

“Evaluation of Parking Demand at Valsad Railway Station”

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ABSTRACT: India is fastest developing major economy in the world. Gujarat is India's one of the leading developing state with increasing industrial and economic development. For holistic development of any region it is necessary to have a balanced transportation system. Along with this, Gujarat has good network of railway connectivity. Due to this, many passengers use Railway for travelling from one place to another. The one of the busiest railway line connecting economic capital Mumbai and political capital Delhi is passing through Gujarat. Valsad is one of the important and busy railway stations on Mumbai- Delhi and Ahmadabad – Mumbai railway line. Many people of Valsad are working in nearby cities like Mumbai, Vapi and Surat etc. Hence, people widely use Railway as a mode of transportation. Salary class and Students prefer railway due to vast availability, comfort and cheaper fares. Most of these people use two wheelers or other vehicles to reach the Railway station from their homes and they use to park their vehicles in the area near by the railway station. In peak hour, like early morning and evening there is high parking demand occurs at Railway Station and people use to park their vehicles outside the parking area. Hence, to avoid this type of scenario proper parking facilities are required. At Valsad Railway Station, as per field observation parking facilities are insufficient. Commuters use to park their vehicles on the periphery of the roads and on walkway which results in traffic jam condition in and around railway station area. So, parking demand evaluation is necessary at Valsad Railway Station. To evaluate parking demand license plate method, parking space inventory and parking usage survey by petrol were conducted. For the valsad railway station the total three numbers of parking lots. Parking lot-A and lot-B for two wheelers and lot-C for four wheelers are being analyzed and the parking demand analysis for three lots is performed. As per the finding the parking demand on normal day for Lot-A (two-wheeler parking) Parking Index is more than one the capacity, same way for Lot-B (two-wheeler parking). Parking accumulation analysis for Lot-A & Lot –B is over utilized from morning 9:00 am to evening 8:30 pm. To study the demand different parking surveys will be used to obtain clear scenario of the present parking situation and future suggestion to ease the parking demand.

Keywords: Traffic management, Parking problems, Parking demand, parking forecasting

I. INTRODUCTION

Each medium 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 vessels, waterways, and port facilities; for rail and road transportation, trains, trucks and stations; for air transportation, planes, airways and airports. Similarly, the elements of motor transportation are vehicle, the road, and a place to park at the end of trip. Increased urbanization gives rise to problem of congestion. As city growing, it will be important to plan and build new facilities for both public and private transportation. There is a strong relationship between parking facilities and traffic flow characteristics in the city. Unplanned urbanization and transport facilities cause parking problems. Inadequate parking facilities results in decrease of road capacity and many negative side effects such as air, and noise pollution. Beside these, it also causes economic consequences by losing time and fuel, loss of productivity, high energy consumption and increase in accidental death rates. Thus, all parking facilities as well as others should be designed and planned properly in order to provide a better life for the people and for the prosperity of the city. Due to rapid growth in population, increase in mobility of the traffic flow rate has begun. Although shopping centers have their own parking facilities, people tend to park on the street and go to underground parking only when no space is available on the street.

II. LITERATURE REVIEW

Reddy and Prasad (2017) “Application of QGIS for Parking Study in Tirupati” The municipality should grant permissions only to those multi-storey structures such as apartments and shopping complexes which show adequate cellar or valet parking. In order to avoid non serious road users the municipality may collect parking charges. But before taking any such initiative the municipality should have a credible data on parking. The current work concentrates on parking studies for a small crowded portion in Central Tirupati. QGIS, open source GIS software is used for this purpose.

P.Kolhar (2012) has studied “On Street Parking Management Plan and Cost-Benefit Analysis for Dharwad City”. The study was conducted in Dharwad of Karnataka state in India. It has present population of about 5 lakh and covers an area of 101

sq.km. Dharwad is the district head- quarters and is the educational, financial and industrial hub for North Karnataka. The city is provided with necessary communication and infrastructure facilities like rail, road, telecommunication, radio and television stations, internet etc. National Highway No.4 connecting Bangalore to Pune is like a backbone.

Rodier and Shaheen (2009) have studied “Transit-Based Smart Parking: An Evaluation of The San Francisco Bay Area Field Test”. The purpose of this study is evaluation of the first transit-based smart parking project in the US at the San Francisco Bay Area Rapid Transit (BART) District station in Oakland, California. Outcome of this study: Most respondents used smart parking to travel to their on-site work location 1–3 days per month. Most respondents used the advanced reservation service via phone or Internet to access the smart parking system. Thirty-seven percent of respondents had seen one or more of the CMSs on Highway 24 with smart parking information, but only 32% of those used this information to decide whether to continue driving or take BART instead.

