

Innovations

A Suggestion to Reconfigure Traffic Flow from Two-Way to One-Way in the Main Market Area of Vidisha City, Aiming to Alleviate Congestion and Promote Sustainability

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Abstract:

Issues: Vidisha, a city in Madhya Pradesh, is currently facing severe traffic congestion due to rapid and intense growth in transportation demand and supply, leading to adverse environmental impacts. To evaluate the gravity of the existing traffic system overwhelmed by congestion in Vidisha. **Methods:** This study involved conducting traffic volume count surveys on different roads in the area and calculating traffic flow capacity. Additionally, significant secondary data was collected. **Findings:** About 15,760 vehicles were registered with the RTO in 2015, and that figure rose to 25,949 in 2019. With only 17,435 registered motor vehicles in 2016 and 25,949 in 2019, an increase of 8,514 automobiles was made in just three years, a massive growth in the number of vehicles in Vidisha. Due to Coronavirus period 2020-2021 the growth decreased due to lockdown which after Covid again vehicle registration increased by 9.58% in 2022 **Conclusions:** This dissertation focuses on the study and analysis of transforming the current two-way streets into one-way streets as a means to alleviate traffic congestion in the Main Market Area of Vidisha city.

Keywords: 1. Traffic congestion 2. Traffic flow capacity 3. Two-Way Street 4. One-Way Street

1. Introduction

Vidisha district is located in central Madhya Pradesh, India. It had previously been referred to as Bhelsa. Vidisha city is 62 kilometers northeast of Bhopal, the capital city of Madhyapradesh. The settlement is located 9 km from Sanchi at the meeting point of the Betwa and Bes rivers, to the east of the Betwa River. The total population of Vidisha was 155,959 in 2011 census. In terms of population, there are 53.2% men and 46.7% women. The average of literacy rate in Vidisha is 86.8%. The developing city of Vidisha has a growing volume of traffic that requires better traffic management. Nowadays, people and their transportation vehicles occupy a large part of urban space. Traffic management in Vidisha city includes traffic design, urban planning, road layout and public transport, etc. All aspects should be considered in the planning process. The traffic and transport problems in Vidisha city are unbalanced to the growing demands on its use. Rapid socioeconomic upheaval has led to an unplanned, uncontrolled dynamic development of the metropolis. The larger Vidisha regions centre around Vidisha City, which is also home to all department heads for corporate offices, 7 temples, as well as one public college, one public medical institution, one public technological institute, two other educational institutions, numerous private medical centres and hospitals, as well as government colleges and schools. As a result, the city has a big influence on how the environment in the Vidisha district unfolds. People from different regions migrate to Vidisha as a result of inadequate planning and enforcement of land use activities, making the city a conglomeration of residential, commercial, and business centres. In

this study, an attempt is made to solve the problem of traffic congestion and unusual delays in traffic flow due to extremely high traffic volume at intersections in Vidisha. A selected traffic volume and road geometry study was conducted. One-way streets have long been used as a means of reducing traffic congestion in cities and towns. By directing vehicles in a single direction, one-way streets can help in improving traffic flow and reducing the number of conflicts between vehicles at intersections and junction.

2. Study Area

For the study purpose Vidisha Main Market area, Which is situated near railway station of vidisha city and the area is bounded by Madhavganj Square, Hospital Square, Gandhi Chowk Square and Tilak Chowk Square is we are going to study and analyse. The total area of study is about 238812.75m² and perimeter is about 2200meters.

