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Assessment of Parking Space Demand : A Case Study of Hisar jn. Railway Station

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Abstract: Every mode of transportation involves three necessary elements, without which it cannot operate effectively: the vehicle, the right-of-way, and the terminal. For water transportation, these essentials consist of the vessels, waterways, and port facilities; for railroad transportation, trains, tracks and stations; for air transport, planes, airways and airports. Similarly, the elements of motor transportation are vehicle, the road, and a place to park at the end of the trip or destination. This study will be conducted for investigation and evaluation of problem related to present parking facilities at Hisar Railway Station (Bikaner Division) Haryana. The license plate method will be conducted for collecting the data of current conditions for improving services. The parking management strategies like short term, medium term and long term, the way that can be implemented are discussed. To solve the current parking problem and solutions which are used to recommend that will manage the parking facility of off-street parking. But based on the future parking demand in the study area long term parking management can also be suggested, such as provision of Multistory Parking.

Keywords: Parking Space , Parking Demand , Parking Capacity , Two Wheeler , Four Wheeler , Congestion.

I. INTRODUCTION

In India mostly all cities are suffering for a want of sufficient parking facilities. In Haryana, Hisar City is known for its Steel Trade, Textile Trade, Quality Education System i.e Haryana Agriculture University (Largest Agriculture University in Asia) and Lala Lajpat Rai Animal & Veterinary University , Guru Jambheshwar Science & Technology University , Central Research Institute on Equines , Central Research Institute on Buffaloes , Central Sheep Breeding farm ,Regional Fodder Station , Northern region Farm Machinery Training & Testing Institute , large number of livestock farms with the Central Livestock Farm . Because of the Division/Circle/Corporation Hisar Traffic System and Parking facility got complex. The increase in population has put a pressure on the existing transportation system in the city, which has been unable to cope with the Rapid Growth of City. The shortfall in public transportation system has created a vacuum in transport supply causing people opting for personal modes like two wheeler and four wheelers and it requires good parking facility. Hisar railway station road is the lifeline of station area of Hisar city & Red square market. High volume of traffic consisting of both fast and slow moving vehicles is passing through the road. Major traffic generators like bank, restaurants, commercial centers, shopping complex, residential flats, railway station etc, are located along the road. This in turn high parking demand along this road. There are lots of peoples whom are commuters by using railway as transport mode. So that, they are parked their vehicles in station parking area. Therefore, provision of adequate parking facility is essential.

A. Parking Scenario In India

India seems to be moving on the right track to have better parking policy. If reports are to be believed, the Modi-led government may soon allow registration of vehicles only once the vehicle owner produces a certification of availability of parking space. This certification will have to be given to the authorities during the registration process. This move will help the government to overcome the traffic and space congestion woes across the country, especially cities. For this Union Urban Development Minister M Venkaiah Naidu (Currently Deputy President of India) at an event said, "I am holding discussions with Nitin Gadkari and also sensitising the states. We are moving in that direction (to get such a mechanism implemented)".

In a city's central business district (CBD), much of the economic activity is concentrated in a small area. This makes it easier for people to, say, make their purchases in a short period of time without having to commute. This is also the reason why commercial enterprises around CBDs have to be content with very little space. A close look at Delhi's Connaught Place and Mumbai's Nariman Point would show you the same. However, while Connaught Place is the fifth most expensive office space market in the world that charges an annual rent of \$157 per square foot (approx. Rs 10,663 per sq ft*), the monthly parking charge here for category-A parking lots is merely Rs 186 per square metre. This means that a square foot of commercial space costs as much as 50 times of that

of a square foot of parking space. In posh Khan Market, India's most expensive retail market, Khan Market Traders Association (KMTA) charges Rs 93 per square metre per month.

Delhi is not unique in this aspect. According to a study of Colliers International in 2011, Mumbai's CBD parking charges were lower. In fact, parking spaces in Connaught Place, Nariman Point and Khan Market cost far more than many cars parked in those space. When compared by Colliers International in 2011, New York's parking charges were 31 times of that of the parking charges in Delhi, and London's was 50 times higher.

When such studies were done across the world, the cost of free parking was found to be mind bogglingly huge. When studies on cruising behavior was done in CBDs in 11 continents, they showed that 30 per cent of the cars on the roads were found cruising for parking and the average time it took to find a free parking space was eight minutes. All this shows parking spaces are, undoubtedly, valuable real estate that is highly under utilized. George Mason University Professor Tyler Cowen rightly asks: If we don't give away cars, why give away parking spaces?