Erik Ferguson(2000) has studied “Parking Management and Commuter Rail: The Case of Northeastern Illinois”. This article examines the relationship between parking management and commuter rail transit using the Chicago metropolitan area in northeastern Illinois as a case example. Parking in and around Metra's commuter rail stations is sensitive to changes in parking supply and pricing policies. Mode of access to Metra commuter rail stations is far less sensitive to parking pricing than it is to distance from the CBD, this being a reasonable proxy for distance to the station, itself a function of density of development and urban form.

From the above available literature it is evident that, parking demand is varying by nature, place, socio-economic background etc. so there is a need access parking demand for medium size after like Valsad which is situated in developed state Gujarat. The Valsad railway station is category A railway station on one of the busiest railway line of India.

III. STUDY AREA

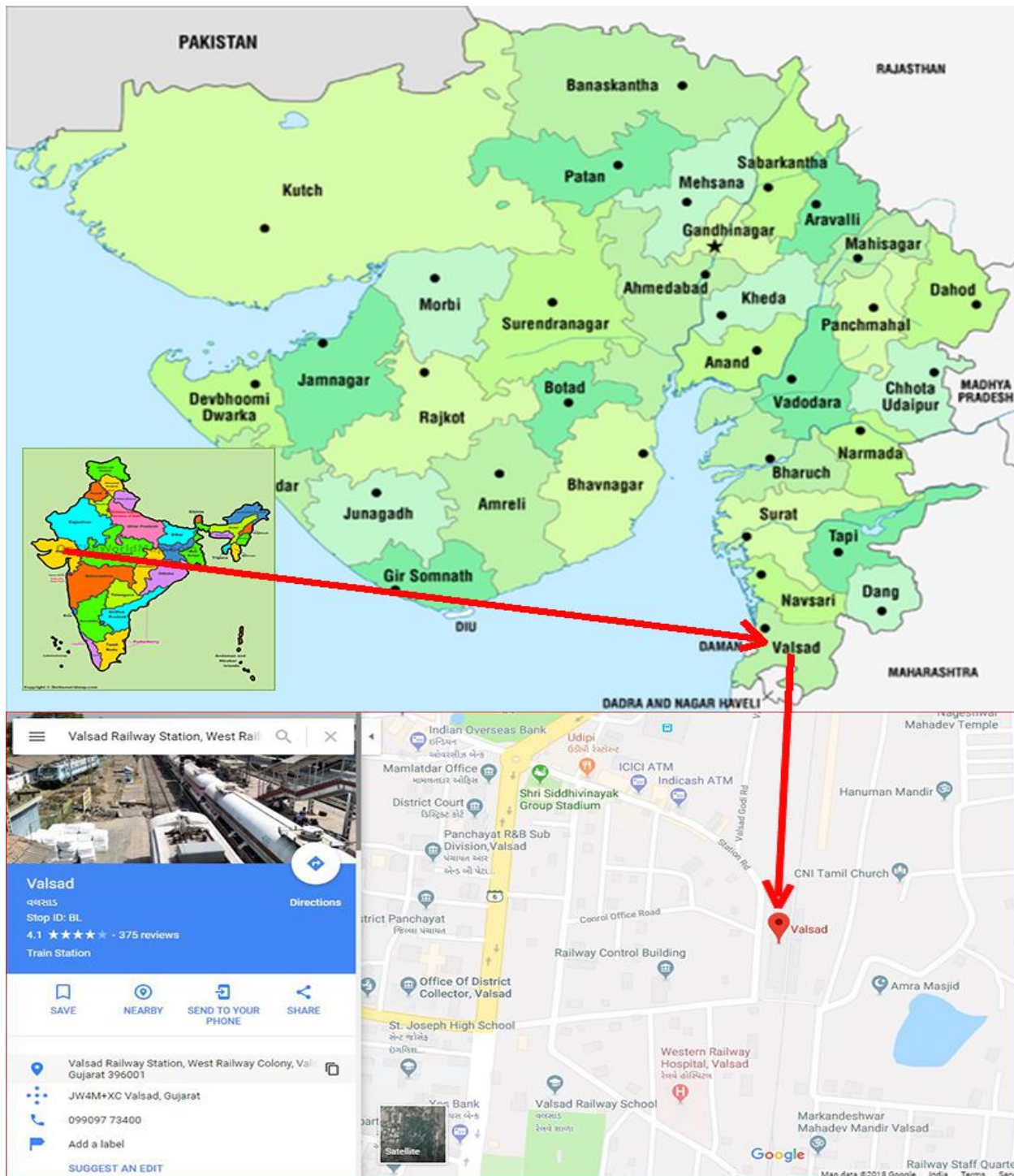
Valsad district is located at the southernmost corner of Gujarat State near Gulf of Cambay and Arabian Sea. The district head quarter is at Valsad. Valsad is Geographically situated on the Southernmost part of Gujarat, between 72.73° to 73° Longitude at Eastern and 20.07° to 21.05° latitude at Northern side. Daman Ganga, Auranga, Kolak, Taan and Maan are the main rivers of Valsad district. The economy of the Valsad district is mainly dependent on industrial sectors such as chemicals, textiles, and paper and pulp industries. The development of the industries in the district increases its employment facilities. According to 2011 census the district has a population of 17,05,678 (persons) including 8,87,222 (males) and 8,18,456 (females). The district has a sex ratio of 922 females for every 1000 males. In the year 2001-2011 the population growth rate in the district was 20.92% (persons) out of which 20.74 % (males) and 21.12 % (females).