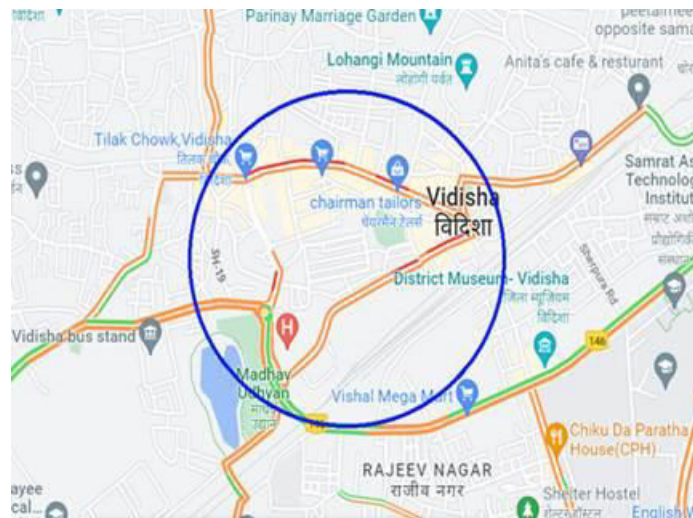


Figure 1: Study Area Location Vidisha Main Market

One of the primary considerations when selecting a study area in Vidisha for traffic management was Vidisha Main Market because as this area contains main market of vidisha and various important public places like Vidisha Railway Station, Kotwali Police Station, Government Hospital and Nagar Palika Vidisha. And so, this area is particularly important, busy and crowded. This makes Vidisha Main Market area a most suitable site for our traffic management project as the traffic congestion and traffic conflict problem is major in this place due to being heavily crowded and traffic.

3. Objective of the study

- To study and analyse the traffic pattern in vidisha city.
- To identify the traffic problems of Vidisha city.
- To suggest the best possible solution to counter traffic problems.
- To analyse the feasibility of One Way Street development to reduce traffic congestion and improve the traffic conditions.

4. Methods of the Study

Stage 1: Choosing a Study Area For the project.

Stage 2: Zoning of Study Area into various sections for data collection

Stage 3: Data collection involved manually counting the number of vehicles operating during peak hours.

Stage 4: Capturing photos at busy and non-peak times to contrast varied circumstances at different times

Stage 5: Data from various sources: The secondary data were gathered from online journals, RTO offices, bus association offices, and bus numbers that are regularly circulating on city roads.

Stage 6: All procedures are applied in a methodical manner, starting with data collection, followed by data handling, data analysis, and finally, a proper staging of the data and Formulation of Result.

5. Field Data Collection

For this project, we collected various data on the traffic condition of Vidisha city. For traffic data collection in the study area, we used the manual counting method for data collection during the summer season and counted the traffic movements on Station Road, Hospital Road and Tilak Chowk Road. The traffic volume of different groups of vehicles was noted and arranged in the table. Two observers stood at the approaches to the roads and physically counted the identical vehicles entering and exiting while noting the number of vehicles of different classes passing through the intersection in a previously prepared table. During the morning and evening rush hours, traffic is counted every 15 minutes. During off-peak hours, the 15-minute traffic is counted and converted to hourly traffic by multiplying by 4. Finally, the traffic data is transformed into a standard variable called Passenger Car Unit (PCU). The peak period is determined by the maximum ordinate of the PCU values, which are then plotted on a grid between the time period and the PCU value.

