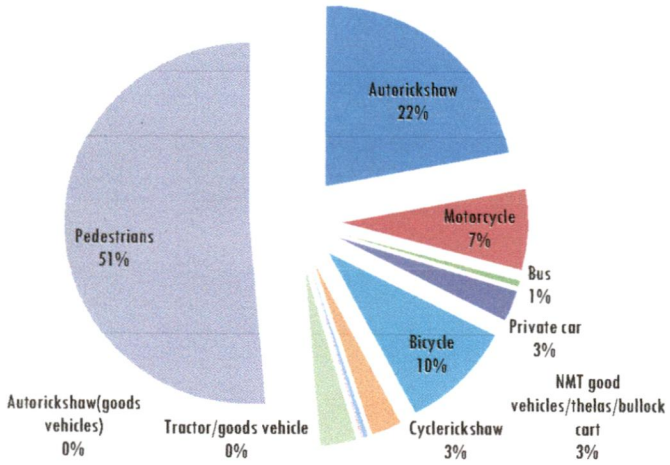


Figure 6-13: Percentage vehicular composition on weekends at 5 P.M., of Mehandru

Buses contribute 1 percent of traffic but it creates more congestion on this part of road. Due to small effective road width and merging of traffic, it is almost jammed at any time of the day. Due to its size it covers more than half of metalled road, which doesn't allow any traffic to overtake. Above all this if a cycle rickshaw or other slow vehicle is ahead of bus, then bus has to move on speed of cycle rickshaw. Overtaking of motorcycle, bicycles and other good vehicles didn't leave space for bus to move.

Pedestrians contribute around 36 percent and 46 percent on weekdays and weekends during morning time, whereas its increases around 48 percent and 51 percent respectively in the evening. Pedestrian generally move for purpose of short trip like taking ration, buying vegetables, having street foods etc. Due to lack of sideways, pedestrians are forced to share same right of way with other vehicles. This stretch is full of students. So students roam around university area, go for coaching, go for college etc by walk only. This reason increases the ratio of pedestrian to almost 50 percent.

Autorickshaw, cyclerickshaw and bicycle increase at this junction in compare to Pather ki masjid because due to commercial area along the road, people work place is situated on that road only. Since less number of commuter visit CBD area from east part of city, hence number of motorcycle, cars, bicycle decrease in that area compare to mehandru. Mehandru offers cheap living place in vicinity of CBD area i.e. just 3.5 km from as well as one has to encounter less traffic jam because from this part road width increases. University, colleges, various competitions coaching centre is in vicinity to this place and offer cheap accommodation, so this place is dominated by student and hence therefore bicycle, pedestrians and students using auto rickshaw are in abundance.

Figure 6-14 : traffic at Mehndru (Source: Author)

6.1.3 Khajanchi road crossing

This location lies between section ' N.I.T. turning to Golghar' with the average width of 20 m. This is the important section where traffic from Khazanchi road mixes with main traffic. The traffic from Khajnchi road comes from old bye pass through Rajendar Nagar over bridge, which merges with ongoing traffic. Patna medical college and other institution are on the north side of road, whereas on south side there are mainly medical shops and book shops. khjanchi road is a wholesale market of stationeries. It becomes the hub for retailers of stationeries from all over Bihar.

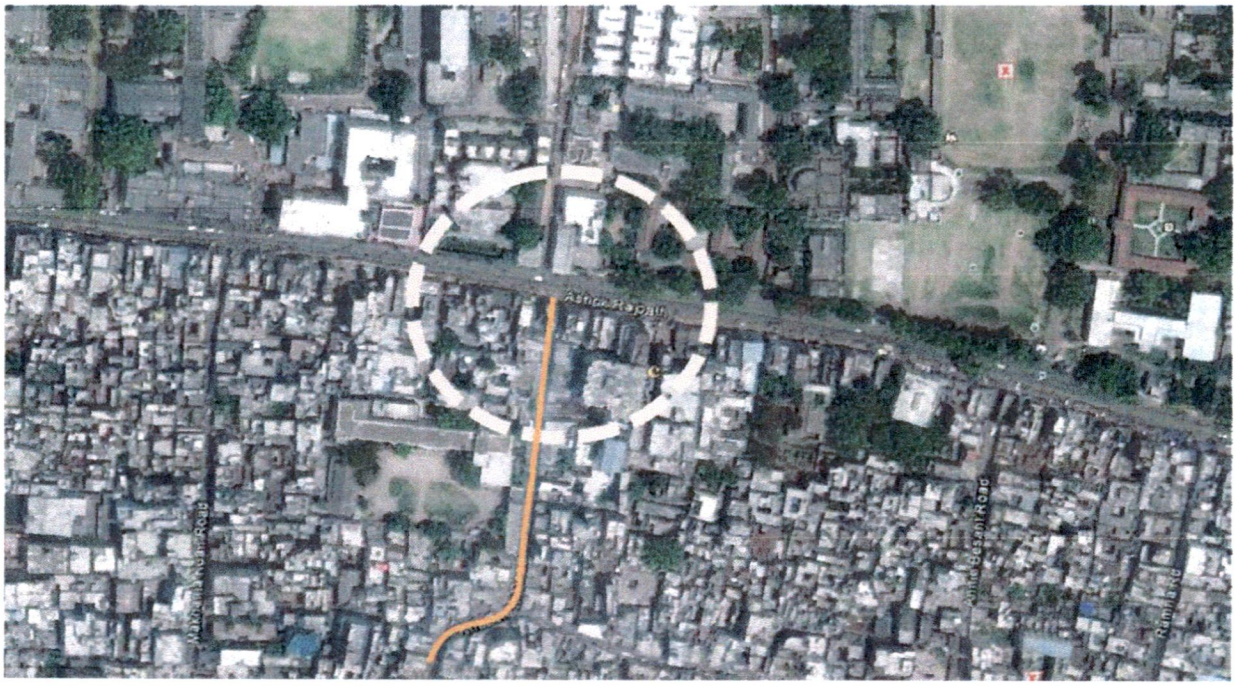


Figure 6-15: Satellite Image of Khajanchi road crossing (Source: Author, Google earth)

Table 6-5 : Vehicular composition of Khajanchi road crossing at 10 A.M. on weedays and weekends

Sl. No.	Khazanchi Road(10 A.M.)	WEEKDAYS	WEEKENDS
1	Autorickshaw	600	612
2	Motorcycle	487	537
3	Bus	55	57
4	Private car	226	213
5	Bicycle	582	462
6	Cyclerickshaw	245	228
7	Autorickshaw(goods vehicles)	8	12
8	Tractor/goods vehicle	7	15
9	NMT good vehicles/thelas/bullock cart	65	51
10	Pedestrians	941	732

Motorcycle constitutes of around 15 percent and 18 percent on weekdays and weekend in morning hours, whereas percentage of constitute of percent for both weekdays and weekend. In

evening hours it contributes 18 and 21 percent on weekdays and weekend respectively, whereas car has contributes 5 and 6 percent respectively. There is certain increase in number as well as in percentage of car and motorcycle in compare to other points of survey. This is due to class of people residing in this area, like professors, teachers, doctors and other upper middle class people.

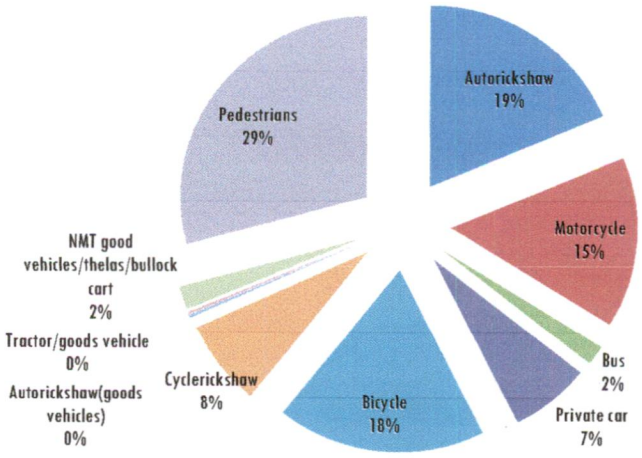


Figure 6-16: Percentage vehicular composition on weekdays at 10 A.M., of Khajanchi road crossing

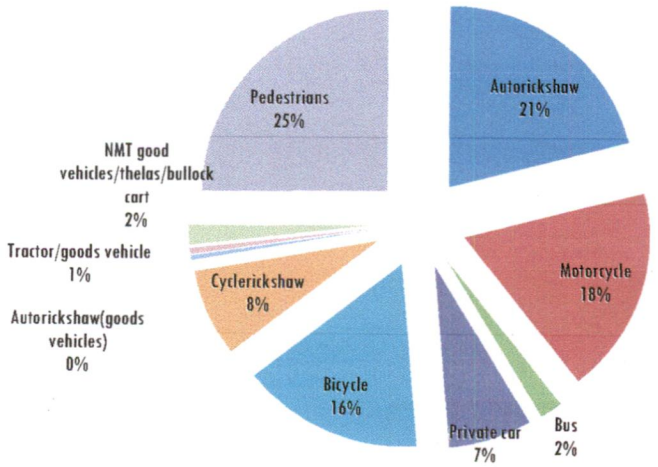


Figure 6-17: Percentage vehicular composition on weekends at 10 A.M., of Khajanchi road crossing

It was found that percentage of auto rickshaw drops in compare to pather ki masjid and mehndru spot. At morning time, It comprises of 19 percent in weekdays and 21 percent on weekends whereas at evening time it contributes 18 and 20 percent respectively on weekdays and weekend. This spot is also used for auto rickshaw stop for search of passenger. Due to one way route for auto rickshaw and width of around 20 m, the road become less congested.

Table 6-6 : Vehicular composition of Khajanchi road crossing at 5 P.M. on weedays and weekends

Sl. No.	Khazanchi Road(5 P.M.)	WEEKDAYS	WEEKENDS
1	Autorickshaw	538	486
2	Motorcycle	793	855
3	Bus	54	57
4	Private car	222	261
5	Bicycle	672	561
6	Cyclerickshaw	274	318
7	Autorickshaw(goods vehicles)	5	3
8	Tractor/goods vehicle	2	3
9	NMT good vehicles/thelas/bullock cart	67	54
10	Pedestrians	1760	1500

Bicycle contributes 18 percent of traffic on weekdays and 16 percent on weekend, means lot of people go for work on bicycle or students go to college and coaching, whereas cycle rickshaw contributes around 8 percent of traffic during morning hours. In evening hours bicycle composes of 16 percent on weekdays and 14 percent on weekend whereas cycle rickshaw composes of 8 percent and 6 percent of traffic on weekdays and weekends respectively. Around 600 bicycles per hour crosses this street along with around 500 auto rickshaw and around 1200 pedestrian per hour. Cycle rickshaw are high in number and percentage both, around 250 cycle rickshaw crosses the street whereas at other point its below 100. Cycle rickshaw of those area avoid Ashok Rajpath, because that part of road is narrower and much congested and this part of Ashok Rajpath is wide which gives equal opportunity to cycle rickshaw to share the road. No segregation of road is done for NMT's , which results into merging of it with other mode, ehich finally result in congestion.

NMT goods vehicles contribute 2 percent on weekdays and weekend both in morning time. At evening hours its constitute of 2 percent and 1 percent during weekdays and weekends respectively. This traffic is due to wholesale market at Khajanchi road, commercial area along road, and goods transporting to old city area. Goods vehicles used to parks on the road and unload goods anytime of the day, which is sufficient for creating congestion in this traffic load and volume of traffic.

Figure 6-18 : khajanchi road (Source: Author)

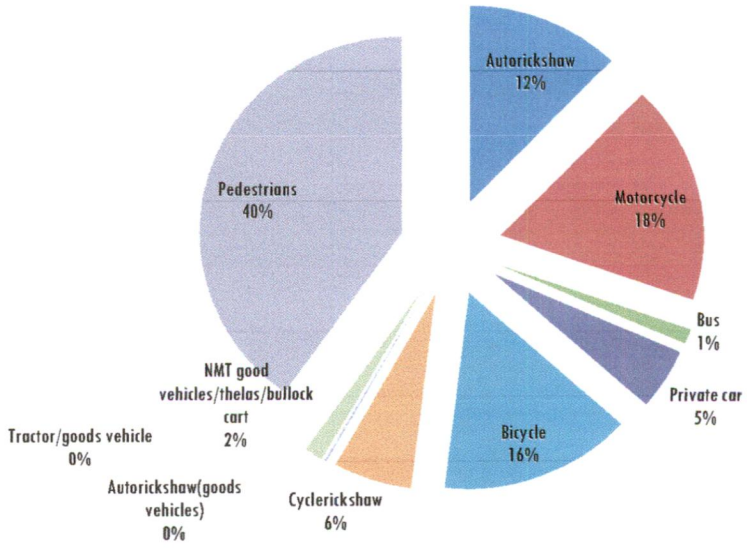


Figure 6-19: Percentage vehicular composition on weekdays at 5 P.M., of Khajanchi road crossing

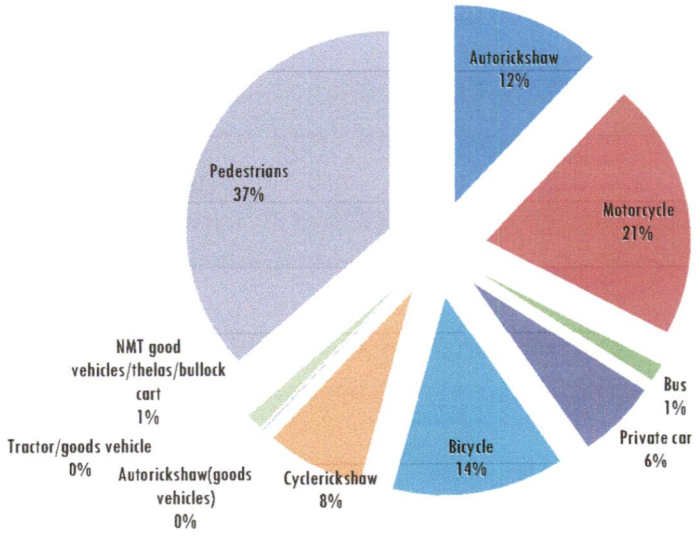


Figure 6-20: Percentage vehicular composition on weekends at 5 P.M., of Khajanchi road crossing

Buses contribute 2 percent in the traffic in morning hours on weekdays and weekend both, whereas it contributes 1 percent in evening hours on both weekdays and weekend. This is due to increase in other mode of transport in the evening. One of the oldest markets is situated on this road 500 m ahead, which attract lot of trips in evening. Generally frequency of buses is similar all day long around 55 buses per hour, but this is triple the number of buses crossing at other points surveyed. Averagely 1/3 buses goes through that congested route. 2/3 buses goes up to N.I.T. turning only, because after that point road starts narrowing

Figure 6-21 : traffic at Khajanchi road (Source: Author)

down from two lanes to one lane.

Pedestrians contribute around 29 percent and 25 percent on weekdays and weekends during morning time, whereas its increases around 40 percent and 37 percent respectively in the evening. Pedestrian generally move for purpose of short trip like buying vegetables, roaming around, having street foods etc. 3-4 m sideway is provided along the road, which are generally used by students. The effective width of sideways decreases to 1 to 2 m, because of encroached books stalls and other vendors.

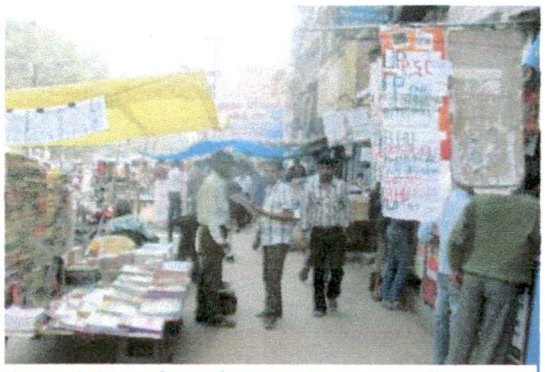


Figure 6-22 : Informal sector covering walkway (Source: Author)

6.1.4 Summary

Auto rickshaw dominates on other mode of transportation on this road. It runs west to east on Ashok Rajpath and while returning it divert route from mehandru. This high density area is filled with middle class family, service class people and students. They prefer Bicycle, Motor cycle, Auto rickshaw, buses as mode of their transport. The reason for auto rickshaw being famous in this road is because of city structure. High density unplanned residential area is connected with this road with 1-3 m concrete pathway, at every 30-50 m. Due to this character of city, passenger waits at every crossing which is at distance 30-50 m, and it is easy for autorickshaw to pick and drop those passenger than any other mode. Its small in size and allows 4 -5 passenger to sit at a time, at any stop its easy and take less time to pick and drop passenger.

Buses in this route are overcrowded. 15 buses per hour crosses through old part of city up to Gai ghat, whereas 30 buses per hours goes up to N.I.T. turning only, so around 55 buses per hour crosses the wider part of Ashok Rajpath. These buses don't affect auto rickshaw in term of commuters. Auto rickshaw gets their passengers easily, but this sector is affected due to traffic jam causes by bus. Buses are used as auto rickshaw by commuters, means buses pick and drop commuters at every 30-50 m. Since bus can accommodate more number of people, hence it stops at almost every junction. Due to which bus literally crawl at average speed of 10 km per hour. Its size and narrow road (one lane) don't allow any vehicles to move simultaneously, all traffic has to move behind the bus. The situation becomes more pathetic when a cycle rickshaw and other NMT vehicles are in front of bus. Due to absence of bus stop, buses used to park at road only.

Figure 6-23: vehicle parking on road at khajanchi road crossing (Source: Author)

Motorcycle is used more, than cars due to availability of middle income groups in this area. Motorcycle is cheap in all the aspect than car and its can be transported easily in this

congested road. So, motorcycles are used predominantly as private mode of transport.

Bicycle also contributes good percentage in traffic composition. This is due to low income group of people and student residing here. Bicycle has lowest maintenance charge among other mode and it doesn't need fuel to run it.

Cycle rickshaw is predominantly used in wide section of Ashok rajpath. It is generally used by people for having short trip like and the other reason is low income group of household. Patna market, university area, or towards old bye pass road, where any public mode of transportation is not available. Cycle rickshaw avoids moving on narrower section of Ashok Rajpat, because it jammed at maximum of time. Rather than stucking in traffic jam, they prefer other route, where they can earn more. They park their cycle rickshaw at road side.

Good vehicles, NMT good vehicles (*thelas*) move in this road at any time of the day. NMT goods vehicles slows down the overall speed and affect the line of vision of overall traffic, and most of all they park and unload goods at the road only.This trips are made due to presence of commercial area, wholesale area and small sale industry along the road.

Commercial area, University area and other service area along the road attract lot of trips by all mode of transport. Most of all, It attracts people who lives nearby, who prefer to go there by walk. Parking of cycles & motorcycles on sideway, and also vendors on sideway, forces pedestrian to walk on road itself.

Due to city structure, pathway of 2-3 m connects to major residential area. Any construction material in case of construction is unloaded at main road only, and then labour used to put them inside in 2-3 days. This is also the main reason of congestion.

Overall, due to its land use, class of people, road shared by all mode of transport including NMTs, pedestrians and poor traffic management result into a total mess. All the vehicles think they have right over road first than other, every vehicle wanted to overtake other; they turn their vehicles wherever they want. No traffic rules are followed at the road or its junction and there is no one to implement the rules and act.

Figure 6-24 : Construction material accumulated on carriageway (Source: Author)

6.2 Auto rickshaw Driver survey

This survey is conducted by collecting information from the respondents through the interview method based on questionnaire. (**Refer** ***Annexure 2: Questionnaire for Auto Rickshaw drivers Survey***) The filled in questionnaires were entered into a database and analyzed thereupon (**Refe r Annexure 3: Guidelines for Data Analysis for Auto Rickshaw Survey and Annexure 4: Data sheet for Auto Rickshaw drivers Survey**). The analysis was done with the help of tables, graphs and pie charts. Sample size of 40 is taken for this survey.

6.2.1 Age group of auto rickshaw driver

Table 6-7: Age group of auto rickshaw driver

Sl.no.	Age(in years)	No.
1	18-20	10
2	21-25	5
3	26-30	9
4	30-40	8
5	40-50	2
6	>50	6

From the survey result shown in above table, it is found that out of 40 respondents 10 are from age group of 18-20 years, 5 from 21-25 age group, 9 from 26-30 age group, 8 from 30-40 age group and 8 respondents are more than age of 40.

The main finding from above table is that 25 percent respondents are below age of 20, means young people is now joining this sector. 35 percent of respondents are from age group 20-30, 20 percent are from age group of 30-40.The percentage decrease in age group 40-50, which is just 5 percent whereas for age group more than 50 years comprises 15 percent. It shows that all age group of people is working in this sector, even people of older ages still drive auto rickshaw, for extra earning.

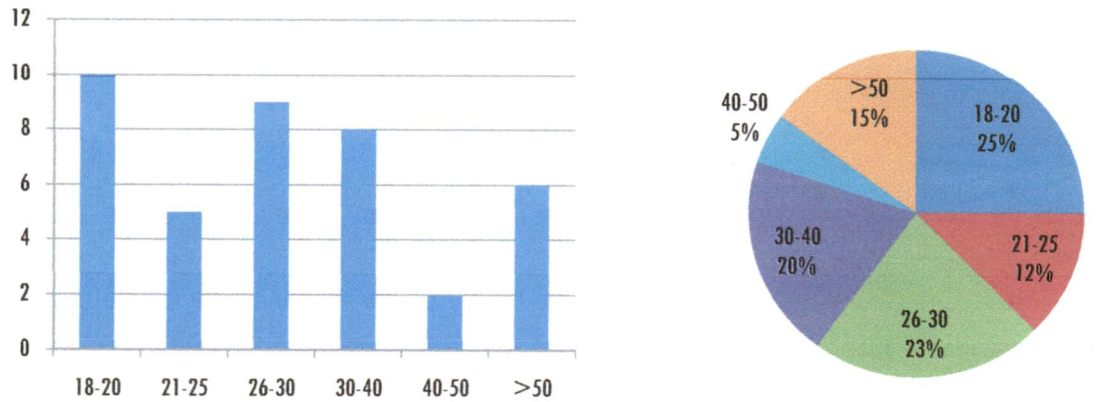


Figure 6-25 : Bar chart and pie chart showing Age of auto rickshaw driver.

6.2.2 Education Qualification

Table 6-8 : Chart showing education qualification of respondents

Sl. No.	Education Qualification	No.
1	uneducated	20
2	< 8th pass	9
3	10th Pass	11
4	12th Pass	0
5	Graduation	0
6	Other	0

From the survey result shown in above table, it is found that out of 40 respondents, 20 respondents are uneducated, 9 respondents has primary education and other 11 respondent has passes matriculation. No respondent has higher secondary education.

The main finding from above table is that 50 percent of respondents are uneducated, 22 percent has primary education and 28 percent has done matriculation. No one has studied till 12th standard or done graduation. Maximum of *muslim* respondents are uneducated, and other went to *madrsa*. It shows that due to lack of education, they didn't get any other job rather than coming in this sector.

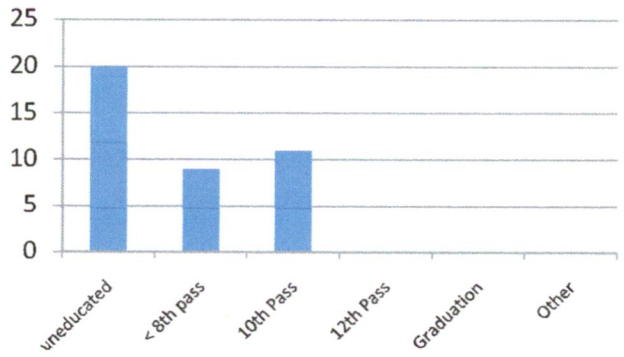


Figure 6-26: Bar graph showing distribution of education qualification of respondents

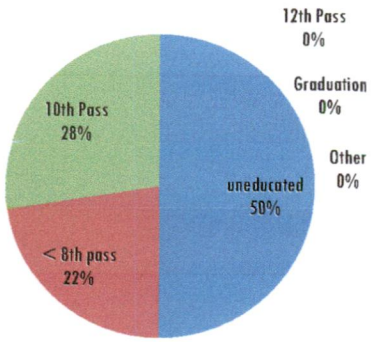


Figure 6-27 : Pie chart showing percentage distribution of educated respondents

6.2.3 Marital Status

Table 6-9: Marital status of respondents

Sl. No.	Marital Status	No.
1	Married	30
2	Single	10
3	Divorced	0

From the survey result shown in above table, it is found that out of 40 respondents, 30 respondents are married and 10 are unmarried. No one is divorced.

The main finding from above table is that 75 percent of respondents are married, 25 percent are unmarried which can be justified by respondent age group of below 18 year i.e. 25 percent. This can be interpreted by the fact that auto rickshaw driver get married before 25 year, and their family runs on his earnings.

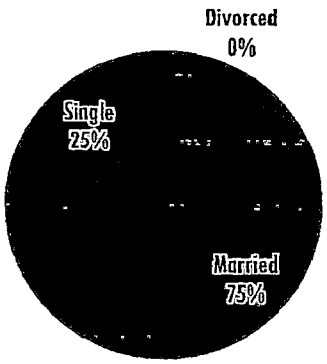


Figure 6-28: Pie chart showing percentage distribution of marital status of respondents

6.2.4 Place of permanent Residence

Table 6-10 Places of permanent residence

Sl. No.	Place of permanent residence	No.
1	patna	27
2	Outside city	13

From the survey result shown in above table, it is found that out of 40 respondents, 27 respondents are from Patna and 13 are from other part of Bihar.

The main finding from above table is that 67 percent of auto rickshaw driver are from Patna itself, whereas 33 percent of Auto rickshaw driver are from other part of Bihar, who came to capital in search of job and stick to this sector. Despite having home in Patna, auto rickshaw driver live as a nuclear family, renting some place. This is due to dispute between families regarding earnings, so auto rickshaw driver prefer to live alone with his wife and children's. This kind of setup helps the auto rickshaw driver to manage the family expenses.

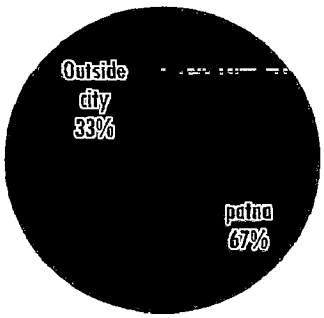


Figure 6-29: percentage composition of residence of respondents

6.2.5 Number of Family Members

Table 6-11: No of family members of respondents

Sl. No.	No. of family members	No.
1	Alone	0
2	2	0
3	3 to 4	5
4	> 4	35

From the survey result shown in above table, it is found that out of 40 respondents, 5 respondents has a family of 3 to 4 and 35 respondents has a family member of greater than 4.

The main finding from above table is that 88 percent of respondents has a family member more than 4 persons and 12 percent of respondents have a household size of 3 to 4. It shows that respondent either live with his wife and children or with his sibling, mother and father. In any case they have to take care of their family expense.

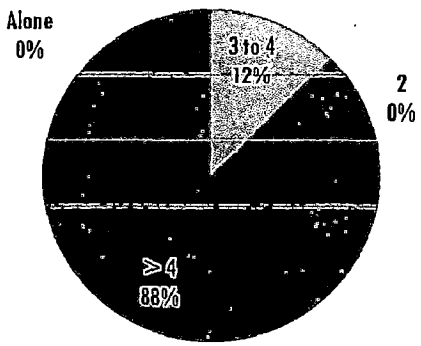


Figure 6-30: percentage composition of no. of family members of respondents

6.2.6 Number of Children

Table 6-12: no. of children's of respondents

Sl. No.	No. of Children	No.
1	0	12
2	1	3
3	2	7
4	3	8
5	>3	10

From the survey result shown in above table, it is found that out of 40 respondents, 12 respondents have no children or live alone, 3 respondent have 1 child, 7 respondent have 2 children, 8 respondent have 3 children and 10 people have more than 3 children.

The main finding from above table is that 25 percent of respondents have more than 3 children, 20 percent have 3 children, 18 percent have 2 children, 7 percent have 1 child and 30 percent have no children. This can be justified with marital status of respondent, 25 percent are not married that means 5 percent married couple have no children. Muslim respondent generally have more than 3 children.

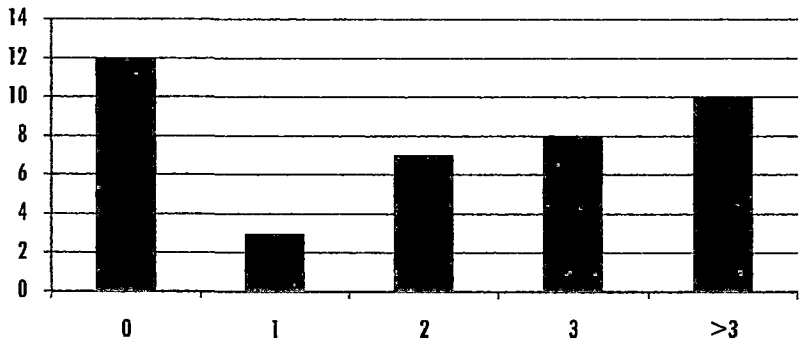


Figure 6-31: Chart showing no. Of children of respondents

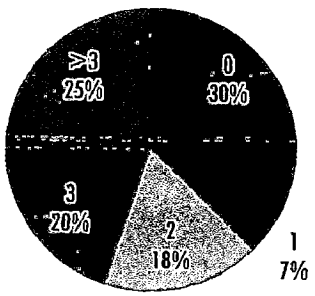


Figure 6-32 : Chart showing percentage distribution of no. Of children of respondents

6.2.7 Monthly Income

Table 6-13: Monthly income distribution of respondents

Sl. No.	Monthly Income (Rs)	No.
1	2000-3000	4
2	3000-4000	3
3	4000-5000	21
4	5000-6000	6
5	>6000	6

From the survey result shown in above table, it is found that out of 40 respondents, 4 respondents earn between Rupees 2000-3000, 3 respondents earns between Rupees 3000-4000, 21 respondent earns between Rupees 4000- 5000, 6 respondents earns 5000-6000 and 6 respondents earns more than 6000.

The main finding from above table is that 10 percent respondents earn between Rupees 2000-3000, 7 percent respondents earns between Rupees 3000-4000, 53 percent respondents earns between Rupees 4000- 5000, 15 percent respondents earns 5000-6000 and 15 percent respondents earns more than 6000. It shows that maximum respondents earns in range of Rupees 4000-5000. 17 percent of respondents who earns between Rupees 2000- 4000 are aged people, whose health doesn't allow them to make more trips, whereas respondents earning around Rupees 6000 are youngster or the person who are unmarried.

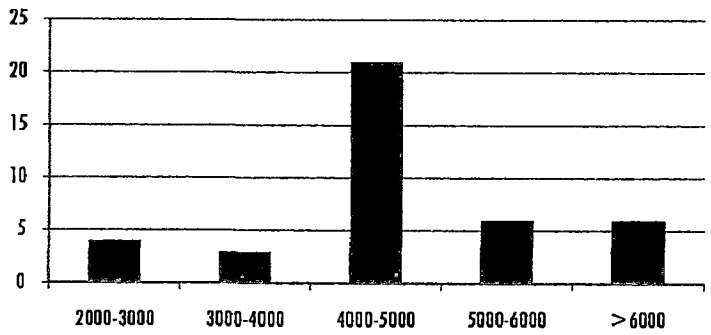


Figure 6-33: Bar chart showing Monthly income distribution of respondents

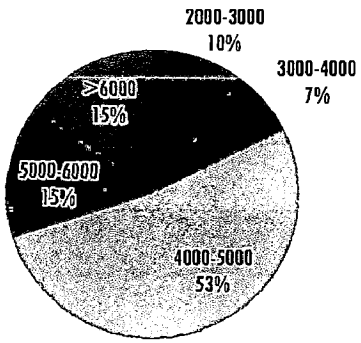


Figure 6-34 : Percentage monthly income distribution of respondents

6.2.8 Family Member Working

Table 6-14: Family member working distribution of respondents

Sl. No.	Family Member working	No.
1	Wife	2
2	Father	6
3	Mother	0
4	Children	8
5	Sibling	6
6	no one	18

From the survey result shown in above table, it is found that out of 40 respondents, 2 respondents wife is working, 6 respondents father is working, 8 respondent's children are working, 6 respondent siblings are working and 18 respondents are only one in his family to earn.

The main finding from above table is that 5 percent respondents wife is working, 15 percent, 20 percent and 15 percent of respondents father, children and sibling are working respectively. 45 percent of respondents are only one his family to earn. In maximum of cases, driving auto rickshaw is family business, so all the members drive auto rickshaw. Wife generally works in shops or other home as *dai/aaya*.

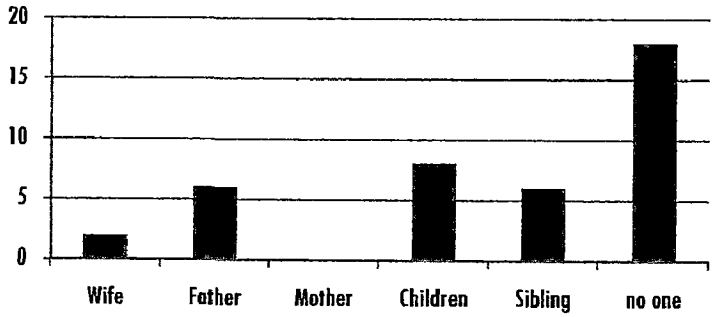


Figure 6-35: Bar graph showing distribution of Family member working of respondents

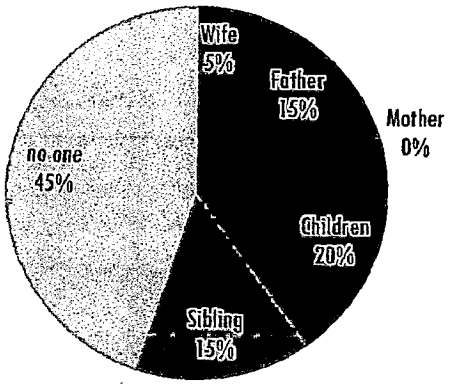


Figure 6-36: Percentage distribution for family member working of respondents

6.2.9 Monthly Family Income

Table 6-15: Monthly family income distribution of respondents

Sl. No.	Monthly Family Income (Rs)	No.
1	<3000	0
2	3000-5000	7
3	5000-8000	13
4	8000-12000	9
5	12000-15000	5
6	>15000	6

From the survey result shown in above table, it is found that out of 40 respondents, 7 respondents monthly family income is between Rupees 3000-5000, 1 3 respondents monthly family income is between Rupees 5000-8000, 9 respondents monthly family income between Rupees 8000- 12000, 5 respondents monthly family income is between 12000-15000 and 6 respondents monthly family income is more than 15000. None of the respondent's monthly family income is below 3000.

The main finding from above table is that 17 percent respondent's monthly family income is between Rupees 3000-5000, 32 percent respondents monthly family income is between Rupees 5000-8000, which can be justified by 45 percent respondent whose family members are not working. 9 percent respondents monthly family income is between Rupees 8000- 12000, 5 percent respondents monthly family income is between 12000-15000 and 6 percent respondents monthly family income is more than 15000.

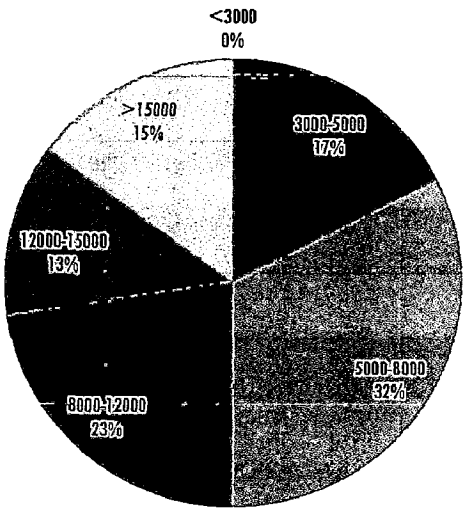


Figure 6-37: Percentage family monthly income distribution of respondents

6.2.10 Monthly Family Expenditure

Table 6-16: Monthly family expenditure distribution of respondents

Sl. No.	Monthly Family Expenditure (Rs)	No.
1	<3000	0
2	3000-5000	15
3	5000-8000	9
4	8000-12000	7
5	12000-15000	7
6	>15000	2

From the survey result shown in above table, it is found that out of 40 respondents, 15 respondents monthly family expenditure is between Rupees 3000-5000, 9 respondents monthly family expenditure is between Rupees 5000-8000, 7 respondents monthly family expenditure between Rupees 8000- 12000, 7 respondents monthly family expenditure is between 12000-15000 and 2 respondents monthly family expenditure is more than 15000. None monthly family expenditure is below 3000.

The main finding from above table is that 37 percent respondent's monthly family expenditure is between Rupees 3000-5000, 22 percent respondents monthly family expenditure is between Rupees 5000-8000, 18 percent respondents monthly family expenditure is between Rupees 8000- 12000, 18 percent respondents monthly family expenditure is between 12000-15000 and 5 percent respondents monthly family expenditure is more than 15000. It shows that in maximum case there is no saving, expense is as per income.

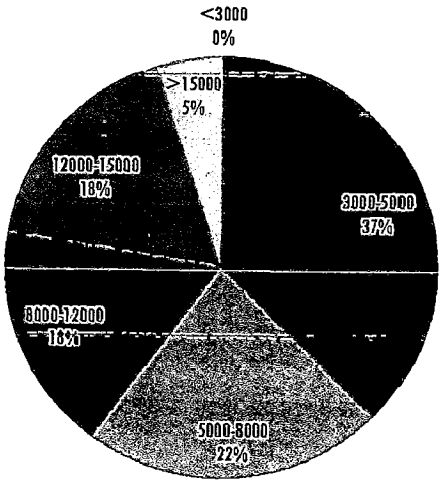


Figure 6-38 : Percentage distribution of monthly family expenditure of respondents

6.2.11 Personal Expenditure

Table 6-17: Personal expenditure distribution of respondents

Sl. No.	Personal Expenditure (Rs)	No.
1	< 500	3
2	500-1000	21
3	1000-2000	13
4	2000-3000	3
5	3000- 4000	0
	>4000	0

From the survey result shown in above table, it is found that out of 40 respondents, 3 respondents personal expenditure is less than Rupees 500, 21 respondents personal expenditure is between Rupees 500-1000, 13 respondents personal expenditure between Rupees 1000- 2000, 3 respondents personal expenditure is between 2000-3000. None of the respondent's personal expenditure is more than 3000.

The main finding from above table is that 7 percent respondent's personal expenditure is less than Rupees 500, 52 percent respondents personal expenditure is between Rupees 500-1000, 33 percent respondents personal expenditure is between Rupees 1000- 2000 and 8 percent respondents personal expenditure is between Rupees 2000-3000. No one spent more than 3000. Their personal expenditure is basically on tobacco and drinks.

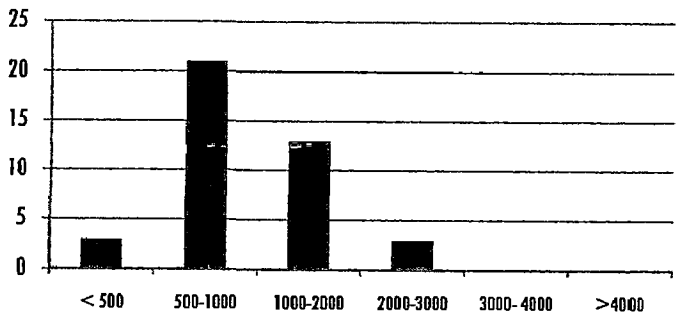


Figure 6-39 : Personal expenditure distribution of respondents

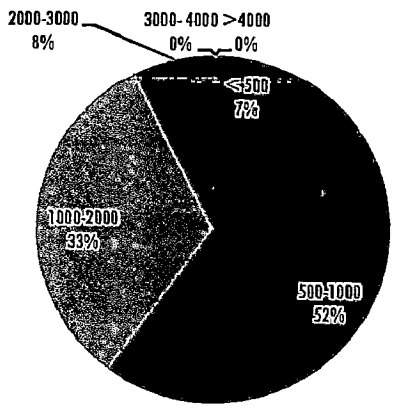


Figure 6-40: Personal expenditure distribution of respondents

6.2.12 Family Member Suffering from Disease

Table 6-18: respondent's family member suffering from disease.

Sl. No.	family member suffering from disease	No.
1	wife	1
2	mother	5
3	father	6
4	children	0
5	sibling	0
6	no one	28

From the survey result shown in above table, it is found that out of 40 respondents, 1 respondent's wife, 5 respondents mother, 6 respondents father is suffering from disease. No one is suffering from disease in 28 respondent's house.

The main finding from above table is that 2 percent, 13 percent, 15 percent of respondent's wife, mother and father are suffering from disease. No one is suffering from disease in 70 percent of respondent. The auto rickshaw driver has to bear more expense for cure of disease. They take loan from local *seth*, for any major problems.

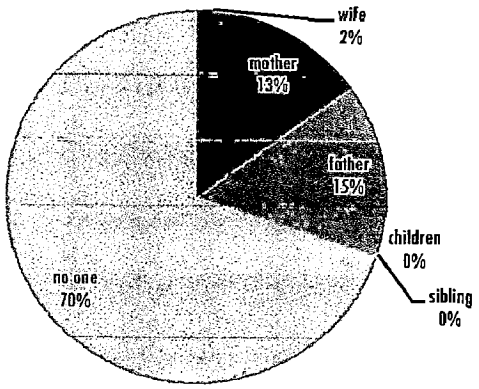


Figure 6-41: Percentage distribution of respondent's family member suffering from disease

6.2.13 Asset Owned

Table 6-19: Distribution of asset owned by respondents

Sl. No.	Asset owned	No.
1	house/land	14
2	Radio	21
3	tv	21
4	bike	2
5	cycle	20
6	mobile	35

From the survey result shown in above table, it is found that 14 respondent's owned a house or land, 21 respondent's owns radio, only two respondent's owns bike, 20 respondent's owns bicycle, 35 out of 40 owns mobile and 21 respondent's owns tv.

Around 85 percent Auto rickshaw driver owns mobile, 45 percent auto rickshaw driver owns cycle.TV and Radio owned by around 50 percent of respondents. House/Land owned by 30 percent of respondent's and 5 percent of Auto rickshaw driver owns bike, whose family income is high

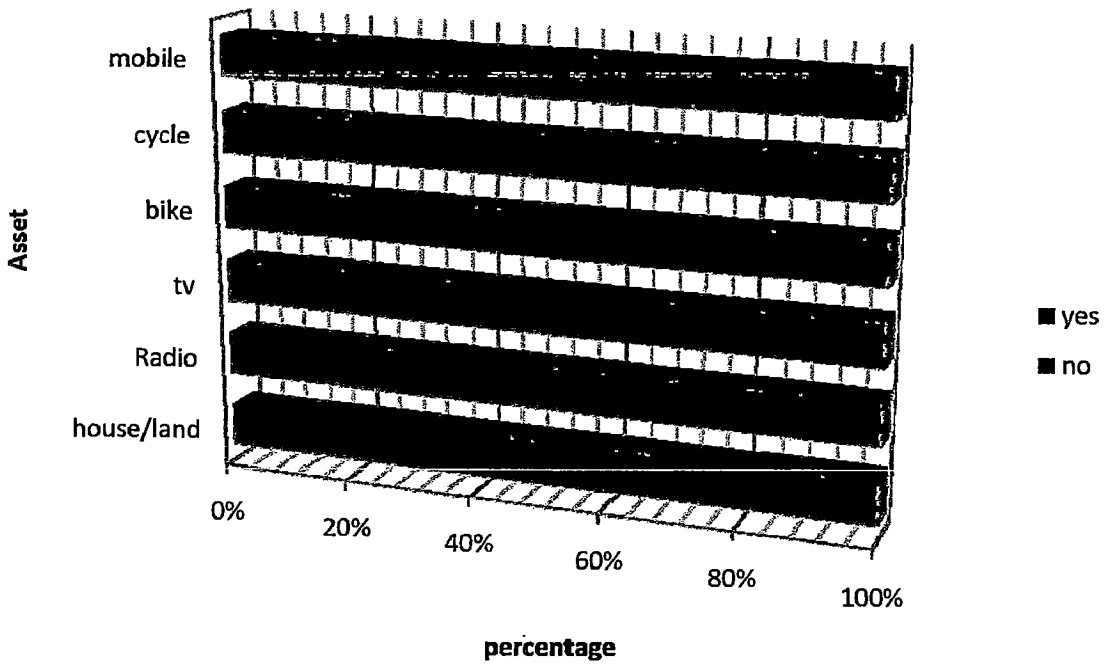


Figure 6-42: Distribution of asset owned by respondents

6.2.14 House Rent

Table 6-20: Distribution of house rent given by respondents

Sl. No.	House rent	No.
1	<500	4
2	500-1000	14
3	1000-1500	13
4	1500-2000	3
5	>2000	0
6	owned/gov house	6

From the survey result shown in above table, it is found that out of 40 respondents, 4 respondents gives house rent less than Rupees 500, 14 respondents gives house rent between Rupees 500-1000, 13 respondents gives house rent between Rupees 1000- 1500, 3 respondents gives house rent between Rupees 1500-2000 and 6 respondents lives in their owned house and none of them give house rent more than 2000.

The main finding from above table is that 10 percent respondent's gives house rent less than Rupees 500 and 35 percent respondents gives house rent between Rupees 500-1000, these respondent's are generally nuclear family. 8 percent respondents gives house rent between Rupees 1500-2000 and 32 percent respondents gives house rent between Rupees 1000- 1500, these respondent's are generally joint family living in 2-3 rooms house. House rent are cheap because they live in this unplanned colony in depleted condition.

