

TRAFFIC CONGESTION IN AZADPUR MANDI: A STUDY ON THE LARGEST VEGETABLES AND FRUITS MARKET OF ASIA

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ABSTRACT. India's intended nationally determined contribution emission which is safe, smart and sustainable green transportation network. Azadpur Mandi which is known for the biggest selling place of fruits and vegetable in Delhi is becoming a place of very heavy traffic area zone. People who are living nearby and the people coming to Azadpur Mandi facing a lot of traffic and also because of no proper direction hinted there people are not able to reach their destination on time. This paper assesses urban traffic congestions and its impact on the daily life of stakeholders and also advocates some possible solutions. In this research found results the number of vehicles has increased in the last ten to fifteen years. The total number of categorised vehicle has also increased. Azadpur Mandi has impacted the land value of the surroundings. The road infrastructure is not sufficient to cater to the traffic volume of this area. The number of lanes in this area is less. This paper outlines the problems of traffic congestion in Asia's largest sabji (Vegetable) Mandi by using statistical tools. There are very few parking lots inside and outside of the Mandi. This paper investigates the goal 11 of Sustainable Development Goals (SDGs). Goal 11 says to make cities safe, resilience, sustainable. According to the Delhi Traffic police, Azadpur is one of the most accident-prone hotspots of Delhi.

KEY WORDS: Traffic, Road, Infrastructure, Transport, Congestion, Azadpur Mandi

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INTRODUCTION

The vehicular road traffic and traffic jam have the liability of vehicular air pollution, noise impacts and accidents, which causes the impairment of many health issues. And all these issues are discussed in the United Nation's Sustainable Development Goals. Out of 17 Sustainable Development Goals, there are two goals which are directly related to the transportation. The present paper has been prepared and analyzed keeping in mind United Nations's Sustainable Development Goal 11, which discusses way to make cities safe, resilient and sustainable (UN 2019). This goal can be divided into sub-objectives, such as reducing the number of traffic accidents and the severity of accidents (Ghate and Sundar 2010). Lack of mass transportation systems, illegal encroachments on roads, lack of pedestrian facilities, and

weak traffic management systems are the major issues of concern in the Azadpur Mandi area. Increasing vehicle traffic is creating many parking issues in the Mandi. The Mandi is served with two main roads to connect and facilitate the traffic to supply Mandi goods and services, but there is inadequate parking space allocated for Slow Moving Vehicles (SMV) and cargo vehicles and other modes of transit on the market (Weinberger, John and Mathew 2010). Transport is a vital component of urban existence. Sustainability in freight transportation demands for a balance among economic, environmental, and social aspects in shipping commodities throughout a supply chain (Pathak et al. 2019). Transport facilities are important framework in the economy of any nation, especially in developing nation like India (Awasthi and Omrani 2018). Traffic rotaries are the notable widespread highlight of

traffic guidelines and the traffic board (Rao et al. 2011). Although the expression «sustainability» didn't pick up footing in India until the 1980s, worries about the outcomes of transportation innovation had begun some time before that (Sultana et al. 2017).

Sustainable development is a development which fulfils the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland Report 1987). A vehicle framework is the place where each individual or traveller can satisfy their versatility needs. It is in a fast, reasonable, sheltered, dependable, and ecologically generous way (Kumar 2014). Transportation systems are complex evolving systems. The presence of multiple, correlated, dynamically changing elements in the system with dependence and feedback add further complexity to the problem (Sayyadi and Awasthi 2018). A sustainable transport system defined by the European Council of Transport Ministers allows the primary access and development needs of individuals, companies and societies to be satisfied in a safe and compatible manner with an understanding of the human and ecosystem health (TERI 2013). Acharya (2005) Channelization has to be done in order to decrease the pace of the vehicles as they enter the crossing points from the carriageways. Channelization has to be done in order to decrease the pace of the vehicles as they enter the crossing points from the carriageways, Channelization will likewise go about as a wellbeing boundary for pedestrians and vehicle proprietors to comprehend the rules of traffic guidelines first and serve their best to maintain a strategic distance from the mishaps occurring in the Mandi, which furthermore makes the passerby crossing safe. Basu (2014) has explained that traffic congestion is an alarming problem on a global scale, and has exponentially increased.

The parking problem is a significant contributor to the question, as well as a substantial problem, such as the increase in the number of vehicles, not a segment of parking spaces and confined spaces in urban areas. Dawra and Kulshreshtha (2017) discussed that Indian cities are witnessing a spurt in urban growth. The growth in private vehicle ownership accompanies this increase in urban growth. Kumar and Ganguly (2018) explained that public transport sent have improved in both developed and developing countries, and various types of traffic have increased. There is an exponential growth in the number of vehicles on Delhi roads, which has risen from the 2.15 millions in 1971 to 6.33 millions in 1981, 18.68 millions in 1991, 34.55 millions in 2001 and to 76.11 millions in the year 2016 and further up (RITES 2016). The construction and maintenance of national highways is the responsibility of the central government, while the other roads fall within the jurisdiction of state governments or local bodies. The union territory of Delhi covers 0.04 percent geographical area of India (Anand 2010). Azadpur Mandi is Asia's biggest one of the most famous fruit and vegetable markets of India producing Mandi and thousands of commercial vehicles load and unload their vegetables and fruits daily here (Rao 2015; Upadhya 2016). It is located along the Grand Trunk (G.T.) Karnal road which connects inner Delhi to outer Delhi. This G.T. road is often reported as congested due to presence of heavy freight vehicles coming to Azadpur Mandi for transferring the goods (Singh 2018). Trucks in the Mandi coming from all the states of India use the entire national highway which connects to the Mandi. According to the Delhi traffic police, Azadpur is one of the most accident-prone hotspots in Delhi. India intends to implement nationally determined regulations for traffic emissions with a safe, smart and sustainable