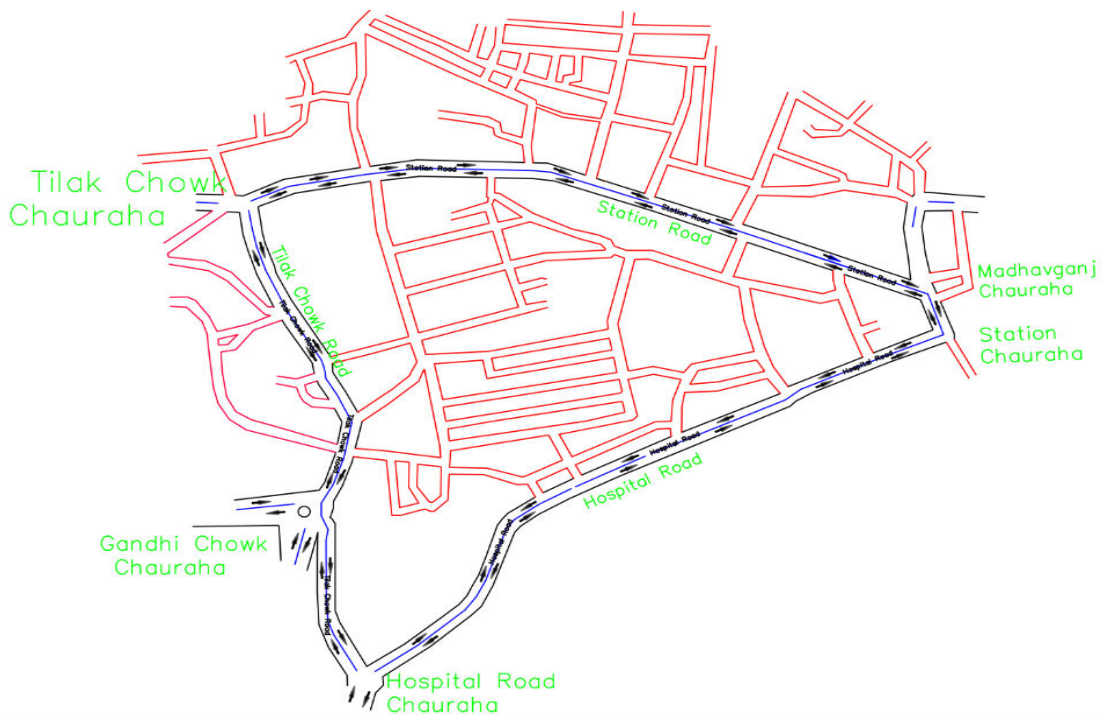


Figure 2: AutoCAD Drawing of Existing Road System in Vidisha Main Market

The largest traffic volume from the collected data is selected and presented in the following tables.

Table 1 Detail of PCU of Maximum day at Station Road

Time Interval	Madhavganj to Tilak Chauraha	Tilak Chauraha to Madhavganj
7AM-8AM	389.5	321.5
8AM-9AM	509.5	554.5
9AM-10AM	673.5	736.5
10AM-11AM	782	782.5
11AM-12PM	750	807
1PM-2PM	735.5	841.5
2PM-3PM	694.5	686.5
3PM-4PM	773	784.5
4PM-5PM	802.5	867
5PM-6PM	823	878.5
6PM-7PM	861.5	891
7PM-8PM	886	904.5
8PM-9PM	838	836
9PM-10PM	698	667.5
10PM-11PM	478	491.5
AVERAGE	712.9667	736.7
SUM	10694.5	11050.5

Table 2. Detail of PCU Maximum day at Hospital Road

Time Interval	Hospital Road Chauraha to Station	Station to Hospital Road Chauraha
7AM-8AM	392	421
8AM-9AM	670.5	548
9AM-10AM	826	761
10AM-11AM	793	806
11AM-12PM	904.5	871.5
1PM-2PM	850.5	893
2PM-3PM	879.5	784
3PM-4PM	891	855.5
4PM-5PM	951.5	883
5PM-6PM	920.5	984.5
6PM-7PM	898.5	919.5
7PM-8PM	904.5	954.5
8PM-9PM	812	932
9PM-10PM	694.5	685.5
10PM-11PM	348.5	510
AVERAGE	782.47	787.27
SUM	11737	11809

Table 3. Detail of PCU Maximum day at Tilak Chowk Road

Time Interval	Tilak Chowk to Gandhi Chowk	Gandhi Chowk to Tilak Chowk
7AM-8AM	297.5	360
8AM-9AM	545	438
9AM-10AM	831.5	793
10AM-11AM	888.5	788
11AM-12PM	743	755.5
1PM-2PM	838.5	803
2PM-3PM	783	858
3PM-4PM	786.5	865.5
4PM-5PM	734.5	799.5
5PM-6PM	741	811.5
6PM-7PM	939	755
7PM-8PM	798.5	799
8PM-9PM	700.5	806.5
9PM-10PM	632	612.5
10PM-11PM	418.5	517.5
AVERAGE	711.83	717.5
SUM	10677.5	10762.5

6. Traffic Data Analysis

The traffic count was done for three arterial roads which are connected and form a circular network which is interconnected by various local streets at multiple locations. The three roads for which the data was collected are as follows:

- i. Station Road**
- ii. Hospital Road**
- iii. Tilak Chowk Road**

Table 4. Flow Direction of Daily Average Traffic Volume

Traffic Flow Direction	Daily Average Traffic Volume
Madhavganj to Tilak Chauraha	9576.5
Tilak Chauraha to Madhavganj	9800.4
Hospital Road Chauraha to Station Chauraha	9994.4
Station Chauraha to Hospital Road Chauraha	10500.3
Tilak Chowk to Gandhi Chowk	9693.7
Gandhi Chowk to Tilak Chowk	9761.4