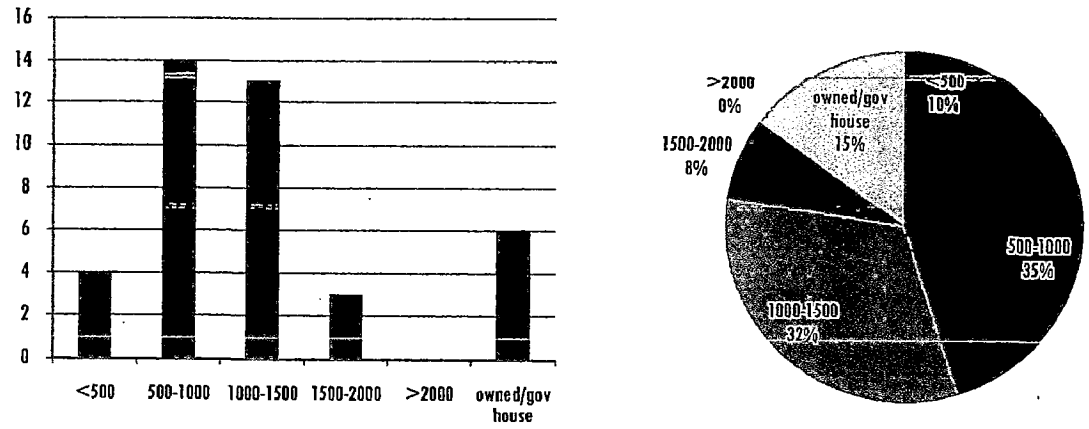


Figure 6-43: Distribution and percentage distribution of house rent given by respondents

6.2.15 Health Problem

Table 6-21: Distribution of health problem expense by respondents

Sl. No.	Health Problem	No.
1	<500	22
2	500-1000	10
3	1000-1500	6
4	1500-2000	2
5	>2000	0

From the survey result shown in above table, it is found that out of 40 respondents, 22 respondents spent less than Rupees 500 on health problem, 10 respondents spent between Rupees 500-1000 on health problem, 6 respondents spent between Rupees 1000- 1500 on health problem, 2 respondents spent between Rupees 1500-2000 on health problem and none of the respondent spent more than 2000 health problem.

The main finding from above table is that 53 percent respondent's spent less than Rupees 500 on health problem, 25 percent respondent's spent between Rupees 500-1000 on health problem. This can be justified by survey result of family members suffering from diseases. 70 percent of respondent's family members are not suffering from any disease. This expense is on generally seasonal viral disease and normal disease.

20 percent respondent spent between Rupees 1000- 2000 on health problem, which is due to some family members suffering from disease, which has requirement of monthly doses of drugs.

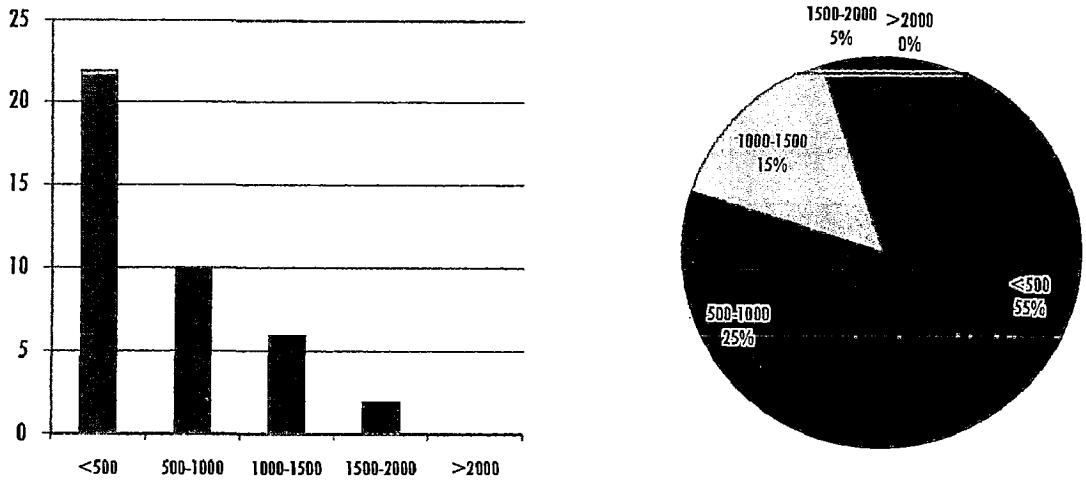


Figure 6-44: Distribution and percentage distribution of health problem expense by respondents

6.2.16 Education

Table 6-22: Distribution of education expense by respondents

Sl. No.	Education	No.
1	<500	20
2	500-1000	8
3	1000-1500	7
4	1500-2000	5
5	>2000	0

From the survey result shown in above table, it is found that out of 40 respondents, 20 respondents spent less than Rupees 500 on education, 8 respondents spent between Rupees 500-1000 on education, 7 respondents spent between Rupees 1000- 1500 on education, 5 respondents spent between Rupees 1500-2000 on education and none of the respondent spent more than 2000 on education.

The main finding from above table is that 50 percent respondent's spent less than Rupees 500 on education and 20 percent respondent's spent between Rupees 500-1000 on education.. This 70 percent comprise of respondent's, who doesn't send their children for education or children going to *madarsa* or government school.

17 percent of respondent's spent between Rupees 1000-1500 on education. 13 percent of respondent's spent between Rupees 1500-2000 on education. This respondent's has more number of children or they sent them to private school for good education but no one spent more than 2000 on education.

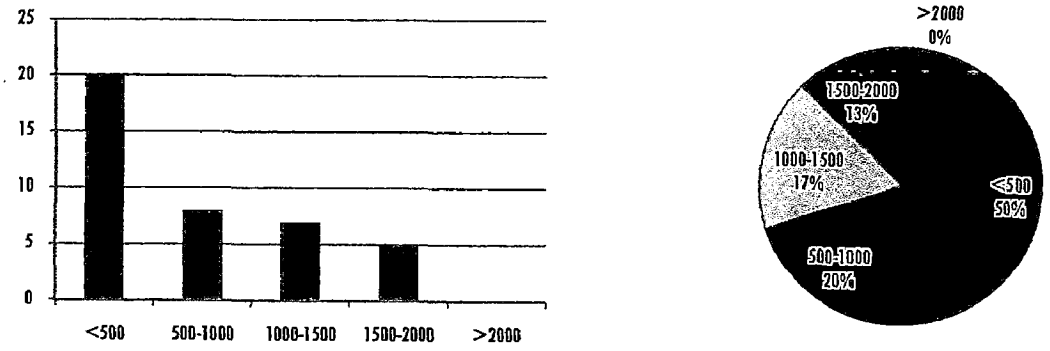


Figure 6-45: Distribution and percentage distribution of respondents based on education expense

6.2.17 Festival/ Ceremonies

Table 6-23 : Distribution of respondents based on festivals/ceremonies expenses

Sl. No.	Festival/ceremonies (annually)	No.
1	<2000	8
2	2000-3000	15
3	3000-5000	17
4	>5000	0

From the survey result shown in above table, it is found that out of 40 respondents, 8 respondents spent less than Rupees 2000 on Festival/ceremonies, 15 respondents spent between Rupees 2000-3000 on Festival/ceremonies, 17 respondents spent between Rupees 3000- 5000 on Festival/ceremonies, and none of the respondents spent more than 5000 on Festival/ceremonies.

The main finding from above table is that 20 percent respondent's spent less than Rupees 2000 on Festival/ceremonies and 37 percent respondent's spent between Rupees 2000-3000 on Festival/ceremonies. This 57 percent comprise of respondent's, who have nuclear family or leave alone.

43 percent of respondent's spent between Rupees 3000-5000 on Festival/ceremonies. This respondent's has big family comprise of children elders, for which festival is important part of their life, so expenses increase in that case.

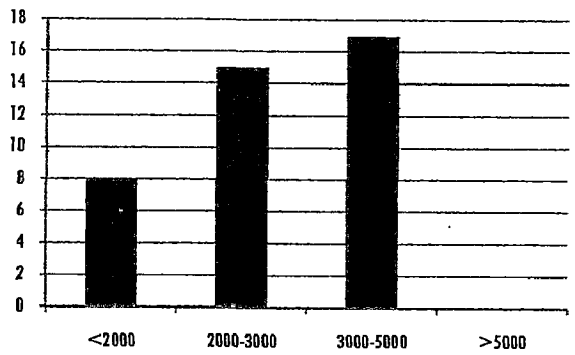


Figure 6-46: Distribution of respondents based on festivals/ceremonies expenses

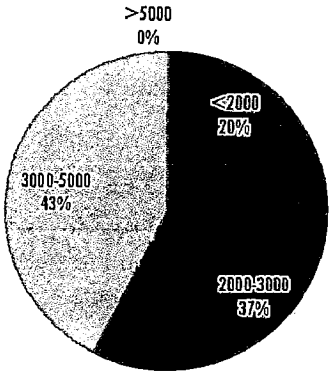


Figure 6-47: Percentage distribution of respondents based on festivals/ceremonies expenses

6.2.18 Food

Table 6-24 : Distribution of respondents based on food expense

Sl. No.	Food	No.
1	<1000	0
2	1000-3000	16
3	3000-5000	20
4	>5000	4

From the survey result shown in above table, it is found that out of 40 respondents, none of the respondents spent less than Rupees 1000 on food, 16 respondents spent between Rupees 1000-3000 on food, 20 respondents spent between Rupees 3000- 5000 on food, and 4 respondents spent more than 5000 on food.

The main finding from above table is that 40 percent respondent's spent between Rupees 1000-3000 on Food. This 40 percent comprise of respondent's, who have nuclear family or leave alone.

10 percent respondent's spent more than Rupees 5000 on Food and 50 percent of respondent's spent between Rupees 3000-5000 on Food. This respondent's has big family comprise of bigger household size.

Expenses on food are more than 1000 for any respondent.

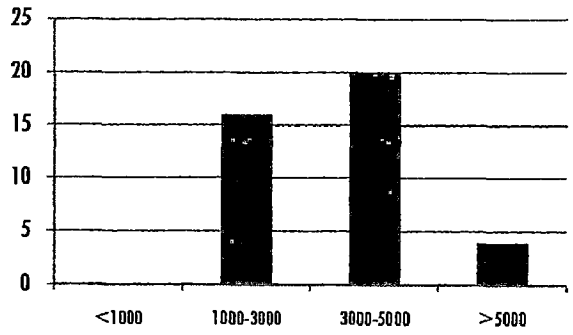


Figure 6-48: Distribution of respondents based on food expense

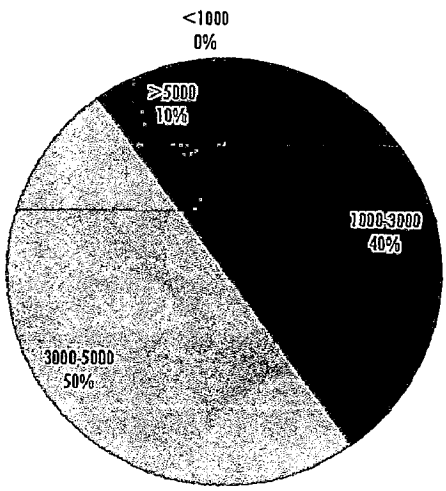


Figure 6-49: Percentage distribution of respondents based on food expense

6.2.19 Why drive auto rickshaw

Table 6-25: Distribution of respondents for reason of driving auto rickshaw

Sl. No.	Why drive autorickshaw	No.
1	Din't get any other job	22
2	gives higher earning than other job	0
3	family business	11
4	Family/friend suggested	7

From the survey result shown in above table, it is found that out of 40 respondents, 22 respondents drive auto rickshaw because they didn't get any job, 11 respondents join this sector because of family business, and 7 respondents enter in this sector on friend family suggestion. No one drives auto rickshaw because of its earning.

The main finding from above table is that 55 percent respondent's drive auto rickshaw because they didn't get any job, 27 percent respondents join this sector because of family business, and 18 percent respondents enter in this sector on friend family suggestion. No one drive auto rickshaw because of its earning.

Its shows that maximum of respondents enters this sector because they didn't get any job. This is due to lack of education among respondents who doesn't have any choice rather than entering in this sector.

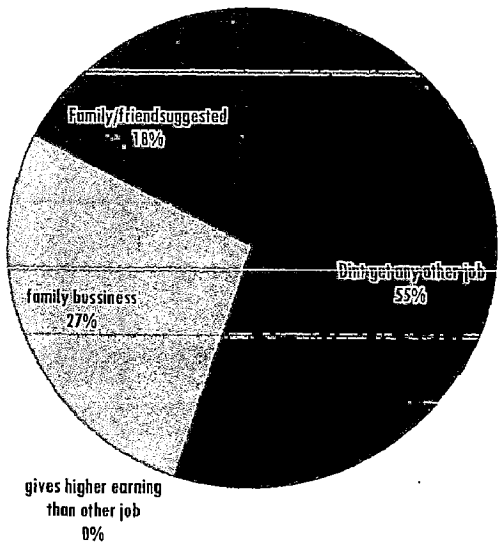


Figure 6-50: Percentage distribution of respondents for reason of driving auto rickshaw

6.2.20 Experience in driving auto rickshaw

Table 6-26: Distribution of respondents as per experience in driving autorickshaw

Sl. No.	Experience in driving auto rickshaw	No.
1	less than 1 year	4
2	3-5 years	14
3	5-10 years	4
4	10-15 years	3
5	15-20 years	5
6	>20 years	10

From the survey result shown in above table, it is found that out of 40 respondents, 4 respondents has experience of less than 1 year in driving auto rickshaw, 14 respondents has experience between 3-5 years in driving auto rickshaw, 4 respondents has experience between 5-10 years in driving auto rickshaw, 3 respondents has experience between 10-15 years in driving auto rickshaw, 5 respondents has experience between 15-20 years in driving auto rickshaw and 10 respondents has experience of more than 20 years in driving auto rickshaw.

The main finding from above table is that 10 percent respondents has experience of less than 1 year in driving auto rickshaw, which means young population is also entering in this sector but it is comparatively less. Young people is trying to earn in different sector rather than entering in this sector. This is due to saturation of this sector, congestion, exhaustion and less earning.

35 percent respondents has experience between 3-5 years in driving auto rickshaw, which shows that lot of people enter in this sector in previous 5 years.

17 percent respondents have experience between 5-15 years in driving auto rickshaw and 38 percent respondents have experience for more than 15 years in driving auto rickshaw. This shows that this sector generated good earning in earlier days, but now this sector don't give good earning.

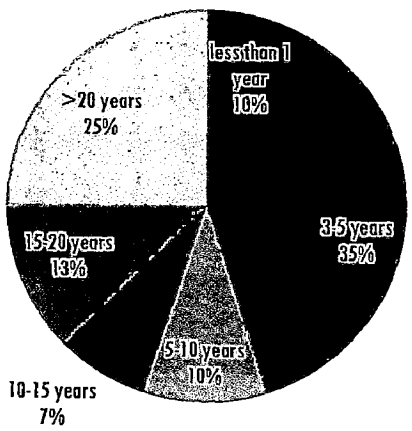


Figure 6-51: Percentage distribution of respondents as per experience in driving autorickshaw

6.2.21 How do you learn driving

Table 6-27: Distribution of respondents as per way of learning auto rickshaw

Sl. No.	How do you learn driving	No.
1	Self trained	16
2	Trained by friends/family	24
3	Driving school	0

From the survey result shown in above table, it is found that out of 40 respondents, 16 respondents learn driving by self and 24 respondents were trained by friend, family. No one had taken training from driving school.

The main finding from above table is that 40 percent respondents are self trained and 60 percent was trained by family members or friends. No one has ever visited driving school. Due to lack of proper training they drive rashly, don't follow traffic rules and are not aware of government regulation.

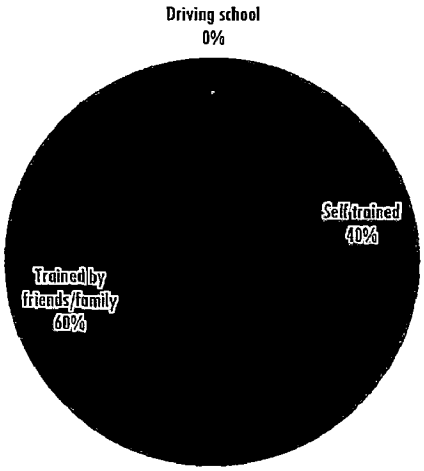


Figure 6-52: Percentage distribution of respondents as per way of learning auto rickshaw

6.2.22 Kilometres driven per day

Table 6-28 : Distribution of respondents as per kilometre driven per day

Sl. No.	Kilometres driven per day	No.
1	<40	6
2	40-80	22
3	80-120	10
4	>120	2

From the survey result shown in given table, it is found that out of 40 respondents, 6 respondents drives less than 40 kilometre, 22 respondents drives between 40-80 kilometre, 10 respondents drives between 80-120 kilometre and 2 respondents drives more than 120 kilometres.

The main finding from above table is that , 15 percent respondents drives less than 40 kilometre, 55 percent respondents drives between 40-80 kilometre, 25 percent respondents drives between 80-120 kilometre and 5 percent respondents drives more than 120 kilometres.

Auto rickshaw from Gandhi Maidan runs up to Gai ghat or Malslami which is at distance 6.5 km and 14 km respectively. In a day they make 4-5 trips (up-down) from Gai ghat and 2-3 trips(up-down) from Malslami, whereas they are able to make 7-8 trips(up-down) and 5-6 trips (up-down) respectively before introduction of city bus on this route. Bus causes congestion and increases travel time which result in less travelling speed. That's the reason behind 55 percent respondent driving between 40- 80 kilometres.

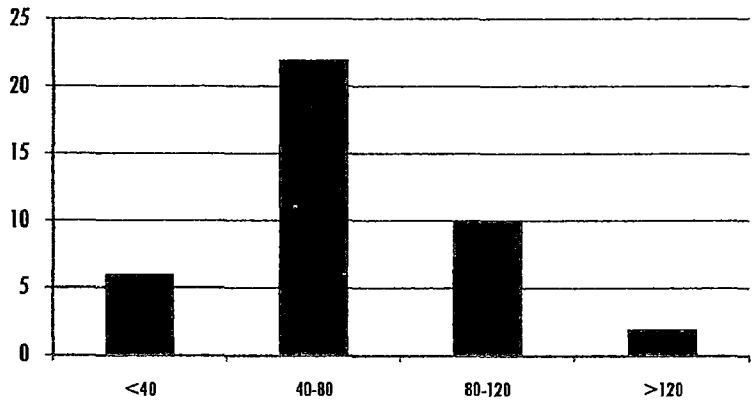


Figure 6-53: Distribution of respondents as per kilometre driven per day

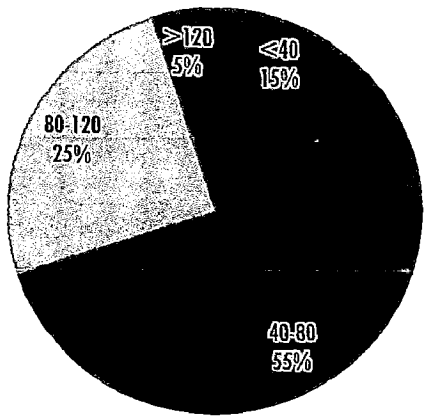


Figure 6-54: Percentage distribution of respondents as per kilometre driven per day

6.2.23 Hour spent driving per day

Table 6-29: Distribution of respondents as per hours spent in driving per day

Sl. No.	Hour spent driving per day	No.
1	<10	14
2	10 to 12	16
3	12 to 14	7
4	14 to 16	3
5	>16	0

From the survey result shown in given table, it is found that out of 40 respondents, 14 respondents drives less than 10 hours, 16 respondents drives between 10-12 hours, 7 respondents drives between 12-14 hours, 3 respondents drives between 14-16 hours and no respondents drives more than 16 hours.

The main finding from above table is that 35 percent respondents drives less than 10 hours, because congestion and pollution leaves the auto rickshaw driver exhausted. So, they are not able to drive more.

Despite exhaustion, 40 percent respondents drive between 10-12 hours because its gives less earning due to less number of trips on this congested road.

17 percent respondent's drives between 12-14 hours and 8 percent respondent's drives between 14-16 hours and no respondents drives more than 16 hours.

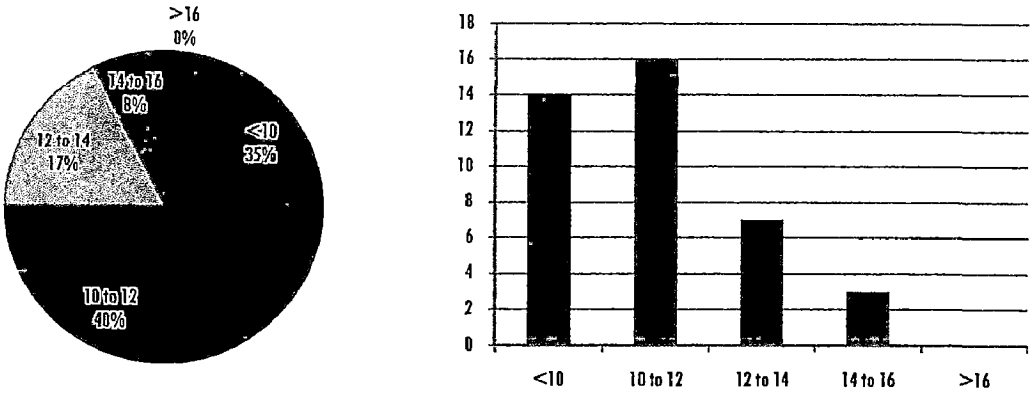


Figure 6-55: Percentage distribution and distribution of respondents as per hours spent in driving per day

6.2.24 Average time waiting per day

Table 6-30: Distribution of respondents as per Average waiting time per day

Sl. No.	Avg time waiting per day	No.
1	<2	40
2	2 to 4	0
3	4 to 6	0
4	>6	0

From the survey result shown in given table, it is found that out of 40 respondents, all of them wait less than 2 hours per day.

Auto rickshaw is Patna is used as major public transport. There are always passenger waiting for this auto rickshaw due to lack of other option and it is filled with in 5 minutes. They park their vehicles only in case when they have to take break.

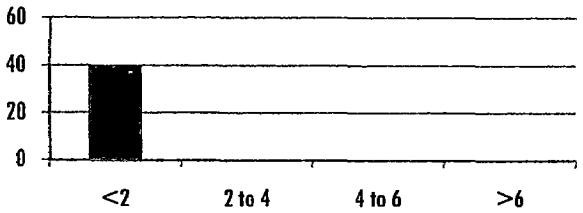


Figure 6-56: Distribution of respondents as per Average waiting time per day

6.2.25 Average speed of travel

Table 6-31 : Distribution of respondents as per average speed of travel

Sl. No.	Avg Speed of travel	No.
1	<15	31
2	15 to 25	9
3	25 to 35	0
4	35 to 45	0
5	> 45	0

From the survey result shown in given table, it is found that out of 40 respondents, 31 respondents drives at average speed of less than 15 km per hour and 9 respondent's drive auto rickshaw at average speed between 15 to 25 km per hour. No one drives at more than speed of 25 km per hour.

The main finding from above table is that 77percent respondent's drives at average speed of less than 15 km per hour and 23 percent respondent's drive auto rickshaw at average speed between 15 to 25 km per hour. No one drives at more than speed of 25 km per hour. This is due to congested road, less width of road and bad condition of auto rickshaw.

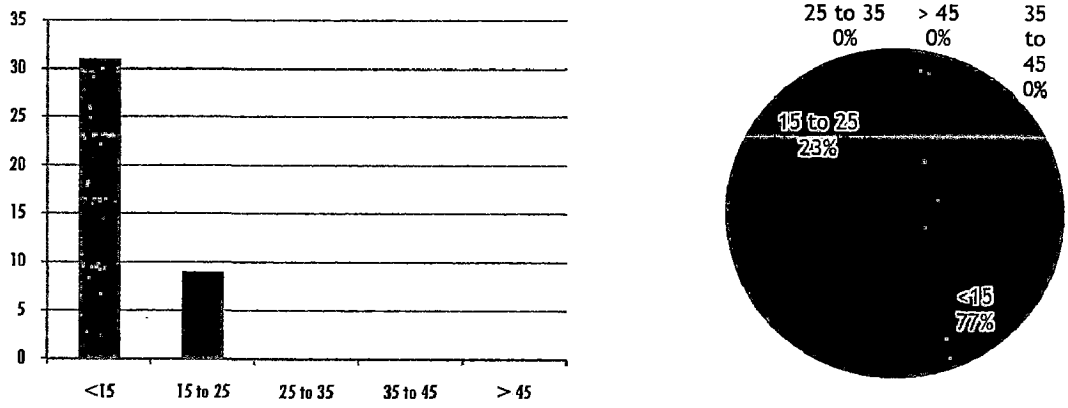


Figure 6-57: Distribution and percentage distribution of respondents as per average speed of travel

6.2.26 Maximum speed of travel

Table 6-32: Distribution of respondents as per maximum speed of travel

Sl. No.	Max. Speed of travel	NO.
1	30 km/hr	29
2	40 km/hr	11
3	50 km/hr	0
4	60 km/hr	0
5	70 km/hr	0

From the survey result shown in given table, it is found that out of 40 respondents, 29 respondents drives at maximum speed of 30 km per hour and 11 respondent's drive auto rickshaw at maximum speed between 40 km per hour. No one drives at more than maximum speed of 40 km per hour.

The main finding from above table is that 72 percent respondent's drives at maximum speed of 30 km per hour and 28 percent respondent's drive auto rickshaw at maximum speed between 40 km per hour. This is due to same reason mentioned in above finding. This speed is achieved only in early morning or late night time.

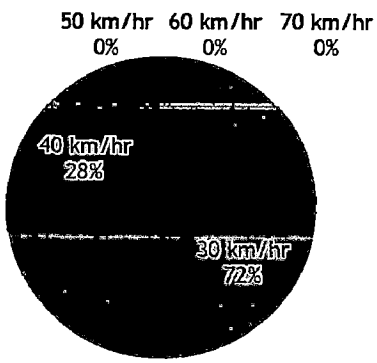


Figure 6-58: Percentage distribution of respondents as per maximum speed of travel

6.2.27 Fuel type

Table 6-33: Distribution of respondents as per fuel used for auto rickshaw

Sl. No.	fuel type	No.
1	petrol	12
2	kerosene	2
3	mix(petrol+kerosene)	24

From the survey result shown in given table, it is found that out of 40 respondents, 12 respondents use petrol as fuel in auto rickshaw, 2 respondents uses kerosene as fuel and 24 respondents uses mixture of kerosene and petrol.

The main finding from above table is that 32 percent respondents use petrol as fuel in auto rickshaw, 5 percent respondent's uses kerosene as fuel and 63 respondents uses mixture of kerosene and petrol.

Round 85 percent auto rickshaw are rented, majorly uses kerosene or mixture of kerosene and petrol as fuel. They give Rupees 100-150 per day as rent, and respondents are able to earn 500-600 per day by using kerosene which cost rupees 100-300 per day. This results in saving of 100-200 per day by using kerosene as fuel. By using of petrol they will not be able to earn enough to give rent and buy fuel. Due to this congestion they can't make enough trips to make sufficient money. Petrol is used by those respondents who owns auto rickshaw. Since they have no rent to give, hence they make sufficient money in same condition. In addition to petrol and kerosene they have to add Mobil also.

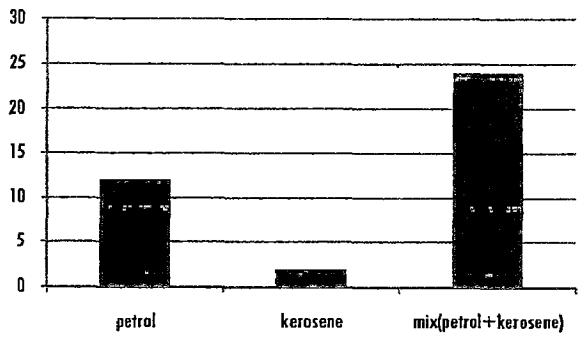


Figure 6-59: Distribution of respondents as per fuel used for auto rickshaw

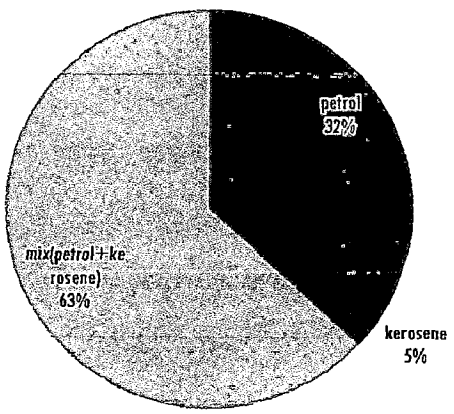


Figure 6-60: percentage distribution of respondents as per fuel used for auto rickshaw

Average Fuel Rate, which is used by respondent:-

Petrol+ mobil = Rs 75 per litre
Kerosene= Rs 25-30 per litre
Petrol+ mobil +kerosene = Rs. 40-50 per litre
Mileage= 15-16 km/l

Engine of kerosene used auto rickshaw generally breaks down in 6 month, which requires around Rupees 4000-5000 for maintenance. These are generally rented auto rickshaw, whose major expenses is bear by owner only. Despite of this expense, owner allows them to use kerosene because no one will rent it, if he wouldn't allow this.

Generally this fuel contains at least 50 percent of kerosene and naptha which causes three time more pollution than petrol. Such a high proportion of kerosene reduce the fuel combustion efficiency, resulting in high level of unburnt fuel along with respirable particulate matter (RPM) emitted by auto rickshaw. This RPM restrict the flow of oxygen to lungs, which can lead to any number of life threatening condition. This can cause severe upper respiratory tract infection and allergic rhinitis, including bronchial asthma, and too much inhalation of this smoke can cause lung cancer.[41]

Among all roads in Patna, this is the only road, where kerosene is used as fuel at such an extent. There is no proper authority to check this; no proper action has taken yet to resolve this issue.

[41] Adulterated fuel poses threat to kids - Times Of India Articles.timesofindia.indiatimes.com/..../28284686_1_rickshaw-check-fuel-adulteration-kerosene

6.2.28 Fuel Cost

Table 6-34 : Distribution of respondents as per expenses in fuel per day

Sl. No.	fuel cost (daily)	No.
1	>200	10
2	200-400	20
3	400-600	7
4	> 600	3

From the survey result shown in given table, it is found that out of 40 respondents, 10 respondent spend less than rupees 200 on fuel, 20 respondent spend between Rupees 200-400 on fuel, 7 respondent spend between rupees 400-600 on fuel and 3 respondent spend more than rupees 600 on fuel.

The main finding from above table is that 50 percent respondents spend between Rupees 200-400 on fuel, which is generally mixture of kerosene and petrol, 25 percent spend more than rupees 400 on fuel and other 25 percent spend less than rupees 200 on fuel, which are petrol and kerosene respectively.

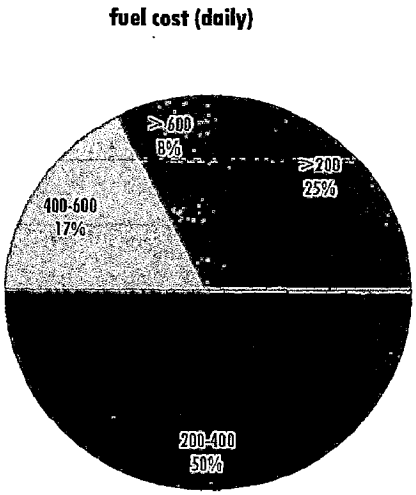


Figure 6-61: Percentage distribution of respondents as per expenses in fuel per day

6.2.29 Maintenance

Table 6-35 : Distribution of respondents as per expenses on auto rickshaw monthly

Sl. No.	Maintenance (monthly)	No.
1	>500	14
2	500-1000	12
3	1000-2000	14
4	> 2000	0

From the survey result shown in given table, it is found that out of 40 respondents, 14 respondents spend less than rupees 500 on maintenance, 12 respondents spend between Rupees 500-1000 on maintenance, 14 respondents spend between rupees 1000-2000 on maintenance and none of the respondent spend more than rupees 2000 on maintenance.

The main finding from above table is that 35 percent respondents spend less than rupees 500 on maintenance, 30 percent respondents spend between Rupees 500-1000 on maintenance, 35 percent respondents spend between rupees 1000-2000 on maintenance and no respondent spend more than rupees 2000 on maintenance. Most of the auto rickshaw is rented and major expenses are beared by owner itself. Expenses up to 1000 rupees are beared by respondent which are minor problems in auto rickshaw.

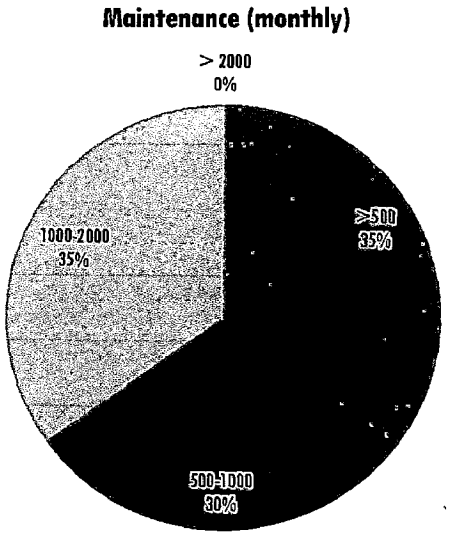


Figure 6-62: Percentage distribution of respondents as per expenses on auto rickshaw maintenance monthly

6.2.30 Satisfied with shared system

Table 6-36: Distribution of respondents as per satisfaction with shared auto system

Sl. No.	Satisfied with shared auto system	No.
1	yes	40
2	no	0

From the survey result shown in given table, it is found that out of 40 respondents, all of them are satisfied with this shared system. This is because they are used as public transport and they need not to wait for passenger.

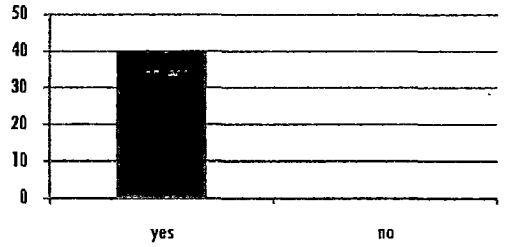


Figure 6-63: Distribution of respondents as per satisfaction with shared auto system

6.2.31 Ownership

Table 6-37: Distribution of respondents as per ownership of auto rickshaw

Sl. No.	Ownership	Ownership
1	owned	6
2	rented	34

From the survey result shown in given table, it is found that out of 40 respondents, 6 of them owned auto rickshaw whereas 34 runs it on rental basis.

It is found that 85 percent of respondents rent auto rickshaw. They gave Rupees 100 for old auto rickshaw and Rupees 150 for new auto rickshaw as rent.

15 percent owns auto rickshaw which cost around 1.17 lakh for back engine 3 seater autorickshaw. (On road 1.35 lakh, including permit tax) and 2- 2.4 lakh for bigger 8 seater auto rickshaw. The permit costs rupees 7000 for 5 years and rupees 1500-200 per year. Permit is issued by RTA (Regional Transport Authority, under ADM, Commissioner). The permit is issued for this particular route of 16 km from Gandhi maidan to Malslami.

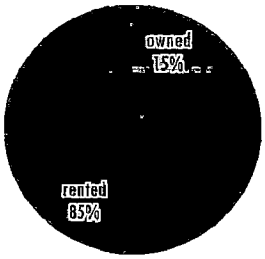


Figure 6-64: Percentage distribution of respondents as per ownership of auto rickshaw

6.2.32 Faces competition with other mode of transport

Table 6-38: Distribution of respondents as per opinion against other mode of transport

Sl. No.	face competition with other mode	No.
1	taxi	0
2	bus	40
3	cycle rickshaw	0
4	none	0

From the survey result shown in given table, it is found that out of 40 respondents, all of them have problem from buses. One of the problems is congestion due to which their trips are reduced and other problem is its cheap fare. Auto rickshaw charges 12 rupees from Gai ghat to Gandhi maidan whereas buses charges 5 rupees for same distance. Despite less amount of time taken by auto rickshaw compared to buses, people prefer buses.

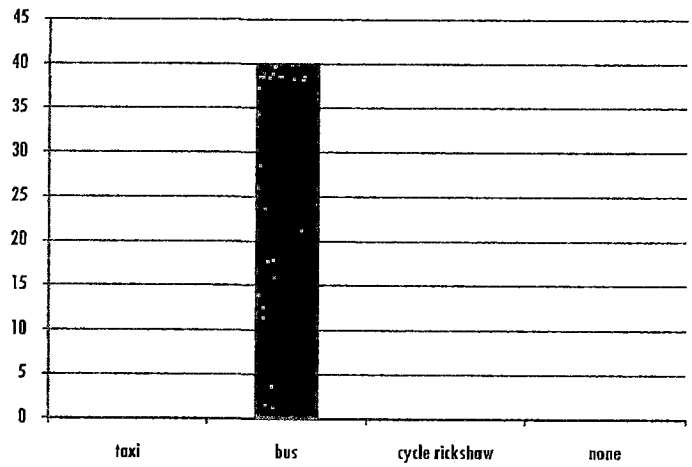


Figure 6-65: Distribution of respondents as per opinion against other mode of transport

6.2.33 Things done during waiting hours

Table 6-39: Distribution of respondents as per things done during waiting hours

Sl. No.	Things done during waiting hour	No.
1	Sleep	10
2	Listen to radio	9
3	Chat with fellow autorickshaw driver	30
4	Smoke	29
5	have tea/snacks	32

From the survey result shown in above table, it is found that 10 out of 40 respondent's sleep, 9 out of 40 respondents listen to radio, 30 out of 40 respondent chat with fellow auto rickshaw driver, 29 out of 40 respondents smoke and 32 out of 40 respondents had tea/snack during waiting hours.

As such they have no waiting hours, they just take a break from this exhaustive drive along this road in which around 20 percent respondent's slept and listens to radio during waiting hours. Around 70 percent respondent chats with fellow auto rickshaw driver, smoke and had tea/snack during waiting hours.

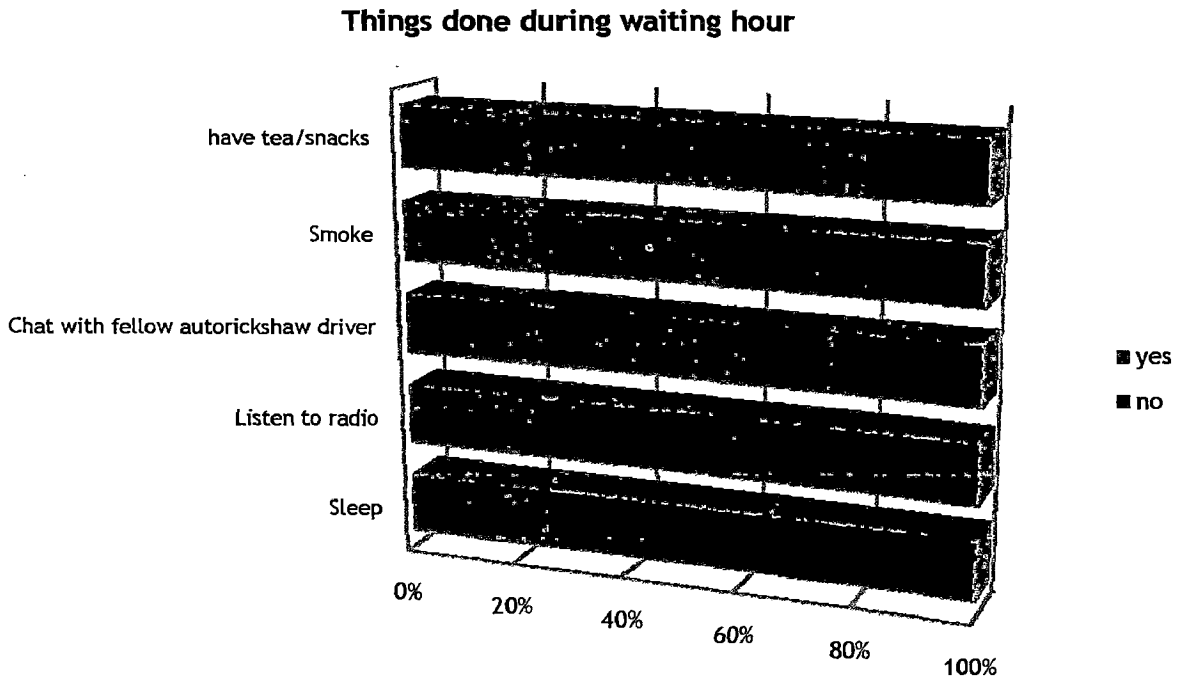


Figure 6-66: Distribution of respondents as per things done during waiting hours

6.2.34 Day off from work

Table 6-40: Distribution of respondents as per their leave taken from work

Sl. No.	Day off from work	No.
1	Work all days	6
2	once or twice in month	18
3	5-7 days in month	4
4	Weekly once	12

From the survey result shown in above table, it is found that out of 40, 6 respondents work all days in a week, 18 take leave for 1 or 2 days in a month, 4 respondents take 5-7 days in month and 12 respondents take weekly leave.

It is found that 60 percent respondent generally wok all day or take leave for once or twice a month. This is not a higher earning sector and for meeting the requirement of family respondents has to work more. Other 40 percent take leave regularly. These are older peoples or having some health problems.

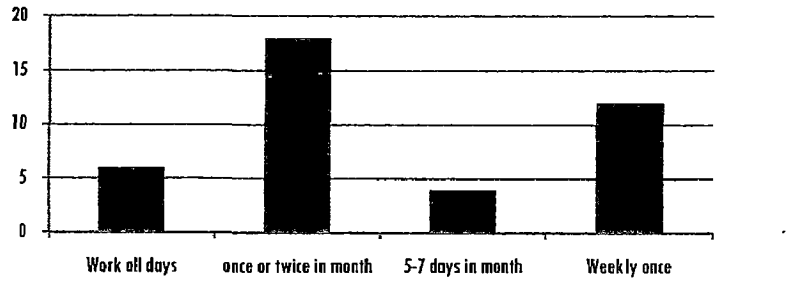


Figure 6-67: Distribution of respondents as per leave taken from work

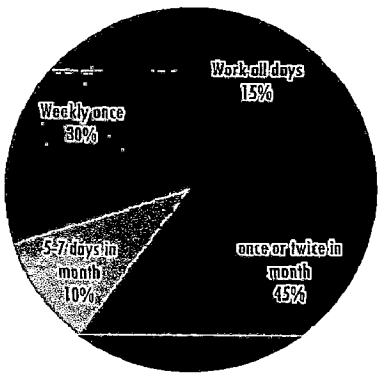


Figure 6-68: Percentage distribution of respondents as per leave taken from work

6.2.35 Reason for day off from work

Table 6-41: Distribution of respondents as per reason for their leave

Sl. No.	Reason for Day off from work	No.
1	Illness	2
2	Work	8
3	Family	12
4	Leisure/Rest	18

From the survey result shown in above table, it is found that out of 40, 2 respondents take leave because of illness, 8 respondents take leave because they some other work, 12 respondents take leave because of some family issue and 18 respondents take leave for rest or leisure.

It is found that 5 percent respondents take leave because of illness, 20 percent respondents take leave because they some other work, 30 percent respondents take leave because of some family issue and 45 percent respondents take leave for rest or leisure.

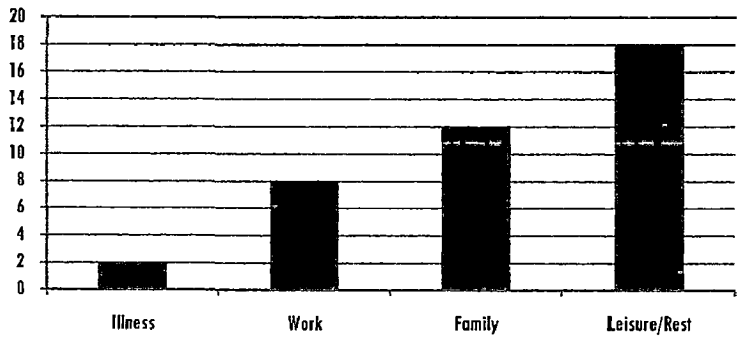


Figure 6-69: Distribution of respondents as per reason for their leave

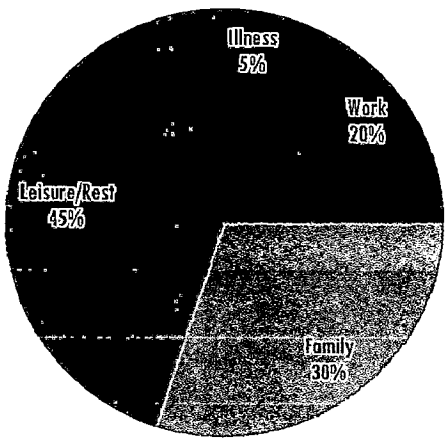


Figure 6-70: Percentage distribution of respondents as per reason for their leave

6.2.36 Hours of sleeping

Table 6-42: Distribution of respondents as per hours of sleeping

Sl. No.	Hours of sleeping	No.
1	4 - 6 hrs	0
2	6 - 8 hrs	13
3	8 -10 hrs	27
4	>10 hrs	2

From the survey result shown in above table, it is found that out of 40, 13 respondents sleeps for 6-8 hours, 27 respondents sleeps for 8-10 hours, 2 respondents sleeps for more than 10 hours.

It is found that 31 percent respondents sleeps for 6-8 hours, 64 percent respondents sleeps for 8-10 hours and 5 percent respondents sleeps for more than 10 hours. This shows that respondents sleep properly. This route is so congested and polluted, that one's get more exhausted in compare to other route.

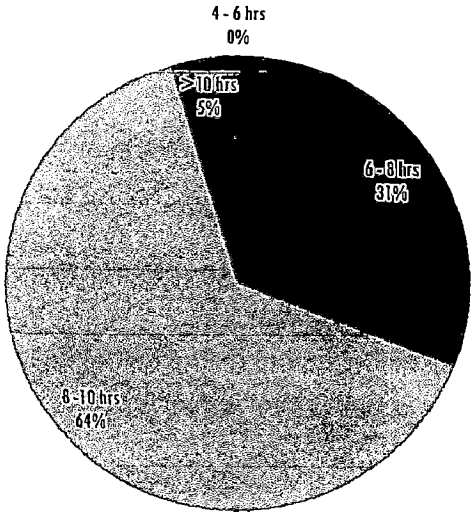


Figure 6-71: Percentage distribution of respondents as per hours of sleeping

6.2.37 On job problems

Table 6-43: Distribution of respondents as per on job problem

Sl. No.	On the job problems	No.
1	Tension	8
2	Driver Fatigue	20
3	lack of Interest	0
4	boredom	2
5	Tiredness	2
6	Stress	8
7	Distraction	0

From the survey result shown in above table, it is found that out of 40, 8 respondents has tension, 20 respondents has problem of driver fatigue, 2 respondents suffer from boredom, 2 from tiredness and 8 from stress.