Valsad Railway Station (Category A, station code BL) is a very important railway station serving Valsad city, beside Bhilad, Umargam and Vapi Railway Station. Valsad Railway station is under the administrative control of Western Railway zone of the Indian Railways. It is on the Vadodra Railway Station-Surat-Mumbai rail route. The present railway station building was established in 1925.

There are about 70 passenger trains which pass through Valsad Railway Station. At Valsad railway station 6929 tickets are purchased per day and 21077 tickets in a month. The monthly passes given to the regular passenger from the Valsad railway station are 7084. Table 1 presents presently available parking space at Valsad railway station.

Table: 1: Present Parking Area and Charges details

Sr. No.	Parking Lots	Area (Sq. Mt)	Charges detail
1	2W Parking Lot- A	787.50	Rs.20 per 12 hours
2	2W Parking Lot- B	450	Rs.20 per 12 hours
3.	4W Parking Lot-C	1039.4	Rs.30 per 3 hours



(Figure: 1: Map of valsad railway station)

Here we have visited to valsad railway station and the parking lots which is given in the table 1 is details of the regarding the parking lots which has available area at the valsad railway station. Now the figure 2, figure 3, and figure 4 is show the picturing representation of this three parking lots along with the details of its contractor etc.



(Figure: 2:- Two wheelers parking for Lot- A)



(Figure: 3:- Two wheelers parking for Lot- B)



(Figure: 4:- Four-wheelers parking for Lot- C)

IV. DATA COLLECTION

Parking Survey can be performed by different methods out of the available method for the collection of the parking related data we have carried out the survey using parking space inventory and the parking usage survey by petrol.

1. Parking space inventory

- The location, condition, type, and number of parking spaces.
- Time, hours of availability and any other restrictions.
- Lay out of spaces geometry and other features such as crosswalks and city services.

2. Parking usage survey

The parking space inventory establishes parking facilities on street, available in an area. To investigate the demand for that space and the reasons for that demand, the parking usage study is conducted.

The study area is divided into the blocks that can be walked round comfortably in 30minutes within each of these parking blocks, a parked vehicle count can be made at 30 minute interval, by an observer walking and noting down the registration number of every parked vehicle. It is assumed that each vehicle seen once has stayed for 30 minute, if seen twice for half hour and soon.

The analysis of license plate survey showed that the how much percentage of vehicle park in specific time interval. Also the give parking accumulation curve, parking load, parking duration of different vehicles cure, parking index and parking turn-over information.

• Definition of Common Terms

I. Parking accumulation: it is defined as the number of vehicles parked at a given instant of time. Normally this is expressed by accumulation curve. Accumulation curve is the graph obtained by the number of bays occupied with respect to time.