green transportation network. Four-arm channelization intersection can provide more efficiency and safety to the road users (Martin and Shaheen 2010).

In Azadpur Mandi, more than 5000 trucks bring fresh produce from all over the country everyday (from places such as Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Punjab, and Uttar Pradesh), and the annual arrivals amount to millions of tones (APMC 2018). It is the most critical link in Delhi's food supply chain. Earlier the Mandi was situated in old subzi Mandi area. In 1968, a fire broke out there and it got completely burnt.

In the same year, the govt decided to shift the market and selected the present location for it. The allotment process of this new Mandi started in 1969, but it was ultimately completed by July 1976 (APMC 2018). In central business areas of the city, because of less space, demand for parking spaces has grown by a large amount in recent times. Sustainable portability is fundamental to guarantee financial practicality, ecological well-being and improve personal satisfaction in present day urban communities (Awasthi and Omrani 2019). Due to lack of parking space in Azadpur Mandi, people are used to parking their vehicle on the road. This narrows down the road width and causes traffic congestion problem. Due to this people tend to waste a lot of their time and energy near Azadpur Mandi and have various urban issues, for example, clog, air contamination, unending urban spreads and improper land improvement with low urban thickness (Way and Ming 2019).

Research Question

What is the growth of vehicles in Azadpur Mandi?

What are the types of motor vehicles in Azadpur Mandi?

What is the traffic flow pattern of Azadpur Mandi?

What are the major problems occurs from the traffic Congestion?

To justify this paper, three objectives have been designed which gives the holistic view and describe the causes to understand the traffic congestion of Azadpur Mandi. These objectives are as follow;

To analyse the growth of vehicles and its footfall in Azadpur Mandi.

To understand the traffic flow of vehicles and their characteristic in the study area.

To study the travel characteristics and people perception about traffic congestion in Azadpur Mandi.

MATERIALS AND METHODS

In this study both primary and secondary data sets have been used to fulfil the requirements of the study. Two hundred respondents have been selected through random sampling technique and Purposive sampling technique. Questionnaire has been organised to fulfil the objective of study with proofed out to be ideal for this purpose. The selected sample of people included all the working-class section of the Azadpur Mandi, i.e. from the wealthy class to poor class. People's perception about traffic issues was collected from Azadpur Mandi. The secondary data such as the registered number of vehicles is collected from Transport Department Government of Delhi. The analysis of collected data Quantitative methods have been used and presented with the help of descriptive statistical technique, using of SPSS software, MS office. All stakeholders including residents, labours, transport service providers, costumers and shopkeepers have been taken into consideration during the survey to achieve the required metadata amount to fulfil the objective requirement. Authorities concerned and other service providers/controllers such as