This problem is due to reason mentioned already in different survey. This problems are majorly due to congestion, passenger response, polluted air etc.

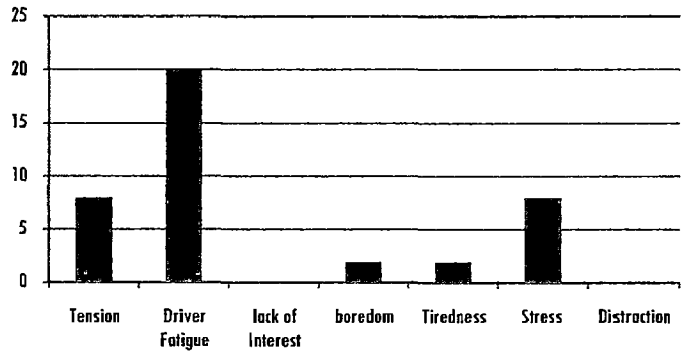


Figure 6-72: Distribution of respondents as per on job problem

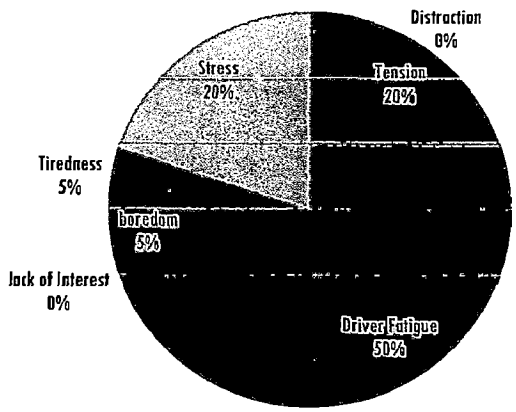


Figure 6-73: Percentage distribution of respondents as per on job problem

6.2.38 Health problem

Table 6-44: Distribution of respondents as per their health problem

Sl. No	Health Problem	No.
1	Restless sleep/insomnia	8
2	Back pains	5
3	Headaches	11
4	Obesity	0
5	Digestive troubles	2
6	Hypertension	0
7	No health problem	14

From the survey result shown in above table, it is found that out of 40, 8 respondents suffers with insomnia, 5 with back pain, 11 with headache, 2 with digestive problems. 14 respondents have no major health problem.

The main finding from above table is that 35 percent respondents have no major health problems. 37 percent respondents are below age of 25 who get used to this situation but at later stages they get a constant problem like insomnia, back pain, headache etc.

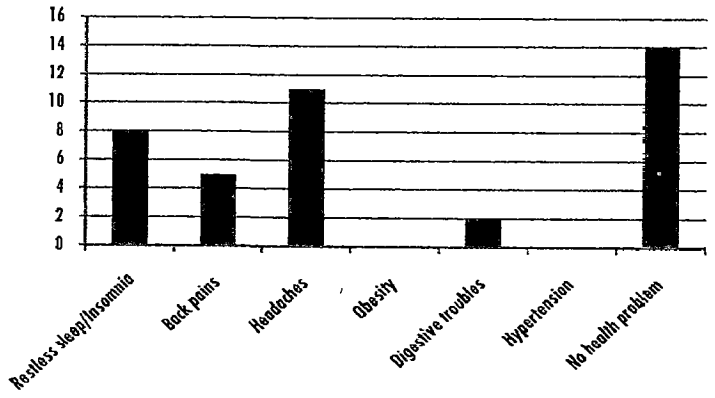


Figure 6-74: Distribution of respondents as per their health problem

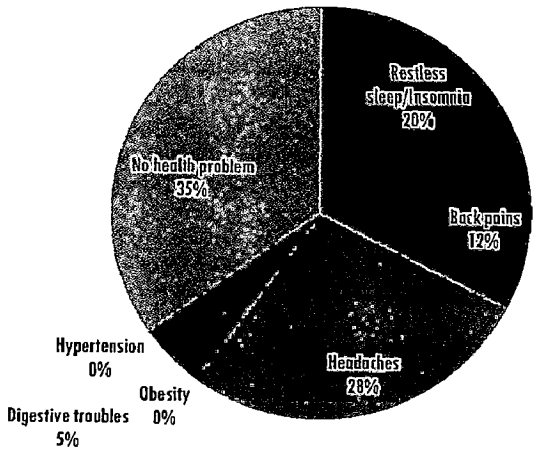


Figure 6-75: Percentage distribution of respondents as per their health problem

6.2.39 Stress coping mechanism

Table 6-45: Distribution of respondents as per things done for coping stress

Sl. No.	Stress coping mechanism	No.
1	Chewing tobacco/Smoking	16
2	Consuming alcohol	16
3	Listening to the radio	2
4	Talking on the mobile phone	2
5	Playing card	6
6	Take a nap	12

From the survey result shown in above table, it is found that out of 40, 16 respondents smokes or chew tobacco, 16 consume alcohol, 2 respondents listen to radio, 12 respondent take a nap, 6 plays card and 2 used to talk on mobile as stress coping mechanism.

It sis found that 29 percent respondent used to chew tobacco and smoke and other 30 percent consume alcohol. Major part their personal expenditure goes in buying alcohol and tobacco and at later stages in medical expense.

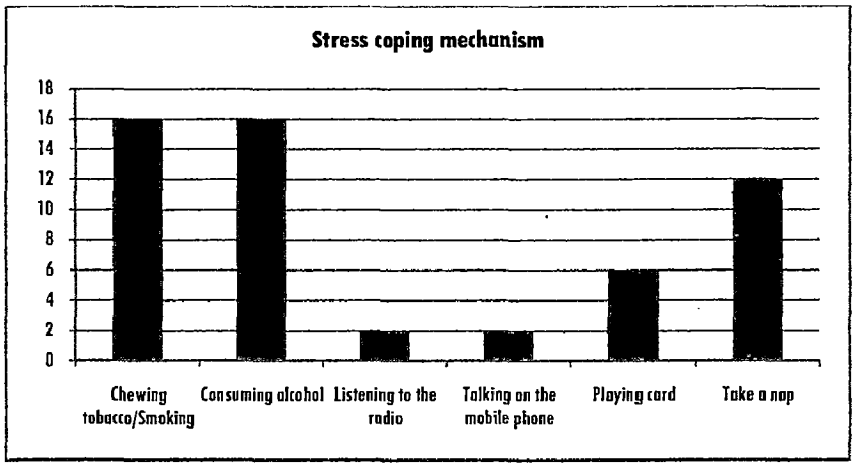


Figure 6-76: Distribution of respondents as per things done for coping stress

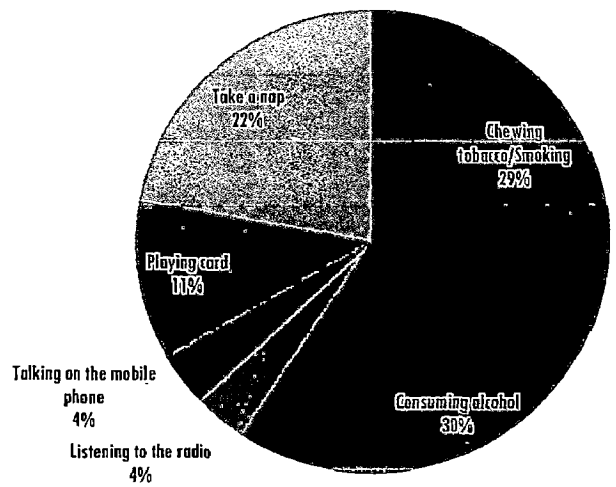


Figure 6-77: Percentage distribution of respondents as per things done for coping stress

6.2.40 How many meals a day

Table 6-46: Distribution of respondents as per meals taken in a day

Sl. No.	How many meals a day	No.
1	Twice	27
2	Thrice	13
3	Four times	0

From the survey result shown in above table, it is found that out of 40, 27 respondents take their meal twice and 13 respondents take it thrice.

It shows that 67 percent of respondents used to take their meal twice and 33 percent respondents used to take their meal thrice. No one have the meal four times a day.

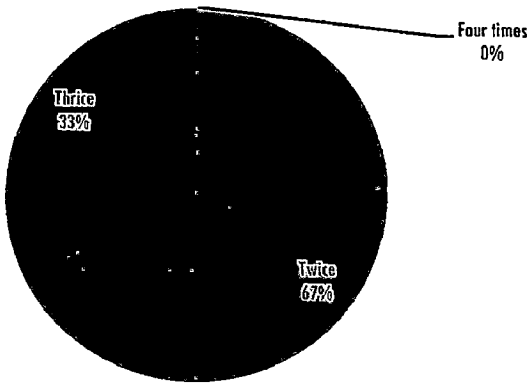


Figure 6-78: Distribution of respondents as per meals taken in a day

6.2.41 Which of the following you experienced

Table 6-47: Distribution of respondents as per problem encountered during driving

Sl. No.	Which of the following you experienced	No
1	Being pulled over at the side of the road by traffic police	10
2	Paid fine	22
3	Met with accident	6
4	Lost license	2
5	Police custody	0

From the survey result shown in above table, it is found that out of 40, 10 respondents are being pulled over at the side of the road by traffic police, 22 respondents has paid fine, 6 respondents had met with accident, 2 respondents had lost his license.

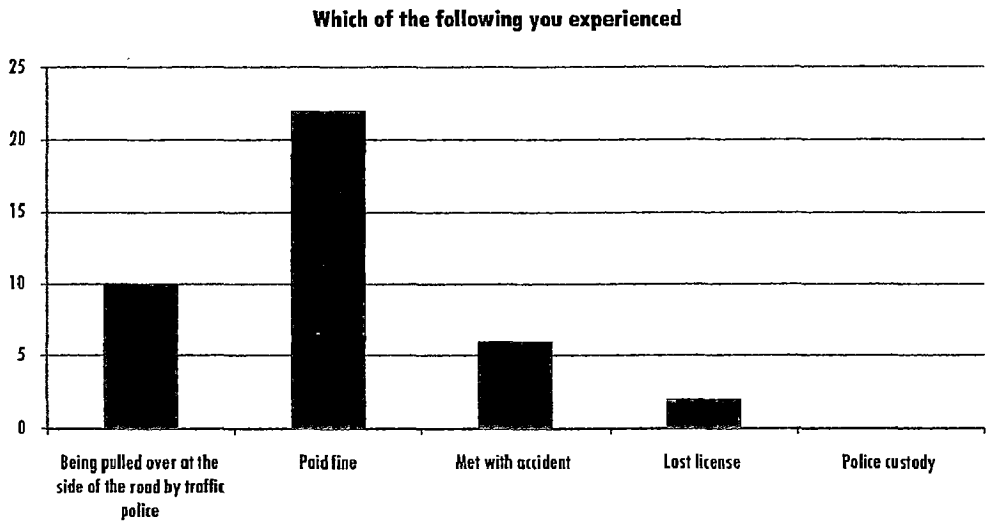


Figure 6-79: Distribution of respondents as per problem encountered during driving

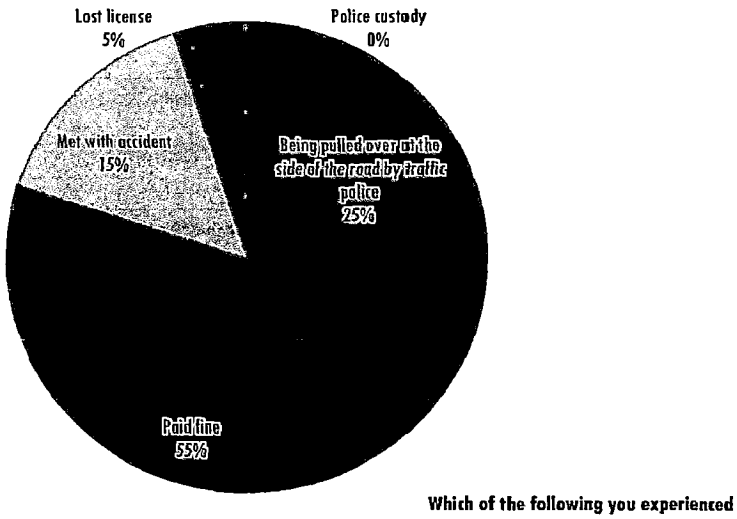


Figure 6-80: Percentage distribution of respondents as per problem encountered during driving

It shows that 25 percent respondents are being pulled over at the side of the road by traffic police, 55 percent respondents has paid fine and 5 percent respondents had lost his license. Auto rickshaw drivers generally don't have pollution check certificate, most of them have no license also. Generally police don't disturb them but sometimes when they have to earn something they start vehicle check.

15 percent respondents had met with accident. As mentioned in above survey's respondents drink alcohol as stress coping mechanism which led to accident. In morning or late night time road is vacant, they drove in full speed. Due to structure of city, visibility blocks at some part of road and auto rickshaw driver are not able to see the coming vehicles which led to accident.

6.2.42 Summary

Auto rickshaw is the backbone of city transportation. 24,276 Auto rickshaws were registered in Patna D.T.O. till 2008. This IPT mode of transport acts as full time public transport. In Patna, Auto rickshaw runs on shared basis like buses, all of the auto rickshaw driver is satisfied with this system because of almost no waiting. It picks up and drops off passenger on their fixed route.

27 percent auto rickshaw driver age is less 25. Less number of youngsters is entering in this sector. 50 percent of them are uneducated, and drive auto rickshaw because they didn't get any job. They are trained by their friends/family, not by any driving school. 75 percent of respondents are married and 33 percent of them are from other part of Bihar, who come to this city for search of job and stick to this sector. Generally they have a family member more than 4 persons with almost 3 or more children. 53 percent respondents earns between Rupees 4000- 5000 in which their personal expenditure is between Rupees 500-1000. Major part of their personal expenditure goes in alcohol and tobacco and at later stages in medical expense. 67 percent respondents give house rent between Rupees 500-1500 and spent around 3000 on food itself. 50 percent respondent's spent less than Rupees 500 on education. Their children are sent in government school. 60 percent them generally wok all day or take leave for once or twice a month for the purpose of family or some work. This route is so congested and polluted, that one's get more exhausted in compare to other route. So, 64 percent respondents sleep for 8-10 hours. Auto rickshaw from Gandhi Maidan runs up to Gai ghat or Malslami which is at distance 6.5 km and 14 km respectively. In a day they make 4-5 trips (up-down) from Gai ghat and 2-3 trips(up-down) from Malslami, whereas they are able to make 7-8 trips(up-down) and 5-6 trips (up-down) respectively before introduction of city bus on this route. Bus causes congestion and increases travel time which result in less travelling speed. That's the reason behind 55 percent respondent driving between 40- 80 kilometres.

15 percent owns auto rickshaw which cost around 1.17 lakh for back engine 3 seater auto rickshaw (On road 1.35 lakh, including permit tax) and 2- 2.4 lakh for bigger 8 seater auto rickshaw. The permit costs rupees 5000-7000 for 5 years and rupees 1500-2000 per year. Permit is issued by RTA (Regional Transport Authority, under ADM, Commissioner). The permit is issued for this particular route of 16 km from Gandhi maidan to city. Around 85 percent auto rickshaws are rented, that majorly uses kerosene or mixture of kerosene and petrol as fuel. They gave Rupees 100 for old auto rickshaw and Rupees 150 for new auto rickshaw as rent, and respondents are able to earn 500-600 per day by using kerosene which cost rupees 100-300 per day. This results in saving of 100-200 per day by using kerosene as fuel. By using of petrol they will not be able to earn enough to give rent and buy fuel. Due to this congestion they can't make enough trips to make sufficient money. Petrol is used by those respondents who owns auto rickshaw. Since they have no rent to give, hence they make sufficient money in same condition. In addition to petrol and kerosene they have to add Mobil also. 50 percent respondents spend between Rupees 200-400 on fuel, which is generally mixture of kerosene and petrol, 25 percent spend more than rupees 400 on fuel and other 25 percent spend less than rupees 200 on fuel, which are petrol and kerosene respectively. Engine of kerosene used auto rickshaw generally breaks down in 6 month, which requires around Rupees 4000-5000 for maintenance. These are generally rented auto rickshaw, whose major expenses is bear by owner only. Despite of this expense, owner allows them to use

kerosene because no one will rent it, if he wouldn't allow this. Expenses up to 1000 rupees are beared by respondent as maintenance which is minor problems in auto rickshaw.

Average Fuel Rate, which is used by respondent:-

Petrol+ mobil = Rs 75 per litre
Kerosene = Rs 25-30 per litre
Petrol+ mobil +kerosene = Rs. 40-50 per litre
Mileage = 15-16 km/l

Figure 6-81: traffic congestion at Mehndru (Source: Author)

Auto rickshaw drivers generally don't have pollution check certificate, most of them haven't got license also. Generally police don't disturb them but sometimes when they have to earn something they start checking vehicle. 15 percent respondents had met with accident. As mentioned in above survey's respondents drink alcohol as stress coping mechanism which led to accident. In morning or late night time road is vacant, they drove in full speed. Due to structure of city, visibility blocks at some part of road and auto rickshaw driver are not able to see the coming vehicles which led to accident.

6.3 Cycle rickshaw Driver survey

This survey is conducted by collecting information from the respondents through the interview method based on questionnaire. (**Refer** ***Annexure 5: Questionnaire for Cycle Rickshaw rider Survey***) The filled in questionnaires were entered into a database and analyzed thereupon. (**Refer** ***Annexure 6: Guidelines for Data Analysis for CycleRickshaw Survey*** **and** ***Annexure 7: Data sheet for Cycle Rickshaw drivers Survey***) The analysis was done with the help of tables, graphs and pie charts. Sample size of 40 is taken for this survey.

6.3.1 Age group of cycle rickshaw rider

Table 6-48: Age group of auto rickshaw driver

Sl. No.	Age	No.
1	18-20	6
2	21-25	4
3	26-30	12
4	30-40	7
5	40-50	5
6	>50	6

From the survey result shown in above table, it is found that out of 40 respondent 6 is from age group of 18-20 years, 4 from 21-25 age group, 12 from 26-30 age group, 7 from 30-40 age group and 11 respondent is more than age of 40 .

The main finding from above table is that 15 percent respondent is below age of 20, means young people is now joining this sector. 40 percent of respondent is from age group 20-30, 17 percent is from age group of 30-40.The percentage decrease in age group 40-50, which is 13 percent whereas for age group more than 50 years comprises 15 percent. It shows that all age group of people is working in this sector, even people of older ages still drive cycle rickshaw, for extra earning.

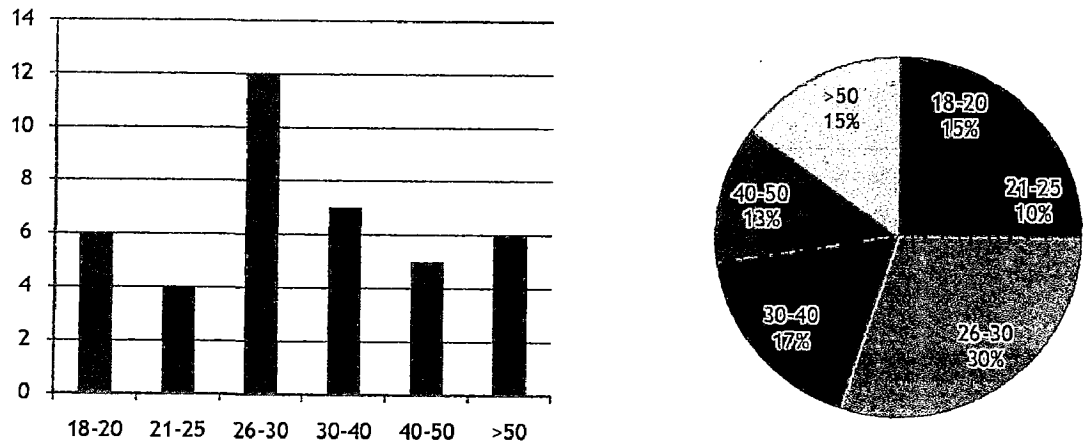


Figure 6-82: Distribution and percentage distribution of age group of auto rickshaw driver

6.3.2 Education Qualification

Table 6-49: Chart showing education qualification of respondents

Sl. No.	Education Qualification	No.
1	uneducated	17
2	< 8th pass	21
3	10th Pass	2
4	12th Pass	0
5	Graduation	0
6	Other	0

From the survey result shown in above table, it is found that out of 40 respondents, 17 respondents are uneducated, 21 respondents has primary education and other 2 respondent has passes matriculation. No respondent has higher secondary education.

The main finding from above table is that 42 percent of respondent is uneducated, 53 percent has primary education and 5 percent has done matriculation. No one has studied till 12^{th} standard or done graduation. Maximum of *muslim* respondent is uneducated, and other went to *madrsa*. It shows that due to lack of education, they didn't get any other job rather than coming in this sector.

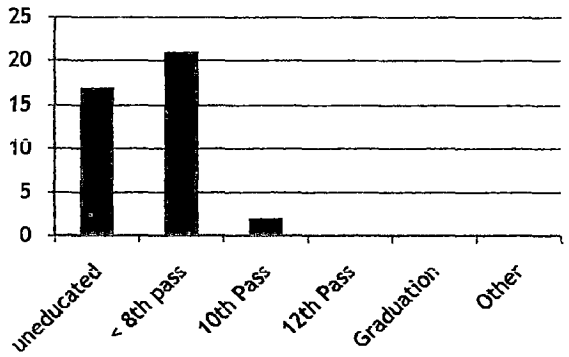


Figure 6-83: Chart showing education qualification of respondents

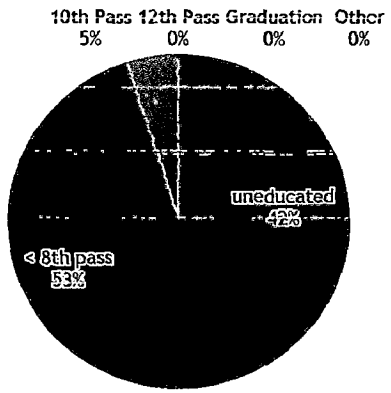


Figure 6-84: percentage distribution of education qualification of respondents

6.3.3 Marital Status

Table 6-50: Marital status of respondents

Sl. No.	Marital Status	No.
1	Married	28
2	Single	12
3	Divorced	0

From the survey result shown in above table, it is found that out of 40 respondents, 28 respondents are married and 12 are unmarried. No one is divorced.

The main finding from above table is that 70 percent of respondent is married, 30 percent is unmarried. 25 percent respondent's is under 25 year. This means cycle rickshaw driver marry at later ages, due to less earning to runs their family.

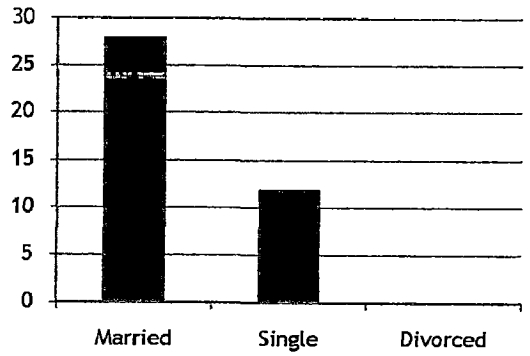


Figure 6-85 : Chart showing marital status of respondents

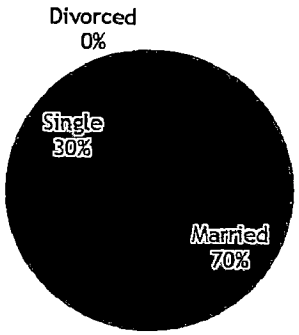


Figure 6-86: Chart showing marital status of respondents

6.3.4 Place of permanent Residence

Table 6-51: Places of permanent residence

Sl. No.	Place of permanent residence	No.
1	patna	21
2	Outside city	19

From the survey result shown in above table, it is found that out of 40 respondents, 21 respondents are from Patna and 19 are from other part of Bihar.

The main finding from above table is that 52 percent of Auto rickshaw rider is from Patna itself, whereas 42 percent of Cycle rickshaw rider from other part of Bihar, who came to capital in search of job and stick to this sector. Percentage of cycle rickshaw rider from other part of Bihar is greater than auto rickshaw driver. They generally lives in *rain basera*, (a EWS houses made by government).

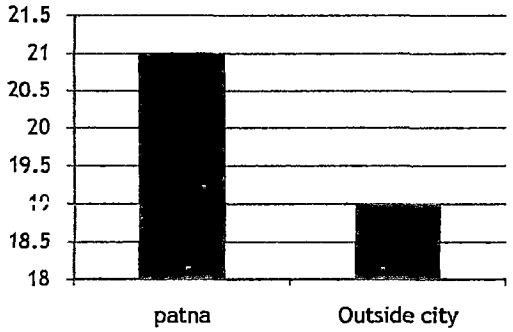


Figure 6-87: Chart showing respondent's places of permanent residence

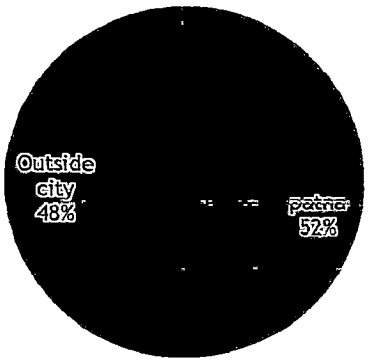


Figure 6-88: Percentage distribution of respondent's permanent residence

6.3.5 Number of Family Members

Table 6-52: No of family members of respondents

Sl. No.	No. of family members	No.
1	Alone	6
2	2	2
3	3 to 4	1
4	>4	31

From the survey result shown in above table, it is found that out of 40 respondents, 6 respondents leave alone, 2 has a family of 2,1 has a family of 3 to 4 and 31 respondent has a family member of greater than 4.

The main finding from above table is that 78 percent of respondents has a family member more than 4 persons and 15 percent of respondent lives alone, who are single and generally lives at *rain basera*.5 percent respondents have family of 2 and 2 percent has family of 3 to 4. They are generally nuclear family from outside the city.

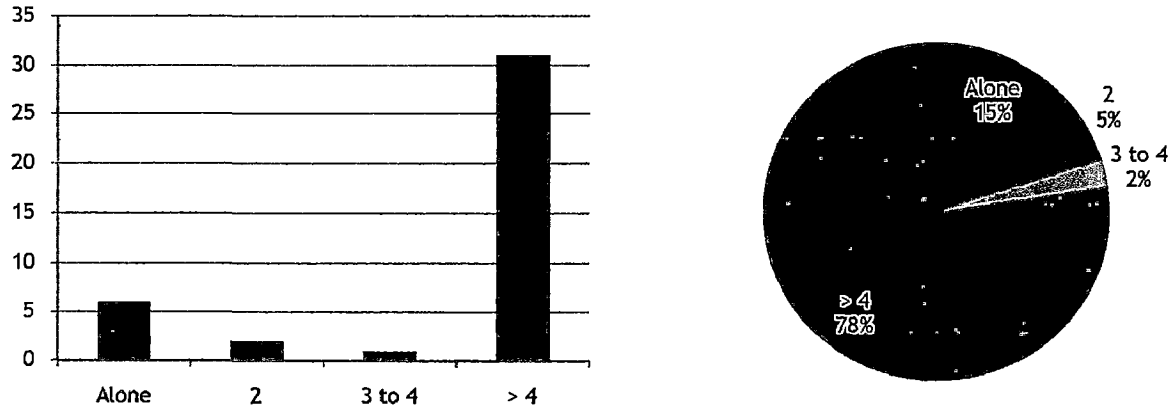


Figure 6-89: Charts showing distribution and percentage distribution of no. of family members of respondents

6.3.6 Number of Children

Table 6-53: no. of children's of respondents

Sl. No.	No. of Children	No.
1	0	12
2	1	0
3	2	9
4	3	11
5	>3	8

From the survey result shown in above table, it is found that out of 40 respondents, 12 respondents have no children or live alone, no respondent have 1 child, 9 respondent have 2 children, 11 respondent have 3 children and 8 people have more than 3 children.

The main finding from above table is that 20 percent of respondents have more than 3 children, 28 percent have 3 children, 22 percent have 2 children and 30 percent have no children. This can be justified with marital status of respondent, 30 percent are not married that means every married person have child.

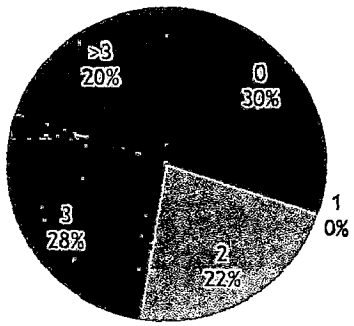


Figure 6-90: Percentage distribution of no. of children's of respondents

6.3.7 Monthly Income

Table 6-54: Monthly income distribution of respondents

Sl. No.	Monthly Income (Rs)	No.
1	2000-3000	6
2	3000-4000	8
3	4000-5000	14
4	5000-6000	5
5	6000-7000	6
6	>7000	0

From the survey result shown in above table, it is found that out of 40 respondents, 6 respondents earn between Rupees 2000-3000, 8 respondent earns between Rupees 3000-4000, 14 respondent earns between Rupees 4000- 5000, 5 respondent earns between 5000-6000 and 6 respondent earns between 6000-7000 and no one earns more than 6000.

The main finding from above table is that 15 percent respondents earn between Rupees 2000-3000, 21 percent respondent earns between Rupees 3000-4000, 36 percent respondent earns between Rupees 4000- 5000, 13 percent respondent earns 5000-6000 and 15 percent respondent earns between 6000-7000. It shows that maximum respondent earns in range of Rupees 4000-5000. This sector has equal and sometimes greater earning than auto rickshaw but because it require physical labour, thats why youngster choose to drive auto rickshaw.

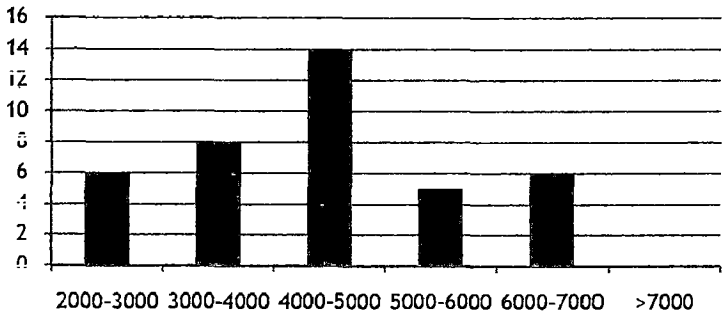


Figure 6-91: Monthly income distribution of respondents

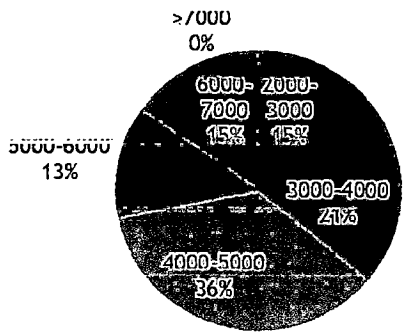


Figure 6-92: Percentage distribution of respondent's Monthly income

6.3.8 Family Member Working

Table 6-55: Family member working distribution of respondents

Sl. No.	Family Member working	No.
1	Wife	0
2	Father	0
3	Mother	0
4	Children	10
5	Sibling	2
6	none	28

From the survey result shown in above table, it is found that out of 40 respondents, 10 respondents children's are working, 2 respondents siblings are working, 28 respondents are only one in his family to earn.

The main finding from above table is that 25 percent of respondent's children are working, 5 percent of respondent's siblings are working. 70 percent of respondents are only one his family to earn. In maximum of cases, children and siblings rides cycle rickshaw as family business.

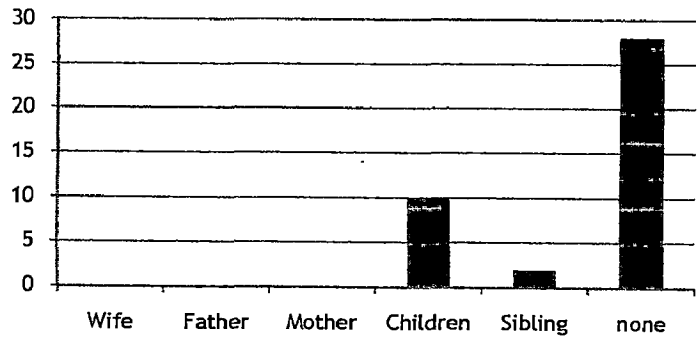


Figure 6-93: Family member working distribution of respondents

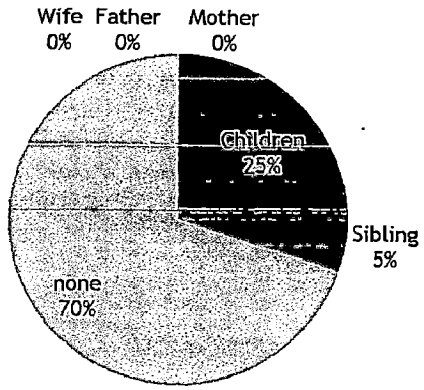


Figure 6-94: Percentage distribution of respondent's family member working

6.3.9 Monthly Family Income

Table 6-56: Monthly family income distribution of respondents

Sl. No.	Monthly Family Income (Rs)	No.
1	<3000	2
2	3000-5000	14
3	5000-8000	8
4	8000-12000	10
5	12000-15000	2
6	>15000	4

From the survey result shown in above table, it is found that out of 40 respondents, 14 respondents monthly family income is between Rupees 3000-5000, 8 respondents monthly family income is between Rupees 5000-8000, 10 respondents monthly family income between Rupees 8000- 12000, 2 respondents monthly family income is between 12000-15000 and 4 respondents monthly family income is more than 15000. 2 respondents monthly family income is below 3000.

The main finding from above table is that 35 percent respondent's monthly family income is between Rupees 3000-5000, 20 percent respondents monthly family income is between Rupees 5000-8000, which can be justified by 70 percent respondents whose family members are not working. 25 percent respondents monthly family income is between Rupees 8000- 12000, 5 percent respondents monthly family income is between 12000-15000 and 10 percent respondents monthly family income is more than 15000. Huge differences can be seen in the monthly family income but the family with higher income has same standard of living. This is because of large family sizes, which are joint family with 3-4 siblings and their children.

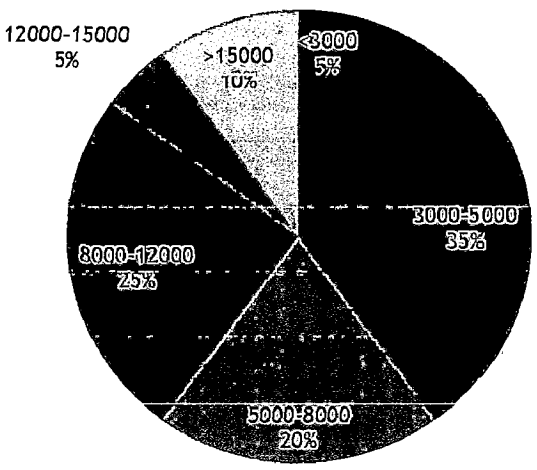


Figure 6-95: Percentage distribution of respondent's monthly family income

6.3.10 Monthly Family Expenditure

Table 6-57: Monthly family expenditure distribution of respondents

Sl. No.	Monthly Family Expenditure (Rs)	No.
1	<3000	4
2	3000-5000	16
3	5000-8000	12
4	8000-12000	5
5	12000-15000	3
6	>15000	0

From the survey result shown in above table, it is found that out of 40 respondents, 16 respondents monthly family expenditure is between Rupees 3000-5000, 12 respondents monthly family expenditure is between Rupees 5000-8000, 5 respondent monthly family expenditure between Rupees 8000- 12000, 3 respondents monthly family expenditure is between 12000-15000 and none of the respondents monthly family expenditure is more than 15000. 4 respondents family expenditure is below 3000.

The main finding from above table is that 40 percent respondent's monthly family expenditure is between Rupees 3000-5000, 30 percent respondents monthly family expenditure is between Rupees 5000-8000, 12 percent respondents monthly family expenditure is between Rupees 8000-12000, 8 percent respondents monthly family expenditure is between 12000-15000. It shows that in maximum case there is no saving, expense is as per income and due to bigger household size.

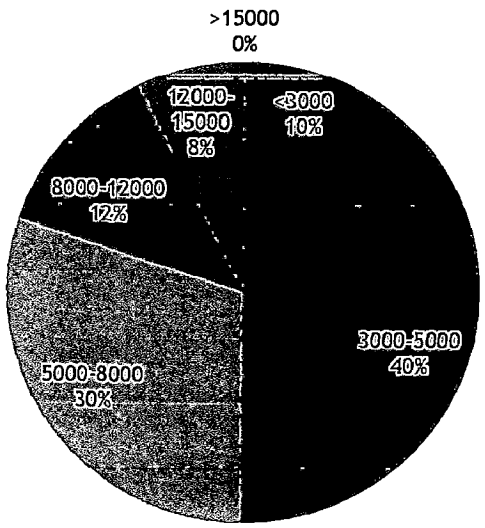


Figure 6-96: Percentage distribution of respondent's Monthly family expenditure

6.3.11 Personal Expenditure

Table 6-58: Personal expenditure distribution of respondents

Sl. No.	Personal Expenditure (Rs)	No.
1	< 500	3
2	500-1000	17
3	1000-2000	14
4	2000-3000	6
5	3000- 4000	0
6	>4000	0

From the survey result shown in above table, it is found that out of 40 respondents, 3 respondents personal expenditure is less than Rupees 500, 17 respondent personal expenditure is between Rupees 500-1000, 14 respondent personal expenditure between Rupees 1000- 2000, 6 respondents personal expenditure is between 2000-3000. None of the respondent's personal expenditure is more than 3000.

The main finding from above table is that 7 percent respondent's personal expenditure is less than Rupees 500, 43 percent respondents personal expenditure is between Rupees 500-1000, 35 percent respondents personal expenditure is between Rupees 1000- 2000 and 15 percent respondents personal expenditure is between Rupees 2000-3000. No one spent more than 3000. Their personal expenditure is basically on tobacco and drinks.

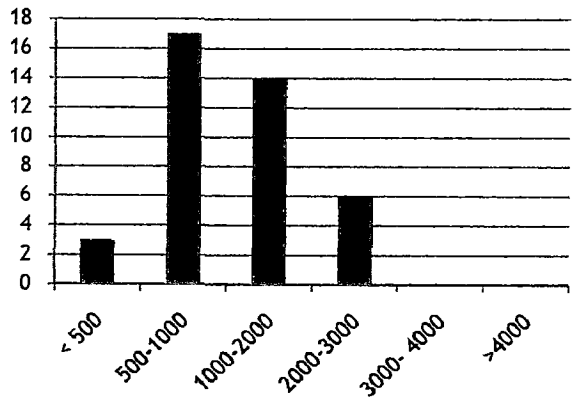


Figure 6-97: Personal expenditure distribution of respondents

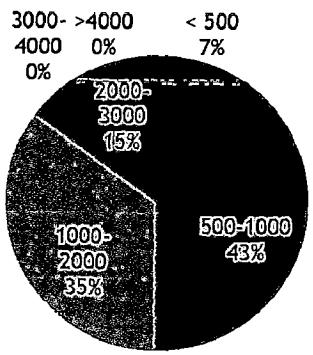


Figure 6-98: Percentage distribution of respondent's Personal expenditure

6.3.12 Family Member Suffering from Disease

Table 6-59: respondent's family member suffering from disease.

Sl. No.	family member suffering for disease	No.
1	wife	3
2	mother	7
3	father	8
4	children	0
5	sibling	0
6	no one	22

From the survey result shown in above table, it is found that out of 40 respondents, 3 respondent's wife, 7 respondents mother, 8 respondents father is suffering from disease. No one is suffering from disease in 22 respondent's house.

The main finding from above table is that 7 percent, 18 percent, 20 percent of respondent's wife, mother and father are suffering from disease. No one is suffering from disease in 55 percent of respondent. The cycle rickshaw driver has to bear more expense for cure of disease. They take loan from local *seth*, for any major problems.

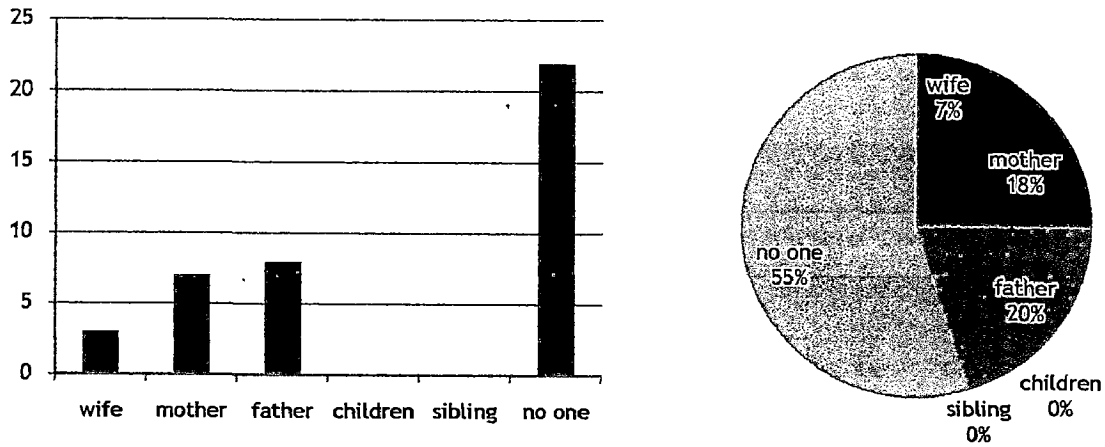


Figure 6-99: Distribution and percentage distribution of respondent's family member suffering from disease.

6.3.13 Asset Owned

Table 6-60: Distribution of asset owned by respondents

Sl. No.	Asset owned	No.
1	house/land	7
2	Radio	25
3	tv	17
4	bike	0
5	cycle	21
6	mobile	30

From the survey result shown in above table, it is found that 7 respondent's owned a house or land, 25 respondent's owns radio, none of the respondent's owns bike, 21 respondent's owns bicycle, 30 out of 40 owns mobile and 21 respondent's owns tv.

Around 70 percent Cycle rickshaw rider owns mobile, 45 percent cycle rickshaw rider owns cycle.TV owned by around 25 percent of respondents. House/Land owned by 15 percent of respondent's and none of the Cycle rickshaw rider owns bike.

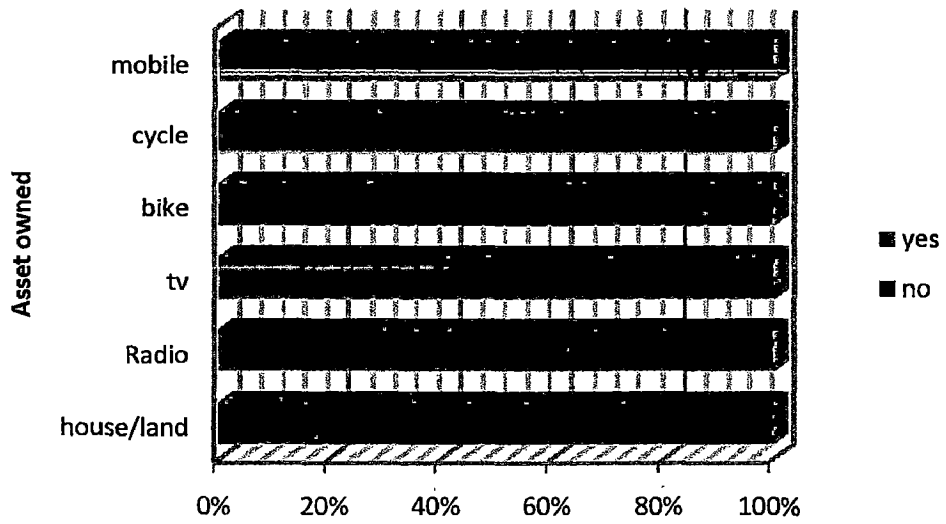


Figure 6-100: Chart showing distribution of asset owned by respondents

6.3.14 House Rent

Table 6-61: Distribution of house rent given by respondents

Sl. No.	House rent	No.
1	<500	10
2	500-1000	14
3	1000-1500	6
4	1500-2000	0
5	>2000	0
	owned/gov house	10

From the survey result shown in above table, it is found that out of 40 respondents, 10 respondents gives house rent less than Rupees 500, 14 respondents gives house rent between Rupees 500-1000, 6 respondents gives house rent between Rupees 1000- 1500, none of the respondents gives house rent more than 1500. 10 respondent lives in their owned house or *rain basera.*

The main finding from above table is that 25 percent respondent's gives house rent less than Rupees 500 and 35 percent respondents gives house rent between Rupees 500-1000, these respondent's are generally nuclear family. 15 percent respondents gives house rent between Rupees 1000- 1500, these respondent's are generally joint family living in 2-3 rooms house. House rent are cheap because they live in this unplanned colony in depleted condition. 25 percent respondents live in his own house or *rain basera* (government provide EWS houses)

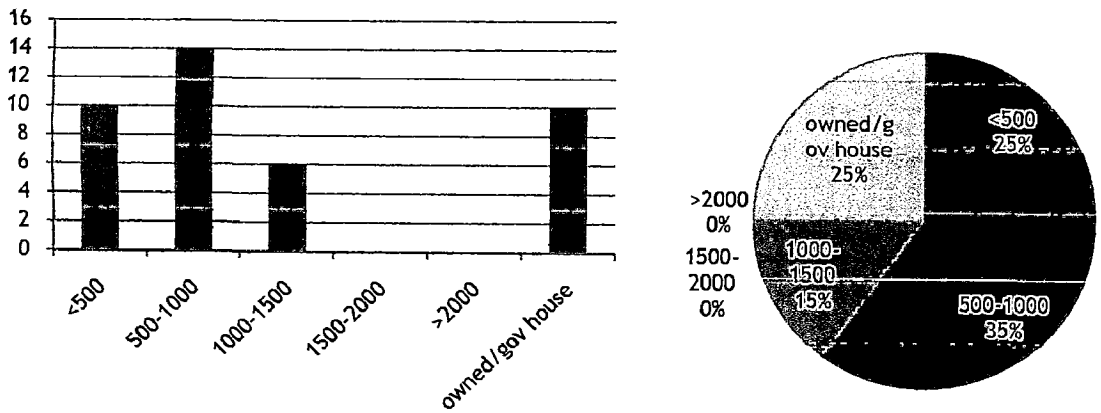


Figure 6-101: Distribution and percentage distribution of house rent given by respondents

6.3.15 Health Problem

Table 6-62: Distribution of health problem expense by respondents

Sl. No.	Health Problem	No.
1	<500	19
2	500-1000	13
3	1000-1500	8
4	1500-2000	0
5	>2000	0

From the survey result shown in above table, it is found that out of 40 respondents, 19 respondents spent less than Rupees 500 on health problem, 13 respondents spent between Rupees 500-1000 on health problem,8 respondents spent between Rupees 1000- 1500 on health problem, none of the respondent spent more than 1500 on health problem.

