

A case Study on para-transit mode (auto-rickshaw) of Vadodara, Gujarat

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Abstract— Auto-rickshaw which is a para-transit mode of urban transportation system. Which provide a flexible movements to the people with affordable cost. This paper presents a study on para-transits in the Vadodara city, a city of Gujarat which exists with around 2 million population. Having more than 75000 para-transits vehicles also the city does not have any public transportation facility excluding few city buses. Thus auto-rickshaws are the major mode of transportation in the city. During this study attempt has been made to find out the role and contribution of auto-rickshaw of auto-rickshaw sector in the Vadodara city.

Index Terms—Auto-rickshaw, para-transits, urban transportation,

I. INTRODUCTION

Para-transit is urban passenger transportation service operating on public streets and highways in mixed traffic provided by private or public operators. It is an alternative mode of flexible passenger transportation. The significant features of para-transit system are their flexibility and door to door service. Moreover, para-transit service offers mobility especially for the trip makers who do not own or have access to private vehicles.

Para-transit (auto-rickshaw) plays an important role in the Vadodara urban area. There is a lack of public transportation facilities in the city. In the urban public transportation there is only few city buses available called vinayak city bus service. There is no other facilities of public transport like BRTS, also there is only few taxi (cabs) are available in the city. So that auto-rickshaws plays major role in the city. They provide flexible transportation services to the passenger's at affordable cost. One side they are playing important role in the city other side they creating issues and problems also. They are increasing heterogeneity, as well as there is lack of parking lots in the Vadodara urban area. The aim of these study was to propose a measures in terms of organizing and regulating which can be advantageous to passengers and auto-drivers.

II. VADODARA

Vadodara is come across at 22.30°N 73.19°E in western India at an elevation of 39 meters (128 ft.). It is the 18th major city in India with an area of 235 square kilometers (91 sq. mi) and the population of Vadodara is 16 lakh according to 2010-2011 statistics. The city became metropolis in 1991. In earlier times, Vadodara – popularly known as “Baroda” was a Maratha princely state ruled by the royal Gaekwad dynasty and was entitled as one of the largest and richest Indian princely state. It was formerly the capital city of Gaekwad state. It is situated on the banks of Vishwamitri River. It is also known as “Sayajirao nagari” (Sayaji's city after its famous ruler Maharaja Sayajirao Gaekwad III) or “Sanskari nagari” (the city of culture, a reference to its status as the cultural capital of Gujarat). It is the administrative headquarters of Vadodara district. Below figure shows the area of Vadodara metropolitan region. It is located 120km Ahmadabad and 140km from state capital Gandhi agar. Vadodara is well connected to Delhi and Mumbai by railway and state bus service with high frequency. The other railway line connects Dabhoi, Chandod, Karjan, Dahod, Padra, Sankheda and Kathana. The city is also connected to all major cities by air. The city also known as a “gateway to the golden corridor” as it has major road and rail arteries joining Delhi, Ahmadabad and Mumbai. Delhi-Mumbai Industrial Corridor also passes through Vadodara.

III. PROBLEM DEFINITION

Thousands numbers of auto rickshaw running every day on the roads of Vadodara city, due to the imbalanced movement of auto-rickshaws and lack of proper parking for the auto-rickshaw stand they are the major reason for creating the congestion in the city during pick hours. Also the auto-rickshaw sector is suffering from the parking issues in the city. Vadodara city police marks more than 50 auto rickshaw stand as needs to be replaced or improved. So that we can say auto-rickshaw sector should be organized or regulate

IV. AUTO-RICKSHAW AS A MAJOR MODE OF URBAN TRANSPORTATION

Auto rickshaws, a para-transit mode of transport, are one of the most popular modes of public transport in India, mostly in urban areas. It is one of the forms of intermediate or informal public transport system. Moreover, auto rickshaw belongs to the family of para-transit vehicles. These vehicles have the operation characteristics of flexible routes and schedules as well. They mostly provide two types of services: one involving trips along a more or less defined route with stops to pick up or alight passengers on request. The other is a demand-responsive transport which can offer a door-to-door service from any origin to any destination in a service area. Auto-rickshaw stands matchless in providing door-to-door transportation and last-mile connectivity at an affordable cost to all passengers. It is popular mode of urban transportation because of its smaller, befitting size and unchartered ability to

provide connectivity. They are becoming more and more popular in mid-size Indian cities. The auto-rickshaw sector not only providing flexible movements to the passenger's they provide employment to thousands number of auto-drivers.