II. Average parking duration: it is the ratio of total vehicles hours to the number of vehicles parked.

$$\text{Parking duration} = \frac{\text{parking load}}{\text{parking volume}}$$

III. Parking turnover: it is the ratio of number of vehicles parked in duration to number of parking bays available.

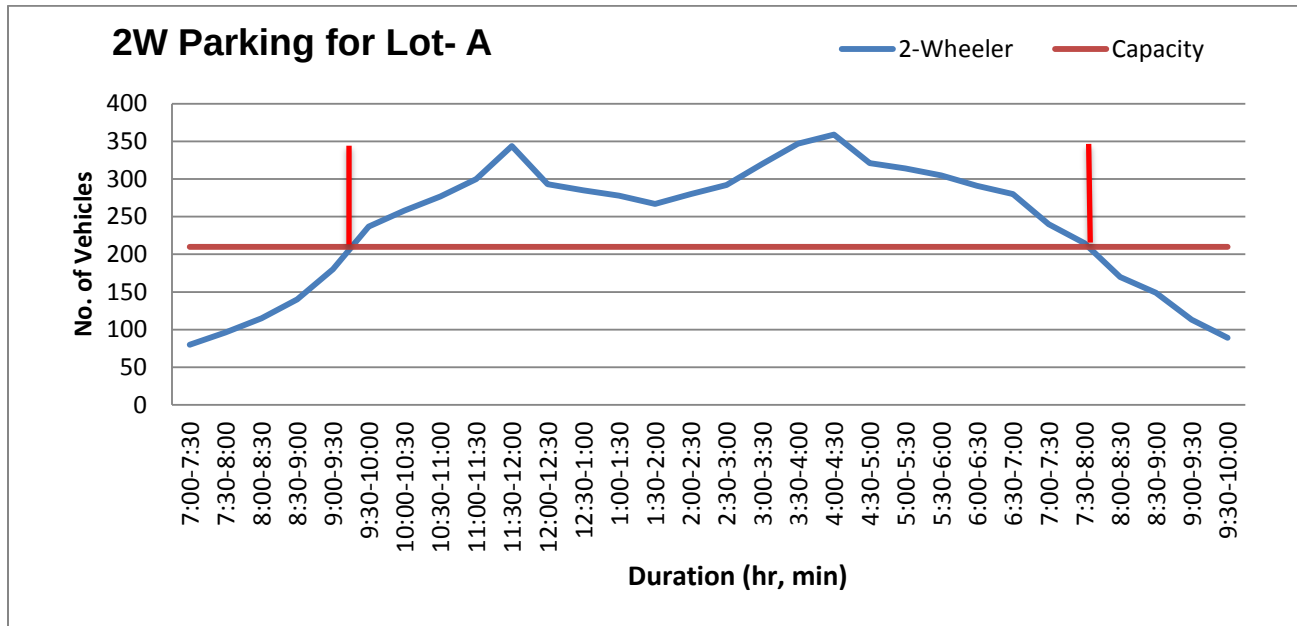
$$\text{Parking turnover} = \frac{\text{parking volume}}{\text{no of bays available}}$$

This can be expressed as number of vehicles per bay time duration.

V. DATA ANALYSIS

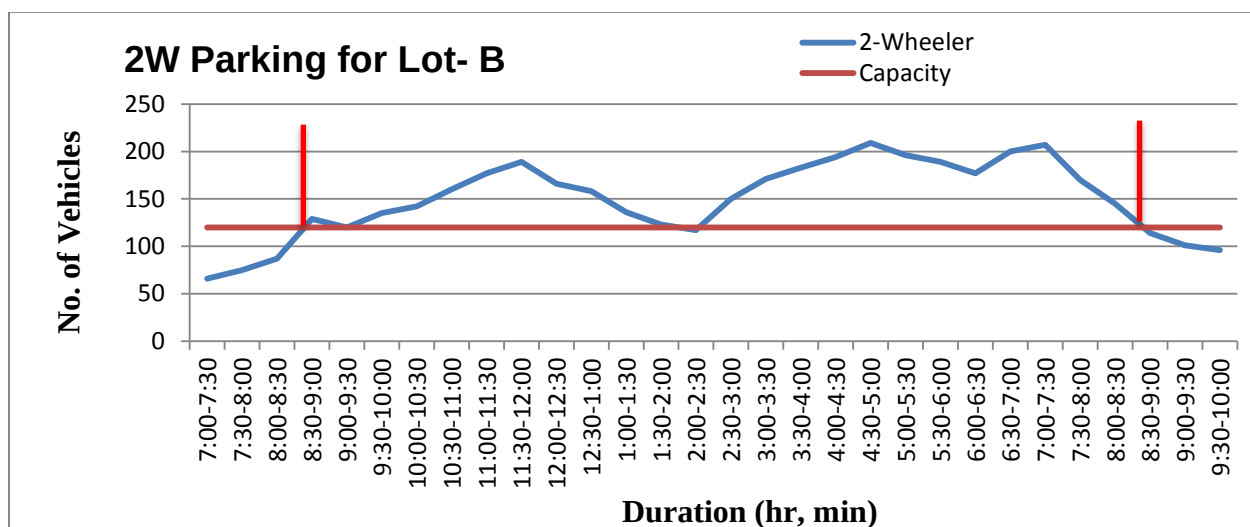
For Data of the parking by conducting parking usage survey by petrol method was conducted on 17th October, 4th and 5th January which is the normal days.