The main finding from above table is that 47 percent respondent's spent less than Rupees 500 on health problem, 33 percent respondent's spent between Rupees 500-1000 on health problem. This can be justified by survey result of family members suffering from diseases. 55 percent of respondent's family members are not suffering from any disease. This expense is on generally seasonal viral disease and normal disease.

20 percent respondent spent between Rupees 1000- 1500 on health problem, which is due to some family members suffering from disease, which has requirement of monthly doses of drugs.

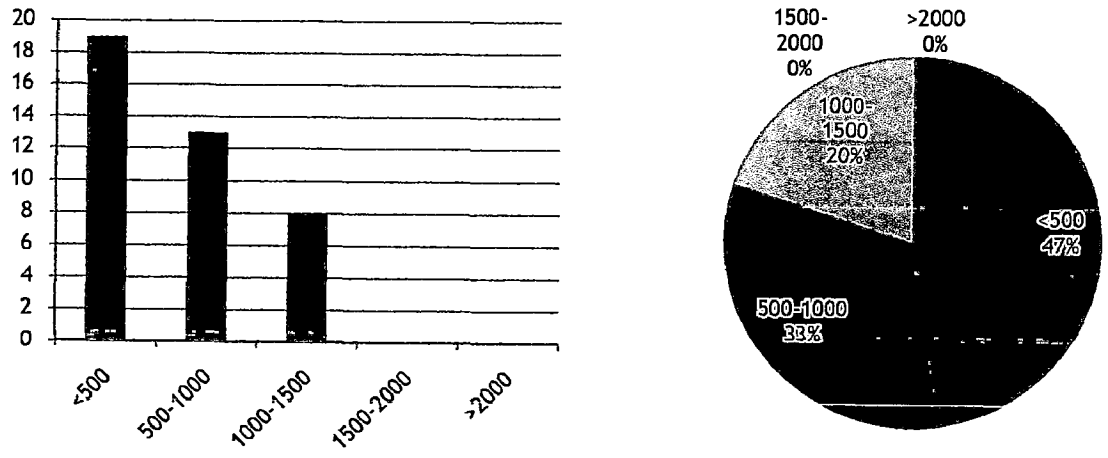


Figure 6-102: Distribution and percentage distribution of health problem expense by respondents

6.3.16 Education

Table 6-63: Distribution of health problem expense by respondents

Sl. No.	Education	No.
1	<500	15
2	500-1000	11
3	1000-1500	14
4	>1500	0

From the survey result shown in above table, it is found that out of 40 respondents, 15 respondents spent less than Rupees 500 on education, 11 respondents spent between Rupees 500-1000 on education, 14 respondents spent between Rupees 1000- 1500 on education, none of the respondent spent more than 1500 on education.

The main finding from above table is that 37 percent respondent's spent less than Rupees 500 on education and 28 percent respondent's spent between Rupees 500-1000 on education. This 65 percent comprise of respondent's, who doesn't send their children for education or children going to *madarsa* or government school.

35 percent of respondent's spent between Rupees 1000-1500 on education. This respondent's has more number of children or they sent them to private school for good education but no one spent more than rupees1500 on education.

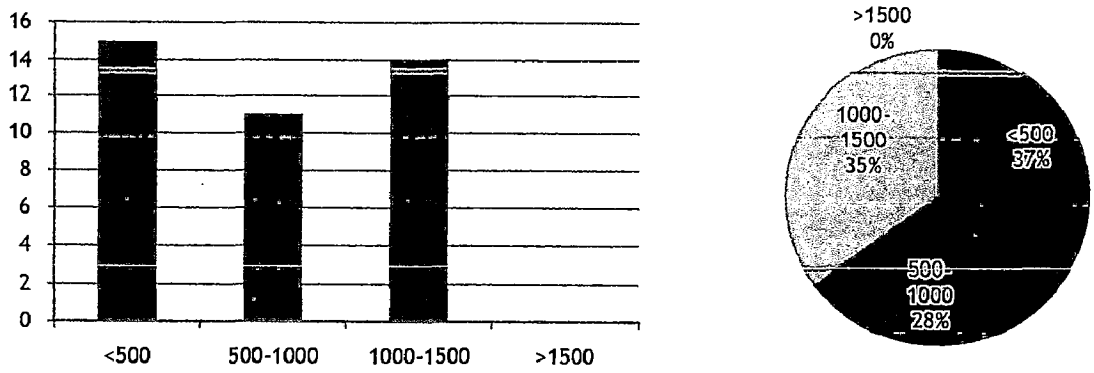


Figure 6-103: Distribution and percentage distribution of health problem expense by respondents

6.3.17 Festival/ Ceremonies

Table 6-64: Distribution of respondents based on festivals/ceremonies expenses

Festival/ceremonies (annually)	No.
<2000	14
2000-3000	20
3000-5000	6
>5000	0

From the survey result shown in above table, it is found that out of 40 respondents, 14 respondents spent less than Rupees 2000 on Festival/ceremonies, 20 respondents spent between Rupees 2000-3000 on Festival/ceremonies, 6 respondents spent between Rupees 3000-5000 on Festival/ceremonies, and none f the respondents spent more than 5000 on Festival/ceremonies.

The main finding from above table is that 35 percent respondent's spent less than Rupees 2000 on Festival/ceremonies and 50 percent respondent's spent between Rupees 2000-3000 on Festival/ceremonies.

15 percent of respondent's spent between Rupees 3000-5000 on Festival/ceremonies. This respondent's has big family comprise of children elders, for which festival is important part of their life, so expenses increase in that case.

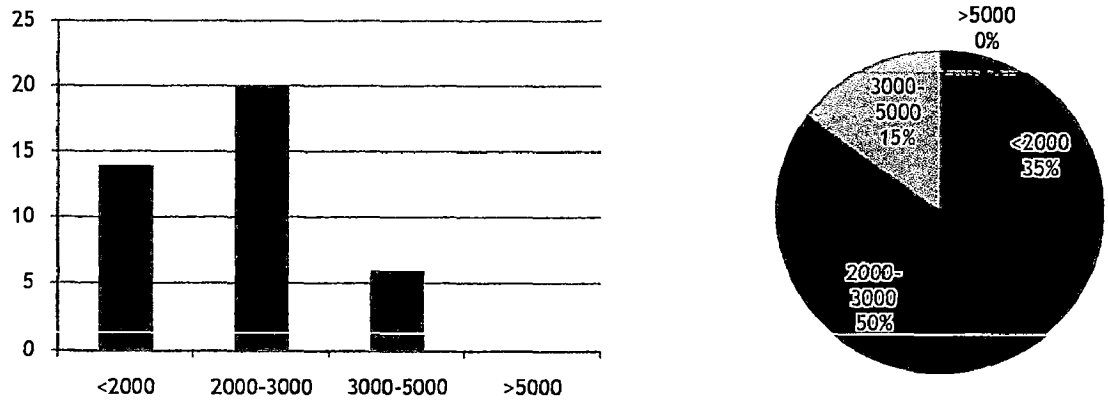


Figure 6-104: Distribution and percentage distribution of festivals/ceremonies expense by respondents

6.3.18 Food

Table 6-65: Distribution of respondents based on food expense

Sl. No.	Food	No.
1	<1000	0
2	1000-3000	29
3	3000-5000	9
4	>5000	2

From the survey result shown in above table, it is found that out of 40 respondents, none of the respondents spent less than Rupees 1000 on food, 29 respondents spent between Rupees 1000-3000 on food, 9 respondents spent between Rupees 3000- 5000 on food, and 2 respondents spent more than 5000 on food.

The main finding from above table is that 72 percent respondent's spent between Rupees 1000-3000 on Food. This percentage comprise of respondent's, who have nuclear family or leave alone.

5 percent respondent's spent more than Rupees 5000 on Food and 23 percent of respondent's spent between Rupees 3000-5000 on Food. This respondent's has big family comprise of bigger household size.

Expenses on food are more than 1000 for any respondent.

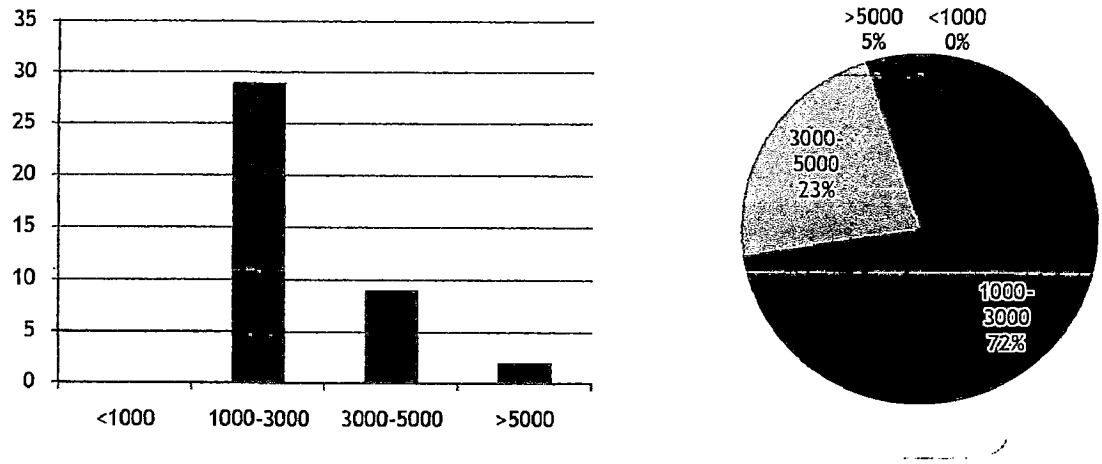


Figure 6-105: Distribution and percentage distribution of food expense by respondents

6.3.19 Why ride cycle rickshaw

Table 6-66: Distribution of respondents for reason of driving a cycle rickshaw

Sl. No.	Why ride Cycle rickshaw	No.
1	Didn't get any other job	22
2	gives higher earning than other job	9
3	family business	5
4	Family/friend suggested	4

From the survey result shown in above table, it is found that out of 40 respondents, 22 respondents drive auto rickshaw because they didn't get any job, 9 respondents join this sector because of higher earnings, 5 respondents join this sector because of family business and 7 respondents enter in this sector on friend family suggestion.

The main finding from above table is that 55 percent respondent's ride cycle rickshaw because they didn't get any job, 13 percent respondents join this sector because of family business, and 10 percent respondents enter in this sector on friend family suggestion. 22 percent ride cycle rickshaw because it gives higher earnings.

Its shows that maximum of respondents enters this sector because they didn't get any job. This is due to lack of education among respondents who doesn't have any choice rather than entering in this sector. In compare to other job for uneducated class of people, this gives good earning. Despite good earning people join auto rickshaw sector because of social status.

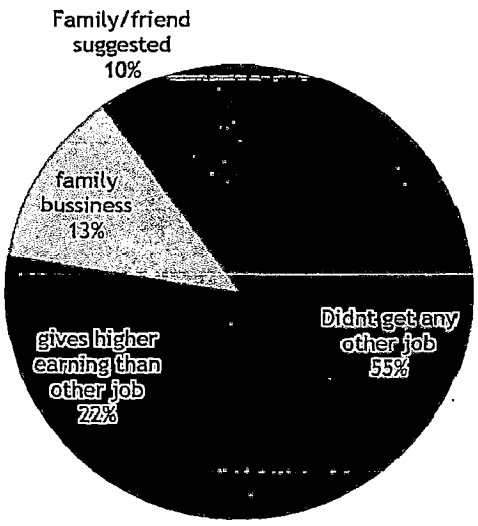


Figure 6-106: Percentage distribution of respondents for reason of driving a cycle rickshaw

6.3.20 Experience in riding cycle rickshaw

Table 6-67 : Distribution of respondents as per experience in driving cycle rickshaw

Sl. No.	Experience in riding cyclerickshaw	No.
1	less than 1 year	0
2	3-5 years	12
3	5-10 years	2
4	10-15 years	5
5	15-20 years	7
6	>20 years	14

From the survey result shown in above table, it is found that out of 40 respondents, none of the respondents has experience of less than 1 year in driving auto rickshaw, 12respondents has experience between 3-5 years in driving auto rickshaw, 2 respondents has experience between 5-10 years in driving auto rickshaw, 5 respondents has experience between 10-15 years in driving auto rickshaw, 7 respondents has experience between 15-20 years in driving auto rickshaw and 14 respondents has experience of more than 20 years in driving auto rickshaw.

The main finding from above table is that none of the respondents has experience of less than 1 year in driving auto rickshaw, which means young population is not entering in this sector because young people is searching job which gives earning with less physical labour and have social status.

30 percent respondents has experience between 3-5 years in driving auto rickshaw, which shows that lot of people enter in this sector in previous 5 years.

17 percent respondents have experience between 5-15 years in driving auto rickshaw and 53 percent respondents have experience for more than 15 years in driving auto rickshaw. This shows that this sector generated good earning in earlier days, but now this sector don't give good earning.

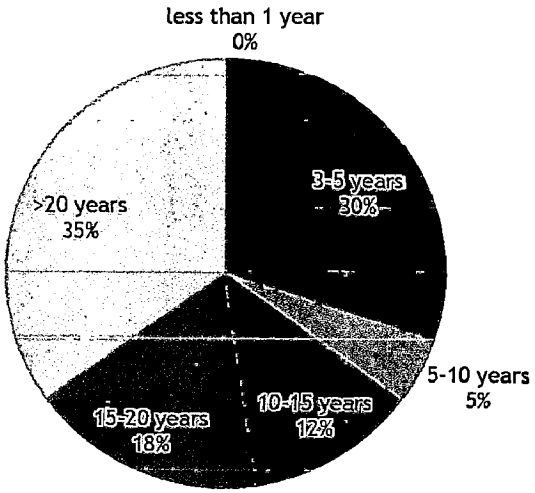


Figure 6-107: Percentage distribution of respondents as per experience in driving cycle rickshaw

6.3.21 Registration with Municipal Corporation

Table 6-68: Distribution of respondents as per their cycle rickshaw registration

Sl. No.	Registered with municipal corporation	No.
1	yes	19
2	No	21

From the survey result shown in above table, it is found that out of 40 respondents, 19 respondents cycle rickshaw is registered with Municipal Corporation and 21 respondents cycle rickshaw is not registered with Municipal Corporation.

The main finding from above table is that 47 percent cycle rickshaw is registered with Municipal Corporation. 35000 registered cycle rickshaws exist in Patna. Another estimate puts the count of cycle rickshaws between 1.2 to 2 lakhs (Source: Master Plan) adding unregistered cycle rickshaw also.

Authority has not any check on registration of cycle rickshaw, so it is increasing day by day. Registration charge has not increased for decades. Cycle rickshaw rider used to give extra money to official to pace up the process of registration.

Registration fees

New Registration: Rupees 14.50 (They give Rs 80)
Renewal: - Rupees 7.50 (They give Rs 50)

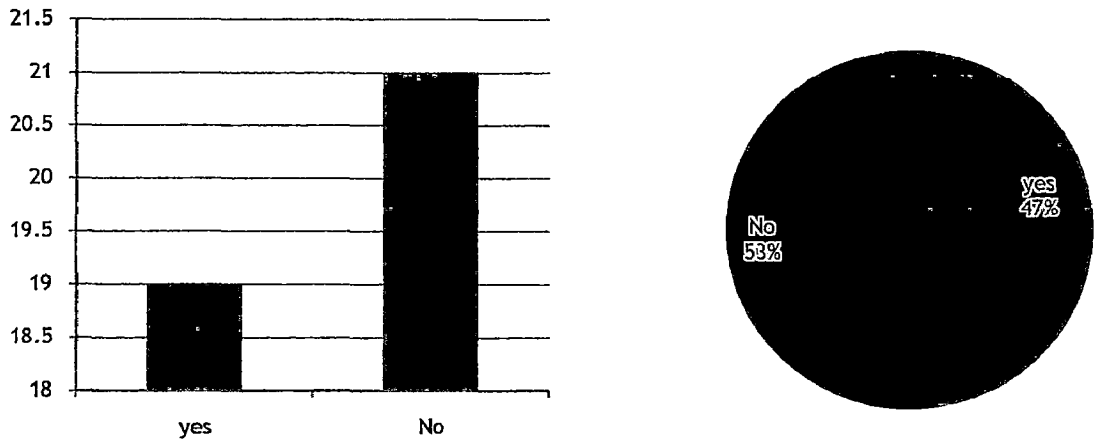


Figure 6-108: Distribution and percentage distribution of respondents as per their cycle rickshaw registration

6.3.22 Kilometres driven per day

Table 6-69 : Distribution of respondents as per kilometre driven per day

Sl. No.	Kilometres ride per day	No.
1	<10	0
2	10-20 km	2
3	20-30 km	18
4	>30 km	20

From the survey result shown in given table, it is found that out of 40 respondents, 2 respondents ride between 10-20 kilometre per day, 18 respondents rides between 20-30 kilometre per day, 20 respondents rides more than 30 kilometre per day.

The main finding from above table is that , 5 percent respondents ride between 10-20 kilometre per day, 45 percent respondents rides between 20-30 kilometre per day, 50 percent respondents rides more than 30 kilometre per day.

Cycle rickshaw of mehandru area, generally make 4-8 trips upto Gandhi maidan charging Rupees 25-30, 2-4 trips towards old bye pass area like rajendar nagar, bahadurpur, kankarbagh charging Rupees 30-50.

Cycle rickshaw of Pather ki masjid area, avoid using ashok rajpath, due to its congestion. This would waste their time in traffic jam in which they can earn in different route. They make around 1 or 2 trips in this route, 4 trips towards rajendar nagar, 3 trips up to kumhrar gumti, 2-3 trips to karbighaiya or sanichar mandir charging Rupees 15 to 40 as per distance.

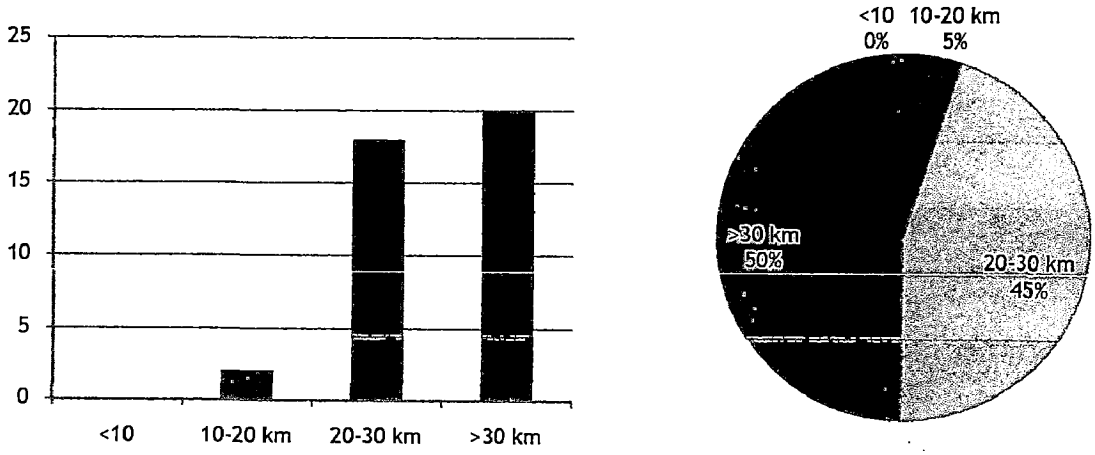


Figure 6-109: Distribution and percentage distribution of respondents as per kilometre driven per day

6.3.23 Hour spent riding per day

Table 6-70 : Distribution of respondents as per hours spent in driving per day

Sl. No.	Hour spent riding per day	No.
1	< 5 hr	13
2	5-10 hrs	27
3	>10 hrs	0

From the survey result shown in given table, it is found that out of 40 respondents, 13 respondents rides less than 5 hours, 27 respondents rides between 5-10 hours, none of the a respondent rides more than 10 hours.

The main finding from above table is that 32 percent respondent's rides less than 5 hours, because they are aged person, and passenger avoids them. 68 percent respondent's rides between 5-10 hours.

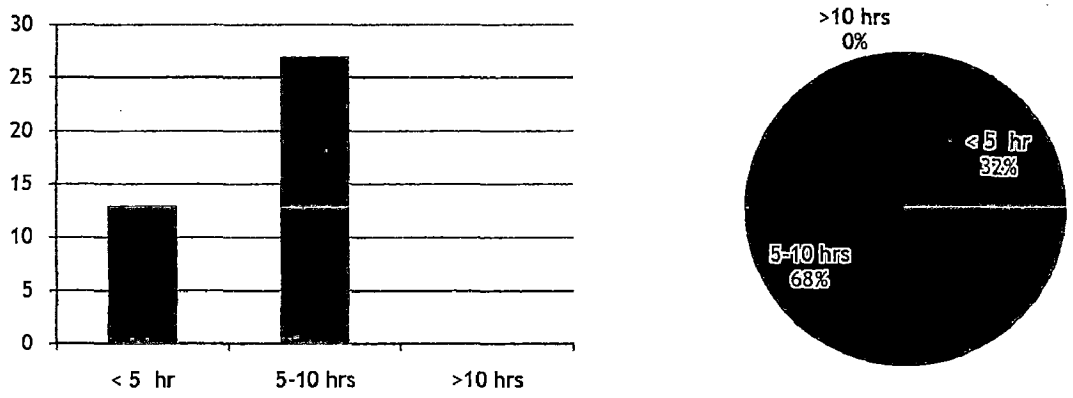


Figure 6-110: Distribution and percentage distribution of respondents as per hours spent in driving per day

6.3.24 Average time waiting per day

Table 6-71: Distribution of respondents as per Average waiting time per day

Sl. No.	Avg. time waiting per day	No.
1	<2	0
2	2 to 4	16
3	4 to 6	24
4	>6	0

From the survey result shown in given table, it is found that out of 40 respondents, 16 respondents' waits for around 2 to 4 hours, and 24 respondents' waits for 4 to 6 hours, none of them waits for more than 6 hours.

40 percent respondents wait for 2-4 hours and 60 percent respondent's waits for 4 to 6 hours.

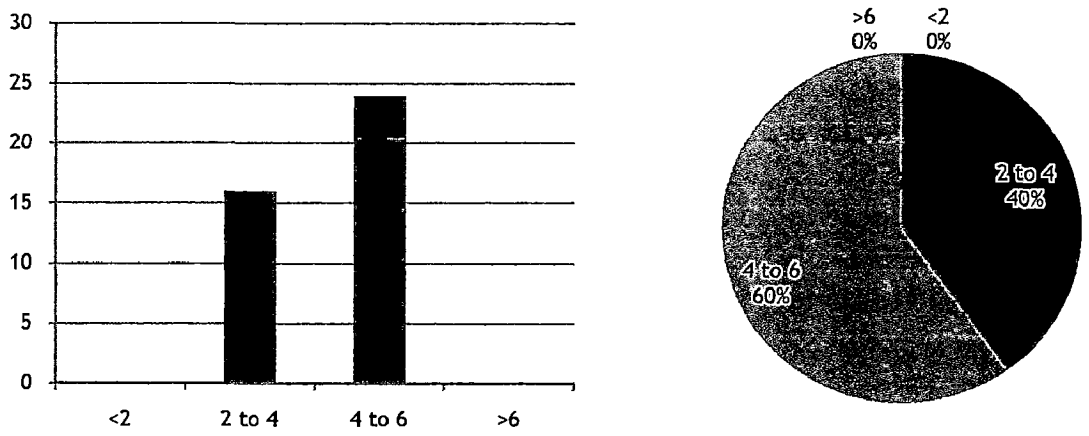


Figure 6-111: Distribution and percentage distribution of respondents as per Average waiting time per day

6.3.25 Do you prefer Ashok Rajpath

Table 6-72: Distribution of respondents as per preference of using ashok rajpath

Sl. No.	Do you prefer Ashok Rajpath	No.
1	Yes	25
2	No	15

From the survey result shown in given table, it is found that out of 40 respondents, 25 respondents' prefer Ashok Rajpath whereas 15 percent don't prefer Ashok Rajpath.

It is found that 62 percent respondents who prefer Ashok Rajpath, rides in wider section i.e. from N.I.T. turning to Gandhi Maidan. 15 percent who don't prefer Ashok Rajpath, rides in narrower section i.e. from mehandru to old city. They prefer to ride in south direction towards old bye pass.

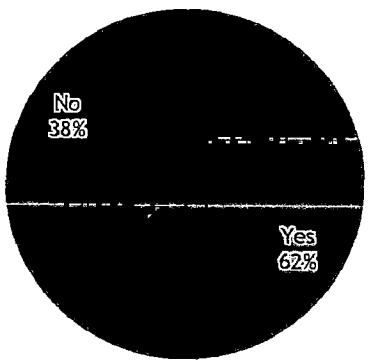


Figure 6-112: Percentage distribution of respondents as per preference of using ashok rajpath

6.3.26 Maintenance

Table 6-73: Distribution of respondents as per expenses on cycle rickshaw monthly on maintenance

Sl. No.	Maintenance (monthly)	No.
1	>100	10
2	100-500	30
3	500-1000	0
4	> 1000	0

From the survey result shown in given table, it is found that out of 40 respondents, 10 respondents spend less than rupees 100 on maintenance, 30 respondents spend between Rupees100-500 on maintenance, none of the respondent spend more than rupees 500 on maintenance.

The main finding from above table is that 25 percent respondents spend less than rupees 100 on maintenance, 75 percent respondents spend between Rupees 100-500 on maintenance. Most of the cycle rickshaw is rented and major expenses are beared by owner itself. Minor expenses are beared by respondent.

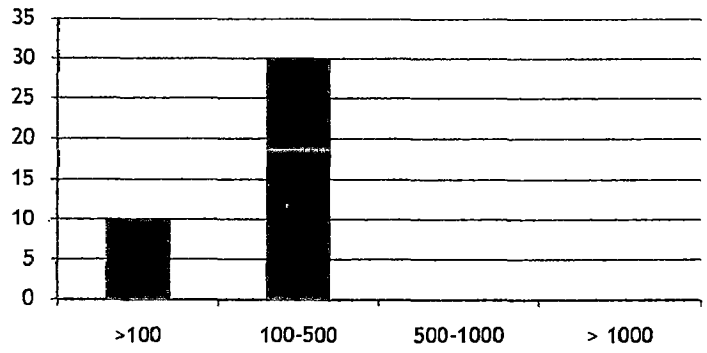


Figure 6-113: Distribution of respondents as per expenses on cycle rickshaw monthly on maintenance

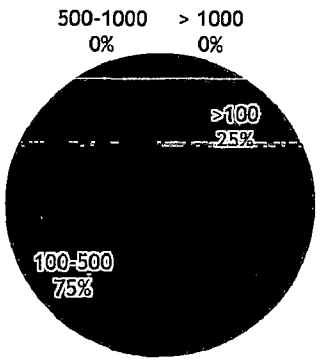


Figure 6-114: Percentage distribution of respondents as per expenses on cycle rickshaw monthly on maintenance

6.3.27 Ownership

Table 6-74: Distribution of respondents as per ownership of auto rickshaw

Sl. No.	Ownership	Ownership
1	owned	9
2	rented	31

From the survey result shown in given table, it is found that out of 40 respondents, 9 of them owned cycle rickshaw whereas 31 rides it on rental basis.

It is found that 78 percent of respondents rent cycle rickshaw. They gave Rupees 35 as rent. 22 percent owns cycle rickshaw which cost around Rupees 12000.

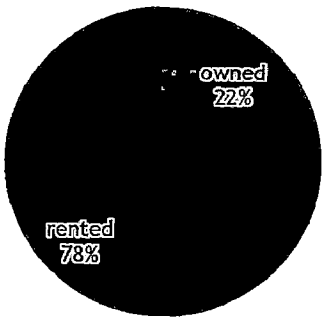


Figure 6-115: Percentage distribution of respondents as per ownership of auto rickshaw

6.3.28 Faces competition with other mode of transport

Table 6-75: Distribution of respondents as per opinion against other mode of transport

Sl. No.	face competition with other mode	No.
1	taxi	0
2	bus	40
3	cycle rickshaw	0
4	none	0

From the survey result shown in given table, it is found that out of 40 respondents, all of them have problem from buses. One of the problems is congestion due to which their trips are reduced and other problem is its cheap fare. Cycle rickshaw charges 30 rupees from N.I.T. turning to Gandhi maidan, whereas bus charges 3-5 rupees only.

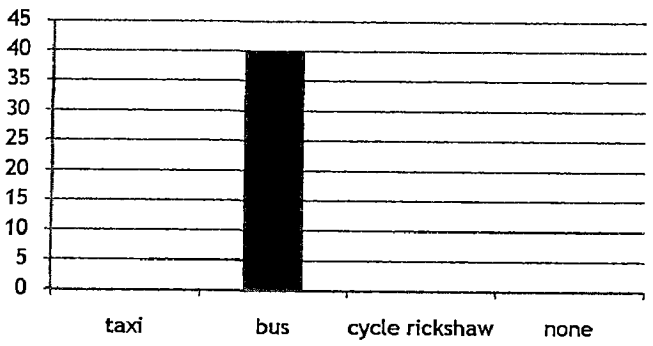


Figure 6-116: Distribution of respondents as per opinion against other mode of transport

6.3.29 Things done during waiting hours

Table 6-76: Distribution of respondents as per things done during waiting hours

Sl. No.	Things done during waiting hour	No.
1	Sleep	21
2	Listen to radio	6
3	Chat with fellow cyclerickshaw rider	19
4	Smoke	25
5	have tea/snacks	24

From the survey result shown in above table, it is found that 21 out of 40 respondent's sleep, 6 out of 40 respondents listen to radio, 19 out of 40 respondent chat with fellow auto rickshaw driver, 25 out of 40 respondents smoke and 24 out of 40 respondents had tea/snack during waiting hours.

It is found that around 50 percent respondent's slept or chats with fellow auto rickshaw driver, 10 percent respondent's listens to radio during waiting hours. Around 60 percent respondent smoke and had tea/snack during waiting hours.

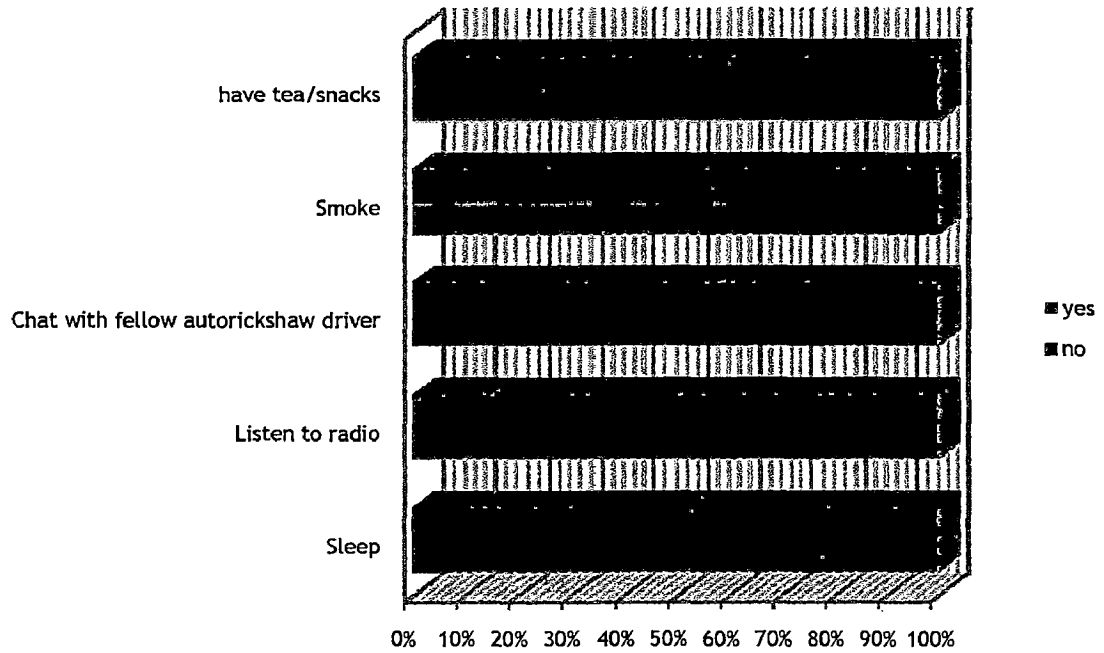


Figure 6-117: Distribution of respondents as per things done during waiting hours

6.3.30 Day off from work

Table 6-77: Distribution of respondents as per their leave taken from work

Sl. No.	Day off from work	No.
1	Work all days	11
2	once or twice in month	16
3	5-7 days in week	4
4	Weekly once	9

From the survey result shown in above table, it is found that out of 40, 11 respondents work all days in a week, 16 take leave for 1 or 2 days in a month, 4 respondents take 5-7 days in month and 9 respondents take weekly leave.

It is found that 67 percent respondent generally wok all day or take leave for once or twice a month for higher earning to meet the requirement of their family. Some leave alone far from family in *rain basera*, so there is no such reason for leave. Other 33 percent take leave regularly. These are older peoples or having some health problems.

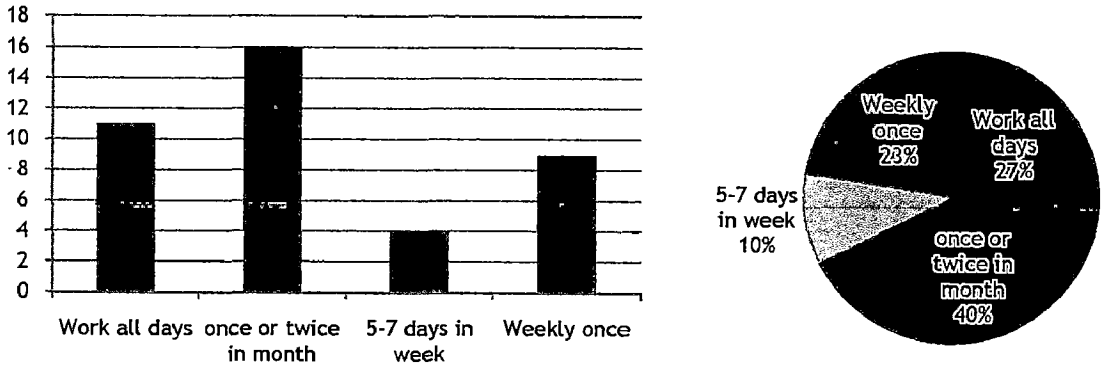


Figure 6-118: Distribution and percentage distribution of respondents as per their leave taken from work

6.3.31 Reason for day off from work

Table 6-78: Distribution of respondents as per reason for their leave

Sl. No.	Reason for Day off from work	No.
1	Illness	10
2	Work	8
3	Family	14
4	Leisure/Rest	8

From the survey result shown in above table, it is found that out of 40, 10 respondents take leave because of illness, 8 respondents take leave because they some other work, 14 respondents take leave because of some family issue and 8 respondents take leave for rest or leisure.

It is found that 25 percent respondents take leave because of illness, 20 percent respondents take leave because they some other work, 35 percent respondents take leave because of some family issue and 20 percent respondents take leave for rest or leisure.

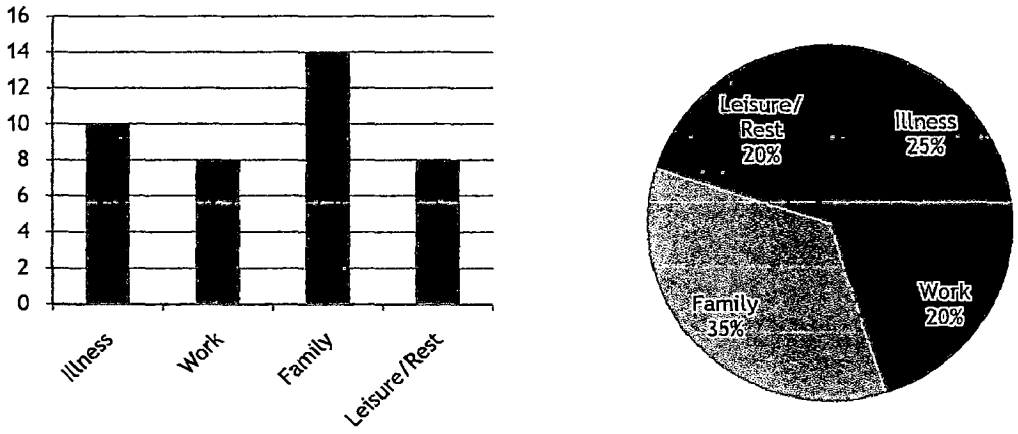


Figure 6-119: Distribution and percentage distribution of respondents as per reason for their leave

6.3.32 Hours of sleeping

Table 6-79: Distribution of respondents as per hours of sleeping

Sl. No.	Hours of sleeping	No.
1	4 - 6 hrs	0
2	6 - 8 hrs	12
3	8 -10 hrs	28
4	>10 hrs	0

From the survey result shown in above table, it is found that out of 40, 12 respondents sleeps for 6-8 hours, 28 respondents sleeps for 8-10 hours, none of the respondents sleeps for more than 10 hours.

It is found that 30 percent respondents sleeps for 6-8 hours, 70 percent respondents sleeps for 8-10 hours. This shows that respondents sleep properly. This route is so congested and polluted, that one's get more exhausted in compare to other route.

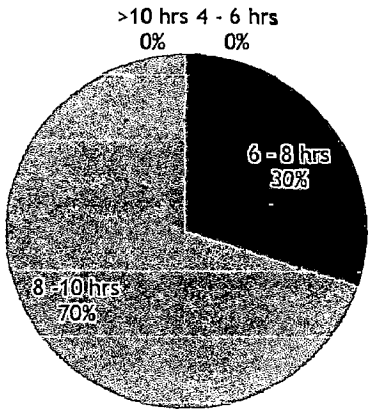


Figure 6-120: Percentage distribution of respondents as per hours of sleeping

6.3.33 On job problems

Table 6-80: Distribution of respondents as per on job problem

Sl. No.	On the job problems	No.
1	Tension	5
2	Driver Fatigue	12
3	lack of Interest	5
4	boredom	2
5	Tiredness	9
6	Stress	6
7	Distraction	1

From the survey result shown in above table, it is found that out of 40, 5 respondents has tension, 12 respondents has driver fatigue, 2 respondents suffer from boredom, 9 from tiredness,6 from stress.

This problem is due to reason mentioned already in different survey. These problems are majorly due to congestion, passenger response, polluted air etc.

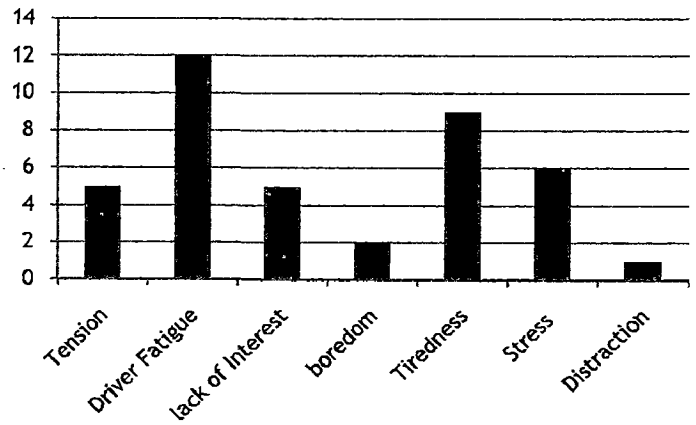


Figure 6-121: Distribution of respondents as per on job problem

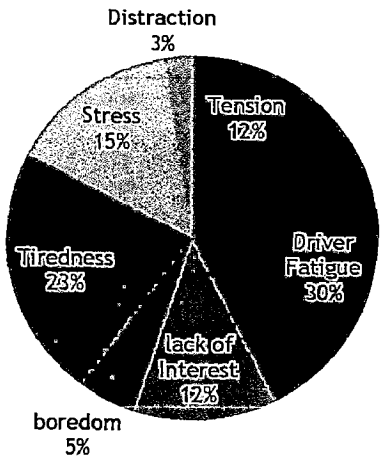


Figure 6-122: Percentage distribution of respondents as per on job problem

6.3.34 Health problem

Table 6-81: Distribution of respondents as per their health problem

Sl. No.	Health Problem	No.
1	Restless sleep/Insomnia	4
2	Back pains	9
3	Headaches	7
4	Obesity	0
5	Digestive troubles	4
6	Hypertension	4
7	No health problem	12

From the survey result shown in above table, it is found that out of 40, 4 respondents suffers with insomnia, 9 with back pain, 7 with headache, 4 with digestive problems and other 4 from hypertension. 12 respondents have no major health problem.

The main finding from above table is that 30 percent respondents have no major health problems.

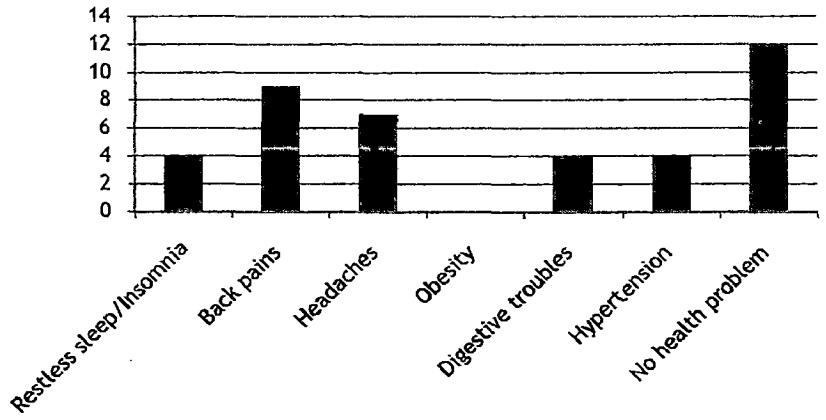


Figure 6-123: Distribution of respondents as per their health problem

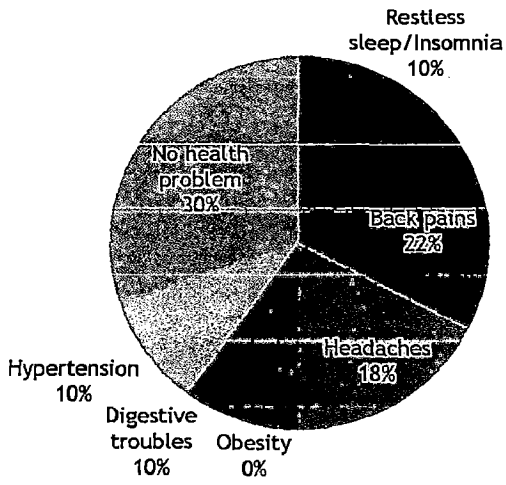


Figure 6-124: Percentage distribution of respondents as per their health problem

6.3.35 Stress coping mechanism

Table 6-82: Distribution of respondents as per things done for coping stress

Sl. No.	Stress coping mechanism	No.
1	Chewing tobacco/Smoking	27
2	Consuming alcohol	12
3	Listening to the radio	1
4	Talking on the mobile phone	0
5	Playing card	0
6	Take a nap	0

From the survey result shown in above table, it is found that out of 40, 27 respondents smokes or chew tobacco, 12 consume alcohol, 1 respondent listen to radio as stress coping mechanism.

It is found that 67 percent respondent used to chew tobacco and smoke and other 30 percent consume alcohol. Major part their personal expenditure goes in buying alcohol and tobacco and at later stages in medical expense.

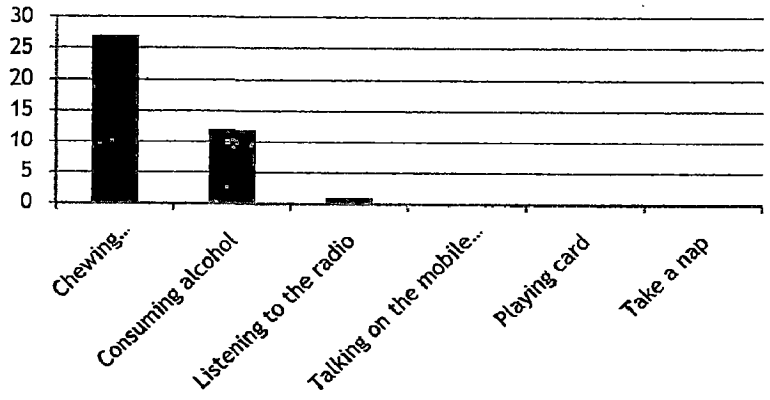


Figure 6-125: Distribution of respondents as per things done for coping stress

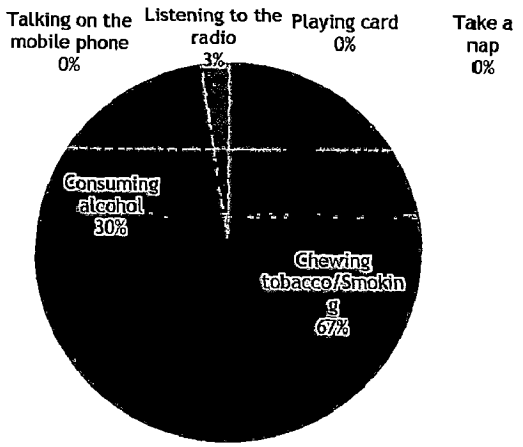


Figure 6-126: Percentage distribution of respondents as per things done for coping stress

6.3.36 How many meals a day

Table 6-83: Distribution of respondents as per meals taken in a day

Sl. No.	How many meals a day	No.
1	Twice	32
2	Thrice	8
3	Four times	0

From the survey result shown in above table, it is found that out of 40, 32 respondents take their meal twice and 8 respondents take it thrice.