V. METHODOLOGY

Initially the problem will be identified such as growth of para-transits with irregular and unorganized manner, also causes traffic in the city, then objectives would be set as per the requirement that minimize the problems and lastly data will be collected on two basis primary data collection, as well as secondary data collection. Mainly three types of surveys has been carried out for the study, auto-occupancy survey, mode split survey, and lastly to know the social and operational characteristics of auto rickshaw sector. After data collection process the analysis of the data will be done. Lastly on the basis of data analysis and its results the suggestions will be concluded to minimize the impact of the problem

VI. VEHICLE OCCUPANCY SURVEY

Vehicle occupancy refers to the number of persons in each vehicle, including the driver, and often excludes both buses and commercial trucks. This data is distinct from lane occupancy. The equipment required for data collection consists of pencil and paper, a watch, and a manual counter of at least six "banks." Usually a vehicle is needed to get to the site and to sit in during data collection. At very low volume sites, data can be collected. Occupancy data are usually used to assess the impact of various geometric (e.g. the addition of a high occupancy vehicle, HOV, lane), control (e.g. the implementation of metering), or operational (e.g. Use of additional bus runs) changes. Occupancy data also reveals the total number of persons utilizing a facility, or a theoretical maximum people carrying capacity. Trends in vehicle occupancy are often caused by new HOV facilities, rideshare promotion, changes in gasoline prices, and changes in bus service.

Auto-occupancy survey

This survey was conducted on major three roads of the city around the railway station. Auto-rickshaw were observed independently and average passengers carried at peak hours has been recorded. This survey was conducted during morning peak hour and conducted for three days. Below tables shows the data collection of auto-occupancy survey, autos were observed independently for 15 minutes interval and marked in data sheet, data sheets were consists of seven boxes for 0 to 6+ passengers.

Table 1 Bidirectional Occupancy Counts

| Bidirectional Occupancy Counts | | | | |
|---------------------------------------|-------|---------------------------|--------------------------------|----------------------------------|
| <i>Location</i> | | <i>No. of auto counts</i> | <i>No. of occupancy counts</i> | <i>Persons per auto rickshaw</i> |
| Aurobindo road | Ghosh | 490 | 1297 | 2.65 |
| Old Channi road | | 469 | 1235 | 2.63 |
| Alkapuri road | | 514 | 1316 | 2.56 |

On Aurobindo Ghosh road, sayajiganj traffic police head quarter, at 8:30 AM in the morning vehicle occupancy alias auto occupancy survey was started. At an interval of every 15 minutes, passenger's travelling in auto rickshaw from the railway station to kalaghoda circle were counted manually. During this time, in one hour of survey, 490 auto-rickshaw were counted and in this 490 auto rickshaw 1297 passengers were travelling. Among them 35 rickshaws marked with zero or no passenger's in it and 145 auto rickshaw were moving with overcapacity means more than 3 passenger's in it. On Old Channi road, central bus depot, at 8:30 AM in the morning vehicle occupancy alias auto occupancy survey was started. At an interval of every 15 minutes, passenger's travelling in auto rickshaw from the railway station to kalaghoda circle to seven apple hotel were counted manually. During this time, in one hour of survey, 469 auto were counted and in this 469 auto rickshaw 1235 passengers were travelling. Among them 41 rickshaws marked with zero or no passenger's in it and 141 auto rickshaw were moving with overcapacity means more than 3 passenger's in it. Details of the occupancy of 15 minutes interval are shown in table below. On Alkapuri road, near Bansal book stall, at 8:30 AM in the morning vehicle occupancy alias auto occupancy survey was started. At an interval of every 15 minutes, passenger's travelling in auto rickshaw from the railway station to Alkapuri were counted manually. During this time, in one hour of survey, 514 auto were counted and in this 514 auto rickshaw 1316 passengers were travelling. Among them 36 rickshaws marked with zero or no passenger's in it and 145 auto rickshaw were moving with overcapacity means more than 3 passenger's in it.