Table 5. Daily Average Traffic Volume

Road	Average Traffic Volume
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Station Road	19376.9
Hospital Road	19794.8
Tilak Chowk Road	20494.7
Study Area	19888.8

Data Analysis for Station Road

The Station Road connects Tilak Chowk Chauraha to Railway station and contains heavy traffic as both sides of this road various shops throughout the length of road present. The traffic data converted into traffic volume for analysis using standard Passenger Car Unit.

After analysis found that the maximum traffic volume was 886 during 7pm to 8pm for traffic direction from Madhavganj to Tilak Chowk Chauraha and 904.5 during 7pm to 8pm for traffic direction from Tilak Chauraha to Madhavganj Chauraha.

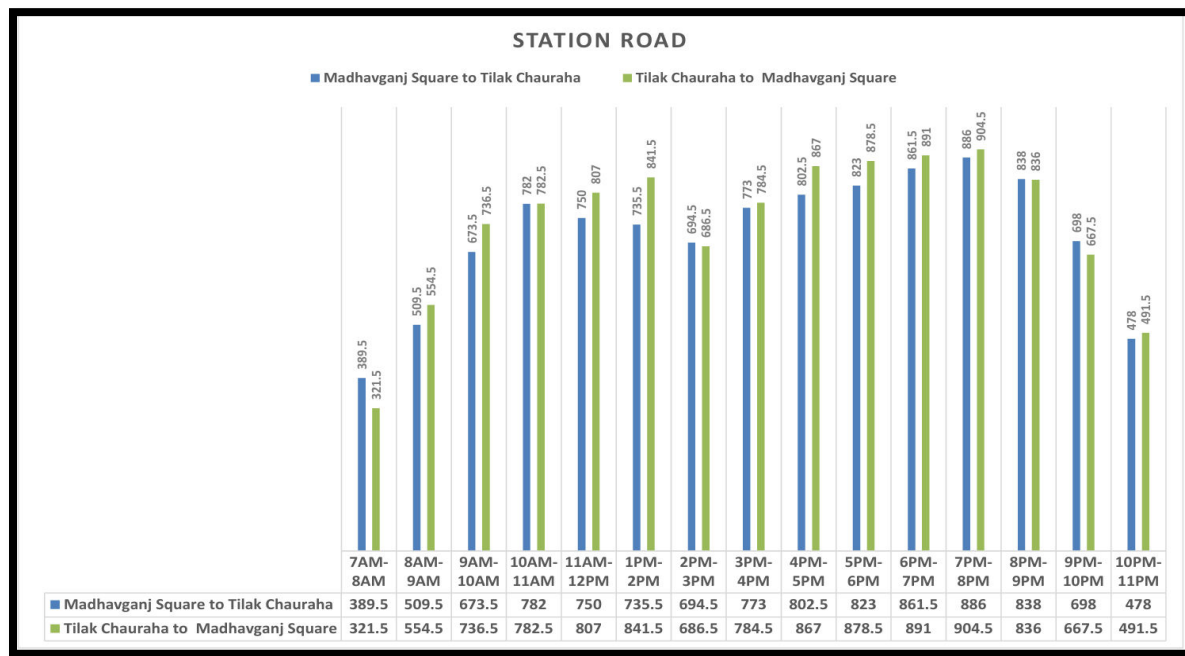


Figure 3: Traffic Volume of Station Road

The average traffic volume flow of the direction Madhavganj Chauraha to Tilak Chowk Chauraha was 712.9 which is less than the traffic volume flow in direction of Tilak Chowk Chauraha to Madhavganj Chauraha was 736.7. That concludes that the traffic flow in the direction of Tilak Chowk Chauraha to Madhavganj Chauraha is greater.

Data Analysis for Hospital Road

The Hospital Road connects Hospital Road Chauraha to Railway station and contains heavy traffic as the name suggests on this road various hospitals are present, and it also has two Petrol Pumps and various shops throughout the length. The traffic data converted into traffic volume for analysis using standard Passenger Car Unit.