It shows that 80 percent of respondents used to take their meal twice and 20 percent respondents used to take their meal thrice. No one have the meal four times a day.

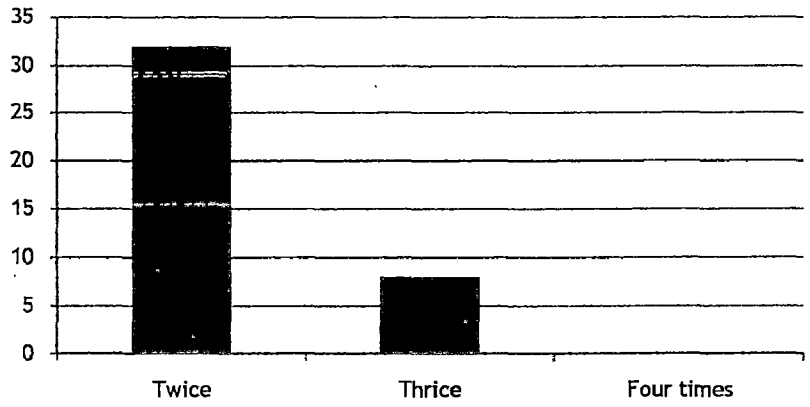


Figure 6-127: Distribution of respondents as per meals taken in a day

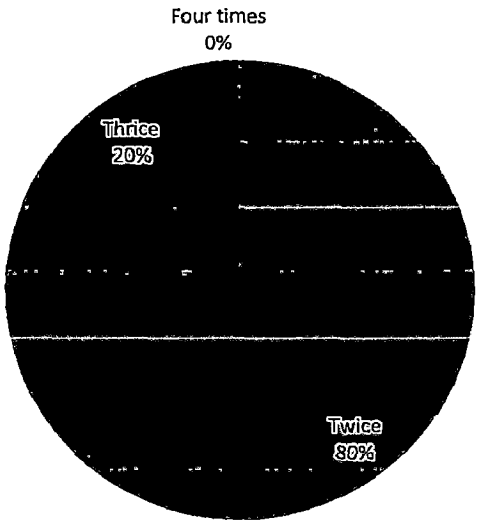


Figure 6-128: Percentage distribution of respondents as per meals taken in a day

6.3.37 Which of the following you experienced

Table 6-84: Distribution of respondents as per problem encountered during driving

Sl. No	Which of the following you experienced	No.
1	Being pulled over at the side of the road by traffic police	21
2	Paid fine	15
3	Met with accident	4
4	Police custody	0

From the survey result shown in above table, it is found that out of 40, 21 respondents are being pulled over at the side of the road by traffic police, 15 respondents has paid fine, 4 respondents had met with accident.

It shows that 52 percent respondents are being pulled over at the side of the road by traffic police, 38 percent respondents has paid fine. Cycle rickshaw riders generally don't have registration. Generally police don't disturb them but sometimes when they have to earn something they start pulling them over.

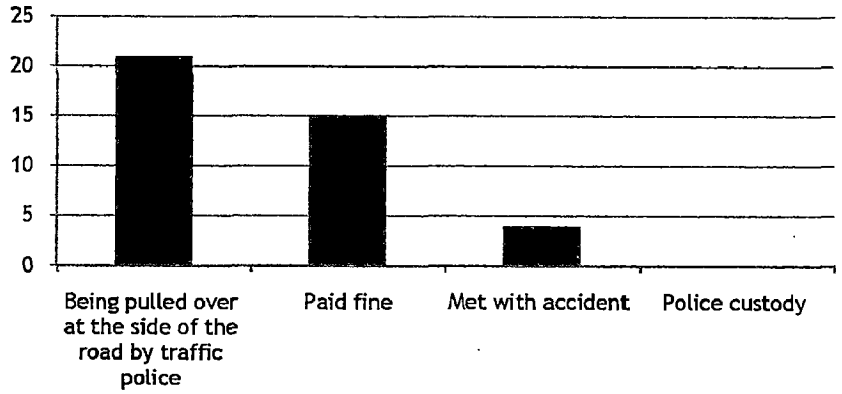


Figure 6-129: Distribution of respondents as per problem encountered during driving

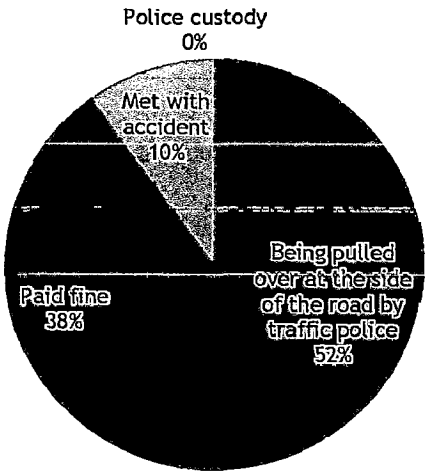


Figure 6-130: Percentage distribution of respondents as per problem encountered during driving

6.3.38 Summary

Cycle rickshaw plays an important role in city transport. It is a environment friendly IPT with no emission. This is used as the alternate mode of transport on this road and also used as feeder service or for visiting those places, which are not connected with auto rickshaw towards south between two major arterial road i.e. Ashok Rajpath and Old bye pass road. This mode of transportation is slow and along with fast motorized mode and limited road space, it becomes the cause of congestion and traffic jam.

25 percent cycle rickshaw rider age is less 25. Less number of youngsters is entering in this sector. 42 percent of them are uneducated, and drive cycle rickshaw because they didn't get any job. 70 percent of respondents are married and 48 percent of them are from other part of Bihar, who come to this city for search of job and stick to this sector by friend or family suggestion. 78 percent have a family member of more than 4 persons with almost 3 or more children. 57 percent respondents earns between Rupees 3000- 5000 in which their personal expenditure is between Rupees 500-1500. Major part of their personal expenditure goes in alcohol and tobacco and at later stages in medical expense. 50 percent respondents give house rent between Rupees 500-1500. House rent are cheap because they live in this unplanned colony in depleted condition. 25 percent respondents live in his own house or *rain basera* (government provide EWS houses) and spent around 3000 on food itself. 65 percent respondent's spent less than Rupees 1000 on education. Their children are sent in government school or *madarsa*. 67 percent them generally wok all day or take leave for once or twice a month for the purpose of family or some work. This route is so congested and polluted, that one's get more exhausted in compare to other route. So, 70 percent respondents sleep for 8-10 hours.

47 percent cycle rickshaw is registered with Municipal Corporation. 35000 registered cycle rickshaws exist in Patna. Another estimate puts the count of cycle rickshaws between 1.2 to 2 lakhs (Source: Master Plan) adding unregistered cycle rickshaw also. Authority has not any check on registration of cycle rickshaw, so it is increasing day by day. Registration charge has not increased for decades. Cycle rickshaw rider used to give extra money to officer to pace up the process of registration.

Registration fees

New Registration: Rupees 14.50 (They give Rs 80)
Renewal: - Rupees 7.50 (They give Rs 50)

22 percent owns cycle rickshaw which cost around Rupees 12000. 78 percent of respondents rent cycle rickshaw. They gave Rupees 35 as rent. 25 percent respondents spend less than rupees 100 on maintenance, 75 percent respondents spend between Rupees 100-500 on maintenance. Most of the cycle rickshaw is rented and major expenses are beared by owner itself. Minor expenses are beared by respondent.

45 percent respondent's rides between 20-30 kilometres per day, 50 percent respondents rides more than 30 kilometre per day. 32 percent respondent's rides less than 5 hours, because they are generally aged person, and passenger avoids them. 68 percent respondent's rides between 5-

10 hours. 40 percent respondents wait for 2-4 hours and 60 percent respondent's waits for 4 to 6 hours.

All of them have problem with bus. One of the problems is congestion due to which their trips are reduced and other problem is its cheap fare. Cycle rickshaw charges 30 rupees from N.I.T. turning to Gandhi maidan, whereas bus charges 3-5 rupees only.

It is found that 62 percent respondents who prefer Ashok Rajpath, rides in wider section i.e. from N.I.T. turning to Gandhi Maidan. 15 percent who don't prefer Ashok Rajpath, rides in narrower section i.e. from mehandru to old city. They prefer to ride in south direction towards old bye pass. Cycle rickshaw of mehandru area, generally make 4-8 trips upto Gandhi maidan charging Rupees 25-30, 2-4 trips towards old bye pass area like rajendar nagar, bahadurpur, kankarbagh charging Rupees 30-50.Cycle rickshaw of Pather ki masjid area, avoid using ashok rajpath, due to its congestion. This would waste their time in traffic jam in which they can earn in different route. They make around 1 or 2 trips in this route, 3 trips up to kumhrar gumti, 2-3 trips to karbighaiya or sanichar mandir charging Rupees 15 to 40 as per distance.

It shows that 52 percent respondents are being pulled over at the side of the road by traffic police, 38 percent respondents has paid fine. Cycle rickshaw riders generally don't have registration. Generally police don't disturb them but sometimes when they have to earn something they start pulling them over.

6.4 Household survey

This survey is conducted by collecting information from the respondents through the interview method based on questionnaire (***Refer:- Annexure 8: Questionnaire for Household and origin destination Survey***). The filled in questionnaires were entered into a database and analyzed thereupon (***Refer:-Annexure 9: Guidelines for data analysis for Household and origin destination Survey and Annexure 10: Data Sheet for Household and origin destination Survey***). The analysis was done with the help of tables, graphs and pie charts. Sample size of 25 is taken for this survey, which further gives 121 O-D survey samples.

6.4.1 Number of family members

Table 6-85: No of family members in household

Sl. No.	No. of family person	No.
1	<3	1
2	3 to 5	9
3	>5	15

From the survey result shown in above table, it is found that out of 25 house hold surveyed, 1 household has a 3 member in his family, 9 household has 3 to 5 member in his family and 15 household comprises of more than 5 members.

The main finding from above table is that 4 percent household has less than 3 members in his family, 36 percent household has 3 to 5 member in his family and 60 percent household comprises of more than 5 members. This shows that this area is densely populated with more travel need.

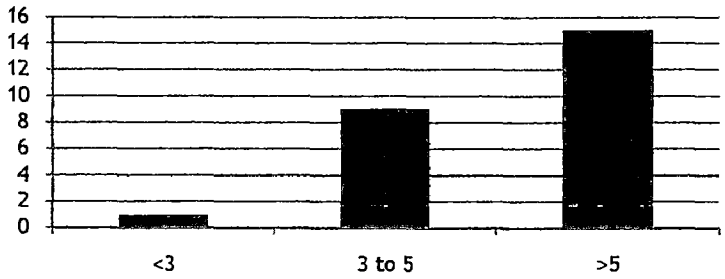


Figure 6-131: Chart showing distribution of no. Of family members of household

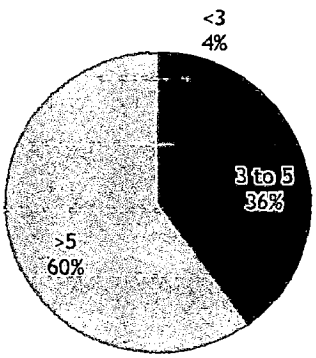
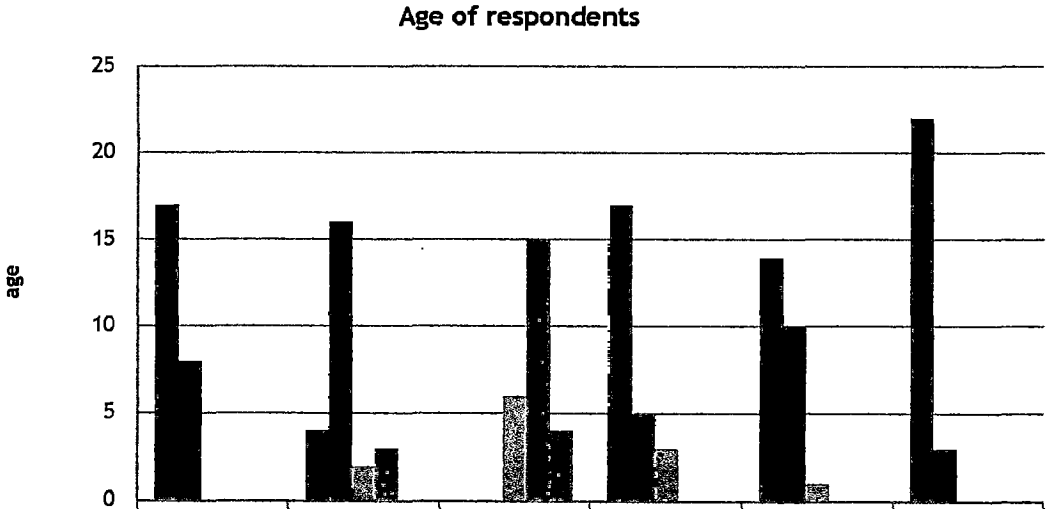


Figure 6-132: Percentage distribution of no. Of family members of household

6.4.2 Age of respondent

Table 6-86: Chart and graph showing total no. of person in a household of different age group



	Age <5 years(Person)	Age 5 to 15 years (Persons)	Age 16 to 40 years (Persons)	Age 41 to 60 years (Persons)	Age 61 to 80 years (Persons)	Age >80 years (Persons)
0 Person	17	4	0	17	14	22
1 Person	8	16	0	5	10	3
2 Person	0	2	6	3	1	0
3 Person	0	3	15	0	0	0
>3 Person	0	0	4	0	0	0

From the survey result shown in above table and graphs, it is found that out of 25 household, only 8 household (32 percent) have child less than 5 year.

21 household out of 25, have some person of age group ranging 5 to 15 year in which 12 percent of household have 3 people in family, 8 percent have 2 and in 64 percent household they have 1 person in their family of this age group.

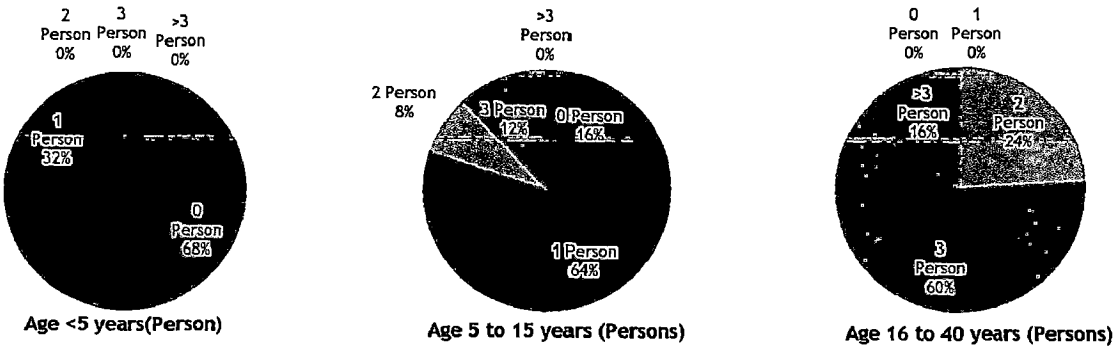


Figure 6-133: Percentage distribution of no. of person in a household of age group 5 to 40 years

Every household has people of age ranging from 16 to 40 years, in which 16 percent of household has more than 3 member of this age group, 60 percent household has 3 person of this age group and 24 percent household has 2 person of this age group.

Only 8 household out of 25 consist of people whose age is between 41 to 60 years, in which 12 percent has 2 person of this age group and 20 percent has 1 person of this age group.

11 household out of 25 consist of people of age group ranging from 61 to 80.

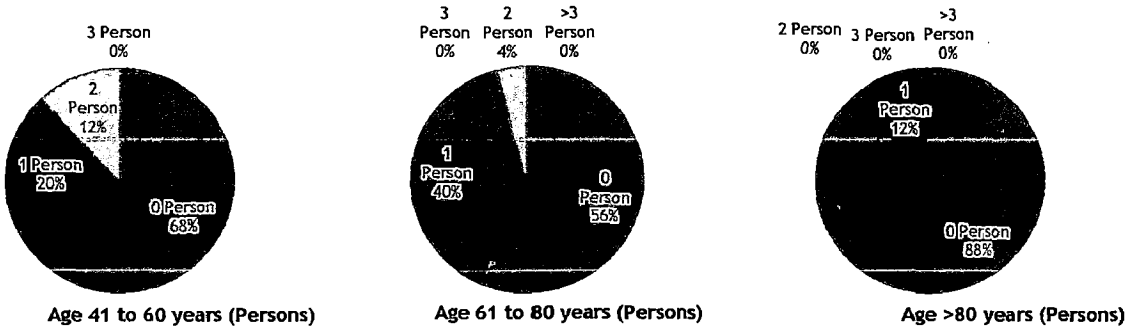


Figure 6-134: Percentage distribution of no. of person in a household of age group 40 to more than 80 years

It is found that 48 percent of the population is between age group of 16 to 40, whereas 24 percent comprises of population between age group 5 to 15 years. It shows that young population exists in this area which comprises of students, office going employees and all have different travel need. People between age group of 5 to 15 year go to school and travels through school buses generally. People going to offices use motorcycle, bicycle or other mode like cycle rickshaw or buses.

This 72 percent of population with different travel need increases the travel demand of this area.

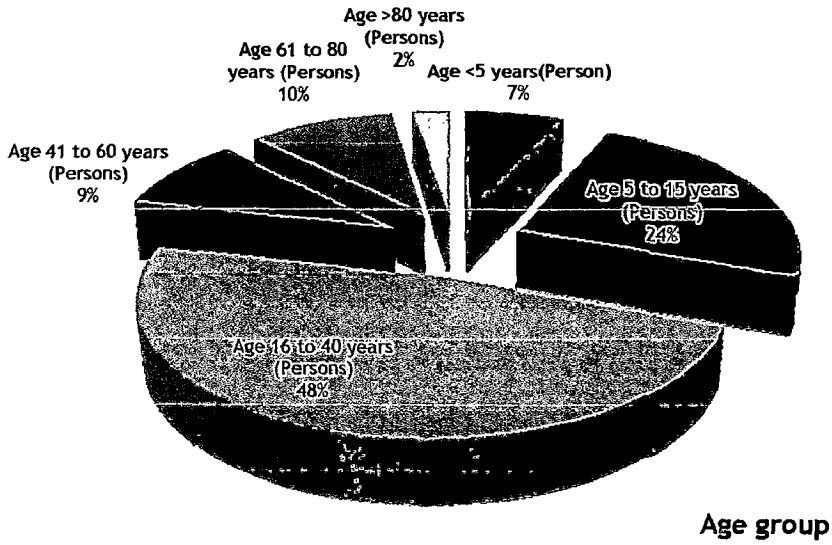


Figure 6-135: Percentage distribution of no. of person of different age group as a whole

6.4.3 Monthly income

Table 6-87: Distribution of monthly household income

Sl. No.	Monthly Household Income (Rs)	No.
1	< 5000	0
2	5000-10000	0
3	10000-15000	3
4	15000-20000	10
5	20000-25000	3
6	>25000	9

From the survey result shown in above table, it is found that out of 40household, 3 household earn between Rupees 10000-15000, 10 household earns between Rupees 15000-20000, 3 household earns between Rupees 20000- 25000 and 9 household earns more than 25000.

The main finding from above table is that 12 percent household earn between Rupees 10000-15000, 40 percent household earns between Rupees 15000-20000, 12 percent household earns between Rupees 20000- 25000 and 36 percent household earns more than 25000. This shows that this society comprises of middle class and upper middle class family. In mehandru and nearby area comprise of education institute and medical college, people living here are also doctor and professor. Due to cheap accommodation towards old city area lot of working class of people lives here, who used to travel to work place, i.e. around 3-5 km from here.

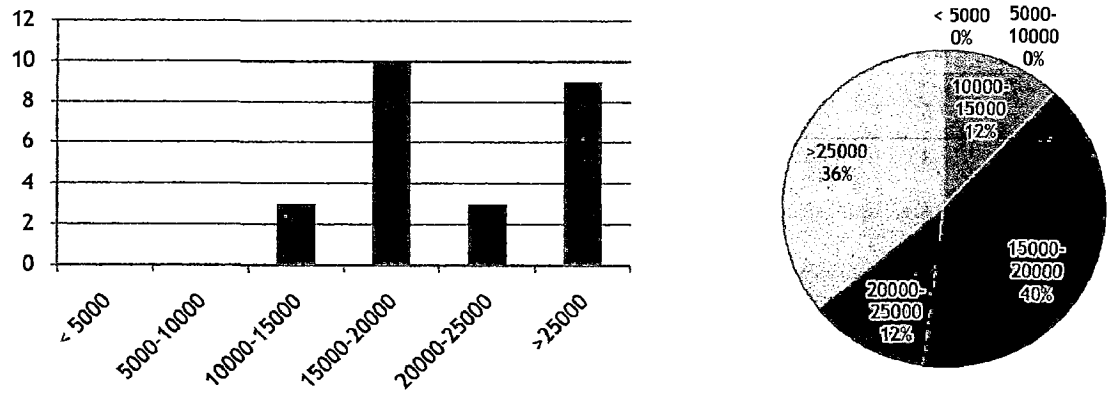


Figure 6-136: Percentage distribution and distribution of monthly household income

6.4.4 Monthly Household Expenditure

Table 6-88: Distribution of respondent's monthly household expenditure

Sl. No.	Monthly Household Expenditure (Rs)	No.
1	< 5000	0
2	5000-10000	0
3	10000-15000	3
4	15000-20000	15
5	20000-25000	2
6	>25000	5

From the survey result shown in above table, it is found that out of 25 household, 3 households monthly family expenditure is between Rupees 10000-15000, 15 households monthly family expenditure is between Rupees 15000-20000, 2 households monthly family expenditure between Rupees 20000-250000, 5 household monthly family expenditure is more than 25000.

The main finding from above table is that 12 percent household's monthly family expenditure is between Rupees 10000-15000, 60 percent households monthly family expenditure is between Rupees 15000-20000, 8 percent households monthly family expenditure between Rupees 20000-250000 and 20 percent household monthly family expenditure is more than 25000.

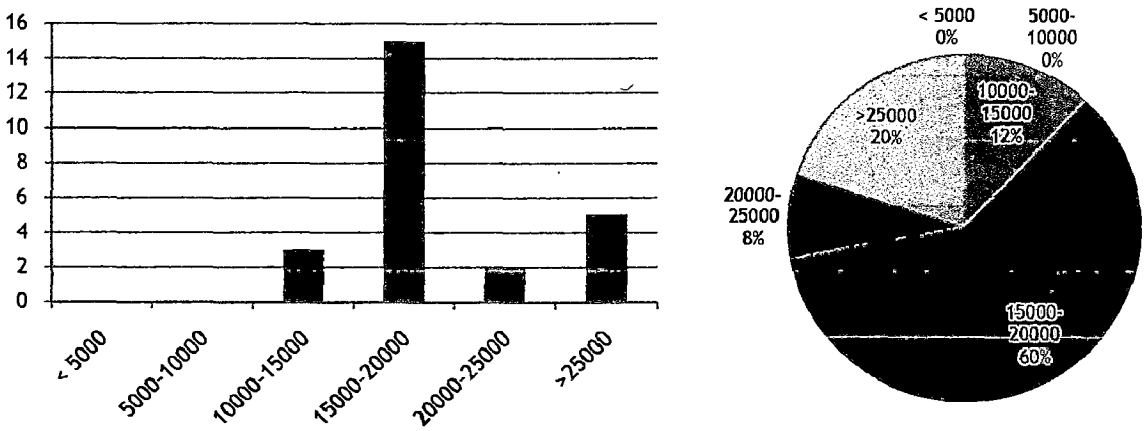


Figure 6-137: Distribution and percentage distribution of respondent's monthly household expenditure

6.4.5 Monthly Household Expenditure on transportation

Table 6-89: Distribution of respondent's monthly household expenditure on transportation

Sl. No.	Monthly Household Expenditure on transportation (Rs)	No.
1	<500	0
2	500-1000	0
3	1000-2000	10
4	2000-3000	3
5	3000-4000	7
6	>4000	5

From the survey result shown in above table, it is found that out of 25 household, 10 households monthly expenditure on transportation is between Rupees 1000-2000, 3 households monthly expenditure on transportation is between Rupees 2000-3000, 7 households monthly expenditure on transportation between Rupees 3000-4000, 5 households monthly expenditure on transportation is more than 4000.

The main finding from above table is that 40 percent household monthly expenditure on transportation is between Rupees 1000-2000.These people are middle class people and uses bus, auto rickshaw as mode of transportation.

12 percent household monthly expenditure on transportation is between Rupees 2000-3000 and 28 percent household monthly expenditure on transportation between Rupees 3000-4000. They uses Auto rickshaw, cycle rickshaw, buses as well as they own motorcycle and bicycle.

20 percent households monthly expenditure on transportation is more than 4000. These are upper middle class people comprise of faculty members of patna university and doctors. They own cars and motorcycle.

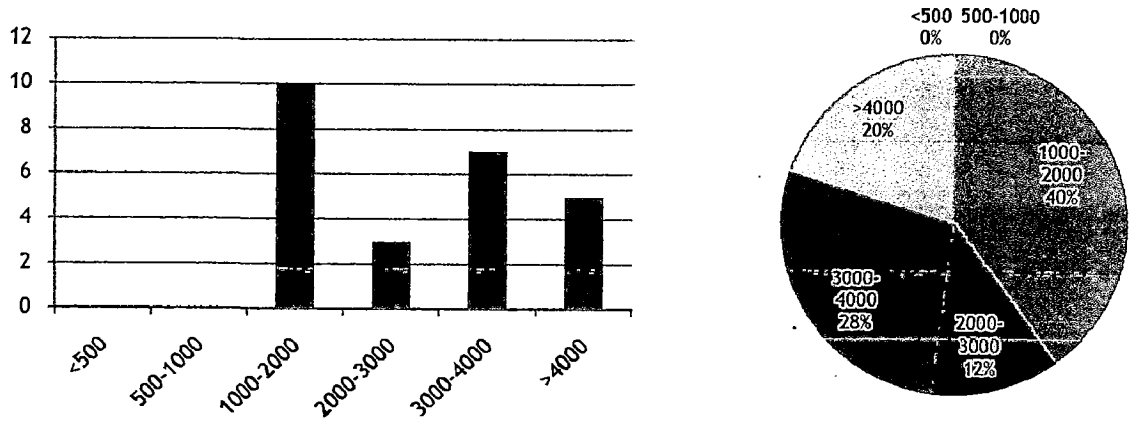
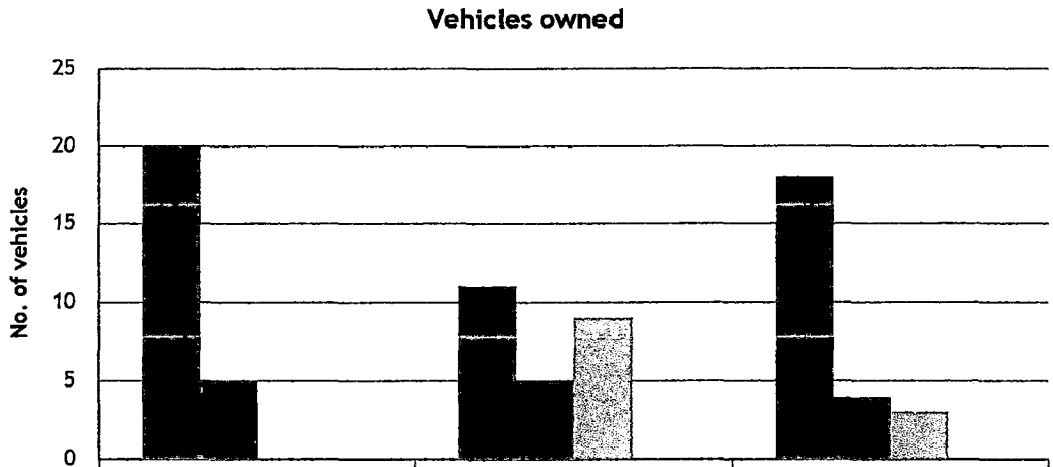


Figure 6-138: Distribution and percentage distribution of respondent's monthly household expenditure on transportation

6.4.6 Vehicles owned by household

Table 6-90: Chart and graph showing total no. of vehicles owned by household



	Car	Motorcycle/ Scooter	Bicycle
0	20	11	18
1	5	5	4
2	0	9	3
>2	0	0	0

From the survey result shown in above table and graph, it is found that 5 household out of 25 owns a car, 5 household owns 1 bike and 9 household own2 bikes/scooter out of 40 households, 4 household owns a bicycle and 3 household owns 2 bicycle out of 40 households.

It is found that 20 percent household own a car. They are generally upper middle class people like doctors and faculty members.

56 percent owns motorcycle/ scooter in which 36 percent owns 2 of them. These people uses bike to reach work place and are from the middle class family. Their family member uses other mode of transport.

38 percent household owns bicycle in which 12 percent owns two of them. This mode is used by student and some cases used by elders also for office purpose.

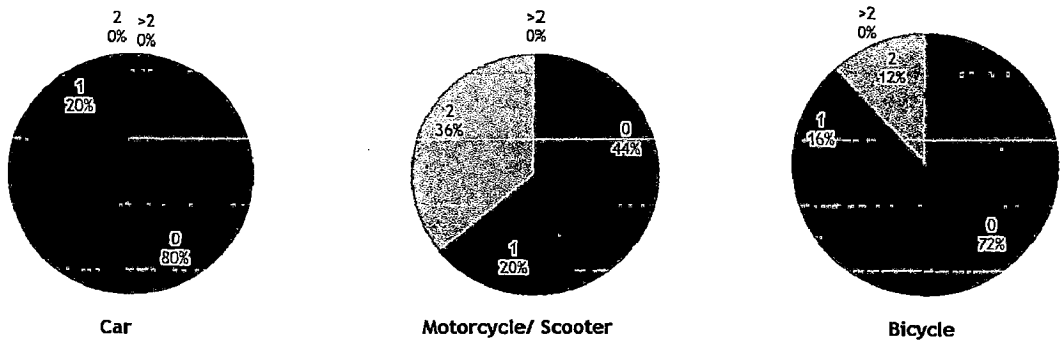


Figure 6-139: Percentage distribution of total no. of different vehicles owned by household

6.4.7 Salary of car driver

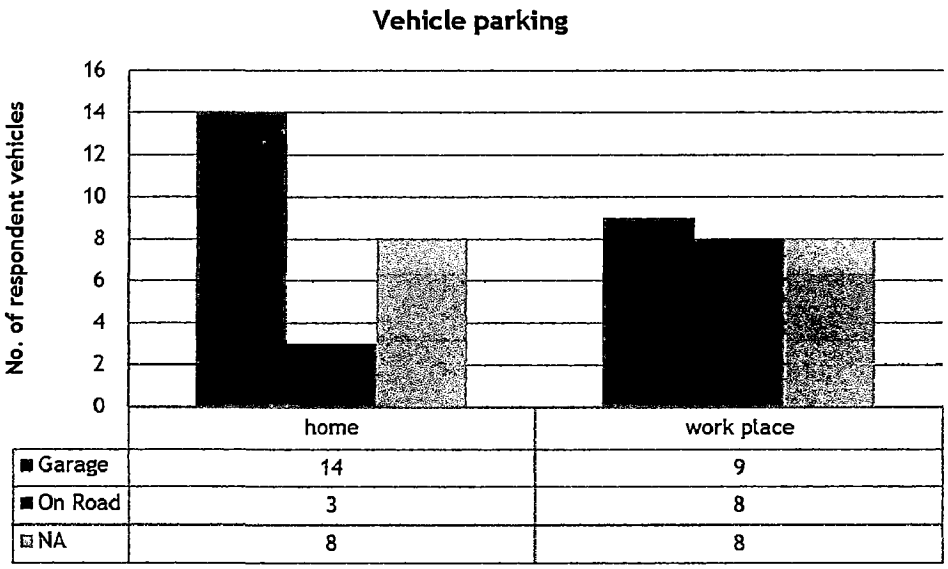
Table 6-91: distribution of car owned respondents as per driver salary given

Sl. No.	Driver Salary	No.
1	Not applicable	22
2	< 5000	2
3	5000-10000	1
4	>10000	0

Out of 5 household who uses car 2 of them drive by themselves, and other 3 has a driver for that purpose. 2 household give them salary less than rupees 5000 and one of them give salary in the range of 5000-10000. In this route one's get exhausted while driving due to congestion, so they had hired driver for that purpose.

6.4.8 Vehicle parking

Table 6-92: Distribution of personal vehicles owned respondents as per vehicles parking at home and work place



Out of 25 household, 17 of them owned some vehicles. Out of 17, 14 park their vehicles in garage at home and 3 park them on the road. At work place 9 of them uses parking area for park and other 8 of them park at road itself.

It is found that there is lack of parking space at C.B.D. area, so maximum of them park it at road. In case of home, they don't have garage so they park it at road.

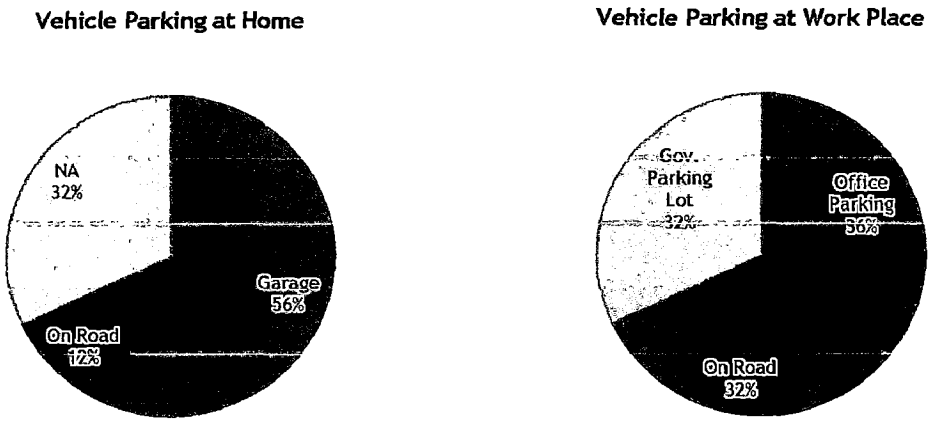


Figure 6-140: Percentage distribution of personal vehicles owned respondents as per vehicles parking at home and work place

6.4.9 Summary

25 samples are taken from the study area and analyzed. 60 percent household comprises of more than 5 members. This shows that this area is densely populated with more travel need. 48 percent of the population is between age group of 16 to 40, whereas 24 percent comprises of population between age group 5 to 15 years. It shows that young population exists in this area which comprises of students, office going employees and all have different travel need. People between age group of 5 to 15 year go to school and travels through school buses generally. People going to offices use motorcycle, bicycle or other mode like cycle rickshaw or buses.

40 percent household earns between Rupees 15000-20000 and 12 percent household earns between Rupees 20000- 25000 which shows that this society comprises of middle class and upper middle class family. In mehandru and nearby area comprise of education institute and medical college, people living here are also doctor and professor. Due to cheap accommodation towards old city area lot of working class of people lives here, who used to travel to work place, i.e. around 3-5 km from here.

40 percent household monthly expenditure on transportation is between Rupees 1000-2000.These people are middle class people and uses bus, auto rickshaw as mode of transportation. 20 percent household's monthly expenditure on transportation is more than 4000. These are upper middle class people comprise of faculty members of patna university and doctors, which are 20 percent of population which owns car. 56 percent owns motorcycle/ scooter, 38 percent household owns bicycle.

It is found that there is lack of parking space at C.B.D. area, so maximum of them park it at road. In case of home, they don't have garage so they park it at road.

6.5 Origin destination survey

This survey is part of household survey. Origin destination questionnaire is attached to household survey form as per commuters in a household.

6.5.1 Gender

Table 6-93: Gender of respondents

Sl. No.	Gender	Gender
1	Male	82
2	Female	39

Out of 121 commuters, 82 are male and 39 are female, means 68 percent are male commuters, who commute for purpose of work. 32 percent female generally commute for purpose of household work like, shopping etc.

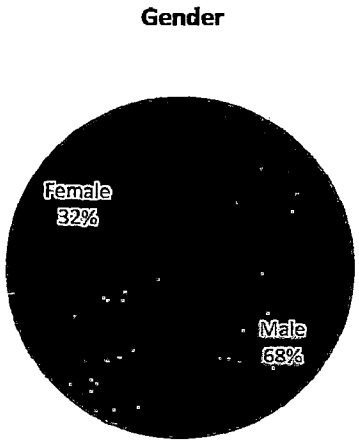


Figure 6-141: Percentage distribution of gender of rspondents

6.5.2 Expense on transportation

Table 6-94: Distribution of respondent's monthly personal expenditure on transportation

Sl. No.	Expense on transportation(monthly)	No.
1	<100	13
2	100-500	46
3	500-1000	44
4	1000-2000	13
5	> 2000	5

Out of 121 commuters, 13 commuters spend less than 100 rupees a month, 46 commuters spend between Rupees 100-500, 44 commuters spend between rupees 500-1000, 13 commuters spend rupees 1000- 2000 and 5 commuters spend more than rupees 2000 on transportation.

It is found that, 11 percent commuters spend less than 100 rupees a month. These people commute on bicycle generally.

38 percent commuters spends between Rupees 100-500,36 percent commuters spends between rupees 500-1000. These are people who use motorcycle, auto rickshaw, buses as mode of transportation.

4 percent commuters spent rupees more than rupees 2000 on transportation. These are those people who uses car.

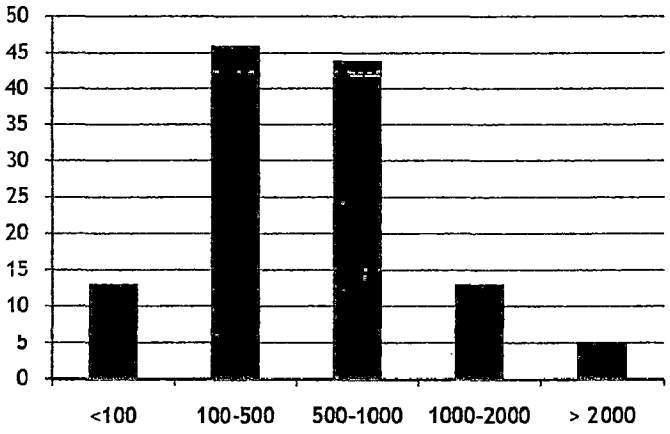


Figure 6-142: Distribution of respondent's monthly personal expenditure on transportation

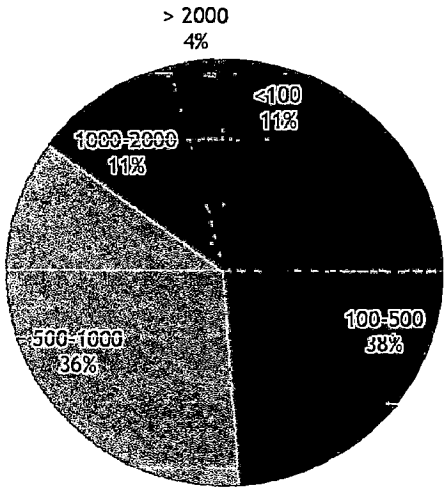


Figure 6-143: Personal distribution of respondent's monthly personal expenditure on transportation

6.5.3 Purpose of trips

Table 6-95: Distribution of respondents as per their purpose of trip

Sl. No.	PURPOSE OF TRIPS	No.
1	Going or coming from work	32
2	To or from education related	67
3	To or from shopping	53
4	Visiting Friends and relatives	41
5	Bussinesss Purpose	6

From the survey result shown in above table, it is found that 32 out of 121 respondents commute for the purpose of going or coming from work, 67 out of 121 respondents commute to or from education related purpose, 53 out of 121 respondents commutes for purpose of shopping, 41 out of 121 respondents commute to visit friends and relatives and 6 out of 121 respondents commutes for business purpose.

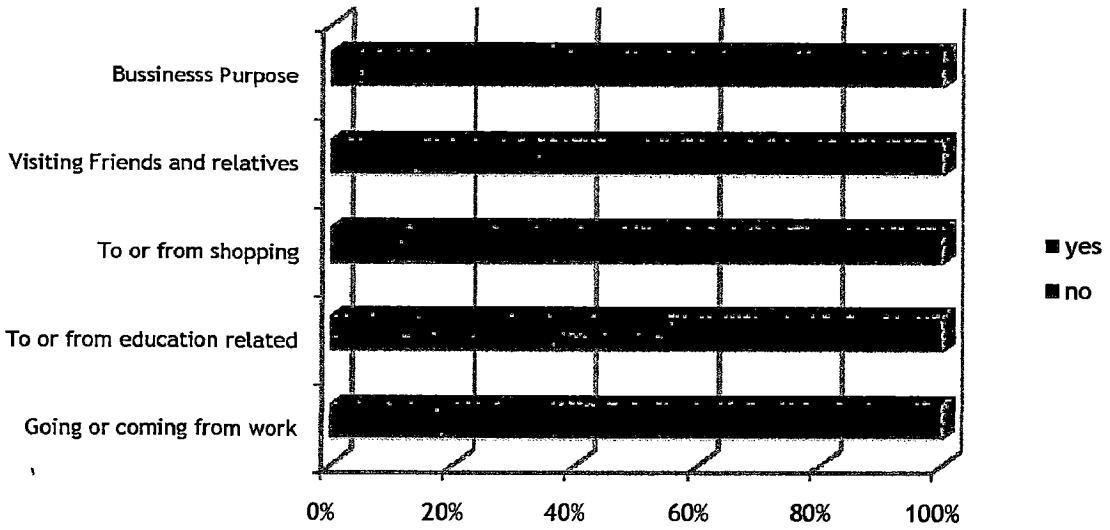


Figure 6-144: Distribution of respondents as per their purpose of trip

It is found that around 22 percent respondents commute for the purpose of going or coming from work, 50 percent respondents commute to or from education related purpose, 40 percent respondents commutes for purpose of shopping, 30 percent respondents commute to visit friends and relatives and around 5 percent respondents commutes for business purpose.

6.5.4 Mode of travel

Table 6-96: Distribution of respondent's as per their mode of travel

Sl. No.	Mode of Travel	No.
1	Bus	27
2	Car	10
3	Motorcycle/Scooter	24
4	Bicycle	13
5	Auto Rickshaw	32
6	Cycle Rickshaw	15

From the survey result shown in above table, it is found that out of 121 respondents, 27 uses bus, 10 uses car, 24 uses motorcycle/scooter, 13 uses bicycle, 32 uses auto rickshaw and 15 respondents uses cycle rickshaw.

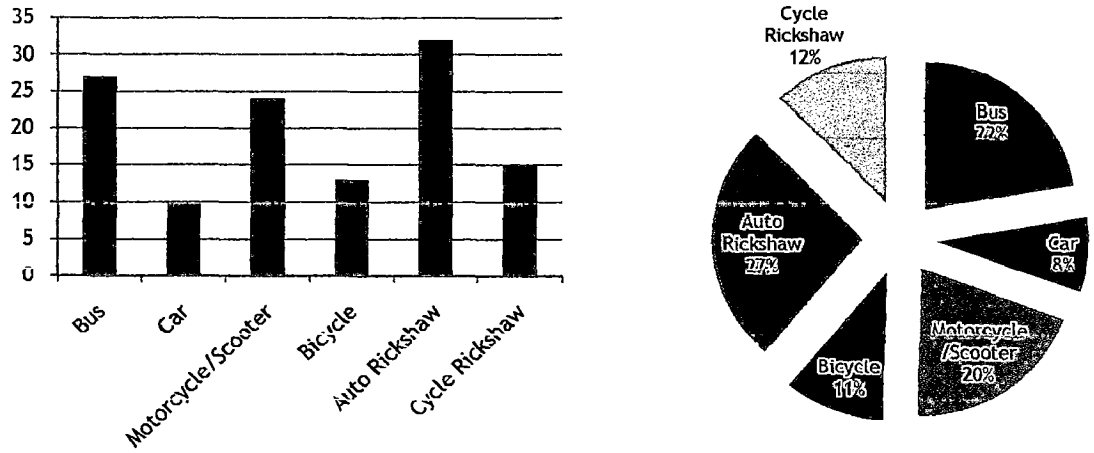


Figure 6-145: Distribution and percentage distribution of respondent's as per their mode of travel

It is found that 22 percent respondent's uses bus, 8 percent uses car, 20 percent uses motorcycle/ scooter, 11 percent uses bicycle, 27 percent uses auto rickshaw and 12 percent uses cycle rickshaw as mode of transportation.

Out of all these auto rickshaw is primarily used. Despite of inefficient public transport, 61 percent depend upon this only. 39 percent use its own personal vehicles, in which bicycle also contribute up to 11 percent.

6.5.5 Reason behind choosing the mode

Table 6-97: Distribution of respondents as per reason behind choosing mode

Sl. No.	REASON BEHIND CHOOSING THE MODE	No.
1	Bad Road Condition	0
2	Flexibility	58
3	Comfort	63
4	Less Walking involved	26
5	Safety	56
6	Convenience	80
7	Availability when you want	71
8	Travel Time	56
9	Cost	27
10	Distance	0

From the survey result shown in above table, it is found that 58 out of 121 respondents choose mode because of flexibility, 63 out of 121 choose mode based on comfort, 26 out of 121 respondents choose mode because of less walking involved, 56 out of 121 respondents choose mode based on safety, 80 out of 121, 71 out of 121 choose mode based on convenience and availability when you want respectively. 56 out of 121 and 27 out 121 choose mode based on travel time and cost respectively.