Further, India faces a much graver problem. Streets here are narrow, while the population density is high. This is especially true of large Indian cities like Mumbai and Kolkata. Despite the fact that only a small minority of the people drive through roads, driving in India does not offer the advantage of speed, like in the US, because roads are congested. So, every vehicle on the road counts. Former World Bank researcher Alain Bertaud once said that transport is mostly a real estate problem. He also argues that Mumbai's streets are too expensive for ox carts to travel.

According to the Centre for Science and Environment (CSE), car parking slot require 23 to 28 sq mt of land, while a low-income home occupies 40 sq mt. Data show that Delhi's slum population of 4.5 million people occupy merely three per cent of the land, while parking spaces occupy 10 per cent of the city's urbanised land. This means that free parking spaces impose huge costs on low-income households. This is one of the greatest barriers to the government's Housing for All mission.

In New York midtown area, road area per person is 33.3 sq mt per person; in Mumbai's Null Bazaar, it is merely 1.7 sq mt. This means that a vehicle that stands in Mumbai's Null Bazaar imposes nearly 20 times as much cost than it does in New York midtown area. CSE found that in Connaught Place parking demand declined by 10 per cent after the metro came into existence. By developing more mass transit network, valuable space given to parking lots may be reduced to a great extent. Note that Delhi metro is the 12th largest subway network in the world and that the decline in parking demand was merely 10 percent.

Cities in low-income countries like India are more likely to be monocentric. This means that much of the trips are from suburbs to the city center. This would mean that many people drive to the Metro station near where they live and travel in Metro to CBDs. But, as they are not likely to drive from CBDs to their work place in their own car, many rickshaw drivers and other vehicles would wait near transit stations in the CBD. This requires greater parking space than in cities where people drive from suburb to suburb for most of their needs. Drastically increase in population of India have created many problems, one of the challenging once being parking which we confront almost every day. With globalization, privatization there has been an increase in employment opportunities in our cities. Subsequently, the income levels of people have risen. This rise, coupled with the decreasing cost of automobiles, has led to a huge increase in the demand for private vehicles.

II. LITERATURE REVIEW

The parking demand is observed to be high at major commercial and work centers which are usually located within the central areas of the city. This is due to functional role of these centers in urban economy. However, now the cities are been planned having distinct and distributed CBD areas over the entire city

A. *The Global Implications for Parking Demand*

A statistical reference point in time puts the world motor vehicle census to 12,588,949 (about 12.6million). In a breakdown of the figure, North and South America put together had a share of 11.16million vehicles while Africa had just 55,832. It is however noted that motor vehicles and ownership, from this reference period, has been growing at a dynamic and exponential rate. In the year 1960, the world motor vehicle rose to about 125million, and then doubling the figure by the year 1970. The trend continued up to the year 2002 when the world vehicle population rose to about 800 million. Thus, the rate of growth of the total stock of motor vehicles in the world is about 3 percent per year. At this rate, the number of motor vehicles is expected to double in 25 years. Findings from the literary statistics shows that the trend and character of motorization is not evenly spread across the globe. Some regions or countries are placed ahead in the vehicle holding per 1000 people influenced by demographic and economic factors. In other finding bordering on the regional relativity, the number of motor vehicles around the world increased by about 60 percent between 1980 and 1995 with one third portions recorded in countries of the Far East including Japan, China, Taiwan, Cambodia and