A. Parking Accumulation Analysis



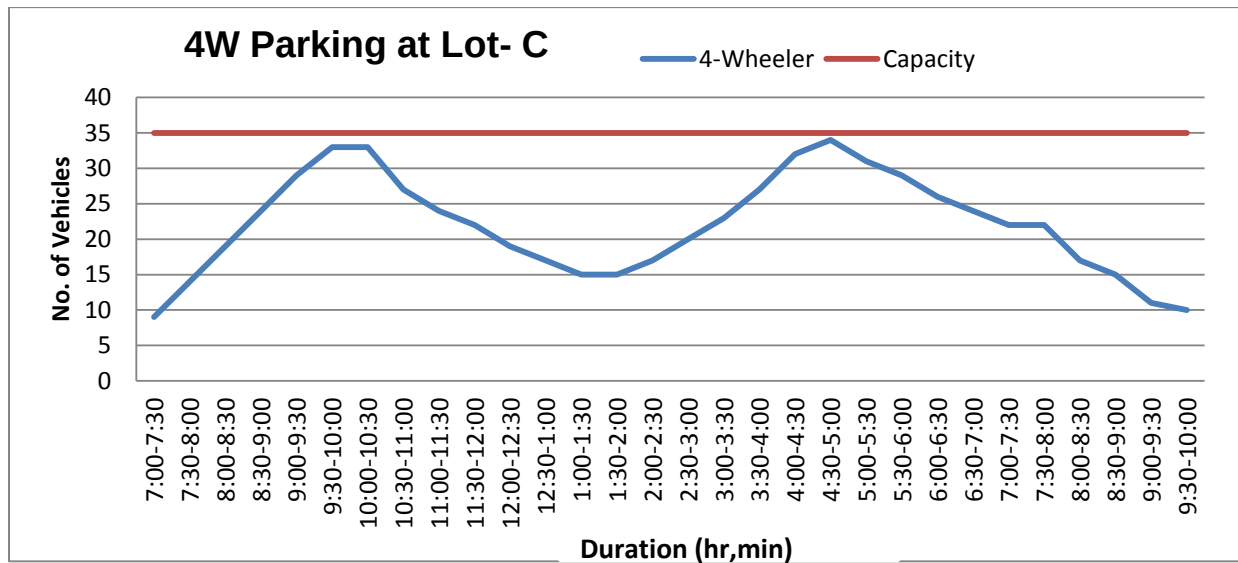
(Figure: 5: Parking accumulation a for Lot-A)

The parking lot which is used two wheeler parking is over utilized for most of the day time. As we can see from the figure: 5 that the two wheeler parking lot-A is from the morning 9:00 am to evening 8:00 pm and it has been soon by the arrow marked on the graph.



(Figure: 6: Parking accumulation curve for Lot-B)

For parking Lot-B it is also clear that it is over utilized from the morning 8:30 am to 9:30 pm evening. From it is clear for that the two wheeler parking are excessively used or there are so many congestion in the Two wheeler parking lot for the whole day period by it is over utilized for two wheeler parking.

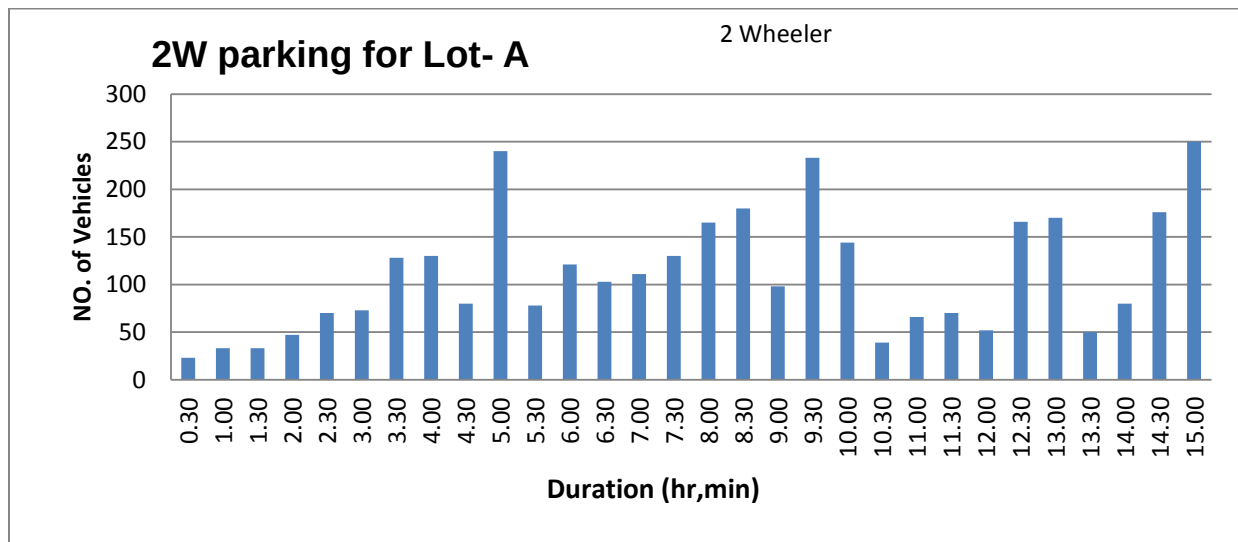


(Figure: 7: Parking Accumulation curve for Lot-C)