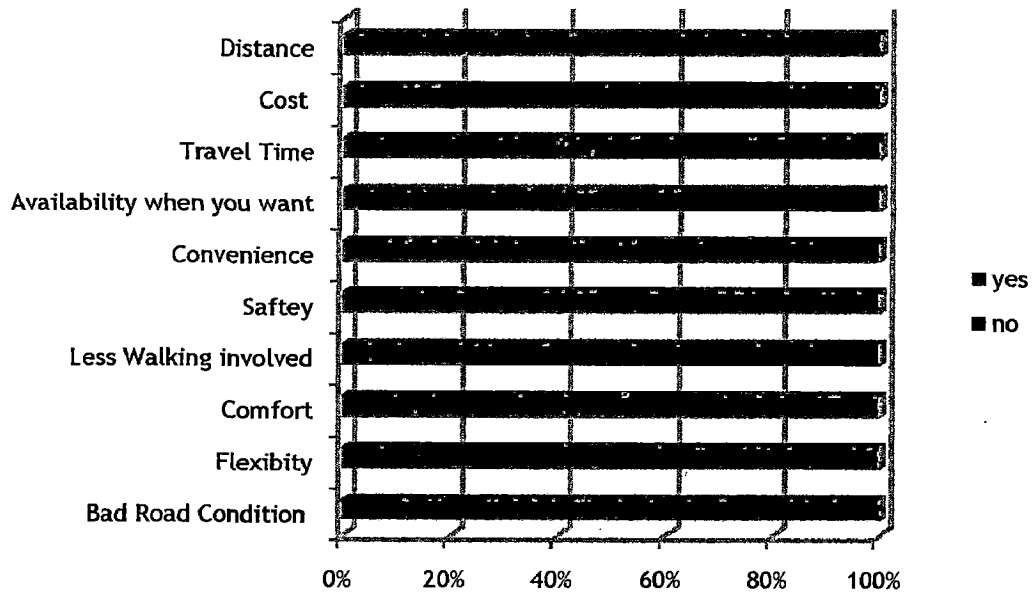


Figure 6-146: Distribution of respondents as per reason behind choosing mode

It is found that convenience; availability when you want is the major factor of choosing mode. Safety, flexibility and comfort are also important factor.

Auto rickshaw rate is around 10-15 autos per minute; it is fastest mode of public transport among all available public transport mode. It is available at any moment on main road.

Buses rate is around 1-2 in 5 minutes, means one have to wait for 5 minutes and it is the cheapest mode of transportation also but its take much more time in compare with auto rickshaw.

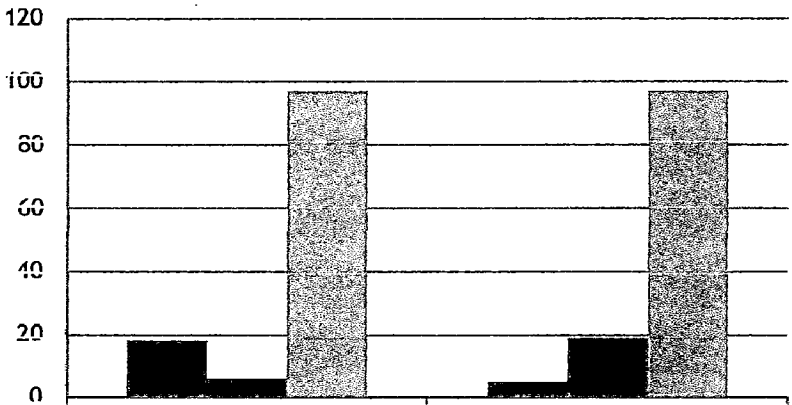
Cycle rickshaw is expensive but comfortable and generally used by ladies going for shopping or bunch of students who are generally in group of 2-3. When 2-3 people hire a cycle rickshaw it cost slightly higher than auto rickshaw per head.

Motorcycle and scooter are famous because it is the most efficient transport in term of travel time, and cost.

Travelling cost by car is pretty high but its most comfortable mode to travel.

6.5.6 Vehicle parking

Table 6-98: Distribution of respondent's personal vehicle parking at home and work place



	home	work place
Garage/parking	18	5
On Road	6	19
NA	97	97

From the survey result shown in above table and chart, it is found that out of 121 respondents 24 owns personal vehicles. 18 of them park their vehicle in garage and 6 on road at home. At office 5 people park in parking lot and 19 of them park at the road.

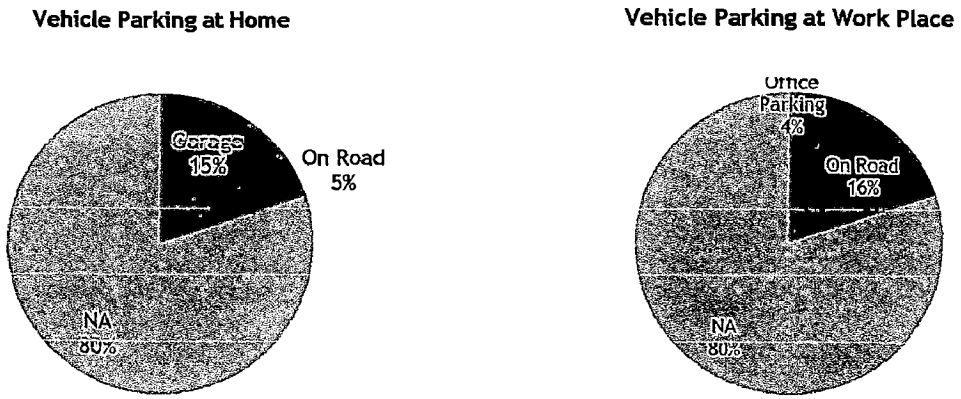


Figure 6-147: Personal distribution of respondent's personal vehicle parking at home and work place

6.5.7 Number of people in vehicles

Table 6-99: Distribution as per no of people in vehicles with respondents

Sl. No.	How Many people in your vehicles	No.
1	Alone	57
2	2	2
3	3	3
4	>3	59

Out of 121 respondents 57 travels alone in the vehicles, 2 respondents are with one more person, 3 respondents are with 2 more people in vehicles and 59 travels along with more than 3 people.

It shows that 47 percent person travel alone either in their personal vehicle or mode they had hired, like cycle rickshaw. That also refers that 47 percent vehicles on the road are of occupancy of just 1 person. If this 47 percent can be filled with more commuters, then lot of vehicles can be removed from road.

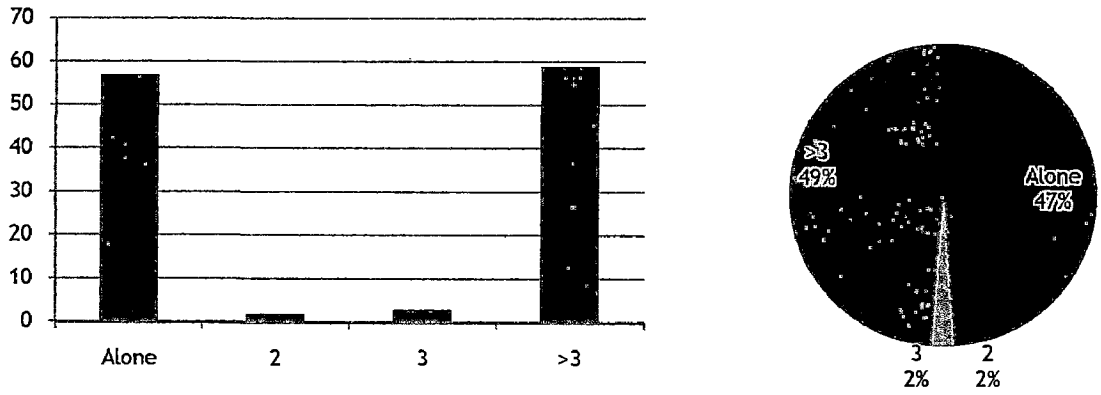


Figure 6-148: Distribution and percentage distribution as per no of people in vehicles with respondent's

6.5.8 Distance between origin and destination

Table 6-100: Distribution as per distance travelled by respondents

Sl. No.	Distance between origin and destination	No.
1	< 1 km	3
2	1-5 km	62
3	5-10 km	20
4	10-15 km	16
5	15-25km	20
6	>25 km	0

From the survey result shown in above table, out of 121 respondents 3 cover distances less than 1 km, 62 covers distance between 1 to 5 km, 20 covers distance between 5-10 km daily, 16 respondents travel 10-15 km daily, 20 respondents travel 15-20 km, No one travels more than 25 km at a time.

It shows that 53 percent travel up to 5 km , which are those people going to C.B.D. area or university area. C.B.D. area is near Gandhi maidan, which is around 4 km from mehndaru.

30 percent travel up to 15 km, which are boring road, secretariat and other government office.

17 percent travels up to 25 km. These are generally school student whose schools are in digha, danapur area.

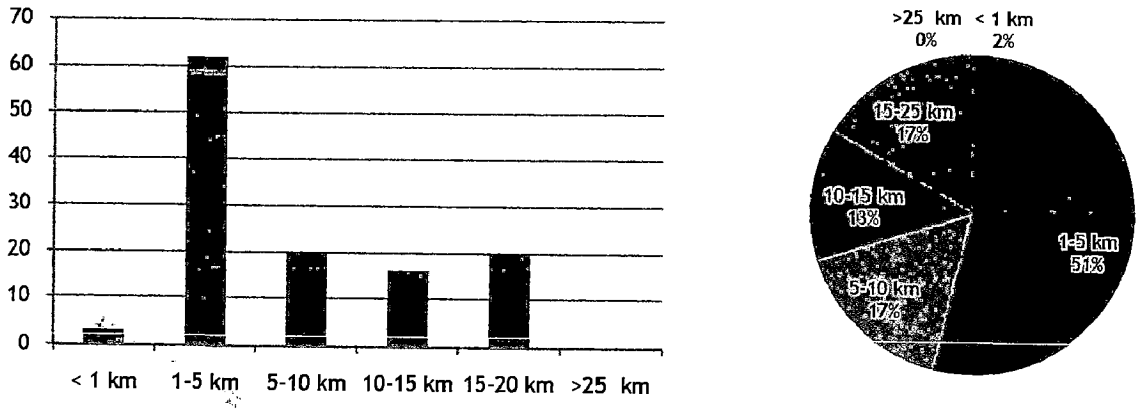


Figure 6-149: Distribution and percentage distribution as per distance travelled by respondents

6.3.9 Average time waiting for conveyance

Table 6-101: Distribution as per average time waiting for conveyance by respondents

Sl. No.	Average time you wait for conveyance	No.
1	No waiting	94
2	< 5 min	7
3	5-15 min	20
4	15-30 min	0
5	>30 min	0

From the survey result shown in above table 94 respondents out of 121 generally don't wait for conveyance, 7 respondents' waits for less than 5 minutes, 20 respondents' waits for around 15-30 minutes.

It shows that in 78 percent cases there is no waiting involved. This is due to rate of auto rickshaw availability. Another 22 percent waits up to 15 minutes. This is due to search of bus or sometimes seats availability in auto rickshaw

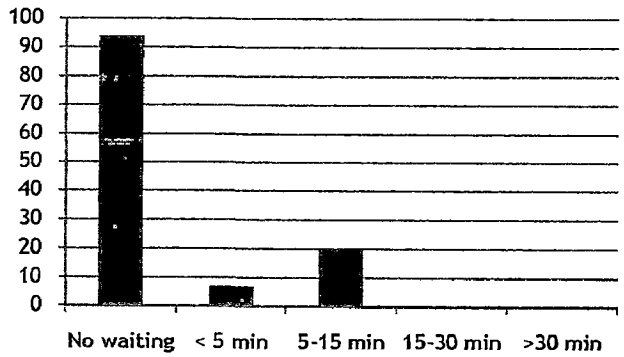


Figure 6-150: Distribution as per average time waiting for conveyance by respondents

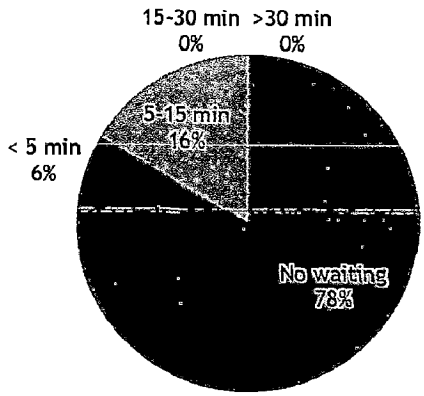


Figure 6-151: Percentage distribution as per average time waiting for conveyance by respondents

6.5.10 Time of travel

Table 6-102: Distribution as per time taken for travel by respondents

Sl. No.	Time of your Travel	No.
1	< 15 min	8
2	15-30 min	45
3	30-45 min	28
4	45- 60 min	25
5	>1 hr	15

From the survey result shown in above table, 8 respondents out of 121 reaches their destination in less than 15 minutes, 45 out of 121 reaches their destination in 15 to 30 minutes, 28 out of 121 reaches their destination in 30 to 45 minutes, 25 out of 121 reaches their destination in 45-60 minutes, and its take more hour for 15 respondent.

It shows that 7 percent respondents reach their destination in less than 15 minutes. Their destination lies on this road only like university and they use motorcycle.

60 percent reaches their destination in 15 to 45 minutes, and left 33 percent reaches their destination in more than 45 minutes.

Auto rickshaw takes 30-40 minutes to reach Gandhi maidan from gai ghat, whereas bus would take around 1 hour, car would take around 45 minutes and motorcycle would take 15-20 minutes to reach there.

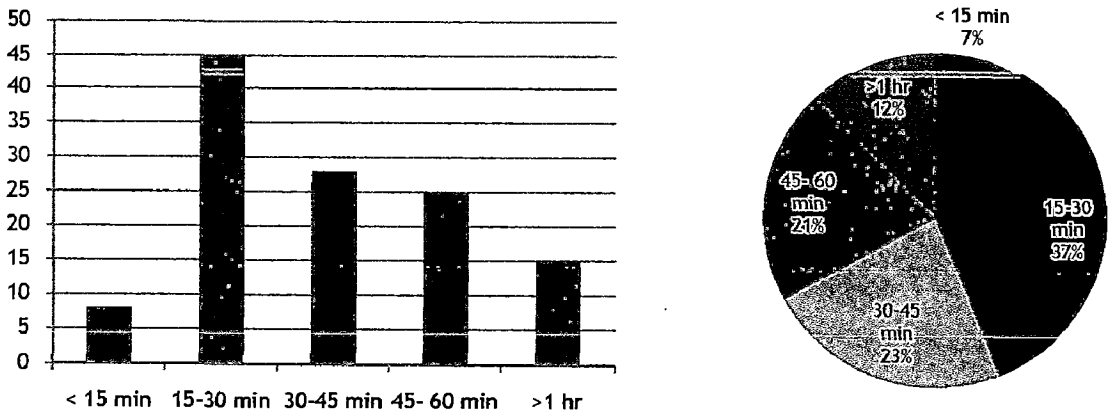


Figure 6-152: Distribution and percentage distribution as per time taken for travel by respondents

6.5.11 Travel cost per day

Table 6-103: Distribution as per travel cost per day spend by respondents

Sl. No.	Travel Cost	no.
1	< Rs 10	45
2	Rs 10-20	33
3	Rs 20-30	11
4	Rs 30-40	20
5	RS 40-50	0
6	> RS50	12

From the survey result shown in above table, 45 respondents out of 121 respondents spend less than 10 rupees daily, 33 out of 121 reaches spend between Rupees 10-20 daily, 11 out of 121 respondents spend 20 to 30 rupees daily, 20 out of 121 respondents spend 30 to 40 rupees daily, and 12 respondents spend more than rupees 50 daily on transportation

It shown in above table, 64 percent respondents spend less than 20 rupees daily. This implies that masses spend less on transportation.

26 percent spend between 20 to 40 rupees daily and 10 percent spend more than rupees 50 daily on transportation.

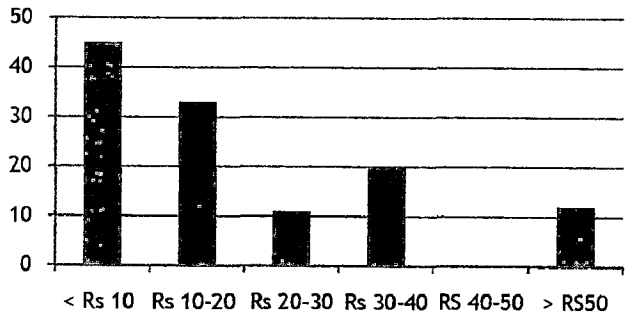


Figure 6-153: Distribution as per time taken for travel by respondents

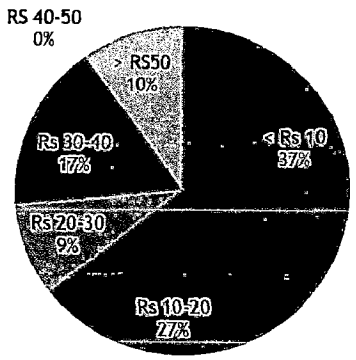


Figure 6-154: Percentage distribution as per time taken for travel by respondents

6.5.12 Summary

Among all commuters, 68 percent are male commuters, who commute for purpose of work. 32 percent female generally commute for purpose of household work like, shopping etc.

11 percent commuters spend less than 100 rupees a month. These people commute on bicycle generally. 38 percent commuters spend between Rupees 100-500 per month, 36 percent commuters spends between rupees 500-1000 month. These are people who use motorcycle, auto rickshaw, buses as mode of transportation. 4 percent commuters spent rupees more than rupees 2000 on transportation. These are those people who uses car. 64 percent respondents spend less than 20 rupees daily. This implies that masses spend less on transportation. 26 percent spend between 20 to 40 rupees daily and 10 percent spend more than rupees 50 daily on transportation Around 22 percent respondents commute for the purpose of going or coming from work, 50 percent respondents commute to or from education related purpose, 40 percent respondents commutes for purpose of shopping, 30 percent respondents commute to visit friends and relatives and around 5 percent respondents commutes for business purpose.

It is found that 22 percent respondent's uses bus, 8 percent uses car, 20 percent uses motorcycle/ scooter, 11 percent uses bicycle, 27 percent uses auto rickshaw and 12 percent uses cycle rickshaw as mode of transportation. Out of all these auto rickshaw is primarily used. Despite of inefficient public transport, 61 percent depend upon this only. 39 percent use its own personal vehicles, in which bicycle also contribute up to 11 percent. It is found that convenience; availability when you want is the major factor of choosing mode. Safety, flexibility and comfort are also important factor. Auto rickshaw rate is around 10-15 autos per minute; it is fastest mode of public transport among all available public transport mode. It is available at any moment on main road. Buses rate is around 1-2 in 5 minutes, means one have to wait for 5 minutes and it is the cheapest mode of transportation also but its take much more time in compare with auto rickshaw. Cycle rickshaw is expensive but comfortable and generally used by ladies going for shopping or bunch of students who are generally in group of 2-3. When 2-3 people hire a cycle rickshaw it cost slightly higher than auto rickshaw per head. Motorcycle and scooter are famous because it is the most efficient transport in term of travel time, and cost. Travelling cost by car is pretty high but its most comfortable mode to travel.

78 percent cases there is no waiting involved. This is due to rate of auto rickshaw availability. Another 22 percent waits up to 15 minutes. This is due to search of bus or sometimes seats availability in auto rickshaw.7 percent respondents reaches their destination in less than 15 minutes. Their destination lies on this road only like university and they use motorcycle. 60 percent reaches their destination in 15 to 45 minutes, and left 33 percent reaches their destination in more than 45 minutes. Auto rickshaw takes 30-40 minutes to reach Gandhi maidan from gai ghat, whereas bus would take around 1 hour, car would take around 45 minutes and motorcycle would take 15-20 minutes to reach the same.

53 percent commuters travel up to 5 km , which are those people going to C.B.D. area or university area. C.B.D. area is near Gandhi maidan, which is around 4 km from mehndaru. 30 percent travel up to 15 km, which are boring road, secretariat and other government office. 17 percent travels up to 25 km. These are generally school student whose schools are in digha, danapur area.

47 percent person travel alone either in their personal vehicle or mode they had hired, like cycle rickshaw. That also refers that 47 percent vehicles on the road are of occupancy of just 1 person. If this 47 percent can be filled with more commuters, then lot of vehicles can be removed from road. In other cases of auto rickshaw and buses, commuter share vehicle with more than2-3 people.

Auto rickshaw generally has 3 seats at back and front seat is for the driver, but amazingly 3 more people manage in front seat along with driver. This is not safe but people get used to it, despite of waiting for other auto rickshaw with vacant seat behind, they prefer to sit in uncomfortable position with drivers. These people are generally youngster. Female members and elder one waits for vacant auto rickshaw or youngster sitting behind offer them seat, and sit ahead with driver. This situation prevails due to high travel demand and less number of mode available.

6.6 EVALUATION OF MASTER PLAN AND CMP RECOMMENDATION

6.6.1 Master Plan, 2006

Land Use Planning:

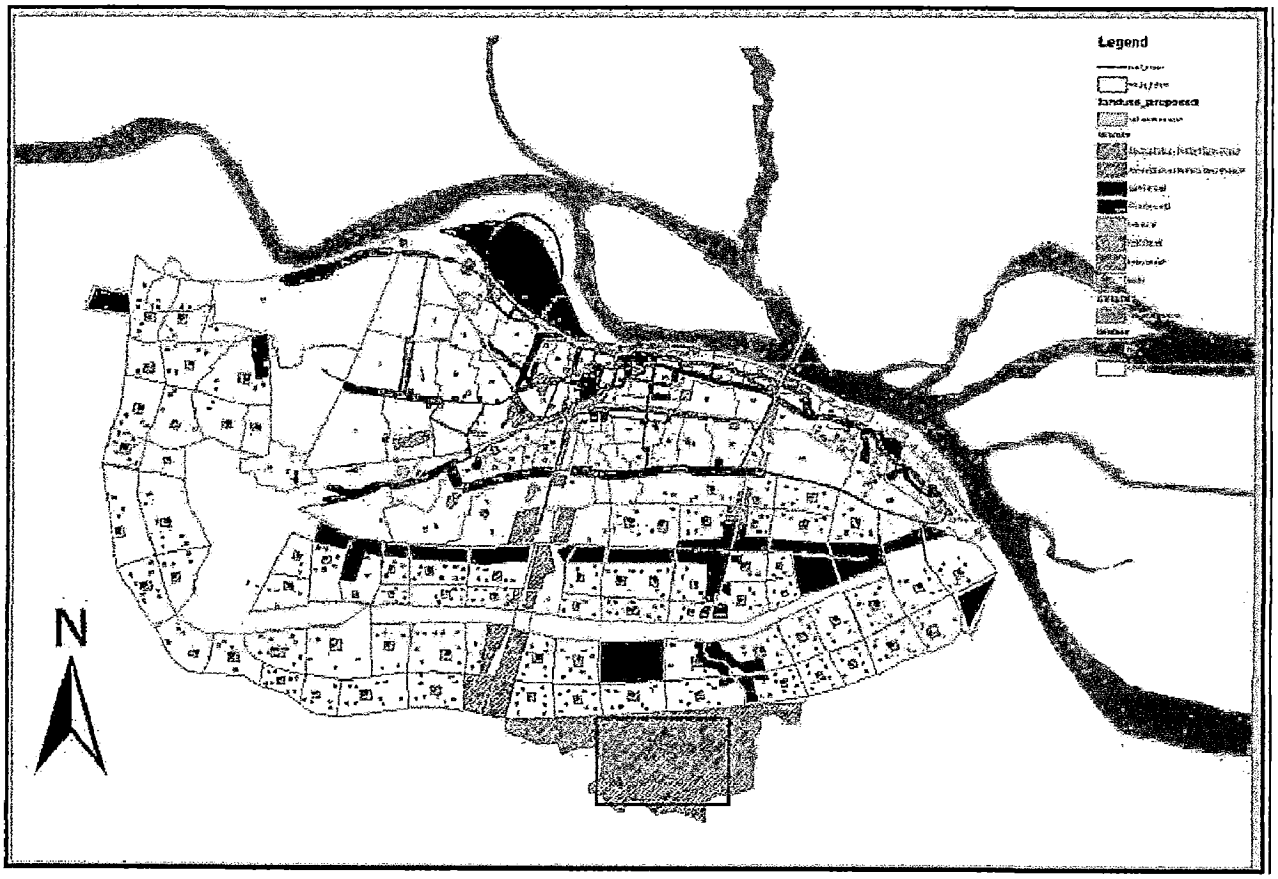


Figure 6-155: Master Plan of Patna (Source: Master plan, 2006)

- A major corridor of institutional and administrative land use along Gaya railway line and another corridor of commercial development parallel to the existing new bypass.
- The west part of the city is expected to provide residential housing for the future with no commercial development. This would increase the trip length in the city with more work trips from the western to the southern part of the city.
- There will an IT city to the north along the banks of the river Ganges while there is a university complex planned to the south, along the outskirts of the city. This would attract lot of the trip but both of them are proposed on diametrically opposite sides of the city.
- Similarly, two major ribbon kinds of developments for commercial use are planned along the new bypass and on another proposed ring road to the south and parallel to the existing new bypass.
- Land use is not planned in order to decentralize industries, which attract lot of trips. These major industries are in old city of Patna.

6.6.2 City Mobility Plan,2009

Recommendation: Proposal for a new road parallel to Ashok Rajpath connecting Danapur to Fatua with interchange point at Gandhi Setu as an alternate of Ashok Rajpath.

- CMP hadn't dealt with the existing traffic problems of Ashok Rajpath, and no specific recommendation has given for transportation issue in old city area.
- No specific recommendation is given for cyclerickshaw and other NMVsector, which dominates in this route.
- Beside terminal location and parking, no specific recommendations are given for autorickshaws, which are the backbone of Patna city transport.

Recommendation: Segregated Bus Lanes for BRTS are recommended for corridors with ROW is greater than 33 meters.

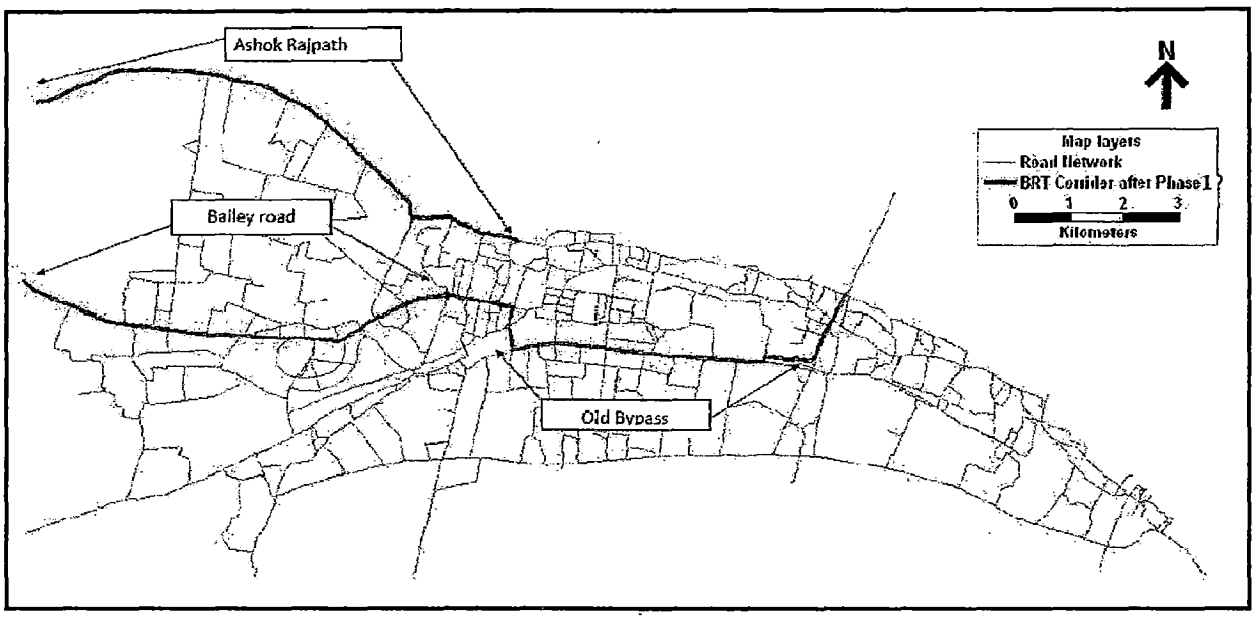


Figure 6-156: Proposed BRTS route of Patna city. (Source: CMP,2009)

- Only 4 percent road have road width of more than 18 m, and only two roads, Bailey road and Digha raod has ROW more than 30 m, that also in few stretch.
- Old bye pass has two lane flyover in majority of its section, and if it is used as segregated lanes for bus, then there would be huge traffic jams, because its V/C ratio is greater than 2 and road is not sufficient enough to take present traffic itself.
- This BRTS system has not been proposed with an integrated approach.
- Many people use the major corridors for a short length in their total trip. end to end trips along the corridors are few and a majority of the trips have origins and destinations outside the corridor.

Recommendation: Road Infrastructure Improvement on the major arterials. 43 km of roads in Patna has to be improved for encouraging public transport.

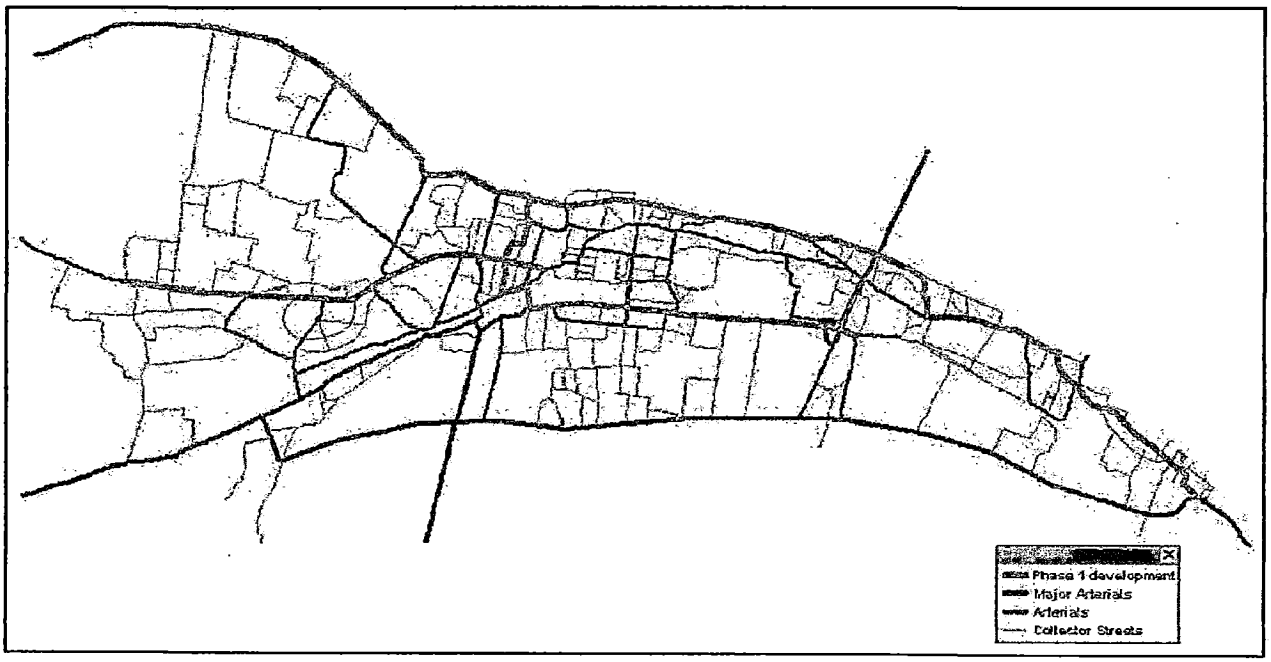


Figure 6-157: Proposed development of corridors (source: CMP, 2009)

- As mentioned before 96 percent of road is of road width less than 18 m. For improving road infrastructure, minimum of 24 m of road width as arterial road is required.
- For Old city area, where road width in 5-6 m and ROW is up to 8 m only ,with residential area along it, it would be tough task to widened it.
- For widening this road, compacted residential area has to demolished along it all along 10-12 km of stretch, which would lead to political intervention, and make this hard to implement.
- There are temples, Mosque and other religious building along this road, demolishing this religious site would hurt people sentiments.
- Constraint and details has been ignored, in the recommendation.

Recommendation: Improved Pedestrian Facilities could be in the form of providing separate pedestrian paths with appropriate heights, junction bus stops and a pedestrian friendly signal. Provision of segregated NMV tracks and painted bicycle tracks of 1.5 meter width, on arterials where the speed of the motorized vehicle is more than 30 km/hr and the Right of Way is greater than 30 meters.

- Generally people don't follow the painted lanes in Indian traffic, that would lead to fatalities of bicyclist, Segregated bicycle track should be provided.
- NMV is allowed in all the roads, including roads with and without segregated NMVs lanes, which affects the traffic movement.
- No specific recommendation on thelas(hand drawn good vehicles) which is the important factor of slowing down of vehicles.

Recommendation: A Special Purpose Vehicle is proposed for management of all transport related projects.

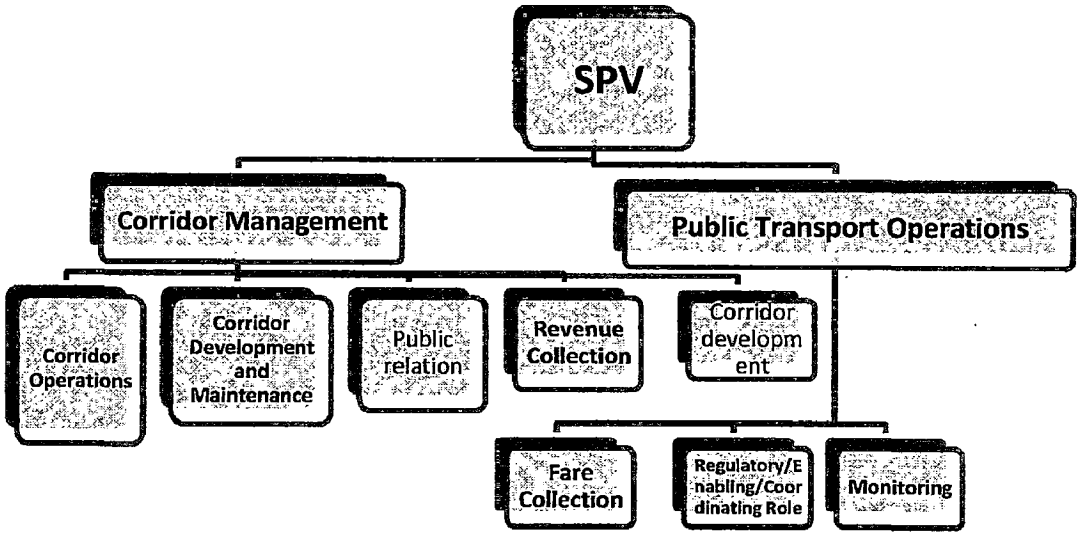


Figure 6-158: Institutional set-up recommended by CMP,2009

- There is huge growth in Autorickshaw and cycle rickshaw, which are not monitored and controlled. Autorickshaw and cyclerickshaw sector need a special attention from the authority. Number of autorickshaw and cyclerickshaw in particular route should be monitored, their growth should be restrained and there proper monitioring should be done, which are not recommended in CMP.
- Traffic police is not integrated with the SPV, which would led to failure, in absence of the body in its control, to enforce rules and regulation.

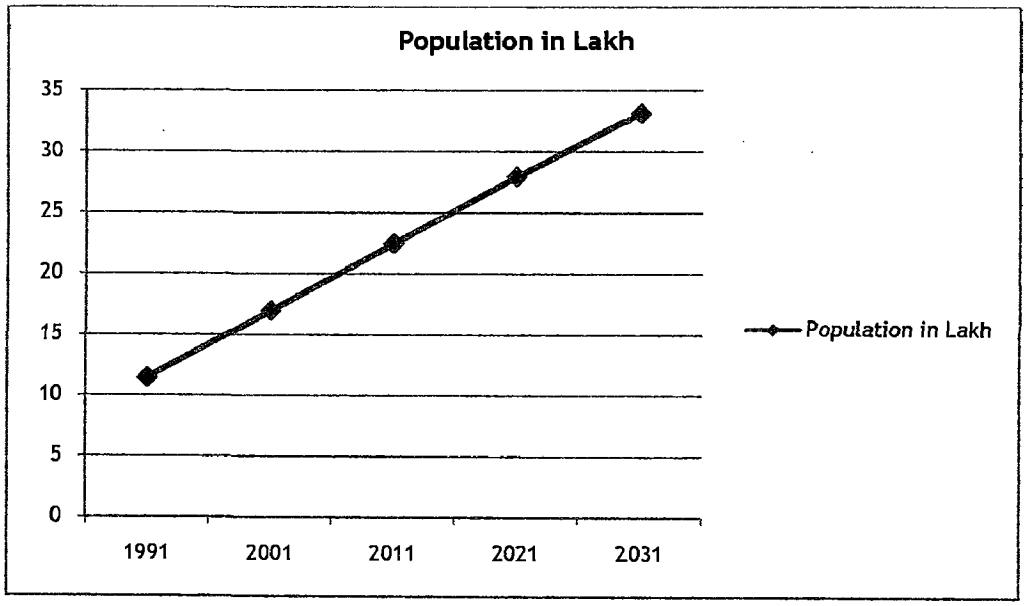
Recommendation: Water transport is recommended for intra city transport along the city.

- Details and study for this mode is not provided..

7 PROJECTION FOR YEAR 2031

The land use and the population figures and other details have been adopted from the master plan and city mobility plan. The Patna Urban Agglomeration Area had a population of 16.98 lakhs as per the 2001 Census while the municipal corporation area of Patna had a population of 13.66 lakh (2001Census). The growth of the population in the Urban Agglomeration Area is observed to increase rapidly from 1991-2001. The growth of population will be 18 lakh in coming 2 decades.

Figure 7-1 : Population projection for year 2031 (Source: Author)



Thus using Fitting curve method, projection has been done for the consecutive decades up to 2031. The population of the Urban Agglomeration Area is expected to and 28.01 lakhs in the year 2021 and 33.157 lakhs in year 2031. In addition the floating population who commute from districts to the Patna Urban Agglomeration Area each day is expected to be 3.00 lakhs- 4 lakhs by 2031.

Sl. No.	Year	Total no of vehicles
1	2005	383734
2	2006	411869
3	2007	445729
4	2008	478910

Figure 7-2: year wise total number of vehicles

Patna registered a 67 fold increase in number of vehicles in the previous two decades (1981-2001) i.e. till the last census. From 1996 to 2009, vehicular population in Patna grew at an average annual rate of around 5%, whereas for period from 1981 to 2001, annual growth rate was 23%.

For year 2031, total number of vehicles are projected using 'Fitting curve method' i.e. 19,68,200, which will increase 4 times to the number of vehicle in 2008.

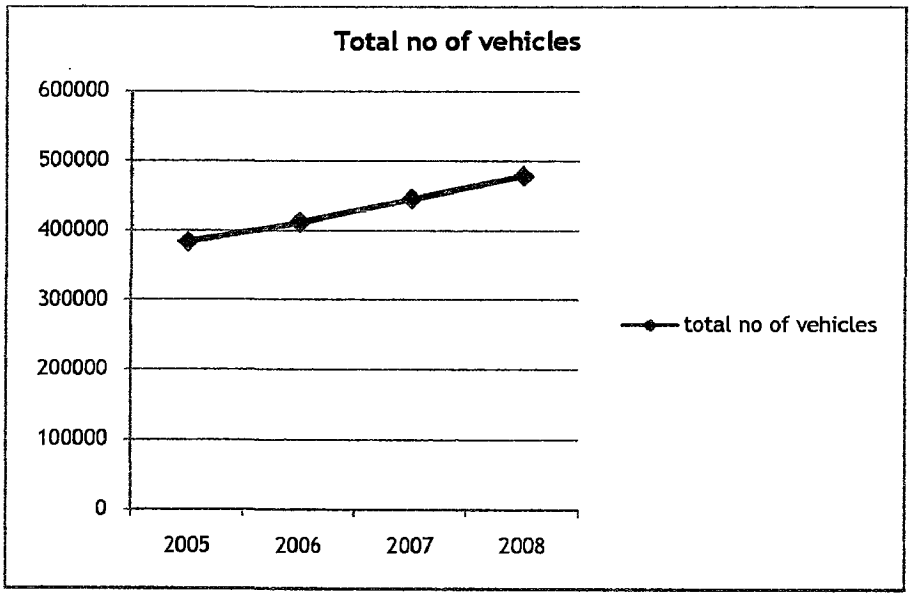


Figure 7-3: Total no. of vehicles at 2031 A.D. (Source: Author)

The overall planned growth for 2021 gives Patna a round shape with many ring road corridors envisaged. The future land use is shown below in the figure where the city's prominent growth can be seen to develop to the west and to the south.

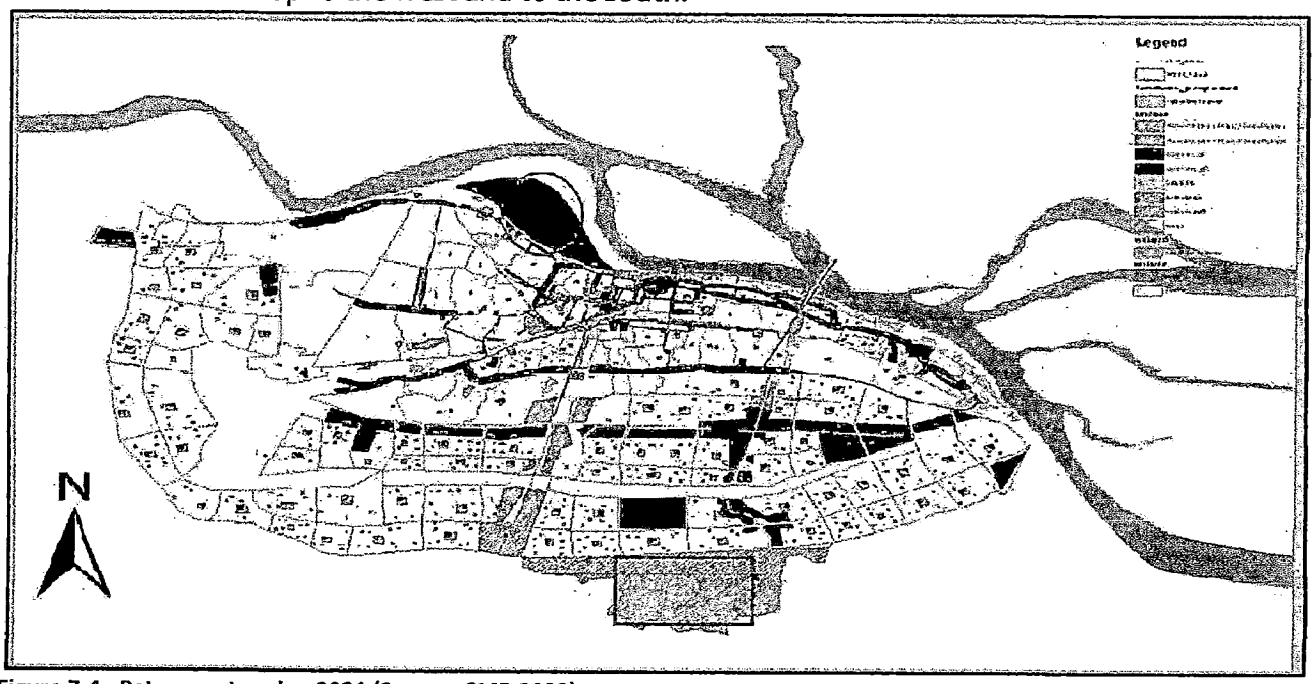


Figure 7-4 : Patna master plan 2021 (Source: CMP 2009)

By the year 2021, according to the master plan there will an IT city to the north along the banks of the river Ganges while there is a university complex planned to the south, along the outskirts of the city. These two developments, shown in boxes in the above figure, can be considered to have a major attractive behaviour for trips. Similarly, two major ribbon kinds of developments for commercial use are planned along the new bypass and on another proposed ring road to the

south and parallel to the existing new bypass. The master plans aims to maintain an overall density of 150 persons/ hectare. It is assumed that the population in the existing, high density (more than 150 persons/hectare) zones would prefer to move out to the new developments as per the master plan. This movement will further depend on the second assumption that people would prefer to settle along the transportation axes and/or those zones along and around the major proposed commercial and institutional developments. As a result only few of the planned zones would develop first and faster than the others.

The present trip behaviour estimated; produce 1.8 lakh trips from PMC and its outgrowth. The number of trips PUAA area which includes Khagaul and Danapur is about 2.1 lakh.

The trip rate is assumed to remain the same (at 0.8) for the next 15 years till 2021; the total trips in 2021is estimated to the about 22.5 lakh trips and for 2031 is estimated 32.4 lakhs. If the trip rate increases to 1.0 then the number of trips in 2021 would be 28.01 lakh and in 2031 it will be 33.157 lakh.

The factor of 17% is taken for the morning peak which is same as the base year, then the additional peak hour traffic will be 5.508 lakhs for year 2031 assuming trip rate as 0.8 and 5.64 lakhs for year 2031 assuming trip rate of 1.

Overall trips for peak hours for year 2031 will be 37.9 lakhs assuming trip rate of 0.8 and 38.8 lakhs assuming trip rate of 1.

RECOMMENDATION

LAND USE

PUBLIC TRANSPORT AND IPT

NMT AND PEDESTRIANS

TRAFFIC ENGINEERING AND MANAGEMENT

INSTITUTIONAL SET-UP

8 RECOMMENDATION

8.1 LAND USE/SPATIAL DEVELOPMENT

19. Decentralization of small scale industry and wholesale market of old city should be done, which will decrease trips mainly as goods vehicles.
    - As per master plan East and South- East part, which is near to old city of Patna is marked as residential area and it will be developed in later phases. It should be developed initially, as industrial and commercial zone for small scale industry and wholesale market and that also in first phase.
    - This will help the industries and commercial sector to move in this new sector, without moving their houses. They can easily transit to work place from their home.
    - Traffic movement will be in north-south direction rather than East-West direction, which will give a great relief to major East-West arterial road of existing Patna.