Thailand. Since the year 2000, the world vehicle population had been on the increase at the rate of 3.6 percent up to the year 2010 thus reflecting the world figure of over one billion vehicles in operation. China particularly, played a major role in overall vehicle population growth in the year 2010 and made the country to have the world's second-largest vehicle population after the United States of America. Also, India, Brazil and some other countries recorded increases in their vehicle population. The unprecedented surge in the rate of vehicle ownership in the early 20th century brought to the fore increased demand for parking spaces on-street and the consequent problem of street congestion and associated dangers due to many more vehicles exercising on-street parking. The negative attributes and restriction policies of on-street parking necessitated considerations for alternative provisions for parking at a period when the demand for parking spaces were becoming critical and congestion was already a bane. Off-street parking (parking spaces provisions detached, but having access, from the street and linking the building/facilities the serve) became a solution to decongest the street of vehicles that were not in motion. The implied policies merely encouraging the use of off-street parking did not fully take care of the demand for parking spaces as there were controversies in development requirements bordering on the provision of parking spaces (parking requirements). The requirement was borne out of the effect of heavy reliance on the use and ownership of motor vehicles in conjunction with the high level of traffic congestion that ensued, especially at the city centers. According to Shoup, parking requirements are based on the observations made on the number of cars parked (at peak periods) at locations of existing developments. They are implicitly based on the observed demand for free parking. Shoup's argument were majorly based on the cost implication of providing off-street these parking spaces. Apart from this, the minimum parking requirement has also been subjected to other opinions peculiar to advanced level of traffic congestion and management. These include the excess provision of parking lots, the resultant increase in the demand for car travel and the notion of the exercise of parking as a right, all of which hitherto have been the results of some related studies carried out in such respects. The management of parking is considered to be borne out of the need to control the generation and the demand for parking vis-à-vis the existing parking supply with the aim of achieving efficiency of the roadway system. Thus, the management of parking is considered to be transportation demand management (TDM) oriented. According to Litman, parking management refers to various policies and programmes that result in more efficient use of parking resources. Several literatures including Spack, M., et al., Kuzmyak, et al. describes TDM as a binding agreement outlining the efforts the owner/tenants towards reducing their traffic impact and to reduce parking demand and traffic generation by 10 to 20 percent compared to typical demand standards of the Institute of Transportation Engineers (ITE). Parking management can therefore be described as one that embraces the totality of sustainability as regards the ordering and optimal use of spatial environment with parking demand being the central issue. It proffers solutions to problems evolving with the trend of motorization without definite or deliberate control of its widespread adoption and consequential effects.

III. RESEARCH METHODOLOGY

The study involves collecting secondary data from various sources and primary data collection conducting actual fact finding surveys. In primary data collection various locations visited and observe actual status of parking on site. The status of parking was physically observed on site. The data collection formats prepared after reconnaissance survey and selection of method for survey. Detailed survey of the parking lots carried out during peak and nonpeak hours. During this survey, sizes of vehicles available at survey places were measured. The provision of parking convenience, required parking as per actual demand are worked out.

A. Steps To Be Followed In Methodology

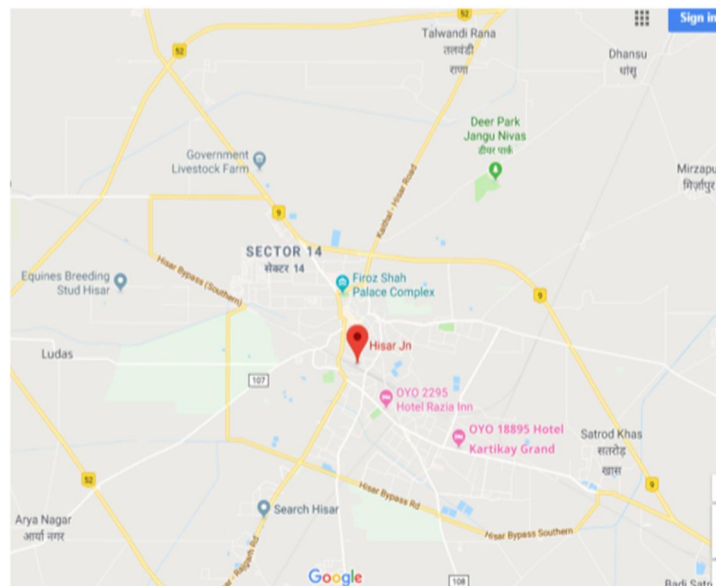
- 1) Review of Existing and Future Data, Paper, Plans.
- 2) Analysis of Existing and Future Data.
- 3) Design & Evaluation of Primary Survey (Inventory).
- 4) Future Demand Forecasting.
- 5) Conclusion and Implementation.