Table 1 OVERALL OCCUPANCY COUNTS

| Overall Occupancy counts | | |
|--------------------------|-------------------------|---------------------|
| No. of auto counts | No. of occupancy counts | Persons per vehicle |
| 1473 | 3848 | 2.612 |

Table 2 shows the overall occupancy counts, in which total number of auto counts are described which is 1473 and number of occupancy counts at all locations which is 3848. So that ratio, person per vehicle is 2.612.

Seating Capacity of auto rickshaw

Seating capacity of auto-rickshaw is 4 including driver. That means 3 passenger at back seat and 1 driver at front seat. From the occupancy counts at various location we can find some statistics that how many rickshaw are running under capacity, and over capacity.

Below figure shows the number of auto rickshaw counted at Aurobindo Ghosh road with different passengers in it. Like (1 passenger, 2 passenger...). In the figure we can see that no. of auto with 1, 2, 3 passengers are under capacity and no. of auto with more than 3 passengers are over capacity.

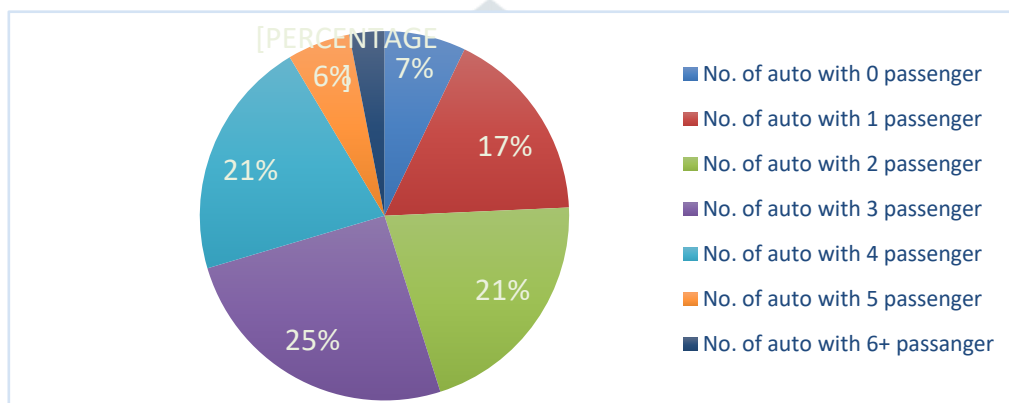


Figure 1 Number of auto-rickshaw at Aurobindo Ghosh road

From the figure 5.2 we can see that no. of auto with 1, 2 and 3 passengers are 17%, 21% and 25% respectively. And no. of auto with 4, 5 & 6 passengers are 21%, 6% and 3% respectively. Which means 30% of total counted auto rickshaw which are running on Aurobindo Ghosh road with over seating capacity. We can also see that 7% of total counted auto are running with zero passenger in it. Statistics shows the same results for all 3 roads.

VII. MODE SPLIT SURVEY

The mode split survey was carried out to know the mode share ratio of the city trips. 304 sample was collected during the survey by questionnaire forms. The survey was collected at various location like near railway station, bus depot, shopping centers, malls, of the city. The questionnaire contains the social characteristics as well as information about trips. After conduction the survey we have compare the results of mode share with past mode share.