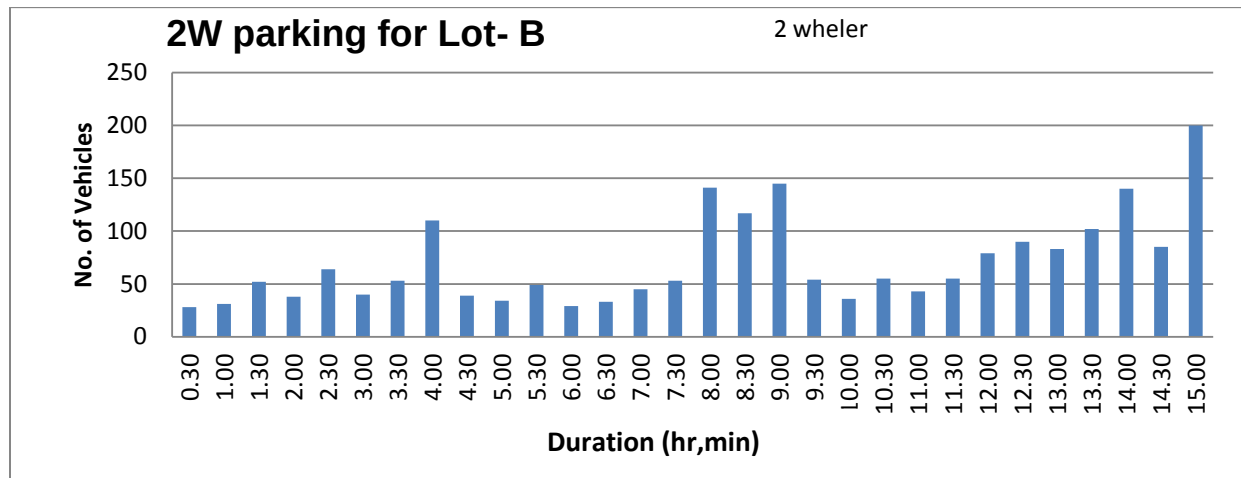
Here we have conducted the parking accumulation analysis for all the three selected parking lots available at the valsad railway station. From this graph it is clear that the parking lot for four wheeler parked is under utilized for most of the period aspect for morning and evening peak. We can show the parking lot-A and parking Lot-B is also over utilized for morning 8:30 am to evening 9:00 pm.

B. Parking Duration

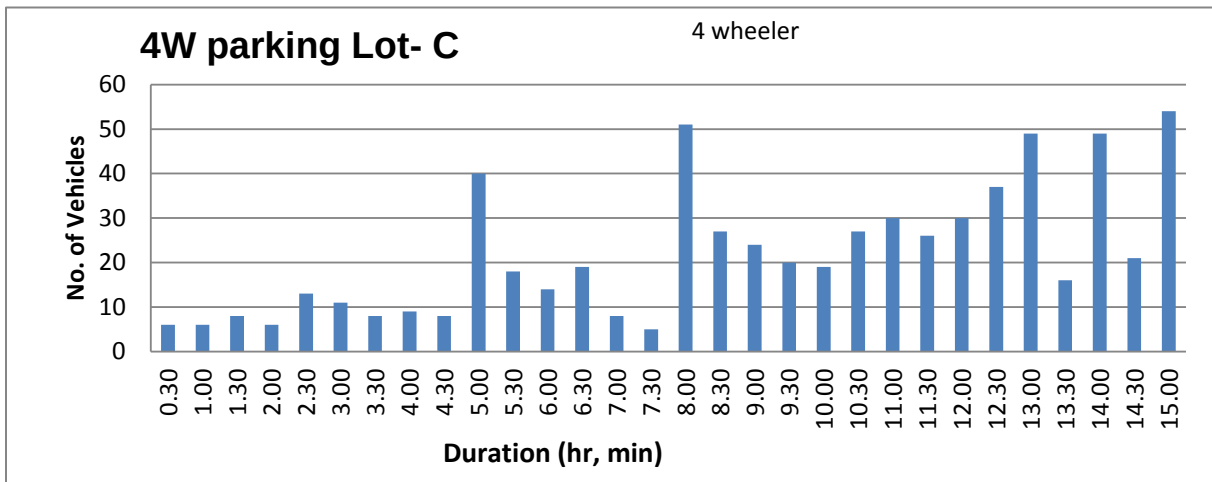
Parking duration analysis was carried out to find the length of time spent in a parking space by the vehicle. After doing License plate Survey of all parking lots it is found that number of vehicles parked for which different time duration on working day and non working day. License plate Survey of all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



(Figure: 8: Number of Vehicles Parked for particular time duration at Lot- A: 2W parking)



(Figure: 9: Number of Vehicles Parked for particular time duration at Lot- B: 2W parking)