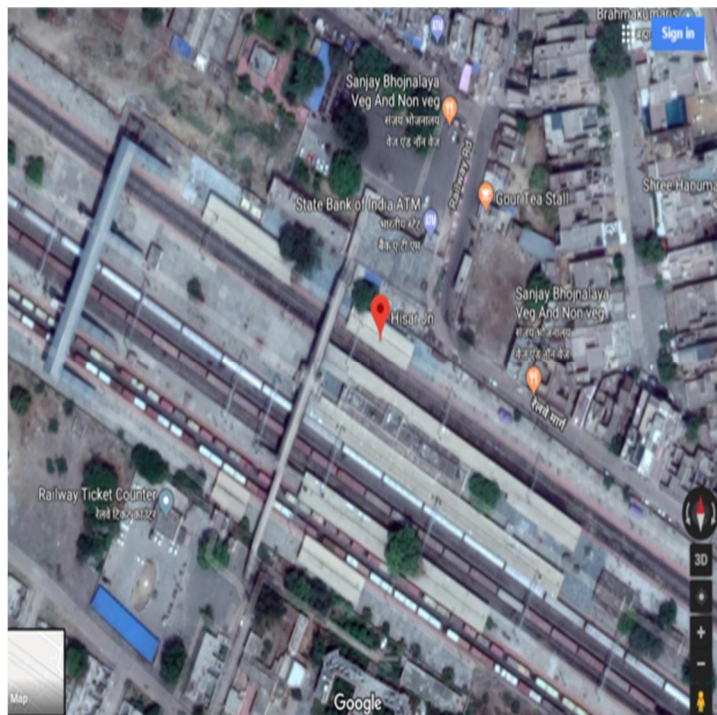
IV. STUDY AREA

Hisar railway station (railway code: HSR) is an A-category railway station,[1] under the Bikaner railway division of North Western Railway zone of Indian Railways, located at Hisar city in Hisar district of Haryana state of India. The station consists of 6 platforms, with 6 broad gauge mostly electrified tracks of Bathinda–Rewari line and Jakhal-Hisar-Sadalpur line, going in 4 directions at an average speed of 120 km/hours. Hisar is one of the 400 stations to be redeveloped with international and private partners for modernization on international standards and optimizing the commercial opportunities.

Hisar Junction	
Express train and Passenger train station	
Location	Railway Road, Hisar, Haryana India
Coordinates	29.1519°N 75.7244°E
Elevation	212 metres (696 ft)
Owned by	Indian Railways
Line(s)	Bathinda–Rewari line Ludhiana–Bikaner line
Platforms	6
Tracks	5
Construction	
Structure type	At-ground
Platform levels	1 (ground level)
Parking	Yes
Bicycle facilities	Yes
Architectural style	simple
Other information	
Status	Functioning
Station code	HSR
Zone(s)	North Western Railway zone
Division(s)	Bikaner
Fare zone	North Western Railway zone
Classification	Passenger and freight
History	
Opened	1873
Electrified	Yes

(Fig.4.1-4.2 Location Map of Study Area)





V. DATA ANALYSIS & FINDING

At Hisar Railway Station the survey conducted on all selected parking lots by license plate method. The survey conduct from morning 9 am to evening 5 pm on working day. From analysis of survey data various results are find out like parking accumulation, parking load, parking duration of different vehicle, parking capacity, parking index and parking turn-over.