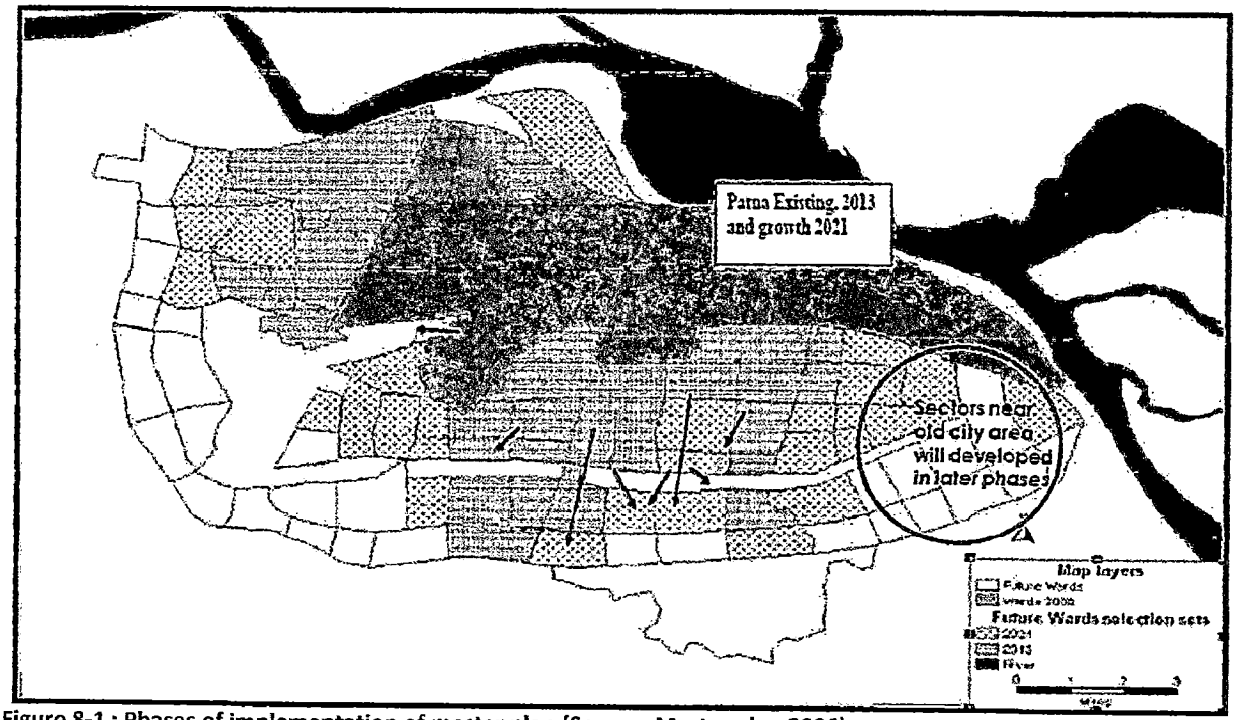


Figure 8-1 : Phases of implementation of master plan (Source: Master plan,2006)

20. Every upcoming sector should be self sufficed, to ensure that people don't travel to main city for their requirement.

21. Interaction between land use and transport should be planned to reduce trips.

8.2 PUBLIC TRANSPORT

22. Buses up to gai ghat should be avoided but up to N.I.T turning it should be resumed.
    - From N.I.T. turning to Gandhi Maidan both auto and buses take almost same fare that would give commuters equal weighted options.
    - From N.I.T. turning to Gandhi Maidan road width is sufficient to carry bus along with other traffic.
    - IPT will act as feeder transport for person going old city.

23. 20 seater buses (yellow buses) should be scrapped out.
    - These buses take the same width of raod as 40 seater bus, but allow half the passengers.
    - These yellow buses are owned by some person and run on their own, without any institution monitoring it.
    - These buses are not comfortable and reliable, for more profit they take passenger from all the intersections.

24. ITS enabled proper bus stop should be planned, to maintain the efficiency of public transport. Proper check should be done to ensure bus stops at scheduled stops only.

25. Low floor buses are recommended to increase accessibility.

26. A.C. buses are recommended to increase comfort and provide options to high class people against private cars.

27. ICT technology (GPS enabled buses, LED display at bus stops showing time schedule etc.) should be used to improve delivery of buses.

28. In present context, BRTS can't run on city routes, but along with the implementation of master plan, it can be planned with the integration with other mode.

29. Upcoming Ganga driveway will be completed in 3-4 years. In that road, city buses can run which will serve passenger from Malsalm to Digha all along Ashok Rajpath.

30. First phase of Patna metro is also going to start which includes two routes, in which one of the routes is along the Ashok Rajpath from Danapur to Patna city. This will give a cheap, reliable, comfortable and faster alternative to other mode of transport.

31. Water transport can be developed as an option for people travelling along Ashok Rajpath.

- As mentioned in O-D survey, people generally travels upto Gandhi Maidan which is C.B.D. area for work purpose, Childrens goes to Digha area for schooling purpose, P.M.C.H.is used for by lot of patient, Institutional area are destination for students and Gai Ghat (the entry point of intercity transport through water) is entry point for commuters from North bihar. These are the major destination for commuters, whereas origin points are high density residential area like Malsalmai, old city, Mehandru etc. This all locations are along River Ganga. In future upcoming IT city along the river will attract lot of trips from these high densly populated area. So, Inland river transport can become a good alternative mode of transport.

- Jetties can be installed at malsalmi, Gai Ghat, Gandhi Ghat, P.M.C.H, Gandhi Maidan and Digha. This location are the major trip generator points along this road and accessible through all season river.

- Environment friendly and cheap mode of transport which would take less time than other modes in congested road.

- Patna metro and ganga driveway project should be kept in mind before planning for this project.

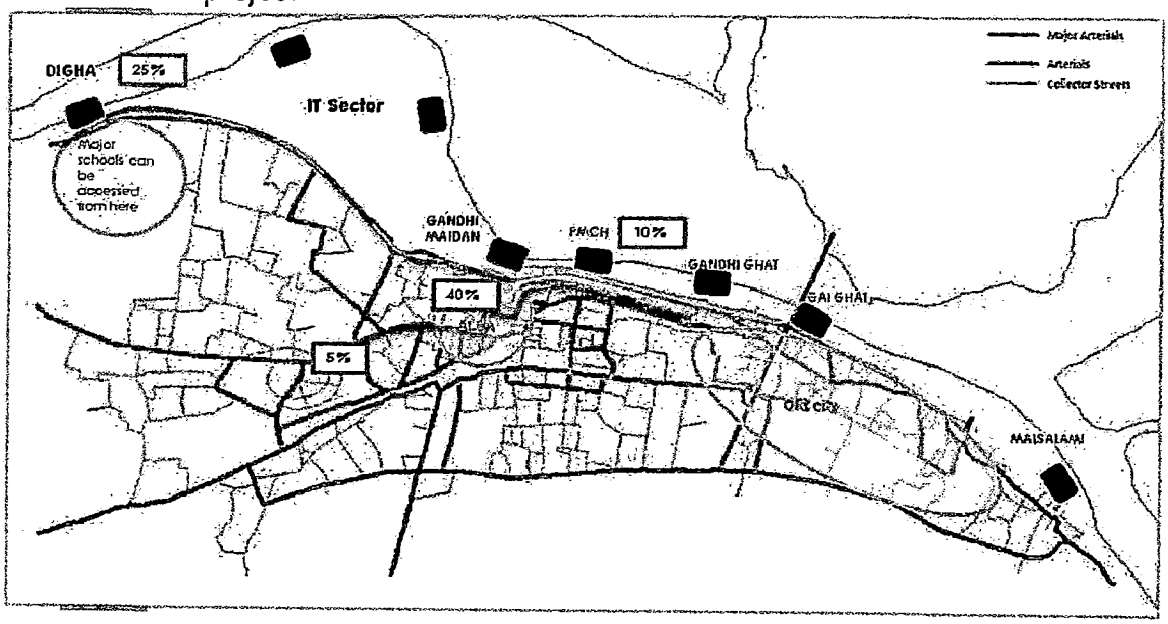


Figure 8-2: Feasibility map for water transport (Source: Author, CMP 2009)

8.3 INTERMEDIATE PUBLIC TRANSPORT (IPT)

32. New IPT registration should be restricted.

33. IPT older than 10 years should be scrapped out, because of its poor performance.

34. Parking area for IPT are required to be develop at various points like Gai Ghat, Gandhi maidan etc.

35. At Ashok rajpath, from Gandhi Maidan to Malsalmi, auto rickshaw should be retained but also regulated and monitored.

36. It is recommended that route shouldn't be diverted while returning back from Malsalami. This will help in increasing its trip after expulsion of Buses, cycle rickshaw, good vehicles, and bicycle. This will help to increase their income and also results in decreasing fare and making it affordable for commuters.

37. 3 seater auto rickshaw should be upgraded to 4 seater, in which 1 seat is attached with driver seat.

    - As mentioned earlier 6-7 people seats in a 3 –seater auto. 3 more person seats ahead with driver. Its not comfortable as well as not safe. Taking the high density and people habits in mind, one more seat will be added ahead.
    - As mentioned earlier, the person seating ahead are generally youngster, who leaves back seats for ladies and old peoples. So, this set up is safe for ladies and elders, who are more venerable.

38. All petrol cum kerosene run auto rickshaw should be converted into CNG auto rickshaw.

    - Generally this fuel contains at least 50 percent of kerosene and naptha which causes three times more pollution than petrol. Such a high proportion of kerosene reduce the fuel combustion efficiency, resulting in high level of unburnt fuel along with respirable particulate matter (RPM) emitted by auto rickshaw.[42]

    - After the successful implementation of the CNG programme in Delhi in 2002 nearly 14 polluted cities were identified in two court orders — that of April 5, 2002, and August 14, 2003. While there is an overlap in the two lists, together they include Agra, Lucknow, Jharia, Kanpur, Varanasi, Faridabad, Patna, Jodhpur and Pune (as in the first order), and Hyderabad, Chennai, Bangalore, Ahmedabad and Solapur (as in the second order).[43] In 2002 court has given order regarding use of CNG fuel, but still Auto in the city use adulterated fuel.

    - Subsidy should be provided for auto conversion.

[42] Adulterated fuel poses threat to kids - Times Of India Articles.timesofindia.indiatimes.com/..../28284686_1_rickshaw-check-fuel-adulteration-kerosene

[43] CNG programme in India: The future challenges – Anumita Roychowdhury
FACT SHEET SERIES, 2010 by CENTRE FOR SCIENCE AND ENVIRONMENT

- 85 percent auto rickshaws are rented. So, it will be comparatively easy to implement it because maximum of auto rickshaw driver would be spared.

- As discussed earlier, generally these 85 percent autos maintenance takes around 12000 annually due to use of kerosene as a fuel. In that case CNG vehicles maintenance would be cheaper.

8.4 NON MOTORISED TRANSPORT (NMT)

39. Cycle rickshaw should be refrained from Ashok Rajpath and should be confined in the North-South routes between two major arterials, which are Ashok Rajpath and Old bye pass.
    - Auto rickshaw returning back from Malsalmi would go through ashok rajpath only, leaving Machua toli and nala road unserved. This decision will help cycle rickshaw to get passenger.
    - After different mode of transport along Ashok Rajpath like metro, buses on both road ganga driveway and ashok rajpath, auto rickshaw from both side start working, there wouldn't be any option left for cycle rickshaw to earn in this road.
    - All arterial road in this area is at walking distance of 10 minute, so commuters can walk easily to get a public transport.

40. Cycle rickshaw shouldn't be allowed through all the roads. They should preferably run through residential route, where vehicular traffic is less.

41. Parking for cycle rickshaw and number of cycle rickshaw waiting in each route should be defined.

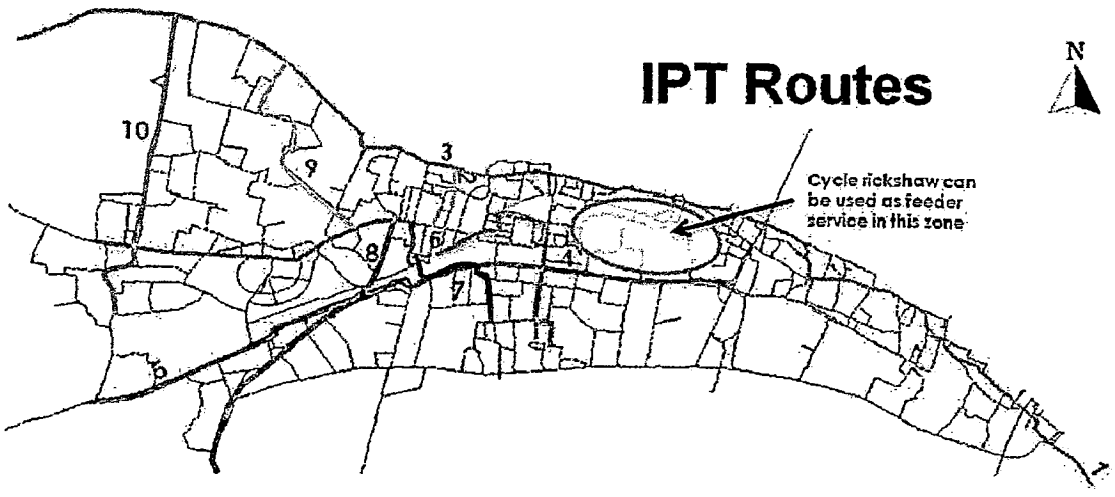


Figure 8-3: Shifted area for cyclerickshaw (Source: Author, CMP 2009)

42. Cycle rickshaw rider living on footpath EWS housing (*Rain basera*) should be removed which are provided by Municipal corporation.

43. O n these route Informal sector should be placed in a planned manner, which would be regulated by related institution.

44. Segregated bicycle track should be made for all arterials and sub arterials roads. If sapace is not available for segregated lane, then alternate route with similar distance should be identified and developed especially for bicycles.

    - This route should be comprises of safe bicycle parking spaces, facilities like shade giving landscaping, provision of drinking water and resting stations along bicycle corridors and pedestrian pathways
    - Since cyclist comprises of 16 percent of total traffic, hence public bicycle program – rent and use a bicycle can be also implemented.

45. River Ganges flow parallel to Ashok rajpath. Segregated bicycle tracks of 3 m and public bicycle programme can be part of river front development.

    - River front development will have all this aspect like facility of drinking water, landscaping area along ghat, which would give shaded route to bicyclist and most of all serine view of Ganges which will give relief to cyclist by its cold breeze.
    - This integration of river front development along with dedicated cycle track will encourage people to use bicycle.
    - Informal sector can also be planned along this track.

8.5 PEDESTRIANS

46. Pedestrian way should be universally accessible by all age group of people. All pedestrian way should be accessed through ramps.

47. 1.5 to 2 m pedestrian way should be provided on roads whose right of way is around 7-8 meter like Ashok Rajpath by acquiring around 1 m from both sides.

48. Separate informal spaces should be carved along the road to adjust informal sector and vendors of footpath.

49. Strict action should be taken against the shops along the road who display their goods at footpath, like book shops at Ashok Rajpath. Heavy fines should be imposed on defaulters.

8.6 TRAFFIC ENGINEERING

50. Junction like Pather ki Masjid, N.I.T. turning, Khajanchi road turning are congested and accident prone junction. These junctions should be widened and geometry should be improved to avoid congestion and accident.

51. At Mehandru and Pather ki masjid, spaces should be identified to construct raised pedestrian way, which would be safe from running vehicles. Pedestrian way should be provided and designed in such a way that it would be raised as well as universally accessible.

52. Road signage's, markings, road furniture should be provided in city roads.

53. Traffic calming measure should be constructed at junctions, where overall traffic velocity is more than 30 km/hr.

8.7 TRAFFIC MANAGEMENT

54. ICT and ITS technology should be used to ensure efficient traffic flow and its management.
    - Traffic camera with plate recognition system should be installed at important junction to ensure proper traffic flow.
    - This would help to track down the defaulters.

55. ITS based parking area should be provided at several locations (like Patna market, N.I.T more etc. in Ashok Rajpath) which would inform car owner about the parking space before reaching the destination.

56. Demand restrain measure should be taken to discourage private vehicles.

    - Congestion charged should be levied upon private vehicles entering to major road of city like Ashok Rajpath.
    - Parking charges should be raised in congested road.

57. Road side parking should be avoided and heavy fine should be imposed upon defaulters.

58. Good vehicles shouldn't be allowed at peak hours at Ashok Rajpath and other major roads.

59. End to end development of road should be done with taking care of pedestrian way and NMV tracks if possible.

60. Traffic from all the junction and intersection should be avoided, which will help in free flow of vehicles.

8.8 INSTITUTIONAL SET UP

61. "Traffic management authority" should be set up in order to manage, maintain, improve and control overall traffic and related infrastructure.

- It should be constituted of Public transport cell, IPT cell, NMV cell, informal sector cell and Private vehicle cell, which would deal with related issues.
- It would based on concept of 'one transport authority for all'
- Ensure the Integration between different modes that they complement each other not compete.
- These cells would control all buses operation, auto operation, NMV routes, their route rationalization, development of time schedule and frequency, there fare collection, minimum standard of public transport.
- IPT and NMV cell would deal with control the increasing number of IPT and cycle rickshaw in order to ease the traffic load. This cell would have a check on all the registered and unregistered vehicles. Allotment of particular number of Auto rickshaw and Cycle rickshaw and their fixed route would be monitored by this cell.
- Petrol auto rickshaw conversion to CNG auto, all scrapped auto, standard of auto, seating capacity of auto, fuel used by auto and all these aspect would be monitored by IPT cell.
- Parking control, levying charges on defaulters.
- There should be representation from Municipal Corporation, Regional development authority, Regional transport office, P.W.D. and other related offices in this authority.
- Traffic police should come under this authority, which will help this authority to enforce and enact these rules and regulation.

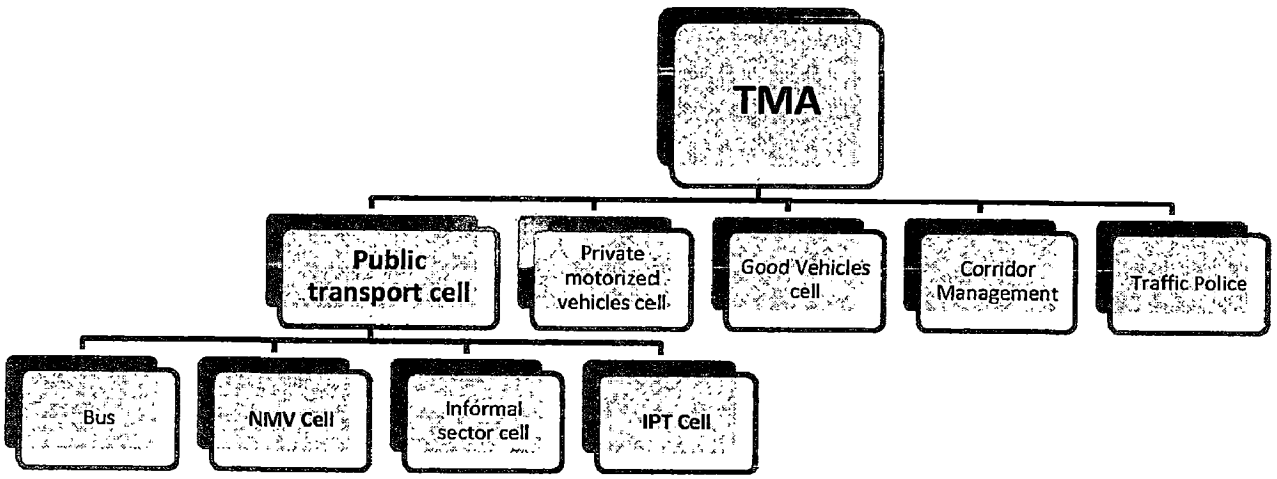


Figure 8-4: Institutional set- up (Source: Author)

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ANNEXURE

TRAFFIC VOLUME COUNT SURVEY SHEET

QUESTIONNAIRES, GUIDELINES AND DATA SHEET OF OTHER SURVEYS

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ANNEXURE

Annexure 1: Traffic Volume Count Survey sheet

Traffic Volume Count Survey at 10 A.M. at selected location

Location:- Pathar ki Masjid									Time : 10 AM
Days	WEEKDAYS						WEEKENDS		
Mode	Monday	Tuesday	Wednesday	Thursday	Friday	AVG.	Saturday	Sunday	AVG.
Autorickshaw	148	140	158	146	130	144	120	87	104
Motorcycle	60	70	52	67	78	65	56	39	48
Bus	2	3	2	2	3	2	2	2	2
Private car	9	5	6	8	10	8	11	10	11
Bicycle	80	77	67	86	83	79	15	22	19
Cyclerickshaw	6	8	4	5	7	6	5	8	7
Autorickshaw(goods vehicles)	6	3	5	4	8	5	2	1	2
Tractor/goods vehicle	0	1	0	0	1	0	0	1	1
NMT good vehicles/thelas/bullock cart	17	23	13	15	20	18	25	20	23
Pedestrians	37	40	33	27	31	34	26	20	23

Location:- Mehandru									Time : 10 AM
Days	WEEKDAYS						WEEKENDS		
Mode	Monday	Tuesday	Wednesday	Thursday	Friday	AVG.	Saturday	Sunday	AVG.
Autorickshaw	165	150	173	168	145	160	85	90	88
Motorcycle	60	50	45	54	68	55	53	45	49
Bus	2	3	3	3	3	3	3	2	3
Private car	5	10	12	14	15	11	17	12	15
Bicycle	90	105	115	95	109	103	45	43	44
Cyclerickshaw	8	15	14	10	9	11	6	5	6
Autorickshaw(goods vehicles)	2	0	1	3	0	1	3	3	3
Tractor/goods vehicle	0	0	1	0	1	0	1	0	1
NMT good vehicles/thelas/bullock cart	13	11	15	11	16	13	14	15	15
Pedestrians	204	170	195	210	225	201	195	188	192

Location:- Khazanchi Road									Time : 10 AM
Days	WEEKDAYS						WEEKENDS		
Mode	Monday	Tuesday	Wednesday	Thursday	Friday	AVG.	Saturday	Sunday	AVG.
Autorickshaw	102	85	98	110	105	100	95	109	102
Motorcycle	78	74	85	78	91	81	80	99	90
Bus	9	8	11	9	9	9	9	10	10
Private car	40	30	50	35	33	38	40	31	36
Bicycle	75	109	114	89	98	97	87	67	77
Cyclerickshaw	45	47	44	38	30	41	35	41	38
Autorickshaw(goods vehicles)	0	2	1	3	1	1	1	3	2
Tractor/goods vehicle	0	3	2	1	0	1	1	4	3
NMT good vehicles/thelas/bullock cart	9	10	11	12	12	11	8	9	9
Pedestrians	156	150	165	162	151	157	126	118	122

Traffic Volume Count Survey at 5 P.M. at selected location

Location:- Pathar ki Masjid									Time : 5 PM
Days	WEEKDAYS						WEEKENDS		
Mode	Monday	Tuesday	Wednesday	Thursday	Friday	AVG.	Saturday	Sunday	AVG.
Autorickshaw	77	85	87	65	78	78	78	65	72
Motorcycle	44	43	50	39	49	45	25	31	28
Bus	4	2	3	2	2	3	2	2	2
Private car	12	10	15	11	9	11	12	6	9
Bicycle	45	35	53	41	49	45	29	33	31
Cyclerickshaw	7	5	8	6	9	7	7	4	6
Autorickshaw(goods vehicles)	1	2	4	2	1	2	3	1	2
Tractor/goods vehicle	0	1	0	0	0	0	1	0	1
NMT good vehicles/thelas/bullock cart	15	12	15	18	11	14	20	17	19
Pedestrians	78	85	87	75	69	79	70	68	69

Location:- Mehandru									Time : 5 PM
Days	WEEKDAYS						WEEKENDS		
Mode	Monday	Tuesday	Wednesday	Thursday	Friday	AVG.	Saturday	Sunday	AVG.
Autorickshaw	142	102	130	127	150	130	105	95	100
Motorcycle	60	87	97	65	58	73	35	30	33
Bus	3	3	3	3	2	3	2	3	3
Private car	17	11	15	16	14	15	13	12	13
Bicycle	67	78	80	56	89	74	55	34	45
Cyclerickshaw	16	17	12	15	13	15	14	10	12
Autorickshaw(goods vehicles)	1	0	1	4	2	2	1	3	2
Tractor/goods vehicle	1	0	1	0	1	1	1	0	1
NMT good vehicles/thelas/bullock cart	12	13	11	17	15	14	18	11	15
Pedestrians	258	342	320	295	295	302	228	240	234

Location:- Khazanchi Road									Time : 5 PM
Days	WEEKDAYS						WEEKENDS		
Mode	Monday	Tuesday	Wednesday	Thursday	Friday	AVG.	Saturday	Sunday	AVG.
Autorickshaw	85	95	94	88	86	90	86	76	81
Motorcycle	110	148	136	126	141	132	135	150	143
Bus	9	9	10	8	9	9	9	10	10
Private car	37	34	40	33	41	37	36	51	44
Bicycle	90	125	110	114	121	112	102	85	94
Cyclerickshaw	38	52	43	44	51	46	35	71	53
Autorickshaw(goods vehicles)	0	1	1	2	0	1	0	1	1
Tractor/goods vehicle	0	0	1	0	1	0	1	0	1
NMT good vehicles/thelas/bullock cart	5	13	15	14	9	11	10	8	9
Pedestrians	245	325	302	285	310	293	240	260	250

Annexure 2: Questionnaire for Auto Rickshaw drivers Survey

1. Profile of the Respondent

a)Name	b) Gender	c)Age (years)	d) Educational Qualification	e) Marital Status	f) Place of Residence in Patna	g) Where do you originally belong to?	h) No. Of family members	i) No. of Children
	i) M ii) F	i) 18-20 ii) 21-25 iii) 26-30 iv) 30-40 v) 40-50 vi) >50	i. < 8th pass ii. 8th pass iii.. 10th pass iv.. 12th pass v. Graduation vi. Other	i)Married ii)Single iii)Divorced			i. Alone ii. 1 iii. 2 iv. 3 v. 4-5 vi. >5	i) 0 ii) 1 iii) 2 iv) 3 v) >3

2. Income

a)Monthly income (Rs)	b) Monthly family income (Rs)	c)Family members working	d) Monthly family expenditure	e)Personal expenditure (except on autorickshaw)
i) 3000 ii) 3000-5000 iii) 6000-8000 iv) 9000-12,000 v) 12,000-15,000 vi) 15,000-20,000 vii) >20,000	i)3000 ii) 3000-5000 iii) 6000-8000 iv) 9000-12,000 v) 12,000-15,000 vi) 15,000-20,000 vii) >20,000	i) Wife ii) Father iii) Mother iv) Children v) Siblings	i)3000 ii) 3000-5000 iii) 6000-8000 iv) 9000-12,000 v) 12,000-15,000 vi) 15,000-20,000 vii) >20,000	i) <=500 ii) <=1500 iii) 1500-3000 iv) 3000-5000 v) 6000-8000 vi) 9000-12,000

a) Family members suffering from health problems	b) Do you have any debts? If yes,	c) Assets owned:
i) Wife ii) Mother iii) Father iv) Children v) Siblings	i) <5000 ii) 5000-15000 iii) 15,000-25,000 iv) 25000-50,000 v) > 1Lakh	i)House/Land ii) Radio iii) TV iv) Bike v) Car vi)mobile

5. Professional Information:

a. Why do you drive an autorickshaw?

4. Expenditure Pattern

a) House rent (in Rs)	b) Health Problems	c) Education	d) Festivals/ Ceremonies	e) Food	f) Electricity Bill	g) EMI on (non-Autorickshaw loan)
Monthly	Monthly	Monthly	Annually	Monthly	Monthly	Monthly
i. 500- 1000 ii. 1000-2000 iii. 2000-3000 iv. >3000	i. <500 ii. 500-1000 iii. 1000-3000 iv. >3000	i. <300 ii. 300-500 iii. 500-1000 iv. >1000	i. <2000 ii. 2000-3000 iii. 3000-5000 iv. >5000	i.<1000 ii. 1000-3000 iii. 3000-5000 iv. >5000	i. <300 ii. 300-500 iii. 500-1000 iv. 1000-1500 v.>1500	i. <500 ii. 500-1500 iii. 1500-3000 iv. 3000-5000 v.5000-10000 vi. >10,000

Why drive autorickshaw?
i) Did not get any other job ii) Gives higher earning than other jobs

iii) Family business iv) Friends/family suggested

b. How many years of experience do you have in driving autorickshaw?
i) Less than 1 year ii) 3-5 yrs ii) 5-10yrs iv) 10-15yrs v) 15-20yrs vi)>20 yrs

d. How did you learn driving?
i) Self trained ii) Trained by friends/family members iii) Driving school

e.1. Kilometres driven per day	e.2. Hours spent driving per day	e.3.Average time spent waiting per day	e.4.Average speed of travel	e.5.Maximum speed of travel
i. <80 ii. 80- 100 iii.100-120 iv. 120-150 v. >150	i. <10 ii. 10-12 iii. 12-14 iv. 14-16 v. >16	i. <2 ii. 2-4 iii. 4-6 iv. 6-7 v. >7	i. <30 ii. 30-40 iii. 40-50 iv. >50	i. 40 ii. 50 iii. 60 iv. 70 v. 80

f) What are your operating costs of the following (in Rs):

f1. Fuel type	f2.Fuel cost (daily)	f3.Rent (daily)	f4.Maintenance/ Repair (monthly)	f5.EMI on loan for Autorickshaw (monthly)	f6.Fines/Penalties/Bribes (monthly)	f7.Other (specify) (monthly)
LPG/ Petrol						

g. Do you use kerosene
a)No b) Yes then

Kerosene cost	Milage	maintenance	Fines for pollution

h. Are you a member of an autorickshaw rickshaw union & why?

a) If yes i) helps in getting passengers ii) helps in times of trouble like accident/deal with police harassment, etc. iii) helps the families of autorickshaw drivers in times of accident/ death iv) provides health insurance/medical benefits v) Other (specify).....

b) If No i) does not help in getting passengers ii) Forced to charge a particular fare iii) High membership fees iv) Restricted to particular zones v) Demands go unheard vi) Other (specify)

i. Are you satisfied with this shared auto system and fixed rate?
a) yes
b) No, reason.....

j. What are your average daily working hours?
a. If day shift : i) 6-8hrs ii) 8-12 hrs iii) 12-14 hrs iv) more than 14 hrs
b. If night shift : i) 6-8hrs ii) 8-12 hrs iii) 12-14 hrs iv) more than 14 hrs

6. Ownership, Leasing and Financing of autorickshaw:

a. How old is your autorickshaw?
a) < 1 yr b) 1 Year c) > 3 yrs d) > 5yrs e) >8yrs

b. Do you own this autorickshaw or is it rented'? a) Owned b) rented

c. If rented, how much do you pay as daily rent?
a) Rs 120 b) Rs 150 c) Rs 200 d) Rs 250 e) Rs 300 f) other Specify....

d. If owned, at what price did you buy it *(excluding Permit price)*?
a) < 1 Lakh b) within 1.2 Lakh c) within 1.3 Lakh d) within 1.5 Lakh e) within 1.7 Lakh f) within 2 Lakh g) >2 Lakh h) Other.....

e. What classes of passengers use autorickshaw services? *(Choose any)*
i) Lower class ii) Lower Middle Class iii) Middle Class
iv) Upper Middle Class v) Upper class

7. Competition:

Do you face competition from other modes of transport? Which ones and why?
a. If yes (choose any): i) Call Taxi ii) Bus iii) cycle rickshaw vi) None
b. No

8. Time spent off work:

a. What do you do during your waiting hours? (Choose any)
i) Sleep ii) listen to radio iii) listen to music iv) Chat with fellow autorickshaw drivers v) Smoke vi) Have tea/snacks vii) Read newspaper/magazine viii) Other (specify).....

b. How often do you engage in leisure activities?
i) Weekly once ii) twice monthly iii) 2-3 in a month iv) 5-7 days in a month v) more than 10 days in a month

c. What kind of leisure activities do you engage in? Choose any.
i) Watch TV/listen to radio ii) Sleep iii) Drink iv) Go out with family shopping/movies v) Help in household chores vi) Other (specify).....

d. In a month, how often do you take a day off from work?
i) Weekly once ii) twice monthly iii) 2-3 in a month iv) 5-7 days in a month v) more than 10 days in a month

e. For what purpose do you take a leave: (can choose more than one):
i) Illness ii) Work iii) Family iv)Leisure/Rest v) Other (specify)

9. Health Concerns:		
a. Hours of sleeping	**b. On- the- job problems (choose any)**	**c. Health problems (choose any)**
i. 4- 6hrs ii. 6-8 hrs iii. 8-10 hrs iv. > 10 hrs	i. Tension ii. Driver fatigue iii. Lack of interest iv. Boredom v. Tiredness vi. Stress vii. Distraction	i. Restless sleep/Insomnia ii. Back pains iii. Headaches iv. Obesity v. Digestive troubles vi. Hypertension vii. Any other (specify) viii. No health problem
e. Stress coping mechanism (Choose any)		

i. Chewing tobacco ii. Consuming alcohol iii. Smoking iv. Listening to the radio v. Talking on the mobile phone vi. Playing cards with fellow drivers during rest breaks vii. Stopping to take a nap viii. Striking a conversation with the passenger ix. Any other (specify)

f. What is your eating pattern on a normal working day?		
1) How many meals a day?	**2) When is your main meal?**	**3) Where do you have your main meals?**
i) Twice ii) Thrice iii)Four times	i) Morning ii) Noon iii) Evening iv) Night	i) Home ii) Outside iii) Depends on the work schedule

10. Traffic Behaviour:

Which of the following have you experienced:
i. Being pulled over at the side of the road by traffic police ii. Paid fine iii. Met with accident (Specify how many times and details) iv. Lost license v. Lost permit vi. Police custody (Specify details)

12. Your suggestion to improve existing transportation system

.....

.....

.....

.....

Annexure 3: Guidelines for Data Analysis for Auto Rickshaw Survey

Guidelines for Data Analysis for auto rickshaw survey		
Variable no.	Variable	Code

V1	Age	Code
	18-20	1
	21-25	2
	26-30	3
	30-40	4
	40-50	5
	>50	6

V2	Education Qualification	Code
	uneducated	1
	< 8th pass	2
	10th Pass	3
	12th Pass	4
	Graduation	5
	Other	6

V3	Marital Status	Code
	Married	1
	Single	2
	Divorced	3

V4	Place of permanent residence	Code
	patna	1
	Outside city	2

V5	No. of family members	Code
	Alone	1
	2	2
	3 to 4	3
	> 4	4

V6	No. of Children	Code
	0	1
	1	2
	2	3
	3	4
	>3	5

V7	Monthly Income (Rs)	Code
	2000-3000	1
	3000-4000	2
	4000-5000	3
	5000-6000	4
	>6000	5

V8	Family Member working	Code
	Wife	1
	Father	2
	Mother	3
	Children	4
	Sibling	5
	no one	6

V9	Monthly Family Income (Rs)	Code
	<3000	1
	3000-5000	2
	5000-8000	3
	8000-12000	4
	12000-15000	5
	>15000	6

V10	Monthly Family Expenditure (Rs)	Code
	<3000	1
	3000-5000	2
	5000-8000	3
	8000-12000	4
	12000-15000	5
	>15000	6

V11	Personal Expenditure (Rs)	Code
	< 500	1
	500-1000	2
	1000-2000	3
	2000-3000	4
	3000- 4000	5
	>4000	6

V12	family member suffering for disease	Code
	wife	1
	mother	2
	father	3
	children	4
	sibling	5
	no one	6

	Asset owned	
	Yes = 1	
	No = 2	
Note: Above code is applicable for all Home Appliances		
V13	house/land	Code
V14	Radio	Code
V15	tv	Code
V16	bike	Code
V17	cycle	Code
V18	mobile	Code

V19	House rent	Code
	<500	1
	500-1000	2
	1000-1500	3
	1500-2000	4
	>2000	5
	owned/gov house	6

V20	Health Problem	Code
	<500	1
	500-1000	2
	1000-1500	3
	1500-2000	4
	>2000	5

V21	Education	Code
	<500	1
	500-1000	2
	1000-1500	3
	1500-2000	4
	>2000	5

V22	Festival/ceremonies	Code
	<2000	1
	2000-3000	2
	3000-5000	3
	>5000	4

V23	Food	Code
	<1000	1
	1000-3000	2
	3000-5000	3
	>5000	4

V24	Why drive autorickshaw	Code
	Dint get any other job	1
	gives higher earning than other job	2
	family bussiness	3
	Family/friendsuggested	4

V25	Experience in driving autorickshaw	Code
	less than 1 year	1
	3-5 years	2
	5-10 years	3
	10-15 years	4
	15-20 years	5
	>20 years	6

V26	How do you learn driving	Code
	Self trained	1
	Trained by friends/family	2
	Driving school	3

V27	Kilometers driven per day	Code
	<40	1
	40-80	2
	80-120	3
	>120	4

V28	Hour spent driving per day	Code
	<10	1
	10 to 12	2
	12 to 14	3
	14 to 16	4
	>16	5

V29	Avg time waiting per day	Code
	<2	1
	2 to 4	2
	4 to 6	3
	>6	4

V30	Avg Speed of travel	Code
	<15	1
	15 to 25	2
	25 to 35	3
	35 to 45	4
	> 45	5

V31	Max. Speed of travel	Code
	30	1
	40	2
	50	3
	60	4
	70	5

V32	fuel type	Code
	petrol	1
	kerosene	2
	mix(petrol+kerosene)	3

V33	fuel cost (daily)	Code
	>200	1
	200-400	2
	400-600	3
	> 600	4

V34	Maintenance (monthly)	Code
	>500	1
	500-1000	2
	1000-2000	3
	> 2000	4

V35	Satisfied with shared auto system	Code
	yes	1
	no	2

V36	Ownership	Code
	owned	1
	rented	2

V37	class of passenger	Code
	lower class	1
	middle class	2
	upper class	3

V38	face competition with other mode	Code
	taxi	1
	bus	2
	cycle rickshaw	3
	none	4

	Things done during waiting hour	
	Yes = 1	
	No = 2	
Note: Above code is applicable for all activities		
V39	Sleep	Code
V40	Listen to radio	Code
V41	Chat with fellow autorickshaw driver	Code
V42	Smoke	Code
V43	have tea/snacks	Code

V44	Day off from work	Code
	Work all days	1
	once or twice in month	2
	5-7 days in week	3
	Weekly once	4

V45	Reason for Day off from work	Code
	Illness	1
	Work	2
	Family	3
	Leisure/Rest	4

V46	Hours of sleeping	Code
	4 - 6 hrs	1
	6 - 8 hrs	2
	8 -10 hrs	3
	>10 hrs	4

V47	On the job problems	Code
	Tension	1
	Driver Fatigue	2
	lack of Interest	3
	boredom	4
	Tiredness	5
	Stress	6
	Distraction	7

V48	Health Problem	Code
	Restless sleep/Insomnia	1
	Back pains	2
	Headaches	3
	Obesity	4
	Digestive troubles	5
	Hypertension	6
	No health problem	7

V49	Stress coping mechanism	Code
	Chewing tobacco/Smoking	1
	Consuming alcohol	2
	Listening to the radio	3
	Talking on the mobile phone	4
	Playing card	5
	Take a nap	6

V50	How many meals a day	Code
	Twice	1
	Thrice	2
	Four times	3

V51	When is your meal	Code
	Morning	1
	Noon	2
	Evening	3
	Night	4

V52	Where do have your main meal	Code
	Home	1
	Outside	2
	Depend on the work schedule	3

V53	Which of the following you experienced	Code
	Being pulled over at the side of the road by traffic police	1
	Paid fine	2
	Met with accident	3
	Lost license	4
	Police custody	5

Annexure 4: Data sheet for Auto Rickshaw drivers Survey

Variables	PROFILE OF THE RESPONDENT											GENERAL INFO							EXPENDITURE PATTERN					PROFESSIONAL INFORMATION			
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27
													Asset Owned														
Schedules	Age	Education Qualification	Marital Status	Place of permanent residence	No. of family members	No. of Children	Monthly Income (Rs)	Family Member working	Monthly Family Income (Rs)	Monthly Family Expenditure (Rs)	Personal Expenditure (Rs)	family member suffering for disease	house/land	Radio	tv	bike	cycle	mobile	House rent	Health Problem	Education	Festival/cermonies	Food	Why drive autorickshaw	Experience in driving autorickshaw	How do you learn driving	Kilometers driven per day
1	3	2	1	1	4	4	5	6	3	2	3	6	1	1	1	2	1	1	1	1	4	3	3	1	5	2	3
2	1	3	2	2	3	1	3	2	4	5	3	2	1	1	1	2	1	1	2	4	1	3	3	1	1	2	2
3	4	1	1	1	4	3	3	5	5	4	3	3	1	1	1	2	1	1	3	2	3	3	2	3	5	2	3
4	3	3	1	1	4	4	1	1	6	3	2	6	1	1	1	1	1	1	6	1	3	3	3	4	3	2	2
5	6	1	1	1	4	5	3	4	3	2	1	6	2	2	2	2	1	1	4	2	1	3	3	1	6	1	3
6	2	1	1	1	4	3	5	6	3	3	2	6	2	2	1	2	2	1	3	1	2	2	2	1	2	1	3
7	3	1	1	1	4	4	3	6	2	2	2	2	2	1	2	2	1	1	6	3	2	2	3	4	2	1	2
8	4	3	1	1	4	4	2	6	2	2	2	6	2	2	1	2	1	1	2	1	1	1	2	1	6	1	2
9	5	3	1	2	4	5	3	6	2	2	1	6	2	1	1	2	2	1	3	1	2	3	2	3	6	1	2
10	1	1	2	2	4	1	3	5	6	5	2	6	2	2	2	2	2	1	2	1	1	1	2	1	1	2	2
11	1	2	2	1	4	1	3	2	4	3	3	3	2	2	2	2	2	1	2	2	1	2	3	3	2	2	1
12	1	3	2	1	4	1	5	2	5	5	3	6	2	2	2	2	1	1	3	1	1	1	3	3	2	2	4
13	6	1	1	1	4	3	2	4	4	4	3	6	1	1	1	2	1	2	6	2	1	3	4	1	6	1	1
14	2	1	1	1	3	1	4	6	3	2	3	6	2	1	2	2	2	1	1	1	1	2	2	1	2	2	2
15	4	1	1	2	4	2	4	6	2	2	2	6	2	1	1	2	2	1	2	1	3	2	2	1	4	1	2
16	4	1	1	1	4	5	3	4	3	3	2	6	2	2	1	2	2	1	3	2	1	2	3	4	4	2	2
17	1	2	2	2	4	1	3	5	5	5	4	3	2	2	2	2	2	1	2	3	3	3	3	3	2	2	2
18	6	1	1	1	4	5	1	4	6	6	2	2	1	2	2	2	2	2	2	3	1	2	2	1	6	1	1
19	3	2	1	1	4	5	3	6	4	4	2	6	1	1	1	2	1	1	3	1	2	3	4	3	2	2	2
20	3	3	1	2	4	3	4	6	3	3	2	6	2	2	2	2	2	1	3	1	4	1	3	1	3	2	3
21	3	2	1	1	4	4	5	6	3	2	3	6	1	1	1	2	1	1	1	1	4	3	3	1	5	2	3
22	1	3	2	2	3	1	3	2	4	5	3	2	1	1	1	2	1	1	2	4	1	3	3	1	1	2	2
23	4	1	1	1	4	3	3	5	5	4	3	3	1	1	1	2	1	1	3	2	4	3	2	3	5	2	3
24	3	3	1	1	4	4	1	1	6	3	2	6	1	1	1	1	1	1	6	1	3	3	3	4	3	2	2
25	6	1	1	1	4	5	3	4	2	2	2	6	2	2	2	2	1	1	4	2	1	3	3	1	6	1	3
26	2	1	1	1	4	3	5	6	3	3	2	6	2	2	1	2	2	1	3	1	2	2	2	1	2	1	3
27	3	1	1	1	4	4	3	6	2	2	2	2	2	1	2	2	1	1	6	3	2	2	3	4	2	1	2
28	4	3	1	1	4	4	2	6	2	2	2	6	2	2	1	2	1	1	2	1	1	1	2	1	6	1	2
29	5	3	1	2	4	5	3	6	2	2	1	6	2	1	1	2	2	2	3	1	2	3	2	3	6	1	2
30	1	1	2	2	4	1	3	5	6	5	2	6	2	2	2	2	2	1	2	1	1	1	2	1	1	2	2
31	1	2	2	1	4	1	3	2	4	3	3	3	2	2	2	2	2	1	2	2	1	2	3	3	2	2	1
32	1	3	2	1	4	1	5	2	4	5	3	6	2	2	2	2	1	1	3	1	1	1	3	3	2	2	4
33	6	1	1	1	4	3	3	4	4	4	4	6	1	1	1	2	1	2	6	2	1	2	4	1	6	1	1
34	2	1	1	1	3	1	4	6	3	2	3	6	2	1	2	2	2	1	1	1	1	2	2	1	2	2	2
35	4	1	1	2	4	2	4	6	3	2	2	6	2	1	1	2	2	1	2	1	3	2	2	1	4	1	2
36	4	1	1	1	4	5	3	4	3	3	2	6	2	1	2	2	2	1	3	2	1	2	3	4	5	2	2
37	1	2	2	2	4	1	3	5	4	5	4	3	2	2	2	2	2	1	2	3	3	3	3	4	2	2	2
38	6	1	1	1	4	5	1	4	6	6	2	1	1	2	2	2	2	2	2	3	1	2	2	1	6	1	1
39	3	2	1	2	4	5	3	6	4	4	2	6	1	1	1	2	1	1	3	1	2	3	4	3	2	2	2
40	2	2	1	2	3	2	4	6	3	3	2	6	2	2	2	2	2	1	4	1	4	1	3	1	3	2	3