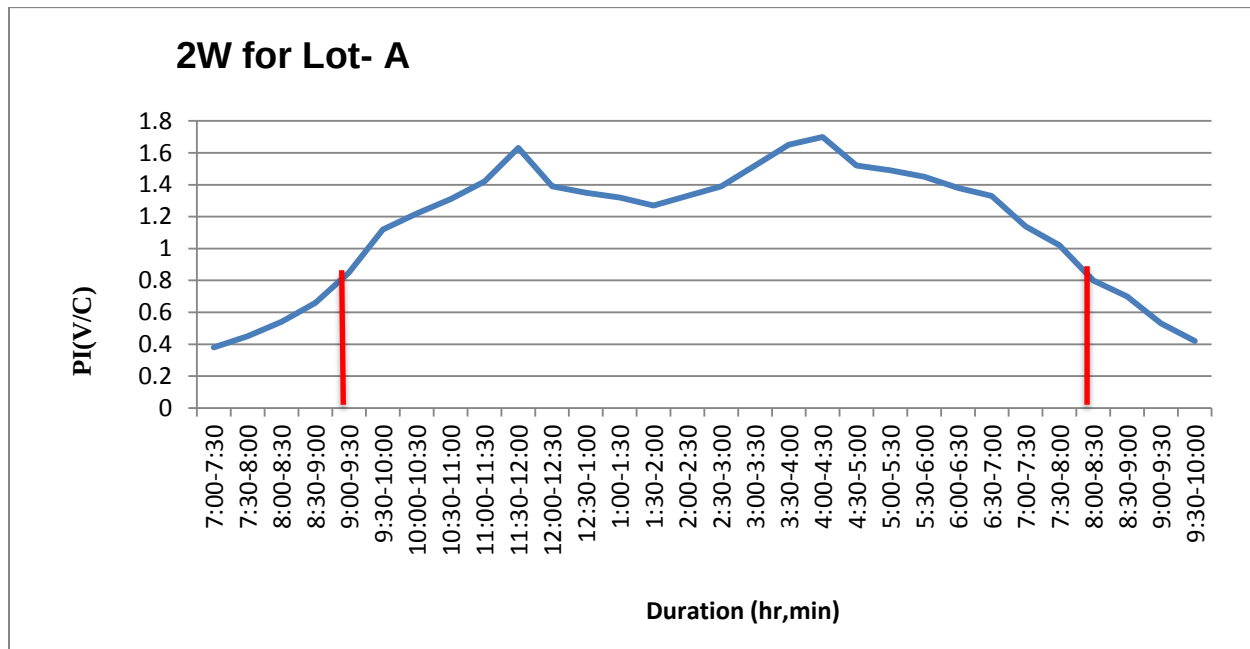
(Figure: 10: Number of Vehicles Parked for particular time duration at Lot- C: 4W parking)

C. Table:2: Parking Turn over in Terms of Capacity of Each Parking Lots

Sr. No.	Parking lots	Volume of vehicles	Capacity of parking lots	Turn over (vehicle/bay/ 15 hours)
1.	2W Parking at Lot- A	507	210	2.41
2.	2W Parking at Lot- B	320	120	2.66
3.	4W Parking at Lot-C	44	35	1.25