A. Parking Accumulation

Fig5.1.1 Parking Accumulation In 4Wheeler Parked at 1st Entry

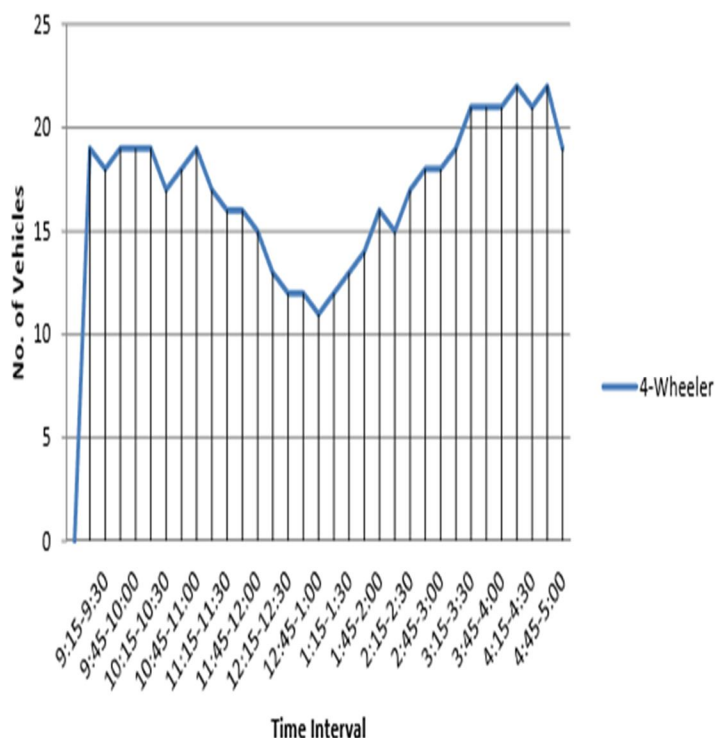


Fig5.1.2 Parking Accumulation In 2Wheeler Parked at 1st Entry

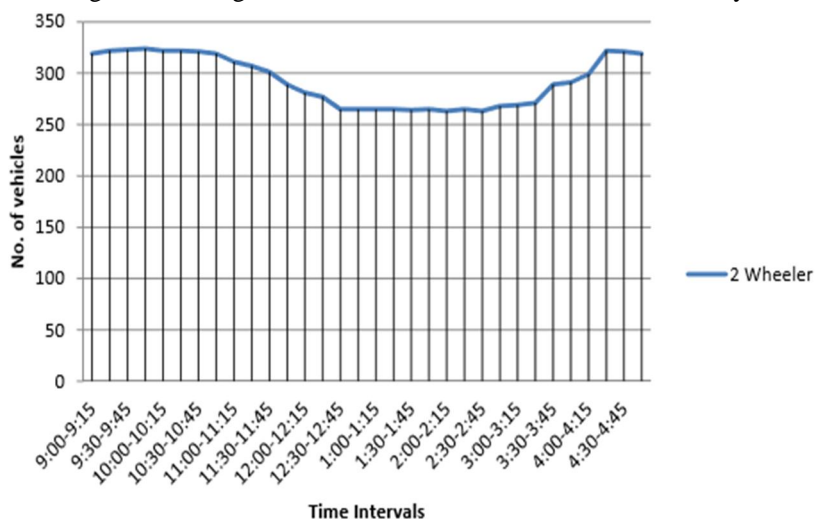


Fig5.1.3 Parking Accumulation In 4Wheeler Parked at 2nd Entry

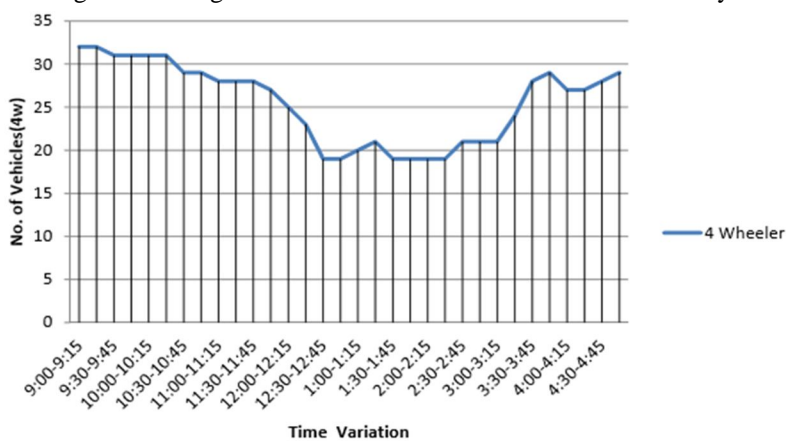
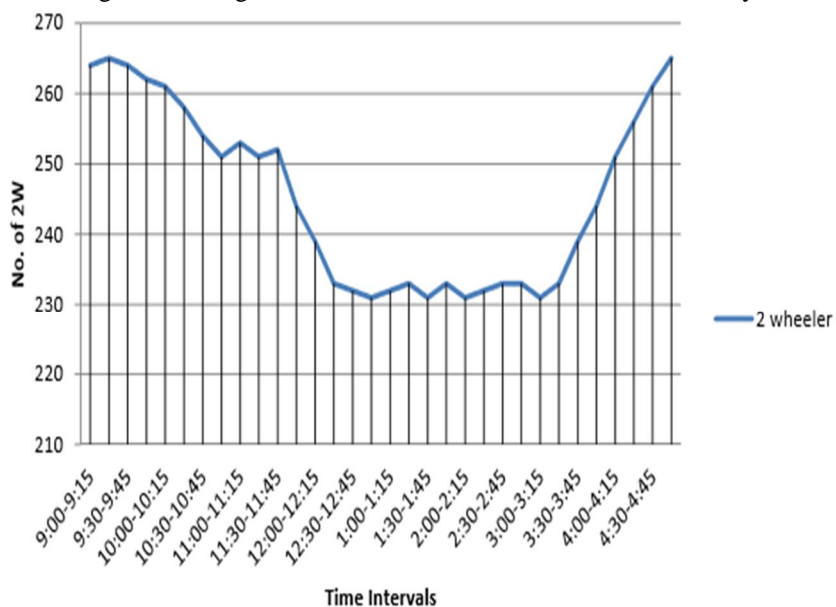


Fig5.1.4 Parking Accumulation In 2Wheeler Parked at 2nd Entry



B. Parking Duration

Parking duration analysis was carried out to find the length of time spent in a parking space by the vehicle. After doing License plate Survey of all parking lots it is found that number of vehicles parked for which different time duration.