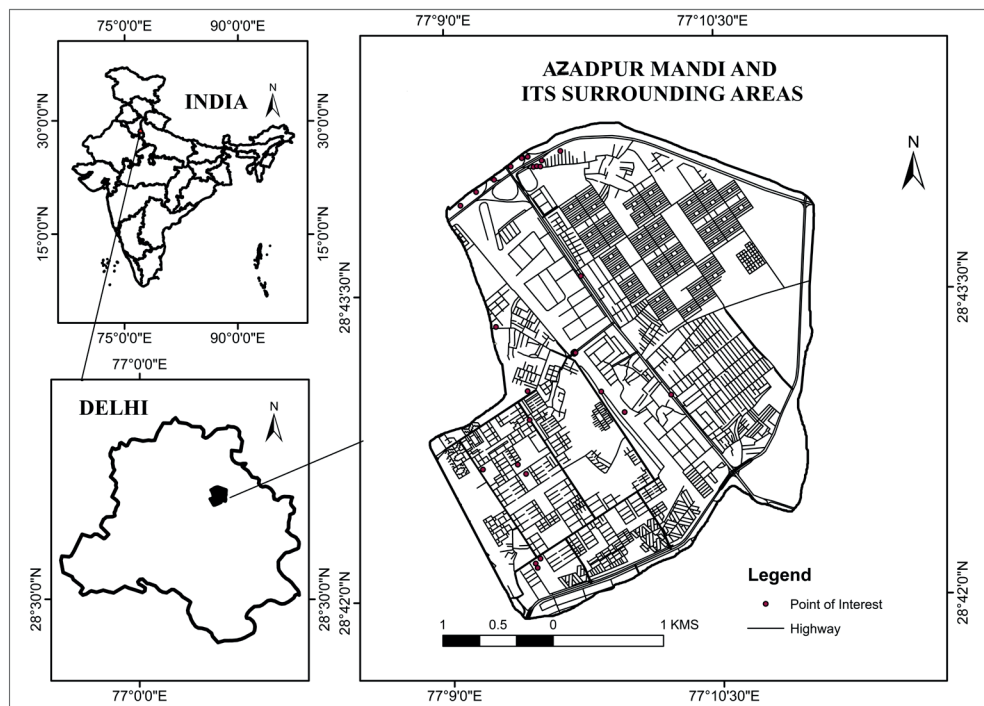


Fig. 1. Location of Azadpur Mandi

Source: Census of India, 2011

Delhi Transportation Corporation (DTC), Central Pollution Control Board (CPCB), Municipal Corporation of Delhi (MCD), Delhi Development Authority (DDA), Centre for Science and Environment (CSE), Delhi police and the School of Planning and Architecture (SPA) have also been taken into consideration during preparation of impact related metadata. Other archive sources like journal, books, newspaper and reports are also have been consulted and analysed for the completion of study.

The area of Azadpur Mandi is at $28.71^{\circ} 28'N$, $77.17^{\circ}08'E$. Azadpur Mandi comes under the northwest district of Delhi. As per the Census of India 2011 figure, the population of this district is 883,418. Population density is at 14, 973 inhabitants per square kilometres. Azadpur Mandi has a total of seven gates; the people of the area commute from this route and face many environmental and social problems due to unavailability of parking for the vehicles. Azadpur Mandi is essential for Delhi as it provides the nutritious vegetables and fruits to the Delhi residents. The livelihoods of millions of peoples are dependent on Azadpur Mandi. However, lack of proper parking facility is now creating severe environmental issues (CPCB 2010) in the Mandi.

RESULTS

The networks of roads in Delhi are maintained by the National Highway Authority of India (NHAI), Delhi Development Authority (DDA), Public Work Department (PWD), North Delhi Municipal Corporation (NDMC) and Delhi Cantonment Board (Singh et al. 2016). The road networks of Delhi have been categorized into four types, i.e., arterial road, sub-arterial road, minor arterial road and collector road. Azadpur Mandi is located along the Grand Trunk (G.T.) Karnal road which connects inner Delhi to outer Delhi.

Growth of Registered Vehicle

Vehicles of the all over state as well as Delhi NCR region come to Azadpur Mandi. It received the influx of the vehicles

which are increasing by huge numbers continuously. To meet the growing demand of vegetables and fruits of this region Mandi receives fruits and vegetables from all over the country which further distributed to next level of supply chain from here. In this process, Azadpur Mandi receives a large number of trucks and loaders and it is showing the sign of continuous increasing. On other hand the numbers of vehicles in Delhi as well as in the study area also souring with the increase of the population. The trends of motor vehicles count is presented in Fig. 2. It can be observed that the yearly growth rate has registered an exponential growth since last decade both in Delhi as well as in the study area. However, it is also observed that the growth in number of vehicle has been reduced in last year but it is not much to ease the load of vehicles in roads. In Azadpur Mandi, more than 5000 can be spotted every day. The numbers of the vehicle are increasing on the daily basis.

Growth of Different Type of Vehicle in the Azadpur Mandi
There are many types of vehicles have come to Azadpur Mandi with different perspectives like trucks and loader to transports the different products. As it known to all that this is the largest Mandi of Asia, it provides thousands of the people to earn their livelihood means. Due to apathy of public transport system and social compulsion, most of the people who work in Mandi come here with their own vehicles and add to the numbers of vehicles in road. In this study, all vehicles has been categorised in four categories to proper understanding the load of vehicles in arteries of Azadpur Mandi. The number of light motor vehicles has increased since 2011, and there has also been a rapid increase in the numbers of two-wheelers also. The distribution can see the growth of vehicles in the Azadpur Mandi for the various types of vehicles entering to Mandi (Fig. 3).

Fig. 3 shows that there has been a rapid increase in the number of Light Motor Vehicles (LMV) in 2015-2016. LMVs include motorcars, jeeps, taxis, delivery vans. Light Motor Vehicles are used for various applications ranging from personal to commercial use. However, there are total 7 seven gates in Azadpur Mandi for swiftly movement of traffic but the problem here is that all vehicles come at the same time since there's no provision for different time slot for entrance of the vehicles, which is one of the reasons for traffic congestion in Azadpur Mandi.