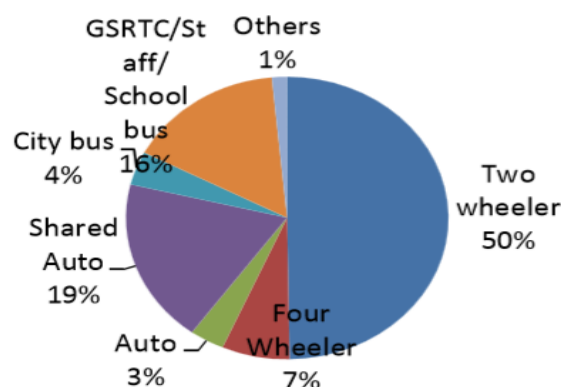


Figure 2 existing mode share in Vadodara city in 2012

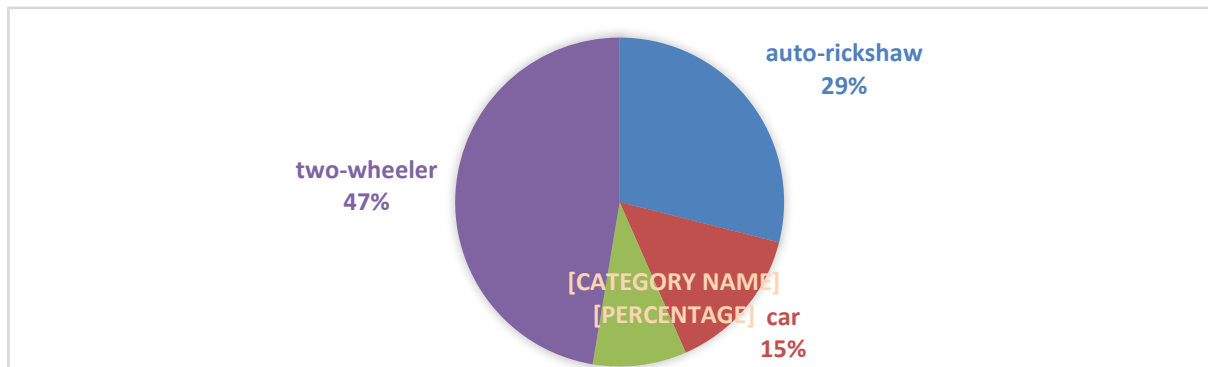


Figure 3 result of mode split survey

From the above fig.2 we can see that in 2012, 50% of trips occurs with two-wheeler. Where 22% of trips occurs with the auto-rickshaw. While comparing this to 2017 statistics the mode share is increased to 29% for auto-rickshaw. Also the mode share for city-buses also increasing which was 4 % in 2012 and now it is 9%.

VIII. RESULT DISCUSSION

During the auto-occupancy survey we have counted a passengers without auto-drivers and after finding the occupancy in terms of passengers/vehicle after that we have compare this results to per auto-rickshaw capacity, which is 3 passenger. In this survey we have counted passenger per vehicle on major three roads of the city. Namely Aurobindo Ghosh road which is railway station to east zone of the city. Old Channi road which is going to railway station to north zone of city, Alkapuri road which is going to railway station to west zone of city. During the three day survey at each road one day for one session say one hour we have counted 1473 auto-rickshaw, and 3848 passengers in it. Thus person per vehicle is 2.612 persons/vehicle. From the auto-occupancy survey we have conclude that the occupancy for the auto-rickshaw is near about 3 persons/auto-rickshaw. From the results we can say that due to shuttle system in the city there is imbalance in passenger distribution per auto-rickshaw. From the data we have collected we can say that 30 % of auto-rickshaws are running with over capacity. Also by the mode splits survey we can say that the use of auto-rickshaw is increasing continuously. It was 22% in 2012 and now it is 29% mode share.

IX. CONCLUSION

1. It is evident from the study that the passenger distribution for auto-rickshaw which is imbalanced and it is because of majority drivers are running their auto-rickshaw with shuttle system. Thus probable solution for these problem is city policed should take action against the drivers who's riding their auto-rickshaw with more than three passengers. Even city police should take measure to restrict the shuttles in the city.
2. It is observed from the study that due to shuttle system, drivers stops their auto-rickshaw for collecting the passenger's at anywhere, where there is no stop points so that the auto-rickshaw are creating congestion on the roads of city. Therefore, the following recommendations may be made to improve the services of the auto-rickshaw sector.
3. Pre- defined stoppages to pick up and alight passengers.
4. The maximum number of passengers carried should be less than or equal to the capacity of the vehicle.
5. Auto-rickshaw may not be permitted further to increase the noise pollution.
6. The old auto- rickshaw may be removed from the city for environmental pollution control.
7. The fare revision should be done as the last fare revised before 4 to 5 years.
8. To reduce the congestion new parking lots (auto-stands) should be provided as most of the autos are parked on road.

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