After analysis found that the maximum traffic volume was 951.5 during 4pm to 5pm for traffic direction from Hospital Road Chauraha to Railway station and 984.5 during 5pm to 6pm for traffic direction from Railway station to Hospital Road Chauraha.

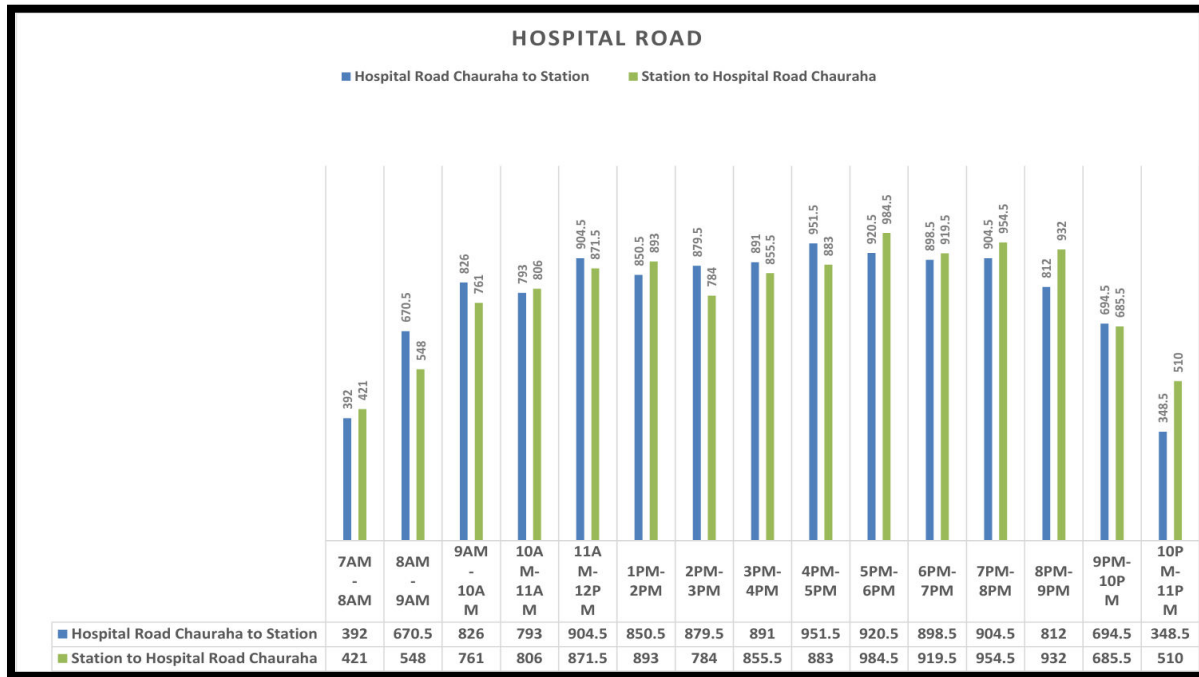


Figure 4: Traffic Volume of Hospital Road

The average traffic volume flow of the direction Hospital Road Chauraha to Railway station was 782.47 which is less than the traffic volume flow in direction of Railway station to Hospital Road Chauraha was 787.27. That concludes that the traffic flow in the direction of the Railway station to Hospital Road Chauraha is greater.

Data Analysis for Tilak Chowk Road

The Tilak Chowk Road connects Tilak Chowk Chauraha to Gandhi Chowk Chauraha and contains heavy traffic as both sides of this road various shops throughout the length of road present. The traffic data converted into traffic volume for analysis using standard Passenger Car Unit.

After analysis found that the maximum traffic volume was 865.5 during 3pm to 4pm for traffic direction from Gandhi Chowk Chauraha to Tilak Chowk Chauraha and 939 during 6pm to 7pm for traffic direction from Tilak Chauraha to Gandhi Chowk Chauraha.