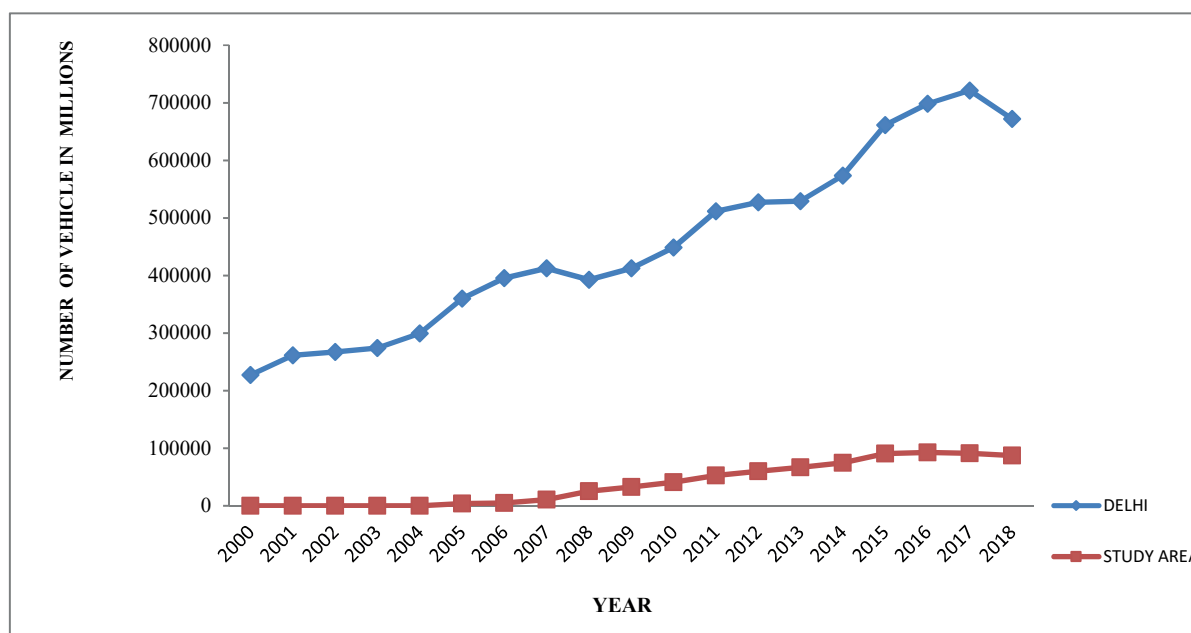


Fig. 2. Trend Comparison of the Total Number of Registered Vehicles in Delhi and Azadpur

Source: Regional Transportation Office (RTO), 2018

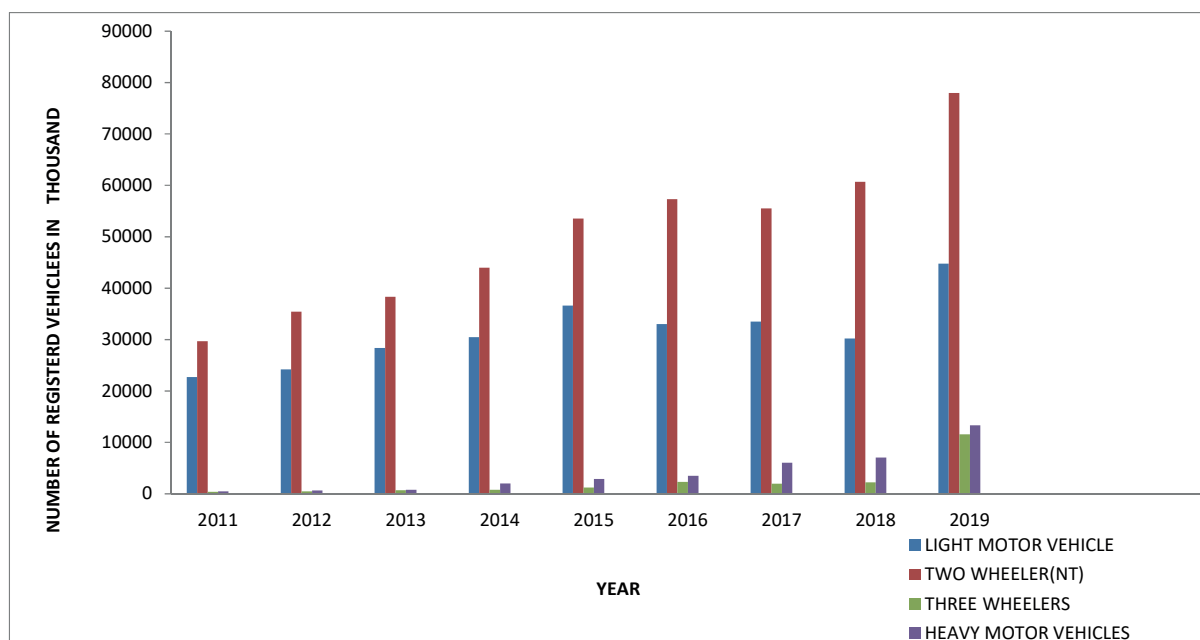


Fig. 3. Total Number of Category-wise Registered Vehicles in the Azadpur Mandi

Source: Regional Transportation Office (RTO), 2018

DISCUSSION

Traffic characteristics study is very vital for designing the required geometric features in the roadway. It includes volume of traffic, speed of traffic, and percentage of trucks or larger vehicles like bus, etc. Study of traffic characteristics helps to avoid direct conflicts, reduce crash rates and their severity, provides orderly traffic flow.

