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Study of traffic characteristics, a case of Udaipur

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Abstract
With the population increasing rapidly, there is increase in the traffic congestion on the Indian roads. To prepare master plan of any city, it is vital to study the existing traffic and transportation characteristics of the city which includes the network of roads, accident profile, traffic volume, parking index, public transportation to understand the current scenario, problems, gaps to make necessary interventions for improving the present condition keeping in due consideration the future possibilities. This paper aims to study aspects mentioned above and to evaluate different methods for the analysis of the existing situation of the Udaipur city.

Keywords: traffic, capacity, accidents, analysis, volume

1. Introduction
Traffic and transportation are a very important aspect to study for preparation of any master plan because it gives an overall view of the town in term of the various activities with respect to circulation. Its role in town and cities of varying sizes cannot be ignored. In the subject of town or city development, transportation plays a great role.

2. Methodology
A field survey was conducted for 7 days in September 2018, in which road network, traffic volume, accident profile, means of public transportation was observed and calculated, the primary and secondary data had been collected from offices such as D.T.O. and Traffic police department. The observation time was selected as the peak hours at which the traffic flow is highest in the day which is from 8:00 to 9:00, 17:00 to 18:00 and 18:30 to 19:30. All the data was recorded in the excel sheet and calculations were made to gather information about the problems and constraints in the city.

3. Analysis and Results
3.1 Road Network
Udaipur is a fast-growing city. At many places geometry of roads and intersection are not adequate. The N.H.8 connects the city to Ahmedabad and N.H.76 connects the city to Chittorgarh are passing through the center of the town connecting both ends of the town. The roads face traffic congestion at Chetak circle and Delhi gate and Suraj pol and needs smooth flow of traffic. Chetak circle is an important sub-arterial road connecting Rampura roads to Pratap road and Fatehpura chowk where both the national highway intersects to each other. The character of roads changes from the regional roads to urban roads as these roads entre in the M.C. limits of the city. Major land uses of Udaipur are situated along the national highway, state highway as well as major road arterial, sub-arterial is not according to URDPFI standards (Refer table 1)

Table 1: Hierarchy of roads

Hierarchy	ROW	Length	Effective width
R1	30 Mt.	31653 mt.	13 mt.
R2	24 Mt.	13775 mt.	14 mt.
R3	18 Mt.	16536 mt.	12 mt.
R4	15 Mt.	27236 mt.	12 mt.
R5	12Mt.	5462 mt.	9 mt.

***Source*:** Field survey and computed values

3.2 Terminals: Udaipur has primarily three main terminals namely Bus stand, Railway station, Truck terminal. The bus terminal is located in the center of the city. It is situated in Udaipol which has an area of 5929 sq.mt. (Udaipur Master Plan). Buses move in all the direction on inter-city and intra-city roads. The entry and exit of the buses cause great traffic problems during peak hours. The location of the bus stand is not appropriate because buses exit from the internal part of the city. Bus stand faces traffic problem at entry gate and exit gate. Because this road has heavy traffic load which lead to traffic congestion at Udaipol chowk. The district has two railway stations for the interstate movement Rana pratap nagar railway station having area of 38008sq.mt. and Udaipur city railway station having an area of 18259 sq.mt. in the Udaipur city. Daily trains run from New Delhi, Jaipur, Ahmadabad and Indor. It is also connected with Kolkata and Mumbai.

3.3 Public transport System
The public transport system of the city is dominated by single mode of transport i.e. auto rickshaws which run on all the major roads except few which have less traffic. These

auto rickshaws are having fixed routes on which they operate on seat based system. Cycle rickshaws are present in few areas only due to the terrain of the city which makes it difficult to use this as mode of transport in many areas. City bus service is not available but buses are running from the city bus terminal to various nearby settlements like Sukher, Amberi, etc. However, three bus routes have been proposed under smart city mission in order to cater the needs of the people. Auto rickshaws do not operate beyond MC limits due to less passengers as well as long routes. Bus Service is present on these routes to serve the nearby villages within the urbanisable area. There are 12 routes on which buses are functional serving the villages of urbanisable area. The bus routes are serving the villages up to 10 kilometers from the terminal, the farthest being Kala Rohi. Village present in the eastern side of the MC are least served as the distance served is only 1.6 km outside MC area. These routes are not concentrated on one side of the area but are well distributed to serve the area. The buses stop at every village which falls in its way hence serving the population of that village.

3.4 Traffic Volume

Traffic volume data has been collected through primary survey. 32 cardon points were selected to conduct traffic volume survey along the sub-arterial and collector roads. The volume recorded was mode wise that is truck, bus, car, autos, cycle/scooter etc. This volume was converted in passenger car unit (PCU) and the maximum total value was calculated. Maximum traffic is flowing around Sevashram chowk mainly on the Hiran Magri Road i.e. 4635 PCUs because this road passes through a very densely populated area. This road is ranked 1 as per volume. Road connecting Suraj pole circle to Sevashram chowk also has very high traffic due to presence of various educational institutions along with commercial area. Minimum traffic flow is on the road leading from Sukhadia Circle towards Saheli Marg i.e. 600 PCUs as this road is acting as a connecting road between two parallel roads. Very few trucks can be seen within the city as there are two transport nagar at the periphery of the municipal boundary due to which trucks do not enter the city.