Fig.5.2.1 (4Wheeler Parked at 1st Entry In Term of Duration)

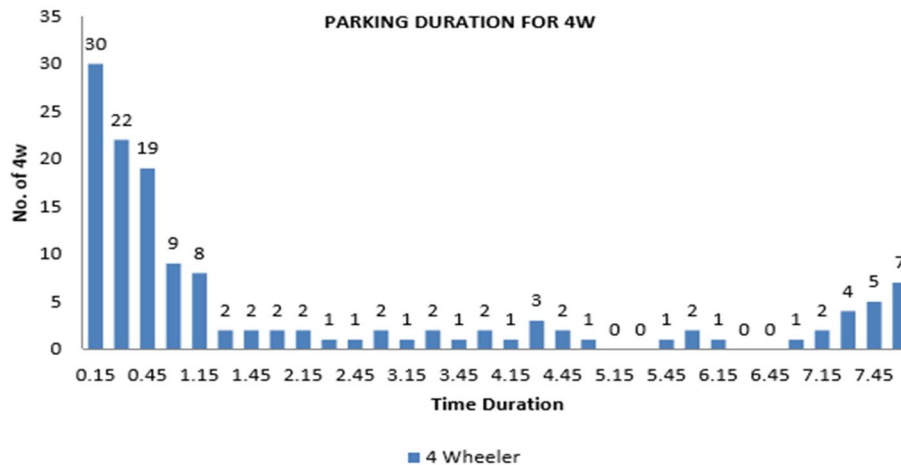


Fig.5.2.2 (2Wheeler Parked at 1st Entry in Term of Duration)

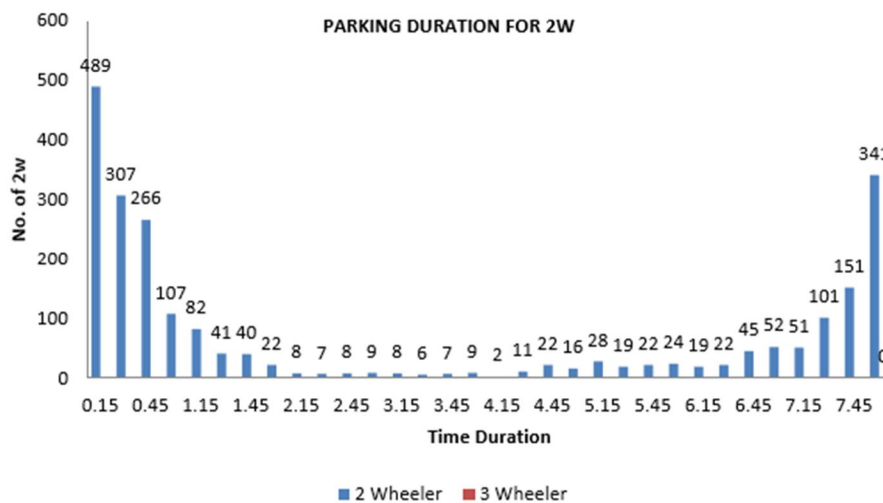


Fig.5.2.3(4Wheeler Parked at 2nd Entry in Term of Duration)

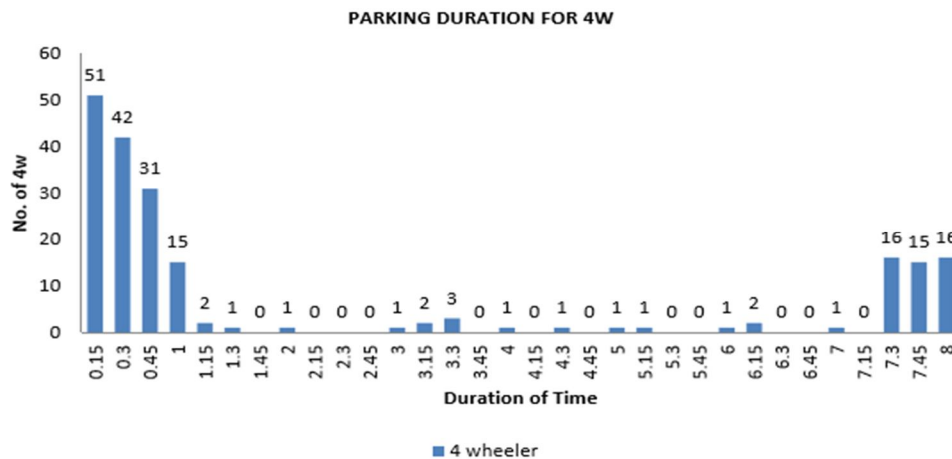
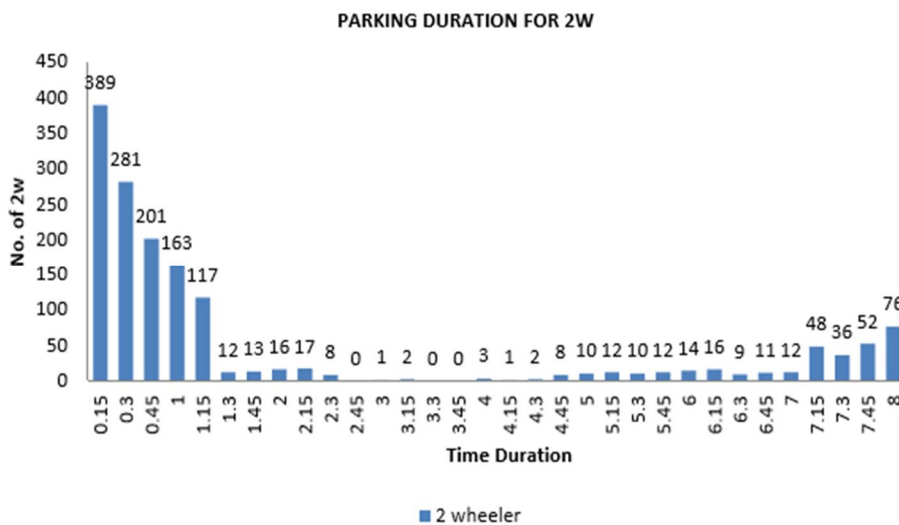