Traffic Characteristics

The lack of public transportation in Azadpur Mandi forced the increase in private mode for travel needs to result in an increase in privately owned vehicles. Most of the people use their own vehicles or hired private taxis, auto rickshaw, cycle rickshaw and cycles, e-rickshaw, ten tyre-trucks, six tire trucks etc. The poor management of traffic become worst in the peak hours when entire fleet of loaded vehicles enter the Mandi. There are

many themes to study the traffic characteristic which has been discussed below;

Traffic Flow

Study of the traffic flow helps to understand the traffic characteristics of an area. Here to understand this and fulfil the objective of the study traffic flow has been measured in peak days and non-peak days. Table 1 shows Traffic flow near gate of Mandi and it has been observed that in peak days there are very high traffic flows which create traffic congestion primarily.

The above table shows the traffic flow of Grand Trunk (G.T.) Karnal road in peak days, which is Monday to Saturday (on Sundays the Mandi remains closed). The survey was conducted on 5th February 2018 from 9.00 am to 11.00am and then from 1.00pm to 3.00 pm. The number of vehicles from Azadpur to bypass was higher than bypass to Azadpur. This route is used for many different purposes

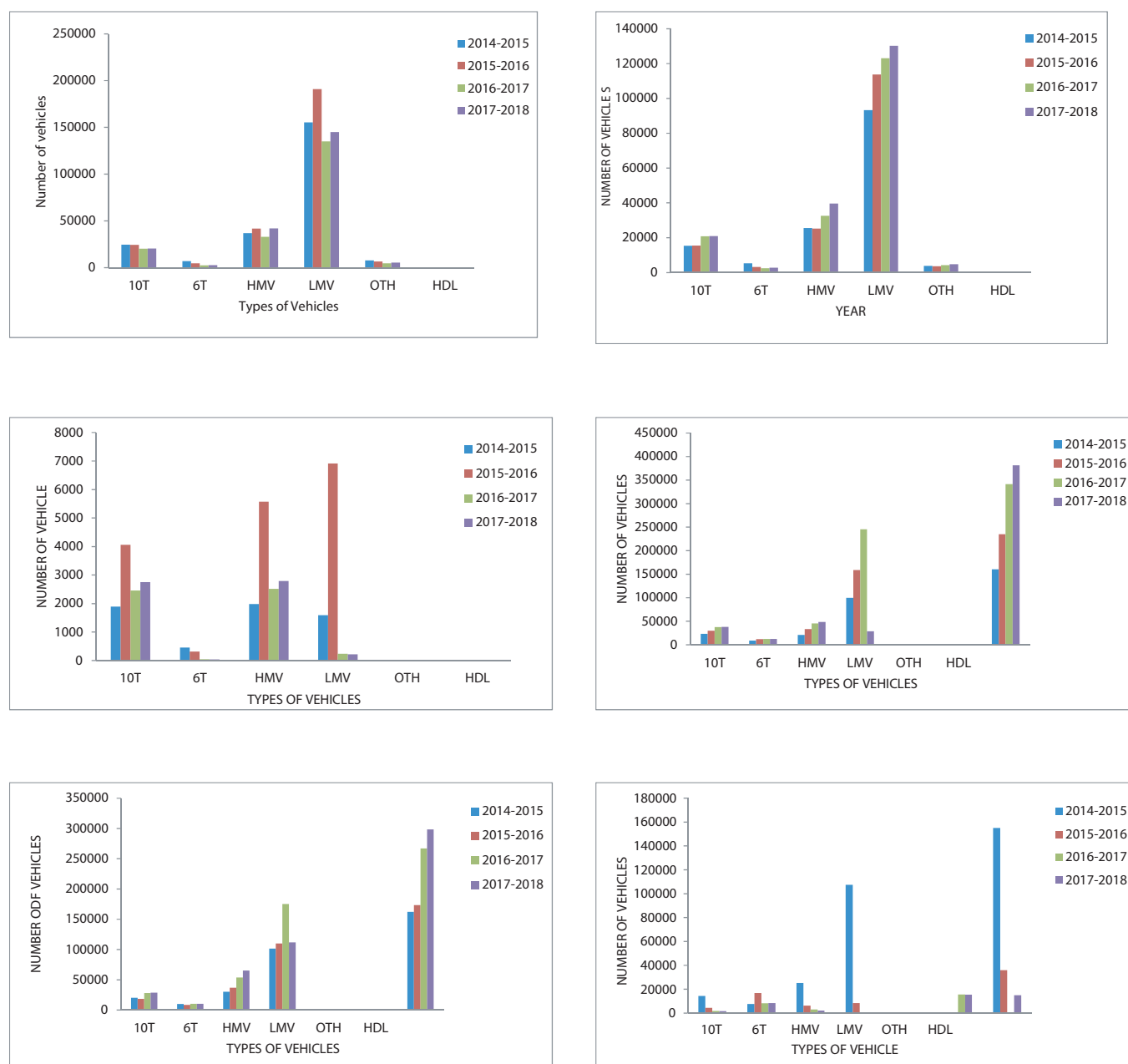


Fig. 3a. Total Number of Category-wise Registered Vehicles in the Azadpur Mandi

Source: (APMC), 2018

Table 1. Traffic Flow in Peak days

| Local Field Survey (Traffic Flow) Peak Days | | | | | |
|--|-------------------|-----------------------|-------------|-------------|---------------------------|
| Date 05/3/2018 | | Place G.T Karnal Road | | | Time: 9:00 Am to 11:00 Am |
| S.No. | Name of Road | LMV (in no.) | MMV(in no.) | HMV(in no.) | TOTAL TRAFFIC FLOW |
| 1 | Azadpur to Bypass | 462 | 749 | 557 | 1768 |
| Date 06/3/2018 | | Place G.T Karnal Road | | | Time: 9:00 Am to 11:00 Am |
| 2 | Bypass to Azadpur | 467 | 507 | 335 | 1309 |
| Date 12/3/2018 | | Place G.T Karnal Road | | | Time: 1:00 pm to 3:00 pm |
| 1 | Azadpur to Bypass | 580 | 639 | 987 | 2206 |
| Date 13/3/2018 | | Place G.T Karnal Road | | | Time: 1:00 pm to 3:00 pm |
| 2 | Bypass to Azadpur | 379 | 510 | 580 | 1469 |

Source: Primary Survey, 2018

like jobs, education, etc., as it connects inner Delhi to outer Delhi. Afternoon time slot 1.00pm to 3.00pm found more traffic than the morning slot. The cause of heavy traffic here was that this road linked Delhi to other states like Haryana, Himachal Pradesh, etc. It has been observed that local people also use this same route to reach their destinations.

Table 2 shows the traffic flow of G.T. Karnal road in nonpeak days. The survey was conducted on 11th November 2018 from 9:00 am to 11:00 am and then again from 1:00 pm to 3:00 pm. Nonpeak days received a smaller number of the vehicles as compared to peak days because on Sunday all offices and schools are closed along with the Mandi.