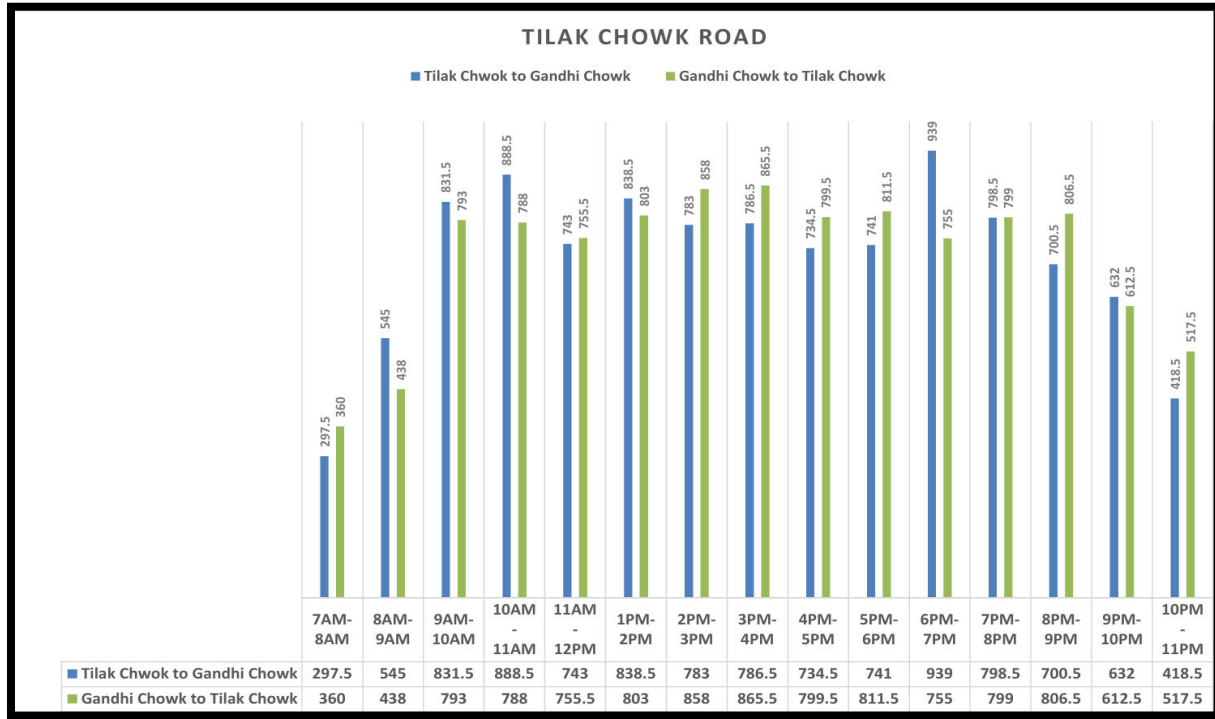


Figure 5: Traffic Volume of Tilak Chowk Road

The average traffic volume flow in the direction of Gandhi Chowk Chauraha to Tilak Chowk Chauraha was 717.5 which is greater than the traffic volume flow in direction of Tilak Chowk Chauraha to Gandhi Chowk Chauraha was 711.8. That concludes that the traffic flow in the direction of Gandhi Chowk Chauraha to Tilak Chowk Chauraha is greater.

6. Conclusions

This report contains the findings of a thorough analysis of traffic data gathered at Vidisha City's Main Market over the course of a week. Insights into many aspects of traffic patterns, such as volume, congestion, and peak hours, were sought after by the analysis. The information gathered and examined forms the basis for the conclusions given below.

Traffic Volume:

The analysis revealed that the average daily traffic volume during the analyzed period was 19888 (PCU) number of vehicles per day. This data indicates the overall intensity of traffic flow within the studied area.

Peak Hours:

The study determined the times of day when traffic congestion was the worst. In Vidisha City's Main market area, peak hours were recorded between 6:00 PM and 8:00 PM in the evenings as well as between 10:00 AM and 12:00 AM in morning hours. The aforementioned findings show when there are the highest traffic demands.

Congestion Hotspots:

By analyzing traffic flow data, several congestion hotspots were identified. The Station Chauraha, as well as Station Road and Hospital Road, were found to be the most congested areas. These locations experienced significant delays during peak hours, affecting the overall traffic efficiency in the area.