Fig.5.2.4 (2W Parked at 2nd Entry In Term of Duration of Time)



C. Parking Capacity and Occupancy Ratios

Fig.5.3.1 Parking Capacity & Demand Deviation For

4w 1st Entry

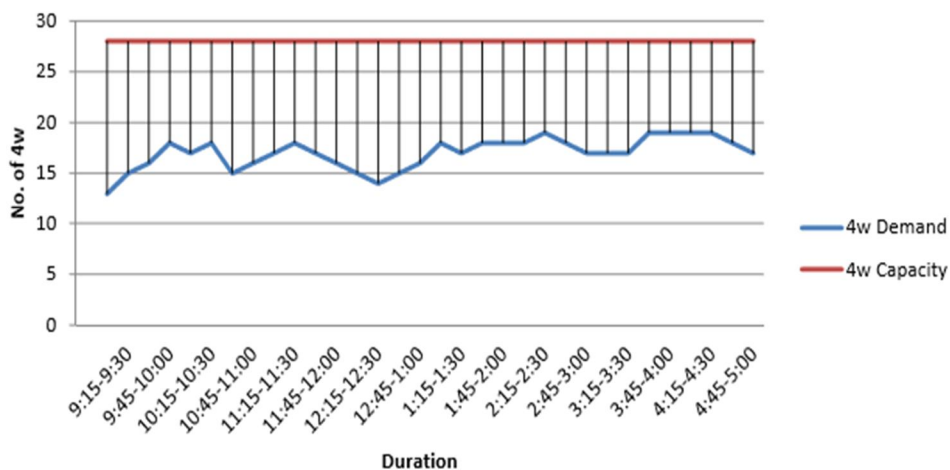


Fig.5.3.2 Parking Demand & Capacity Deviation/Ratio For

2w 1st Entry

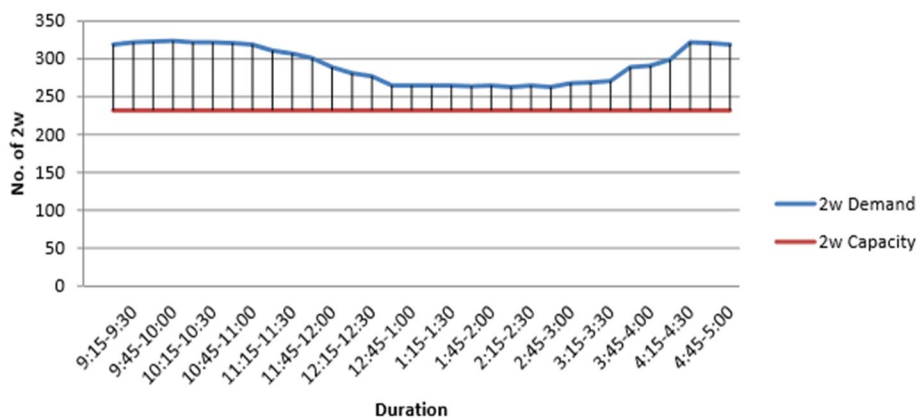


Fig.5.3.3 Parking Demand & Capacity Deviation For
4w 2nd Entry Parking

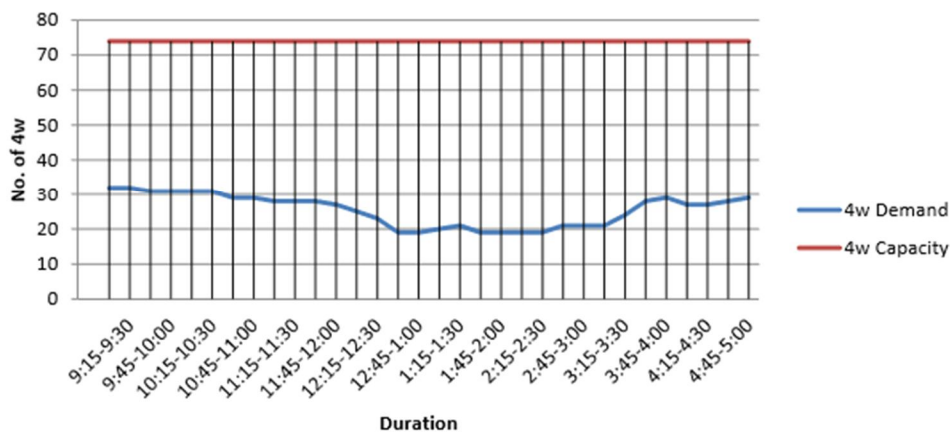
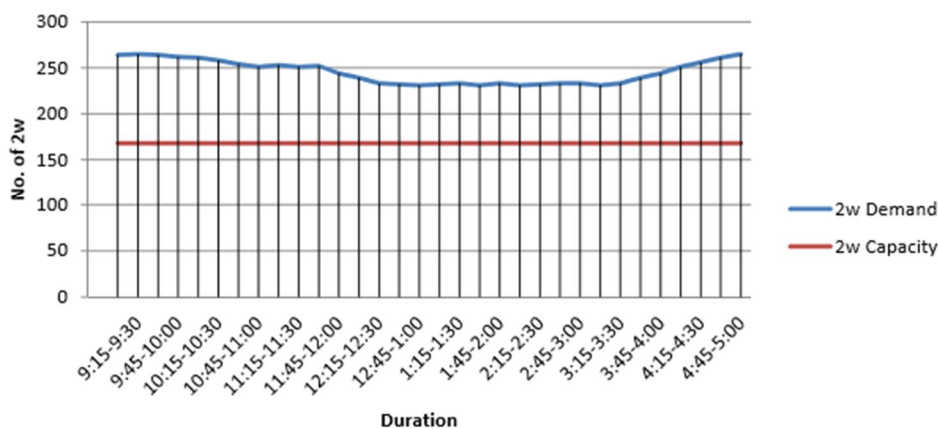


Fig.5.3.4 Parking Demand & Capacity Deviation For
2w 2nd Entry Parking



VI. SUMMARY OF RESULT

- A. Parking is very giant hiccup or trouble for under-developing country like INDIA. Hence, if not diagnosed and mitigated on time then its consequences will be terrible.
- B. Here we Analysed that the parking demand for two wheeler in all parking lots are higher than capacity of these parking lots and demand of four wheeler (car) is lesser than capacity of these parking lots.
- C. Total revenue generated to Indian Railway from parking charges within 8 hours were observed as 65k.

VII. COUNSEL

The above inferences make it clear that parking lots management of areas, having distinctive parking characteristics and multiple activities, is a complex problem and can be controlled by implementing a combination of possible policies.

- A. For the time being, a time restricted policy can be implemented in the areas. There should be different provisions for short-term and long term parking to improve the mobility and hence efficiency.
- B. Provision of off-street parking lots like multistoried parking, which is conveniently accessible and within the acceptable walking distance must be explored and developed on Public Private Partnership (PPP) bases, so that the 2nd Entry 4w parking is converted into multistoried parking. This parking lot provide sufficient land area for construction of multistoried parking.
- C. The Multi-Story Parking Recommended for better parking and ease. Multi-story parking is a unique style of building; one in which all elements of the structure are normally exposed to the public.



VIII. CONCLUSION

- A. According to my opinion an multi-story parking with basement is recommended for easy movement , accessibility ,mobility.
- B. By Provision of multi-story parking with basement one , two and ground floor reserved for two wheeler ,we can satisfy the 2w parking demand up to 2023.
- C. Concluded that the multi-story parking with 1st, 2nd & 3rd Floor for three or four wheeler (auto/car) parking will satisfy the demand up-to 2024.

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