Table 3 shows the percentage of people for different opinions regarding the traffic flow for different age groups. 64.9 per cent respondents from 60 years above age group believe that there is an increase in the traffic flow and the volume in recent times. At the same time, 60.6 per cent in the age group of 40-60 years also said that there is increase in traffic flow.

Road Density

Road density study also helps to understand the traffic characteristic and provide a logical solution for the problem of traffic congestion. The road density of the Azadpur

Mandi and the surrounding streets which are in the area is very high because the width of the street is just 3.5 to 4 meters. It received more than 5000 trucks and other sorts of vehicles every day. The wider roads are more significant to allow more vehicles to ply on it. The existing Right Of Way (ROW) of the secondary path is 7.5 m, and there is no significant differentiation among side lanes and the main road. People and vehicles use the same narrow road at the same place and makes the whole scene very chaotic.

Table 4 shows the percentage of respondents related to the composition of traffic in the study area. This table also shows the distribution of vehicles which created the most significant nuisance on the roads. According to the respondent's percentage of age group 40-60 years, people said Slow Moving Vehicles (SMV), buses, private cars, and two-wheelers were the most significant problem causing vehicles on the roads of the study area.

The age group of 20-40 years respondents said that 47 per cent of trucks and tempos were the most problematic vehicles in the study area. The old age group of above 60 years old age people said that the most problematic vehicles are the slow-moving vehicles since they are often loaded above their carrying capacity, which in turn slows them down and creates problems for other commuters. Most of the respondents were from the 40 to 60 years age group, and there were very fewer respondents in the age

Table 2. Traffic Flow in Non-Peak days (Sunday)

| Local Field Survey (Traffic Flow) Non- Peak Days | | | | | |
|--|-------------------|-----------------------|-------------|-------------|---------------------------|
| Date 4/11/2018 | | Place G.T Karnal Road | | | Time: 9:00 Am To 11:00 Am |
| S.No. | Name of Road | LMV (in no.) | MMV(in no.) | HMV(in no.) | TOTAL TRAFFIC FLOW |
| 1 | Azadpur to Bypass | 230 | 749 | 289 | 794 |
| Date 11/11/2018 | | Place G.T Karnal Road | | | Time: 9:00 Am To 11:00 Am |
| 2 | Bypass to Azadpur | 345 | 507 | 312 | 947 |
| Date 18/11/2018 | | Place G.T Karnal Road | | | Time: 1:00 Pm To 3:00 pm |
| 1 | Azadpur to Bypass | 320 | 520 | 324 | 1164 |
| Date 25/11/2018 | | Place G.T Karnal Road | | | Time: 1:00 Pm To 3:00 pm |
| 2 | Bypass to Azadpur | 360 | 254 | 360 | 974 |

Source: Primary Survey, 2018.