3.5 Volume/Capacity Ratio

V/C ratio of stretches are calculated where traffic volume survey was conducted. VC ratio is calculated by dividing the observed volume by the standard capacity of the road. The standard capacity is based on the effective carriage way width of the road. If the VC ratio comes out to be less than 0.8 then it has C level of service which indicates stable flow. If the VC ratio comes out to be between 0.8 to 1 then it has D level of service indicating unstable flow with congestion and intolerable delay. If the VC ratio is more than 1 then it has E level of service indicating forced flow with jammed conditions. There are 9 stretch having VC ratio more than 1 while there are 12 stretch having VC ratio between 0.8 and 1. The remaining roads have stable flow. The major two reasons for high VC ratio is abutting land use as well as narrow roads leading to traffic generating nodes.

3.6 Parking

Parking remain another critical area for Udaipur with increasing number of vehicle population, narrow road network, small old houses in the core areas, absence of parking space with in majority of built space, parking problems are on the rise in the city. In Udaipur, on street parking is evident in the major commercial areas of the city along with two off street parking lots. Parking volume survey was conducted along these roads in order to calculate parking index (Refer table 2). Parking Index of A-I stretch and A-B stretch is maximum (171%) which is Hathi Pole market and Ashwini Bazaar which are the main commercial markets of the city. Parking Index of stretch E-F and G-H is minimum as it has lower order commercial areas and residential areas i.e. 70 and 76% respectively. Parking duration of vehicles vary from half an hour to one hour as people come for buying various goods.

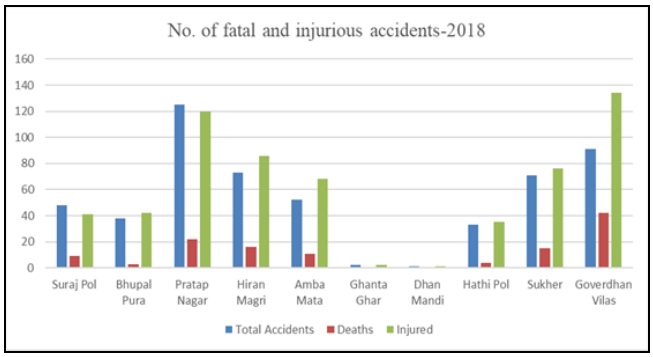
Table 2: Parking Index

Stretch	Length	No. of Bays	Parking Volume	Parking Index (%)
A-B	771	131	222	170
B-C	803	321	478	149
C-D	521	88	120	136
E-F	1644	279	195	70
G-H	1645	279	212	76
A-I	183	73	125	171

***Source*:** Field survey and computed values

3.7 Road Accident

The road accidents survey collects all road accidents resulting in deaths, injurious involving at least a vehicle circulating on the road documented by a Police authority. Date and location of the accident, data collector, localization, road type and name, junction, road bed, traffic signs, weather, road accident type, circumstances and consequences on persons involved. With the view to assess the safety of the road users in Udaipur city, it is important to study the road accidents in the city as per the figures made available by traffic police, number of road accidents recorded. Despite rapid increase in vehicular growth, the number of accidents has by far remained at the same level. Accidents in various areas of Udaipur take place because of the congestion on roads, at some places traffic signals are not working properly, channelizers has not been provided to guide the movement e.g., Surajpol (Refer figure1)



***Source*:** RTO, Udaipur

Fig 1: Number of fatal and injurious accidents

4. Conclusion

Udaipur is having good linkage with surrounding area like on north Ranakpur and Jaipur and eastern side Chittorgarh and umarda and in south Ahmadabad and Jaismand as NH8 AND NH76 is passing through the city. There are 5 hierarchy of roads present in Udaipur having width 30m, 24m, 18m, 15m and 12m. There are two railway stations, two bus terminals present within the city. Apart from this,

two transport nagar are also present at the periphery of the city to restrict the entry of goods vehicle within the city. Public transport system of the city is dominated by auto rickshaws which ply on all the major roads on fixed routes. Buses are also plying in Udaipur serving the population of urbanisable area. There are two roads namely Hiran Magri road and College road having jammed traffic flow conditions as VC ratio of these roads is more than 1. Parking index of major commercial bazaars is also quite high due to lack of adequate parking facilities. These include Hathi pol, Ashwini Bazaar and Udai Pol. In order to solve the parking issues, three parking lots have been proposed at Delhi Gate, Chandpol and Gulab Bagh. Accidents in various areas of Udaipur take place because of the congestion on roads, at some places traffic signals are not working properly, channelizers has not been provided to guide the movement e.g., Surajpol.

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