Following are the Recommendations:

The Main Market area is accepting high traffic which cannot be handled by the available system. Hence it is essential to raise its capacity. But the Roads are already at the level of the highest capacity it can handle and further cannot be widened.

1. As Vidisha city is a rapidly growing city so is its traffic. The high traffic creates heavy traffic congestion and massive traffic conflict.
2. As the roads cannot be widened the traffic capacity can be increased by converting them from Two Way to One Way Street.
3. The conversion to One Way will lead to not only increasing traffic capacity but also various benefits like following,
 - Improving traffic flow and safety
 - Enhancing urban design and livability
 - Flexibility for Emergency Vehicles
 - Increased Parking Possibilities
 - Improved Pedestrian Facilities
4. We recommend converting the Tilak Chowk Road, Station Road and Hospital Road into One-Way Street starting from Gandhi Chowk Chauraha to direction of Tilak Chowk Chauraha then to Hospital Road Chauraha connecting the Madhavganj Chauraha and Station Chauraha. Forming a small Ring Road type formation with a mash like interconnecting road system.
5. As there are various Interconnecting local roads which are highlighted with red lines are having sufficient width for vehicles like Car, Auto, Small Pickup truck, also during the daytime Heavy vehicles like Truck, Bus etc. are not permitted to enter the Vidisha Main Market area so this will create opportunities of taking U-turns or exiting the One-Way Corridor easily.
6. The establishment of obvious signs and road markings is crucial to ensure drivers are aware of the one-way street system. Install prominent, clear signage that clearly shows the direction of traffic flow at entry locations. Paint directing arrows on the surface of the road to provide visual guidance to drivers.

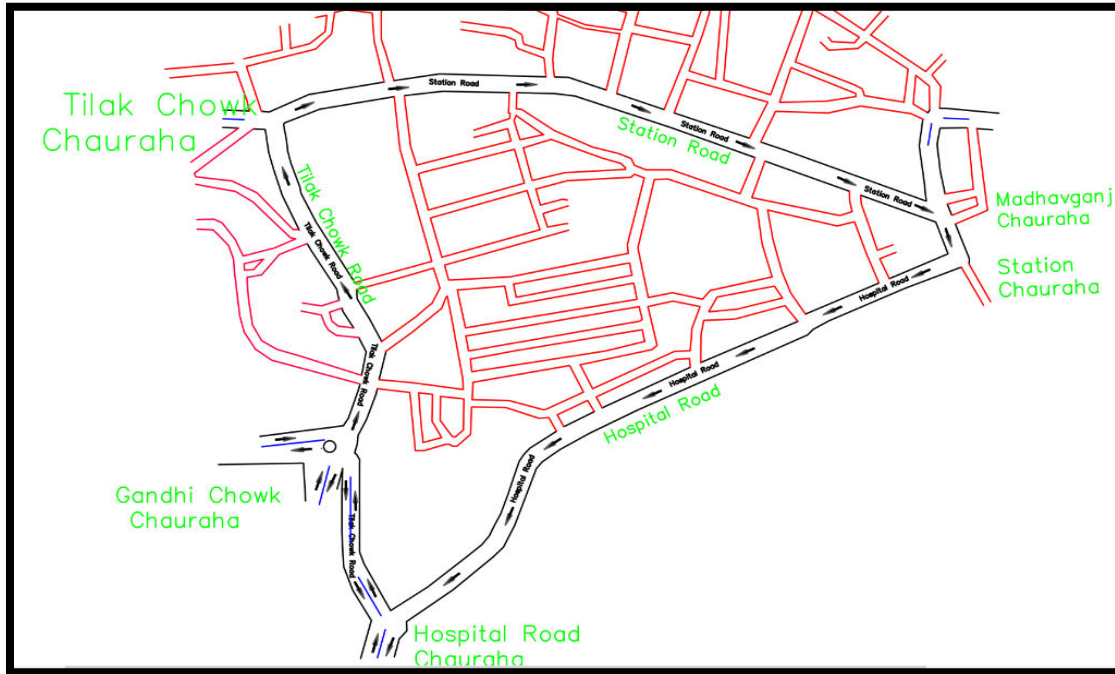


Figure 6: AutoCAD Drawing of Recommended Road System in Vidisha Main Market

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