Table 3. Traffic flow: People perception

| Age of the Respondents (years) | Increase in the flow of traffic in recent times (%) | | | |
|--------------------------------|---|------|--------|-------|
| | Yes | No | Others | Total |
| Below 20 | | | | |
| 20-40 | 18.8 | 17.5 | 63.7 | 100 |
| 40-60 | 50.4 | 21.6 | 28 | 100 |
| 60 Above | 60.6 | 38.1 | 11.3 | 100 |
| | 64.4 | 24.5 | 11.1 | 100 |

Source: Primary Survey, 2018

Table 4. Distribution of Most Problematic Vehicle

| Age of the Respondents (years) | Type of vehicles (%) Respondents Percentage | | | | | | | |
|--------------------------------|---|-------------|----------------|--------------|-------|-------------|--------|-------|
| | Slow moving vehicle | Two-wheeler | Three Wheelers | Private cars | Buses | Truck/Tempo | Others | Total |
| Below 20 | 15.5 | 27.1 | 12.6 | 6.6 | 18.8 | 13.5 | 5.9 | 100 |
| 20-40 | 14.3 | 11.1 | 20.0 | 15.8 | 14.3 | 21.0 | 3.5 | 100 |
| 40-60 | 25.4 | 15.0 | 15.0 | 20 | 20 | 11.8 | 4.8 | 100 |
| 60 Above | 21.4 | 24.1 | 15.0 | 13.6 | 10.0 | 10.6 | 4.3 | 100 |

Source: Primary Survey, 2018

group Below 20 years and above 60 years. Because in the Mandi most people are in the age group of 40-60 years and have been working for more than 15 years there, they have seen more road traffic problems than the people of other age groups. As per respondent, the flow of traffic had increased in the last 15 to 20 years. They said that the number of trucks entering the city is increasing as the population is also increasing day by day. «log badhenge to zarurat to badhegi hi (when people increase, then the needs also increase)» was what one of the respondents said. Fig. 4 shows a typical traffic jam in the streets of the Mandi. It can be clearly seen that different kind of vehicles are entering and exiting at the same time on the seemingly narrow road. There are no separate lanes for different type of vehicles whatsoever. The very same road can be seen to be used for parking as well. There should be dedicated parking space for the vehicles so it can make resilient for people. It also can be seen in fig. 4 that some vendors have placed their shops on the road itself, and people are gathered near these stalls to eat. All this adds to the traffic jam in the study area.

The model share of passenger trips in the study area is presented in Table 5. The table shows that 95.5 percent of the 40-60 year age group people are rich aadhti or prominent merchants travel by their own cars. While 46.7

per cent palledar who are in 20-40 years age group use bicycle to commute into the Mandi. And 54 per cent of people commute by a commercial vehicle such as three-wheelers, e-rickshaw Bus, etc.

People's Perception of Road Traffic

In the survey results, 48 out of total respondents said, they were stuck for more than 5 hrs inside the Mandi due to bad traffic management. There are many schools, offices, hospitals, industries, and other institutions in nearby areas. Delay due to traffic affects everyone. Many respondents said they get late many times while reaching their concerned destinations. There should be different timings for different type of vehicles for entering in the Mandi, so it will not create chaotic environment, there should also be different lane for various type of vehicles so traffic congestion can be addressed.

Delay Due to Traffic

Table 6 shows the percentage of respondents for delay of traffic. Sixty-one per cent of respondents in the age group of 40-60 years said that they usually stuck in the traffic for less than 30



Fig. 4. Traffic Congestion in the Azadpur Mandi

Primary Survey, 2018

Table 5. Model Share of Passenger Trips

| Age of the Respondents (years) | Mode of Transportation used by Respondents (%) | | | | | | Total |
|--------------------------------|--|--------------|---------------|-----|---------------------|--------|-------|
| | Bicycle | Two wheelers | Three-wheeler | Car | Commercial Vehicles | Others | |
| Below 20 | 23.3 | 20 | 24.4 | 0.1 | 27.1 | 5.1 | 100 |
| 20-40 | 23.7 | 24.5 | 12.9 | 4.5 | 25 | 9.4 | 100 |
| 40-60 | 10 | 23.7 | 13.3 | 5.5 | 24.2 | 3.3 | 100 |
| 60 Above | 9.4 | 30 | 11.9 | 5.2 | 32.3 | 1.2 | 100 |

Source: Primary Survey, 2018

min. These people use to commute daily from these routes for various purposes. While 48 per cent of the respondents said that they are stuck for more than 5 hrs inside the Mandi due to bad traffic management.

Construction of the Flyover

Table 7 shows the percentage of people on their opinion related to the construction of the flyover. It shows how much traffic problems are reduced after the creation of the flyover. It also indicates whether there is any reduction in the traffic on the Grand Truck (G.T.) road after the construction of the flyover. Among all the respondents of age group 40-60 years, 71.2 per cent respondents said that the construction of the flyover had not improved the traffic condition inside the Mandi. While 45 per cent of the respondents of the same age group believed that traffic condition, to a more significant extent, has been enhanced after the construction of the flyover.

Problems Related To Road Traffic Condition in Azadpur Mandi

As per the findings of this study, Azadpur Mandi is facing severe problems. Among them, the first and the most serious problem is of traffic congestion. Almost everyone commuting to the Mandi face this problem. This ultimately results in massive loss of their precious time. As per the survey of the study, among all the respondents between 40-60 age group, 86 per cent of respondents believe that increase in traffic congestion inside the

Mandi area has resulted in great danger for the pedestrians. Table 8 shows the percentage of respondents related to the road traffic inside the Azadpur Mandi. Among all the respondents of age group 40-60 years, 63 per cent of the respondents believe that traffic congestion has created a lot of Air pollution (like fumes) inside the Mandi. Air contamination is a considerable natural hazard for the well-being, and it is assessed to cause roughly 2 million deaths because of PM 2.5 (Chatterjee 2018). The transient health impacts of particulate and vaporous air toxins have been all around recorded, through time-arrangement contemplates relating momentary heights in surrounding levels of such contaminants to increments in grimness and mortality from cardio respiratory conditions (Smoli et al. 2008).