Variables	PROFESSIONAL INFORMATION											HEALTH CONCERN														
	V28	V29	V30	V31	V32	V33	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47	V48	V49	V50	V51	V52	V53
												Things done during waiting hour														
Schedules	Hour spent driving per day	Avg time waiting per day	Avg Speed of travel	Max. Speed of travel	fuel type	fuel cost (daily)	Maintenance (monthly)	Satisfied with shared auto system	Ownership	class of passenger	face competition with other mode	Sleep	Listen to radio	Chat with fellow autorickshaw driver	Smoke	have tea/snacks	Day off from work	Reason for Day off from work	Hours of sleeping	On the job problems	Health Problem	Stress coping mechanism	How many meals a day	When is your meal	Where do have your main meal	Which of the following you experienced
1	3	1	1	1	3	2	1	1	2	2	2	1	2	1	2	1	2	2	2	2	1	1	1	1	1	2
2	1	1	1	1	2	1	2	1	2	2	2	2	2	2	1	1	3	4	4	4	7	2	1	1	3	1
3	2	1	2	2	1	3	3	1	1	2	2	2	2	1	2	1	2	3	2	2	1	1	1	1	3	3
4	2	1	1	1	3	1	1	1	1	2	2	2	2	2	1	2	1	3	3	1	1	1	1	3	1	2
5	1	1	1	1	3	2	3	1	2	1	2	2	2	1	1	1	2	4	2	2	5	1	2	4	2	2
6	4	1	1	1	3	3	3	1	2	2	2	2	2	2	1	1	2	3	2	2	3	2	2	2	2	3
7	2	1	1	1	3	2	2	1	2	1	2	1	1	1	1	1	4	1	3	6	3	1	1	2	2	2
8	1	1	1	1	2	2	1	1	2	3	2	2	1	1	1	1	1	4	3	2	3	2	2	4	1	2
9	1	1	1	1	3	1	3	1	1	2	2	1	2	1	1	1	1	4	2	1	3	1	2	4	3	3
10	2	1	1	1	1	3	1	1	2	3	2	2	1	2	1	2	4	4	2	2	7	2	1	3	2	1
11	1	1	1	1	3	1	1	1	2	3	2	2	2	1	1	1	2	4	3	2	1	2	2	2	2	2
12	3	1	2	2	1	4	1	1	2	2	2	2	2	1	2	1	2	2	3	1	7	1	1	2	2	1
13	1	1	1	1	3	1	3	1	2	2	2	2	2	1	1	1	4	4	3	1	2	2	1	1	1	4
14	2	1	1	1	3	2	3	1	2	2	2	2	2	2	1	1	4	4	3	2	7	2	1	1	1	2
15	2	1	1	1	3	3	2	1	2	2	2	2	1	1	2	1	4	2	3	2	3	2	1	4	1	1
16	2	1	1	1	3	2	2	1	2	2	2	1	2	1	1	2	4	3	2	5	3	1	2	4	1	2
17	3	1	2	2	1	2	1	1	2	3	2	2	2	1	1	2	2	4	3	2	7	1	1	1	1	1
18	1	1	2	2	1	2	3	1	2	2	2	1	2	1	2	1	3	3	3	6	2	1	2	4	1	2
19	2	1	1	2	1	2	2	1	2	3	2	2	2	1	1	1	2	2	3	6	7	1	1	4	1	2
20	3	1	1	1	3	2	2	1	2	2	2	2	1	1	1	1	2	3	3	6	7	4	1	4	1	2
21	3	1	1	1	3	2	1	1	2	2	2	1	2	1	2	1	2	2	2	2	1	1	1	1	1	2
22	1	1	1	1	3	1	2	1	2	2	2	2	2	2	1	1	3	4	4	4	7	2	1	1	3	1
23	2	1	2	2	1	3	3	1	1	2	2	2	2	1	2	1	2	3	2	2	1	1	1	1	3	3
24	2	1	1	1	3	1	1	1	1	2	2	2	2	2	1	2	1	3	3	1	1	1	1	3	1	2
25	1	1	1	1	3	2	3	1	2	1	2	2	2	1	2	1	2	4	3	2	5	1	2	4	2	2
26	4	1	1	1	3	4	3	1	2	2	2	2	2	2	1	1	2	3	2	2	3	2	2	2	2	3
27	2	1	1	1	3	2	2	1	2	1	2	1	1	1	1	1	4	1	3	6	2	1	1	2	2	2
28	1	1	1	1	3	2	1	1	2	3	2	2	2	1	1	1	1	4	3	2	3	2	2	4	1	2
29	1	1	1	1	3	1	3	1	1	2	2	1	2	1	1	1	1	4	2	1	3	1	2	4	3	3
30	2	1	2	2	1	3	1	1	2	3	2	2	1	2	1	2	4	4	2	2	7	2	1	3	2	1
31	1	1	1	1	3	1	1	1	2	3	2	2	2	1	1	1	2	4	3	2	1	2	2	2	2	2
32	4	1	2	2	1	4	1	1	2	2	2	2	2	1	2	1	2	2	3	1	7	1	1	2	2	1
33	1	1	1	1	3	1	3	1	2	2	2	2	2	1	1	1	4	4	3	1	2	2	1	1	1	4
34	2	1	1	1	3	2	3	1	2	2	2	2	2	2	1	1	4	4	3	2	7	2	1	1	1	2
35	2	1	1	1	3	3	2	1	2	2	2	2	1	1	2	1	4	2	3	2	3	2	1	4	1	1
36	2	1	1	1	3	2	2	1	2	2	2	1	2	1	1	2	4	3	2	5	3	1	1	4	1	2
37	3	1	2	2	1	2	1	1	2	3	2	2	2	1	1	2	2	4	3	2	7	1	1	1	1	1
38	1	1	2	2	1	2	3	1	2	2	2	1	2	1	2	1	3	3	3	6	2	1	2	4	1	2
39	2	1	1	2	1	2	2	1	2	3	2	2	2	1	1	1	2	2	3	6	7	1	1	4	1	2
40	3	1	1	1	3	2	2	1	2	2	2	2	2	1	1	1	2	3	3	6	7	4	1	4	1	2

Annexure 5: Questionnaire for Cycle Rickshaw rider Survey

1. Profile of the Respondent

a)Name	b) Gender	c)Age (years)	d) Educational Qualification	e) Marital Status	f) Place of Residence in Patna	g) Where do you originally belong to?	h) No. Of family members	i) No. of Children
	i) M ii) F	i) 18-20 ii) 21-25 iii) 26-30 iv) 30-40 v) 40-50 vi) >50	i. < 8th pass ii. 8th pass iii.. 10th pass iv.. 12th pass v. Graduation vi. Other	i)Married ii) Single iii)Divorced			i. Alone ii. 1 iii. 2 iv. 3 v. 4-5 vi. >5	i) 0 ii) 1 iii) 2 iv) 3 v) >3

2. Income

a)Monthly income (Rs)	b) Monthly family income (Rs)	c)Family members working	d) Monthly family expenditure	e)Personal expenditure (except on cyclerickshaw)
i) 3000 ii) 3000-5000 iii) 6000-8000 iv) 9000-12,000 v) 12,000-15,000 vi) 15,000-20,000 vii) >20,000	i)3000 ii) 3000-5000 iii) 6000-8000 iv) 9000-12,000 v) 12,000-15,000 vi) 15,000-20,000 vii) >20,000	i) Wife ii) Father iii) Mother iv) Children v) Siblings	i)3000 ii) 3000-5000 iii) 6000-8000 iv) 9000-12,000 v) 12,000-15,000 vi) 15,000-20,000 vii) >20,000	i) <=500 ii) <=1500 iii) 1500-3000 iv) 3000-5000 v) 6000-8000 vi) 9000-12,000

a) Family members suffering from health problems	b) Do you have any debts? If yes,	c) Assets owned:
i) Wife ii) Mother iii) Father iv) Children v) Siblings	i) <5000 ii) 5000-15000 iii) 15,000-25,000 iv) 25000-50,000 v) > 1Lakh	House/Land Radio TV Cycle Bike mobile

4. Expenditure Pattern

a) House rent (in Rs)	b) Health Problems	c) Education	d) Festivals/ Ceremonies	e) Food	f) Electricity Bill	g) EMI on (non-Cyclerickshaw loan)
Monthly	Monthly	Monthly	Annually	Monthly	Monthly	Monthly
i. 500- 1000 ii. 1000-2000 iii. 2000-3000 iv. >3000	i. <500 ii. 500-1000 iii. 1000-3000 iv. >3000	i. <300 ii. 300-500 iii. 500-1000 iv. >1000	i. <2000 ii. 2000-3000 iii. 3000-5000 iv. >5000	i.<1000 ii. 1000-3000 iii. 3000-5000 iv. >5000	i. <300 ii. 300-500 iii. 500-1000 iv. 1000-1500 v.>1500	i. <500 ii. 500-1500 iii. 1500-3000 iv. 3000-5000

5. Professional Information:

a. Why do you ride a cyclerickshaw?

i) Did not get any other job ii) Gives higher earning than other jobs

iii) Family business iv) Friends/family suggested

b. From how many years you are riding cyclerickshaw?
i) Less than 1 year ii) 3-5 yrs ii) 5-10yrs iv) 10-15yrs v) 15-20yrs vi)>20 yrs

c. Is your cycle rickshaw registered with mucipal corporation
i) Yes ii)no, Reason.....

d.1. Kilometres driven per day	d.2. Hours spent driving per day	d.3.Average time spent waiting per day
i. <5 ii. 5- 10 iii.10-20 iv. 20-30 v. >30	i. <5 ii. 5-10 iii. 10-15 iv. >15	i. <2 ii. 2-4 iii. 4-6 iv. 6-7 v. >7
d.3.Rent (daily)	d.4.Maintenance/Repair (monthly)	d.5.Fines/Penalties/Bribes (monthly)

e. Do you prefer ashok rajpath?
If yes, b) No ,Reason.....

f. What are alternate route you prefer other than ashok rajpath?
.....

g. What are alternate route that would give you more or similar benefit?
.....

h. No. Of trips made:-

Road		trips
Ashok Rajpath		
Other Routes		

i. Are you a member of a cycle rickshaw union & why?

a) If yes i) helps in getting passengers ii) helps in times of trouble like accident/deal with police harassment, etc. iii) helps the families of cyclerickshaw drivers in times of accident/ death iv) provides health insurance/medical benefits v) Helps in fare regulation vi) Other (specify).....

b) If No i) does not help in getting passengers ii) Forced to charge a particular fare iii) High membership fees iv) Restricted to particular zones v) Demands go unheard vi) Other (specify).....

j. What fare do you charge ?

.....
k. who regulates the fare ?

.....

6. Ownership, Leasing and Financing of autorickshaw:

a. How old is your cyclerickshaw?
a) < 1 yr b) 1 Year c) > 3 yrs d) > 5yrs e) >8yrs

b. Do you own this cyclerickshaw or is it rented'?

c. If rented, how much do you pay as daily rent? .....

d. If owned, at what price did you buy it ? .....

e. How did you finance the purchase?
a) Savings b) Loan from bank c) Loan from private financer, *'Seth'* d)Govt. loan e) Loan from friend/relatives

f. What classes of passengers use cycle rickshaw services? *(Choose any)*
i) Lower class ii) Lower Middle Class iii) Middle Class iv) Upper Middle Class v) Upper class

g. According to you what should be the monthly income of an Cyclerickshaw driver?(in Rs)
i) 1000-2000 ii) 2000-4000 iii) 4000-8000 iv) 8000-10000 v) 10000-12000 vi) >12000

7. Government regulations, Licensing and Registration:					
a. Do you have a registration?	b. Price of registration? (in Rs)	c. Source of Registration	d. Price for renewal of registration	e. Difficulties in getting registration	f. Awareness about Govt. regulations
i)Yes ii)No					

8. Competition:

Do you face competition from other modes of transport? Which ones and why?
a. If yes (choose any): i) Taxi ii) Bus iii) autorickshaw *b. No*

9. Time spent off work:

a. What do you do during your waiting hours? (Choose any)
i) Sleep ii) listen to radio iii) listen to music iv) Chat with fellow cyclerickshaw drivers v) Smoke vi) Have tea/snacks vii) Read newspaper/magazine viii) Other (specify).....

b. How often do you engage in leisure activities?
i) Weekly once ii) twice monthly iii) 2-3 in a month iv) 5-7 days in a month v) more than 10 days in a month

c. What kind of leisure activities do you engage in? Choose any.
i) Watch TV/listen to radio ii) Sleep iii) Drink iv) Go out with family shopping/movies v) Help in household chores vi) Other (specify).....

d. In a month, how often do you take a day off from work?
i) Weekly once ii) twice monthly iii) 2-3 in a month iv) 5-7 days in a month v) more than 10 days in a month

e. For what purpose do you take a leave: (can choose more than one):
i) Illness ii) Work iii) Family iv)Leisure/Rest v) Other (specify)

10. Health Concerns:		
a. Hours of sleeping	b. On- the- job problems (choose any)	c. Health problems (choose any)
i. 4- 6hrs ii. 6-8 hrs iii. 8-10 hrs iv. > 10 hrs	i. Tension ii. climate iii. Lack of interest iv. Boredom v. Tiredness vi. Stress vii. Distraction	i. Restless sleep/Insomnia ii. Back pains iii. Headaches iv. Obesity v. Digestive troubles vi. Hypertension vii. Any other (specify) viii. No health problem

d. Stress coping mechanism (Choose any)		
i. Chewing tobacco ii. Consuming alcohol iii. Smoking iv. Listening to the radio v. Talking on the mobile phone vi. Playing cards with fellow drivers during rest breaks vii. Stopping to take a nap viii. Striking a conversation with the passenger ix. Any other (specify)		
f. What is your eating pattern on a normal working day?		
1) How many meals a day?	2) When is your main meal?	3) Where do you have your main meals?
i) Twice ii) Thrice iii)Four times	i) Morning ii) Noon iii) Evening iv) Night	i) Home ii) Outside iii) Depends on the work schedule

11. Traffic Behaviour:

. Which of the following have you experienced:
i. Being pulled over at the side of the road by traffic police ii. Paid fine iii. Met with accident (Specify how many times and details) iv. Police custody (Specify details)

12. Your suggestion to improve existing transportation system

.....

.....

Annexure 6: Guidelines for Data Analysis for CycleRickshaw Survey

Guidelines for Data Analysis for auto rickshaw survey		
Variable no.	Variable	Code
V1	Age	Code
	18-20	1
	21-25	2
	26-30	3
	30-40	4
	40-50	5
	>50	6
V2	Education Qualification	Code
	uneducated	1
	< 8th pass	2
	10th Pass	3
	12th Pass	4
	Graduation	5
	Other	6
V3	Marital Status	Code
	Married	1
	Single	2
	Divorced	3
V4	Place of permanent residence	Code
	patna	1
	Outside city	2
V5	No. of family members	Code
	Alone	1
	2	2
	3 to 4	3
	> 4	4
V6	No. of Children	Code
	0	1
	1	2
	2	3
	3	4
	>3	5
V7	Monthly Income (Rs)	Code
	2000-3000	1
	3000-4000	2
	4000-5000	3
	5000-6000	4
	6000-7000	5
	>7000	6
V8	Family Member working	Code
	Wife	1
	Father	2
	Mother	3
	Children	4
	Sibling	5
	none	6
V9	Monthly Family Income (Rs)	Code
	<3000	1
	3000-5000	2
	5000-8000	3
	8000-12000	4
	12000-15000	5
	>15000	6
V10	Monthly Family Expenditure (Rs)	Code
	<3000	1

	3000-5000	2
	5000-8000	3
	8000-12000	4
	12000-15000	5
	>15000	6

V11	Personal Expenditure (Rs)	Code
	< 500	1
	500-1000	2
	1000-2000	3
	2000-3000	4
	3000- 4000	5
	>4000	6

V12	family member suffering for disease	Code
	wife	1
	mother	2
	father	3
	children	4
	sibling	5
	no one	6

	Asset owned	
	Yes = 1, No = 2	
Note: Above code is applicable for all Home Appliances		
V13	house/land	Code
V14	Radio	Code
V15	tv	Code
V16	bike	Code
V17	cycle	Code
V18	mobile	Code

V19	House rent	Code
	<500	1
	500-1000	2
	1000-1500	3
	1500-2000	4
	>2000	5
	owned/gov.house	6

V20	Health Problem	Code
	<500	1
	500-1000	2
	1000-1500	3
	1500-2000	4
	>2000	5

V21	Education	Code
	<500	1
	500-1000	2
	1000-3000	3
	>3000	4

V22	Festival/cermonies	Code
	<2000	1
	2000-3000	2
	3000-5000	3
	>5000	4

V23	Food	Code
	<1000	1
	1000-3000	2
	3000-5000	3
	>5000	4
V24	Why ride Cyclerickshaw	Code
	Didnt get any other job	1
	gives higher earning than other job	2
	family bussiness	3

	Family/friend suggested	4

V26	Experience in driving cyclerickshaw	Code
	less than 1 year	1
	3-5 years	2
	5-10 years	3
	10-15 years	4
	15-20 years	5
	>20 years	6

V27	Registerd with muncipal corporation	Code
	yes	1
	No	2

V28	Kilometers driven per day	Code
	<10	1
	10-20 km	2
	20-30 km	3
	>30 km	4

V29	Hour spent driving per day	Code
	<5	1
	5 -10 hr	2
	10-15 hrs	3
	>15 hrs	4

V30	Avg time waiting per day	Code
	<2	1
	2 to 4	2
	4 to 6	3
	>6	4

V31	Do you prefer Ashok Rajpath	Code
	Yes	1
	No	2

V32	Maintenance (monthly)	Code
	>500	1
	500-1000	2
	1000-2000	3
	> 2000	4

V33	Ownership	Code
	owned	1
	rented	2

V34	class of passenger	Code
	lower class	1
	middle class	2
	upper class	3

V35	face competition with other mode	Code
	taxi	1
	bus	2
	cycle rickshaw	3
	none	4

	Things done during waiting hour	
	Yes = 1	
	No = 2	
Note: Above code is applicable for all activities		
V36	Sleep	Code
V37	Listen to radio	Code
V38	Chat with fellow autorickshaw driver	Code
V39	Smoke	Code
V40	have tea/snacks	Code

V41	Day off from work	Code

	Work all days	1
	once or twice in month	2
	5-7 days in week	3
	Weekly once	4

V42	Reason for Day off from work	Code
	Illness	1
	Work	2
	Family	3
	Leisure/Rest	4

V43	Hours of sleeping	Code
	4 - 6 hrs	1
	6 - 8 hrs	2
	8 -10 hrs	3
	>10 hrs	4

V44	On the job problems	Code
	Tension	1
	Driver Fatigue	2
	lack of Interest	3
	boredom	4
	Tiredness	5
	Stress	6
	Distraction	7

V45	Health Problem	Code
	Restless sleep/Insomnia	1
	Back pains	2
	Headaches	3
	Obesity	4
	Digestive troubles	5
	Hypertension	6
	No health problem	7

V46	Stress coping mechanism	Code
	Chewing tobacco/Smoking	1
	Consuming alcohol	2
	Listening to the radio	3
	Talking on the mobile phone	4
	Playing card	5
	Take a nap	6

V47	How many meals a day	Code
	Twice	1
	Thrice	2
	Four times	3

V48	When is your meal	Code
	Morning	1
	Noon	2
	Evening	3
	Night	4

V49	Where do have your main meal	Code
	Home	1
	Outside	2
	Depend on the work schedule	3

V50	Which of the following you experienced	Code
	Being pulled over at the side of the road by traffic police	1
	Paid fine	2
	Met with accident	3
	Police custody	4

Annexure 7: Data sheet for Cycle Rickshaw drivers Survey

Variables	PROFILE OF THE RESPONDENT											GENERAL INFO							EXPENDITURE PATTERN					PROFESSIONAL INFORMATION											HEALTH CONCERN														
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47	V48	V49
													Asset Owned																						Things done during waiting hour														
Schedules	Age	Education Qualification	Marital Status	Place of permanent residence	No. of family members	No. of Children	Monthly Income (Rs)	Family Member working	Monthly Family Income (Rs)	Monthly Family Expenditure (Rs)	Personal Expenditure (Rs)	family member suffering for disease	house/land	Radio	tv	bike	cycle	mobile	House rent	Health Problem	Education	Festival/ceremonies	Food	Why drive cyclerickshaw	Experience in driving cyclerickshaw	Registration with municipal corporation	Kilometers driven per day	Hour spent driving per day	Avg time waiting per day	Do you prefer Ashok Rajpath	Maintainance	Ownership	class of passenger	face competition with other mode	Sleep	Listen to radio	Chat with fellow autorickshaw driver	Smoke	have tea/snacks	Day off from work	Reason for Day off from work	Hours of sleeping	On the job problems	Health Problem	Stress coping mechanism	How many meals a day	When is your meal	Where do have your main meal	Which of the following you experienced
1	4	1	1	1	3	5	2	4	5	4	2	6	2	1	1	2	1	2	2	3	3	3	2	1	6	1	3	2	2	2	2	2	3	2	1	2	1	2	1	2	4	3	6	2	1	1	4	2	2
2	6	1	1	2	4	4	1	4	4	3	3	6	2	2	2	2	2	2	6	1	2	1	2	2	6	2	2	2	2	2	1	2	2	2	2	2	1	1	1	2	2	3	5	2	1	2	3	2	3
3	6	1	1	2	4	5	2	4	4	4	3	6	2	2	2	2	2	2	6	2	1	1	2	3	6	1	3	2	2	1	2	2	1	2	2	2	2	1	1	3	3	3	5	5	1	2	3	2	2
4	4	1	1	2	4	5	1	6	1	1	2	3	2	1	2	2	2	1	2	1	2	1	2	1	4	1	3	1	3	1	1	2	2	2	2	2	1	1	2	1	4	3	2	1	1	1	3	3	2
5	4	1	1	1	4	4	3	6	2	2	1	6	1	1	2	2	2	1	6	1	2	2	2	2	6	1	3	2	3	1	2	2	2	2	1	1	2	1	2	2	3	3	5	5	2	1	4	1	1
6	6	2	1	1	4	5	3	4	4	3	2	6	2	2	2	2	1	2	3	3	2	2	3	1	6	2	4	1	3	1	2	2	1	2	2	2	2	2	1	1	1	3	5	2	1	1	4	2	2
7	3	2	1	1	4	3	3	6	2	2	3	2	2	2	2	2	2	1	6	2	3	2	2	1	5	1	4	2	3	1	2	1	2	2	2	2	2	1	2	1	1	2	2	1	2	1	1	1	1
8	3	1	1	1	4	4	2	6	2	2	1	6	2	1	2	2	1	1	3	1	3	2	2	1	5	2	4	2	3	2	2	2	2	2	2	2	2	2	1	1	4	3	2	7	2	1	4	1	2
9	3	1	2	2	2	1	3	6	2	2	4	6	2	2	2	2	2	1	2	2	1	2	2	3	3	2	3	1	2	1	2	2	2	2	1	2	2	1	1	2	2	3	3	3	1	1	2	2	2
10	5	1	1	1	4	3	3	6	2	2	2	6	2	1	1	2	1	2	3	2	2	1	2	2	6	2	3	2	3	2	2	2	2	2	1	2	1	1	2	2	2	3	6	2	1	1	4	1	1
11	2	2	2	1	4	4	4	6	3	2	2	1	2	2	1	2	1	1	2	2	1	2	2	1	2	1	3	1	2	2	2	1	2	2	2	2	1	2	1	2	3	3	1	6	2	2	4	1	2
12	1	2	2	1	1	1	2	6	2	2	4	2	1	1	1	2	1	1	1	1	1	1	2	1	2	2	3	2	3	1	1	2	1	2	1	2	1	1	2	2	1	3	2	3	1	1	4	1	1
13	1	2	2	2	1	1	5	6	3	3	4	2	2	2	2	2	2	1	1	1	1	2	2	1	2	1	4	1	2	2	2	2	2	2	2	2	2	2	1	2	1	2	6	7	1	1	3	2	1
14	3	3	1	1	4	4	5	6	3	3	2	3	2	1	1	2	1	1	2	2	3	2	2	2	4	1	4	2	3	1	2	2	3	2	1	1	1	2	2	1	2	2	2	7	1	1	4	1	1
15	3	2	1	2	4	3	3	6	4	4	3	6	1	1	1	2	2	1	2	1	3	3	3	1	5	1	4	2	3	2	1	1	3	2	1	2	2	1	1	4	4	3	1	7	2	1	4	1	2
16	5	1	1	1	4	4	1	4	4	3	2	2	1	1	1	2	1	1	6	3	3	3	4	1	6	1	3	1	2	1	1	2	2	2	1	2	2	1	2	4	3	3	5	6	1	1	4	1	1
17	3	2	1	2	4	3	5	6	3	1	2	6	2	1	2	2	1	1	2	1	2	2	3	4	2	2	4	2	3	1	2	2	3	2	1	2	2	1	1	3	3	2	3	7	2	1	4	1	1
18	2	2	2	1	1	1	4	6	2	2	3	6	2	1	2	2	2	1	1	1	1	1	2	1	2	2	4	2	3	1	2	2	2	2	1	2	1	2	1	4	3	2	2	7	1	2	4	2	1
19	1	2	2	2	4	1	3	6	6	4	3	3	2	1	2	2	2	1	1	3	1	1	2	4	2	2	4	2	3	1	2	2	3	2	2	1	1	1	2	1	1	3	4	3	1	1	4	1	1
20	4	2	1	2	4	4	5	5	6	5	3	3	2	2	1	2	1	1	1	2	3	2	3	3	5	2	4	2	2	2	2	1	2	2	1	2	2	1	1	4	3	2	1	2	1	1	4	1	3
21	5	1	1	1	3	5	2	4	5	4	2	6	2	1	1	2	1	2	2	3	3	3	2	1	6	1	3	2	2	2	2	2	3	2	1	2	1	2	1	2	4	3	6	2	3	1	4	1	2
22	6	1	1	2	4	4	1	4	4	3	3	6	2	1	2	2	2	2	6	1	1	1	3	2	6	2	2	2	2	2	1	2	2	2	2	2	1	1	1	2	2	3	5	2	1	2	3	2	3
23	6	1	1	2	4	5	2	4	4	4	3	6	2	2	2	2	2	2	6	1	1	1	2	3	6	2	3	2	2	1	2	2	1	2	2	2	2	1	1	3	3	3	5	5	1	2	3	2	2
24	4	1	1	2	4	5	1	6	1	1	2	3	2	1	1	2	1	1	2	1	2	1	2	1	4	1	3	1	3	1	1	2	2	2	2	2	1	1	2	1	4	3	2	1	1	1	3	3	2
25	4	1	1	1	4	4	3	6	2	2	2	6	1	1	2	2	2	1	6	1	2	2	2	2	6	1	3	2	3	1	2	2	2	2	1	1	2	1	2	2	3	3	5	5	2	1	4	1	1
26	6	2	1	1	4	5	3	4	4	3	2	6	2	2	2	2	1	2	3	3	2	2	3	1	6	2	4	1	3	1	2	2	1	2	2	2	2	2	1	1	1	3	3	3	1	1	4	2	2
27	3	2	1	1	4	3	3	6	2	2	3	2	2	2	2	2	2	1	6	2	3	2	2	1	5	1	4	2	3	1	2	1	2	2	2	2	2	1	2	1	1	2	2	1	2	1	1	1	1
28	3	1	1	1	4	4	2	6	2	2	1	6	2	1	2	2	1	1	3	1	3	2	2	1	5	2	4	2	3	2	2	2	2	2	2	2	2	2	1	4	4	3	2	7	2	1	4	1	2
29	3	1	2	2	2	1	3	6	2	2	4	6	2	2	2	2	2	1	2	2	1	2	2	2	3	2	3	1	2	1	2	2	2	2	1	2	2	1	1	2	2	3	3	3	1	1	2	2	2
30	5	1	1	1	4	3	3	6	2	2	2	6	2	1	1	2	1	2	3	2	2	1	2	2	6	2	3	1	3	2	2	2	2	2	1	2	1	1	2	2	2	3	6	2	1	1	4	1	1
31	2	2	2	1	4	4	4	6	3	2	2	1	2	2	1	2	1	1	2	2	1	2	2	1	2	1	3	1	2	2	2	1	2	2	2	2	1	2	1	2	3	3	1	6	2	2	4	1	2
32	1	2	2	1	1	1	2	6	2	2	4	2	2	1	1	2	1	1	1	1	1	1	2	1	2	2	3	2	3	1	1	2	1	2	1	2	1	2	2	2	1	3	2	3	1	1	4	1	1
33	1	2	2	2	1	1	4	6	3	3	4	2	2	2	2	2	2	1	1	1	1	2	2	1	2	1	4	1	2	2	2	2	2	2	2	2	1	2	1	2	1	2	6	7	1	1	3	2	1
34	3	3	1	2	4	4	5	6	3	3	2	3	2	1	1	2	1	1	2	2	3	2	2	2	4	1	4	2	3	1	2	1	3	2	1	1	1	2	2	1	2	2	2	7	1	1	4	1	1
35	3	2	1	2	4	3	3	6	4	3	3	6	1	1	1	2	2	1	2	1	3	3	3	1	4	1	4	2	3	1	1	1	3	2	1	2	2	1	1	4	4	3	7	7	2	1	4	1	1
36	5	1	1	1	4	4	1	4	4	3	2	1	1	1	1	2	1	1	6	3	3	3	4	1	6	1	3	1	2	1	1	2	2	2	1	2	2	1	2	4	3	3	5	6	1	1	4	1	1
37	3	2	1	2	4	3	5	6	3	1	2	6	2	1	2	2	1	1	2	1	2	2	3	4	2	2	4	2	3	1	2	2	3	2	2	2	2	1	1	3	3	2	3	7	2	1	4	1	1
38	2	2	2	1	1	1	4	6	2	2	3	6	2	1	2	2	2	1	1	1	1	1	2	1	2	2	4	2	3	1	2	2	2	2	1	2	1	2	1	4	3	2	2	7	1	2	4	2	1
39	1	2	2	2	4	1	3	6	6	4	3	3	2	1	2	2	2	1	1	3	1	1	2	4	2	2	4	2	3	1	2	2	3	2	2	1	1	1	2	1	1	3	4	3	1	1	4	1	1
40	4	2	1	2	4	4	5	5	6	5	3	3	2	2	1	2	1	1	1	2	3	2	3	3	5	2	4	2	2	2	2	1	2	2	1	2	2	1	1	4	3	2	1	2	1	1	4	1	3

Annexure 8: Questionnaire for Household and origin destination Survey

Household Survey

Date ..... location.....

Personal Information

Name of family head _____

Address- _____

Family details:

Sr no.	Name	Relation with head	Age	Married	Education	Occupation
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Occupation/Job

Household Income

Expense

Expense on Transportation

No. Of Vehicles Owned:

Car [ ]

Motorcycle/scooter [ ]

Bicycle [ ]

Car User only (if travelled with private Driver) [ ] Driver Monthly Salary .....

Where you park your vehicle(in case of private transport vehicle)

At home .....

At Destination .....

How many people are generally in your vehicle including you .....

Origin Destination Survey

Date ..... location.....

Gender [ ] Male [ ] Female
Occupation/Job .....
Expense on Transportation .....

Trip Based
Trip origin .....
Trip Destination .....
Purpose of Trip
[ ] Going or coming from work [ ] To or from education Related [ ] To or from Shopping [ ] Visiting Friends and relatives [ ] Business Purpose [ ] Others .....
Frequency (No. Of Days per week) .....

Mode of travel
Mode available for trip
[ ] Bus [ ] Car [ ] Motorcycle/ scooter [ ] bicycle [ ] Auto [ ] Cycle rickshaw
Mode of Travel .....
Important reason behind choosing this mode (Rank the following)
[ ] Bad Road condition [ ]Flexibility [ ] Comfort [ ] less walking involved
[ ] safety [ ] Convenience [ ] availability when you want [ ] Travel Time
[ ] cost [ ] Distance [ ] Others .....

Where you park your vehicle (in case of private transport vehicle)
At home ..... At Destination.....
Car User only (if travelled with private Driver) [ ] Driver Monthly Salary .....
How many people are generally in your vehicle including you .....

Distance between origin and distance .....
Average time you wait for conveyance .....
Time of your Travel ....
Travel cost .....

Trip assignment
Which road you use on your trip .....
Where did you *enter* Ashok Rajpath .....
Where did you *exit* Ashok Rajpath .....
What other major roads were included in your trip?
.....
What are the alternate options (mode/ Road) you take for your trip?
.....

Your suggestion to improve existing transportation system
.....
.....
.....
.....

Annexure 9: Guidelines for data analysis for Household and origin destination Survey

Guidelines for Data Analysis for Household and O-D survey		
Variable no.	Variable	Code

V1	No. of family person	Code
	<3	1
	3 to 5	2
	>5	3

V2	Age <5 years(Person)	Code
	0 Person	1
	1 Person	2
	2 Person	3
	3 Person	4
	>3 Person	5
V3	Age 5 to 15 years (Persons)	Code
V4	Age 16 to 40 years (Persons)	Code
V5	Age 41 to 60 years (Persons)	Code
V6	Age 61 to 80 years (Persons)	Code
V7	Age >80 years (Persons)	Code

V8	Monthly Household Income (Rs)	Code
	< 5000	1
	5000-10000	2
	10000-15000	3
	15000-20000	4
	20000-25000	5
	>25000	6

V9	Monthly Household Expenditure (Rs)	Code
	< 5000	1
	5000-10000	2
	10000-15000	3
	15000-20000	4
	20000-25000	5
	>25000	6

V10	Monthly Household Expenditure in transportation (Rs)	Code
	<500	1
	500-1000	2
	1000-2000	3
	2000-3000	4
	3000-4000	5
	>4000	6

	Vehicles Owned	Code
	0	1
	1	2
	2	3
	>2	4
V11	Car	Code
V12	Motorcycle/ Scooter	Code
V13	Bicycle	Code

V11a	Driver Salary	Code
	0	1
	1000-2000	2
	2000-3000	3
	3000-4000	4
	>4000	5

V14	Vehicle Parking at Home	Code
	Garage	1
	On Road	2

V15	Vehicle Parking at Work Place	Code
	Office Parking	1
	On Road	2
	Gov. Parking Lot	3

V16	How Many people in your vehicles	Code
	Alone	1
	2	2
	3	3
	>3	4

V17	Gender	Code
	Male	1
	Female	2

V18	Expense of transportation	Code
	<100	1
	100-500	2
	500-1000	3
	1000-2000	4
	> 2000	5

	PURPOSE OF TRIPS	
	Yes = 1	
	No = 2	
	Note: Above code is applicable for all activities	
V20	Going or coming from work	Code
V21	To or from education related	Code
V22	To or from shopping	Code
V21	Visiting friends and relatives	Code
V22	Bussinesss Purpose	Code

V23	Mode of Travel	Code
	Bus	1
	Car	2
	Motorcycle/Scooter	3
	Bicycle	4
	Auto Rickshaw	5
	Cycle Rickshaw	6

	REASON BEHIND CHOOSING THE MODE	
	Yes = 1	
	No = 2	
	Note: Above code is applicable for all activities	
V24	Bad Road Condition	Code
V25	Flexibity	Code
V26	Comfort	Code
V27	Less Walking involved	Code
V28	Saftey	Code
V29	Convenience	Code
V30	Availability when you want	Code
V31	Travel Time	Code
V32	Cost	Code
V33	Distance	Code

V34	Vehicle Parking at Home	Code
	Garage	1
	On Road	2

V35	Vehicle Parking at Work Place	Code
	Office Parking	1
	On Road	2
	Gov. Parking Lot	3

V36	How Many people in your vehicles	Code
	Alone	1
	2	2
	3	3
	>3	4

V37	Distance between origion and distance	Code
	< 1 km	1
	1-5 km	2
	5-10 km	3
	10-15 km	4
	15-20 km	5
	>25 km	6

V38	Average time you wait for conveyance	Code
	No waiting	1
	< 5 min	2
	5-15 min	3
	15-30 min	4
	>30 min	5

V39	Time of your Travel	Code
	< 15 min	1
	15-30 min	2
	30-45 min	3
	45- 60 min	4
	>1 hr	5

V40	Travel Cost	Code
	< Rs 10	1
	Rs 10-20	2
	Rs 20-30	3
	Rs 30-40	4
	RS 40-50	5
	> RS50	6

Annexure 10: Data Sheet for Household and origin destination Survey

Variables	HOUSEHOLD SURVEY																ORIGION DESTINATION SURVEY																											
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36	V37	V38	V39	V40
		AGE									Vehicles Owned								PURPOSE OF TRIPS						REASON BEHIND CHOOSING THE MODE																		
	No. of family person	Age <5 years(Person)	Age 5 to 15 years (Persons)	Age 16 to 40 years (Persons)	Age 41 to 60 years (Persons)	Age 61 to 80 years (Persons)	Age >80 years (Persons)	Monthly Household income	Monthly Household Expense	Monthly Household Expenditure in transportation	Car	Motorcycle/Scooter	Bicycle	Driver Salary	Vehicle Parking at Home	Vehicle Parking at Work Place	SERIAL NO.	Gender	Expense of transportation	Going or coming from work	To or from education related	To or from shopping	Visiting Friends and relatives	Bussiness Purpose	Mode of Travel	Bad Road Condition	Flexibility	Comfort	Less Walking involved	Saftey	Convenience	Availability when you want	Travel Time	Cost	Distance	Vehicle Parking at Home	Vehicle Parking at Working place	How many people in vehicles	Distance between origion and distance	Average time you wait for conveyance	Time of your Travel	Travel Cost
																	1	1	5	1	2	1	1	1	2	2	1	2	1	1	1	1	2	2	2	1	2	1	4	1	2	6
																	2	2	3	2	2	1	1	2	2	2	1	2	1	1	1	1	2	2	2	1	2	3	5	1	4	6
																	3	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	5	1	3	6
1	3	1	2	4	3	1	1	6	6	6	2	2	3	2	1	2	4	1	2	2	1	2	2	2	1	2	2	2	2	2	2	2	1	2	3	3	4	2	3	3	1
																	5	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	4	3
																	6	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	7	1	2	2	2	1	1	2	5	2	1	1	2	1	2	1	1	1	2	3	3	4	2	1	2	1
2	2	1	1	3	1	1	1	5	4	3	1	1	1	1	3	3	8	1	2	2	1	2	2	2	5	2	1	1	2	2	1	1	1	2	2	3	3	4	4	1	3	3
																	9	1	2	2	1	2	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	3	2
																	10	1	2	1	2	2	1	1	3	2	1	2	1	2	1	1	1	1	2	1	1	1	2	1	3	2
																	11	2	2	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	12	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	2	1	2	1
																	13	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	2	5	3
3	3	1	4	3	1	1	1	4	4	3	1	2	2	1	1	1	14	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	3	3	4	5	2	5	3
																	15	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
																	16	2	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	17	1	3	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	2	2
																	18	1	2	2	1	2	2	2	1	2	2	2	2	2	2	2	1	2	3	3	4	3	3	4	1
4	3	1	2	4	2	1	1	4	4	4	1	2	3	1	1	1	19	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	1	2	1
																	20	2	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	3	1	3	1
																	21	1	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	1	2	3	3	4	3	3	4	1
																	22	2	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	23	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
5	3	1	4	3	1	2	1	4	4	3	1	1	2	1	1	2	24	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	1	1	2	1	1
																	25	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	26	1	4	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	2	2
																	27	2	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	28	1	2	2	1	2	2	2	1	2	2	2	2	2	2	2	1	2	3	3	4	2	2	3	1
6	3	1	3	4	3	1	1	5	4	4	1	1	2	1	1	2	29	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	1	2	3	3	4	2	2	3	1
																	30	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	1	1	2	1
																	31	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
																	32	2	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	33	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
																	34	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
7	2	2	2	4	1	2	1	4	4	5	1	3	1	1	1	1	35	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	3	3	4	5	3	5	2
																	36	1	5	1	2	1	1	1	2	2	1	2	1	1	1	1	2	2	2	2	2	1	4	1	4	6
																	37	2	3	2	2	1	1	2	2	2	1	2	1	1	1	1	2	2	2	2	2	3	2	1	2	6
																	38	1	3	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	3	1	2	3
																	39	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
8	3	1	2	5	1	2	2	6	6	6	2	3	1	3	2	2	40	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	3	3	4	5	3	5	2
																	41	1	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	42	1	3	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	2	2
																	43	2	3	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	2	2
9	2	2	1	4	2	1	1	6	4	4	1	1	1	1	3	3	44	1	3	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	2	2
																	45	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	1	1	3	1	4	1
																	46	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	1	2	3	3	4	2	2	3	1
																	47	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	2	1	3	1
10	3	1	2	4	2	1	1	3	3	3	1	1	1	1	3	3	48	2	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
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																	52	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
11	3	2	2	5	1	1	1	6	5	5	1	2	1	1	1	1	53	1	3	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	2	2
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																	55	1	4	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	2	2
12	1	1	1	3	1	1	1	6	4	3	1	1	1	1	3	3	56	2	4	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	2	2
																	57	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
																	58	2	3	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	3	1	2	3
																	59	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
13	3	2	3	4	1	3	1	6	5	5	1	3	1	1	1	1	60	2	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	3	3	4	5	3	5	2
																	61	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	62	1	3	2	1	2	2	2	1	2	2	2	2	2	2	2	2	1	2	3	3	4	4	3	5	2
																	63	2	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	64	1	3	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	2	2
14	2	1	2	4	1	1	1	4	4	3	1	1	1	1	3	3	65	2	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	1	1	2	1

Variables	HOUSEHOLD SURVEY																ORIGION DESTINATION SURVEY																								
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16		V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36	V37	V38	V39	V40
		AGE									Vehicles Owned							PURPOSE OF TRIPS							REASON BEHIND CHOOSING THE MODE															
	No. of family members	Age 0-5 years (Person)	Age 6 to 15 years (Persons)	Age 16 to 40 years (Persons)	Age 41 to 60 years (Persons)	Age 61 to 80 years (Persons)	Age >80 years (Persons)	Monthly Household Income	Monthly Household Expenses	Monthly Household Expenditure in transportation	Car	Motorcycle/Scooter	Bicycle	Driver/ Salary	Vehicle Parking at Home	Vehicle Parking at Work Place	SERIAL NO.	Gender	Expense of transportation	Going or coming from work	To or from education related	To or from shopping	Visiting Friends and relatives	Bussiness Purpose	Mode of Travel	Bad Road Condition	Flexibity	Comfort	Less Walking involved	Saftey	Convenience	Availability when you want	Travel Time	Cost	Distance	Vehicle Parking at Home	Vehicle Parking at Working place	How many people in vehicles	Distance between origion and distance	Average time you walk for conveyance	Time of your Travel	Travel Cost
																	66	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
																	67	2	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	68	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
																	69	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
15	2	2	2	4	1	2	1	4	4	5	1	3	1	1	1	1	70	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
																	71	1	5	1	2	1	1	1	2	2	1	2	1	1	1	1	2	2	2	2	2	1	4	1	4	6
																	72	2	3	2	2	1	1	2	2	2	1	2	1	1	1	1	2	2	2	2	2	3	2	1	2	6
																	73	1	3	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	3	1	2	3
																	74	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
																	75	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
16	3	1	2	5	1	2	2	6	6	6	2	3	1	2	2	2	76	1	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	77	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
																	78	2	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	79	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
																	80	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
17	2	2	2	4	1	2	1	4	4	5	1	3	1	1	1	1	81	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
																	82	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	3	1	4	1
																	83	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	2	1	2	3	3	4	2	2	3	1
																	84	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	2	1	3	1
																	85	2	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
18	3	1	2	4	2	1	1	3	3	3	1	1	1	1	3	3	86	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	87	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
																	88	2	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	89	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
																	90	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
19	2	2	2	4	1	2	1	4	4	5	1	3	1	1	1	1	91	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
																	92	1	5	1	2	1	1	1	2	2	1	2	1	1	1	1	2	2	2	2	1	1	4	1	4	6
																	93	2	3	2	2	1	1	2	2	2	1	2	1	1	1	1	2	2	2	2	2	2	2	1	2	6
																	94	1	3	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	3	1	2	3
																	95	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
																	96	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
20	3	1	2	5	1	2	2	6	6	6	2	3	1	2	2	2	97	1	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	98	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	4	1	3	4
																	99	2	3	2	2	1	1	2	6	2	1	1	1	2	1	1	2	2	2	3	3	1	2	1	4	4
																	100	2	2	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	2	1	1	2
																	101	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
21	2	2	2	4	1	2	1	4	4	5	1	3	1	1	1	1	102	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
																	103	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	3	1	4	1
																	104	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	1	2	3	3	4	2	2	3	1
																	105	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	2	1	3	1
																	106	2	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
22	3	1	2	4	2	1	1	3	3	3	1	1	1	1	3	3	107	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	108	1	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	1	2	3	3	4	3	3	4	1
																	109	2	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	110	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	5	2
																	111	1	1	2	1	2	1	2	4	2	2	2	2	2	1	1	2	1	2	1	2	1	2	1	3	1
23	3	1	4	3	1	2	1	4	4	3	1	1	2	1	1	2	112	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	113	1	2	1	2	1	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	2	1	2	1
																	114	1	2	2	2	1	1	2	5	2	1	1	2	1	2	1	1	1	2	3	3	4	2	1	2	1
																	115	1	2	2	1	2	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	4	1	3	3
24	2	1	1	3	1	1	1	5	4	3	1	1	1	1	3	3	116	1	2	2	1	2	2	2	5	2	1	1	2	1	2	1	1	2	2	3	3	4	3	1	3	2
																	117	1	5	1	2	1	1	1	2	2	1	2	1	1	1	1	2	2	2	1	1	1	4	1	2	6
																	118	2	3	2	2	1	1	2	2	2	1	1	1	1	2	2	2	1	2	2	5	1	4	6
																	119	1	4	2	1	2	2	2	3	2	2	2	2	2	1	2	1	2	2	3	3	1	5	1	3	6
25	3	1	2	4	3	1	1	6	6	6	2	2	3	2	1	2	120	1	2	2	1	2	2	2	1	2	2	2	2	2	2	2	1	2	3	3	4	2	3	3	1
																	121	1	3	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	2	3	3	4	5	3	4	3