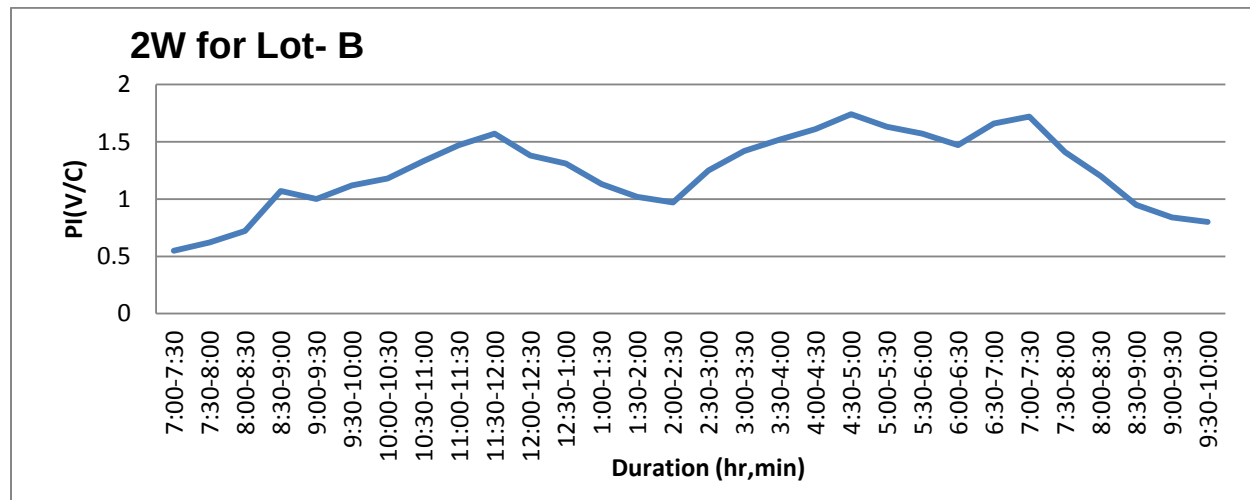
D. Parking Index Analysis

Parking index analysis will give idea about how much deficient or efficient parking lot for a particular time. For parking index, volume by capacity ratio is found out if this ratio is more than 1 it means vehicles parked for particular time is more than capacity of parking lot (Deficiency). Deficiency of parking lot is not good condition for parking. If parking index is less than 1 it means vehicles parked for particular time is less than capacity of parking lot (Efficiency). Efficiency of parking lot is good condition for parking. The analysis gives idea about how much parking area are full or empty as per capacity.



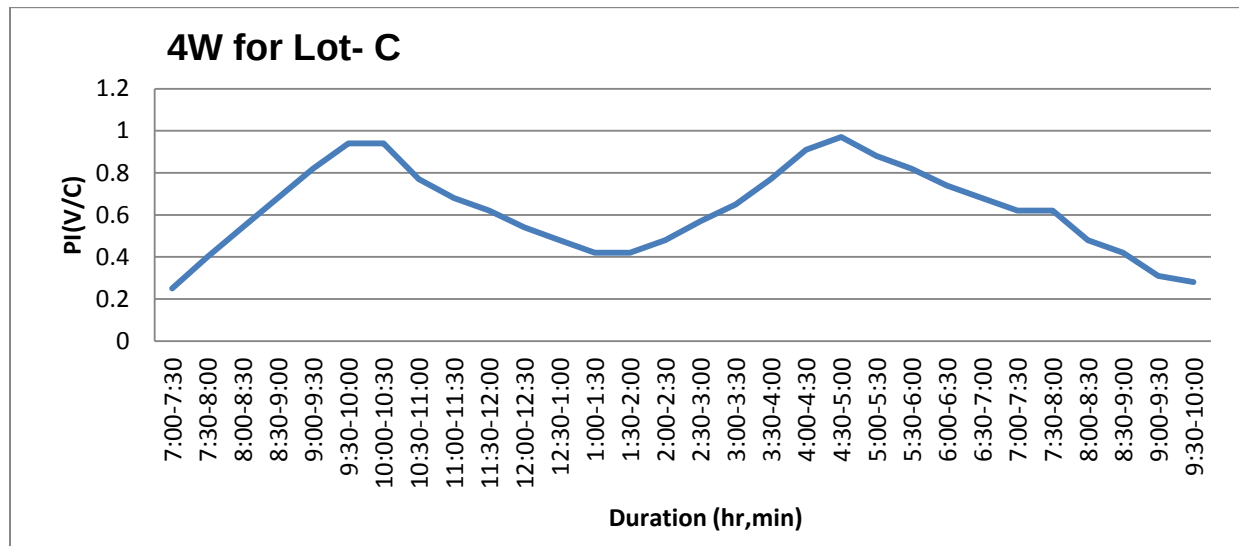
(Figure: 11: Two Wheeler parking Index Analysis for lot-A)

From the parking lot-A is shows that parking index is more than 1, from morning 9:30 am to evening 8:00 pm. so that deficiency of parking lot and the number of vehicles parked is more than the capacity.



(Figure: 12: Two Wheeler parking Index Analysis for lot-B)

From the parking lot-B is show that parking index is more than 1, from the morning 9:00 am to evening 9:00 pm. So that deficiency of parking lot and the number of vehicles parked is more than the capacity.



(Figure: 13: Two Wheeler parking Index Analysis for lot-C)

From the parking lot-C is a show that parking index is less than 1, so that deficiency of parking lot and the number of vehicles parked is less than the capacity.

VI. INFERENCES

For the valsad railway station the total three numbers of parking lots. Parking lot-A and lot-B for two wheelers and lot-C for four wheelers is being analyzed. The parking demand analysis for three lots is performed. From the data analysis for parking accumulation analysis and parking index it is clear that the most of the data in the two wheeler parking is over utilized and four wheeler parking is underutilized. So there is the acute need to provide additional facility for the two wheeler parking at the valsad railway station. Descript of the parking rate Rs.20 charged per 12 hours which is not a less amount. From the table 2 it is clear that the two wheeler parking lot having the parking turn-over ranging for the 2.41 to 2.66 which is also very high. So they should be additional parking facility for the two wheeler parking at the valsad railway station. The thesis proposes to convert parking lot-A in to malty -story parking base for the two wheeler parking. So, That the more number or a double number of two wheeler can be accommodated in the same parking lot with the capacity of vertical expansion and also on the public privet partnership mode.

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