Among the age group of 40-60 years, 52.4 per cent respondents said that they got irritated by the traffic Noise. While 40.5 per cent of the respondents among the age group of 20-40 years complained about delays due to traffic jams. Among all the respondents of the age group of 20-40 years, 64.7 per cent of the respondents complained that the condition of roads inside the Mandi is not safe for the pedestrians. In the same age group, 56.3 per cent of the respondents had a complain regarding the parking (Table 8).

The traffic conditions of the cities, especially in Delhi have deteriorated to a level of great concern (Davis et al. 2017). The current situation of the traffic conditions results from the road infrastructure of the Azadpur Mandi and the surrounding regions. Azadpur Mandi is located along the G.T. Karnal road. There are many densely populated

Table 6. Delay due to Traffic

| Age of the Respondents (years) | How many hours do you stuck in the traffic (%) | | | | | |
|--------------------------------|--|-------------|---------|--------|-------------|-------|
| | Below 30 min | 30min -1hrs | 1-2 hrs | 2-3hrs | Above 3 hrs | Total |
| Below 20 | 23.1 | 18 | 20.9 | 30 | 8 | 100 |
| 20-40 | 33.3 | 13.1 | 17.9 | 23.7 | 12 | 100 |
| 40-60 | 17 | 34.8 | 8.8 | 20.9 | 18.5 | 100 |
| 60 Above | 2.4 | 46.9 | 28.8 | 11.1 | 10.8 | 100 |

Source: Primary Survey, 2018

Table 7. Construction of the flyover

| Age of the Respondents (years) | Do you think the construction of flyover has reduced the traffic conditions (%) | | | | |
|--------------------------------|---|--------------------|-----------------------------|--------|-------|
| | Not improved | Partially improved | Improved to a larger extent | Others | Total |
| Below 20 | 44.1 | 30 | 19.6 | 6.3 | 100 |
| 20-40 | 17.7 | 28.9 | 45 | 8.4 | 100 |
| 40-60 | 21.2 | 26.2 | 40 | 12.6 | 100 |
| 60 Above | 20.8 | 23.1 | 38 | 18.1 | 100 |

Source: Primary Survey, 2018

Table 8. Problem caused by Road Traffic in Azadpur Mandi

| Percentage regarding road traffic conditions in Azadpur Mandi | Age of Respondents (%) years | | | | |
|---|------------------------------|----------|----------|-------------|-------|
| | Below 20 Yrs | 20-40Yrs | 40-60Yrs | 60Yrs above | Total |
| Air pollution / fumes / Dust/dirt | 18.2 | 33 | 33.6 | 18.2 | 100 |
| Irritation from traffic noise | 12.7 | 27 | 52.4 | 7.9 | 100 |
| Congestion | 9.1 | 15.2 | 60.6 | 15.2 | 100 |
| Delay due to travel time | 13.5 | 40.5 | 18.9 | 27 | 100 |
| Pedestrian danger | 16 | 13.3 | 60.7 | 10 | 100 |
| Unsafe road condition | 11.8 | 34.7 | 23.5 | 30 | 100 |
| Parking Problem | 6.3 | 40.3 | 37.5 | 16 | 100 |
| Over speeding Frequent lane changing | 14.3 | 30.7 | 25 | 35 | 100 |

Source: Primary Survey, 2018

residential colonies nearby such as Adarsh Nagar, Kewal Park, Jahangir Puri, Azadpur Village.

CONCLUSION

This research talked about the ownerships of the vehicle and found that the total number of registered private vehicle has increased. The urbanisation rate and the population growth of Delhi has increased which has caused a rise in fruits and vegetables demand. That's why the number of the vehicle into the Mandi has risen. Azadpur Mandi received several vehicles for the last ten-year including various type of loaded heavy motor vehicles to the light motor of the vehicle and the slow-moving vehicles. The Azadpur Mandi is situated in a strategically important place. People use this area for various purposes as it is surrounded by two important hospitals, Fortis

and Max super speciality hospitals. A large number of people commute to Adarsh Nagar sabzi Mandi railway station, Jahangir Puri metro station and Adarsh Nagar metro stations. Many people come from Haryana every day for employment and education purposes. All these factors lead to worst traffic conditions in Azadpur Mandi and the surroundings of Mandi. The road infrastructure is not sufficient to cater to the traffic volume of the area. In Azadpur Mandi vehicles should shift the fuel system from petrol to CNG and electric and solar vehicles. There should be more research and development of alternative power systems for cars, and this should be a high priority of government and vehicle manufacturers of India. Hence my study result also suggests the criteria of Sustainable Development Goals 11 are also not being met under the current scenario. ■

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