

Sustainable Transportation Strategies for Nagpur City

Pallavi D. Dhawad¹, Prof. S. D. Ghodmare²

¹M. Tech Tre. Engg., (Research Scholar) GHRCE, Nagpur

²Asst. Prof. (Civil Engg., Department), GHRCE, Nagpur

ABSTRACT: *The present study has been undertaken to evaluate the delay caused to the traffic of Nagpur city and thus to implement the different strategies to reduce delay to the traffic. The existing signal timings causing delay to the traffic which can be reduce to some extent by changing the pattern of signal timings. Later the work continues with the factor of vehicle emission which can be decrease automatically if the delay reduces. Thus the signal timing data and volume data during peak hour were collected from different Junctions of , Nagpur. After work on simulation, it was found that the delay to the traffic and is reduced by some percent. Thus change in signal timing proves to be one of the strategy that can be implement in Nagpur city.*

Keywords: *Sustainability, Strategies, signal timing, delay, Fuel emission.*

I. Introduction

Nagpur city is well known for highly dense population, mixed traffic flow, wide network of highways, highly polluted and of broadly dispersed pattern. These factors are responsible for time consumption of people and pollution in the city results into the impact on health of people. Thus it forces to put forward the need of sustainable transportation concept in front of society. The automobile dependency creates another set of problem in terms of high-energy consumption, and with depleting fossil fuels resources. This makes us realize the need of development in sustainability. Sustainable transportation refers to any means of transport which reduces the travelling time with low impact on environment and thus on human health without compromising capacity of future need. It provides easy access to the people to any corner of city in a safe and environment friendly mode of transport. Transportation sustainability is measured by effectiveness and efficiency of transportation system. Different strategies includes planning of transportation properly, integrated land use, use of clean fuels, pricing policies, etc.

In this project analysis of some congested junctions of city will be undertaken. The location of interest for the analysis is T-Point, Hingna junction and Pratapnagar junction, Nagpur. In the data collection signal timings and volume pass per hour were counted. The project aims to identify strategies to be taken for the betterment of transportation system in Nagpur city. Transport strategy would bring many tangible benefits like it will improve livability, reduce air pollution, reduces green house gas emissions, increase the whole community's access to transport, revitalize existing city, town and suburban centers, etc.

II. Problem Definition

Nagpur city is characterised with increased population, dispersed land pattern, lack of mass transit system, increase use of automobiles, etc. Thus traffic in the city is facing delay problem. Problem of delay is more during peak hour. Thus sustainability concept which refers to any means of transport that reduces delay with low impact on environment is useful. In this paper, a strategy of reducing the green signal timing of junctions of city is taken into consideration. This reduction will based upon the vehicles passed per hour from that particular junction. Reduction in green timing from particular direction of junction will not cause the delay to the traffic other direction of junctions un-necessarily.

III. Objective of Review

The main objective of undertaking Sustainability concept in Nagpur city is to ensure good governance in the city. The objectives and various tasks to be achieved can be stated as follows:

1. To reduce delay to the traffic on highly Congested signals by changing the signal timings.
2. To reduce fuel emission from the vehicles by reducing the delay to the traffic at squares of Nagpur city.
3. To compare the current results of delay and emission of traffic with the modified values after applying strategies.
4. To evaluate different transportation strategies.

IV. Scope of study

This Research work is a Report covering the analysis of the surveys conducted there by, presenting the existing and future transportation scenario along with the list of strategies identified for Nagpur. The report also presents the future forecasts and the strategies to overcome the transportation deficiencies in the coming years within the study area.

V. Methodology

Methodology includes following steps.

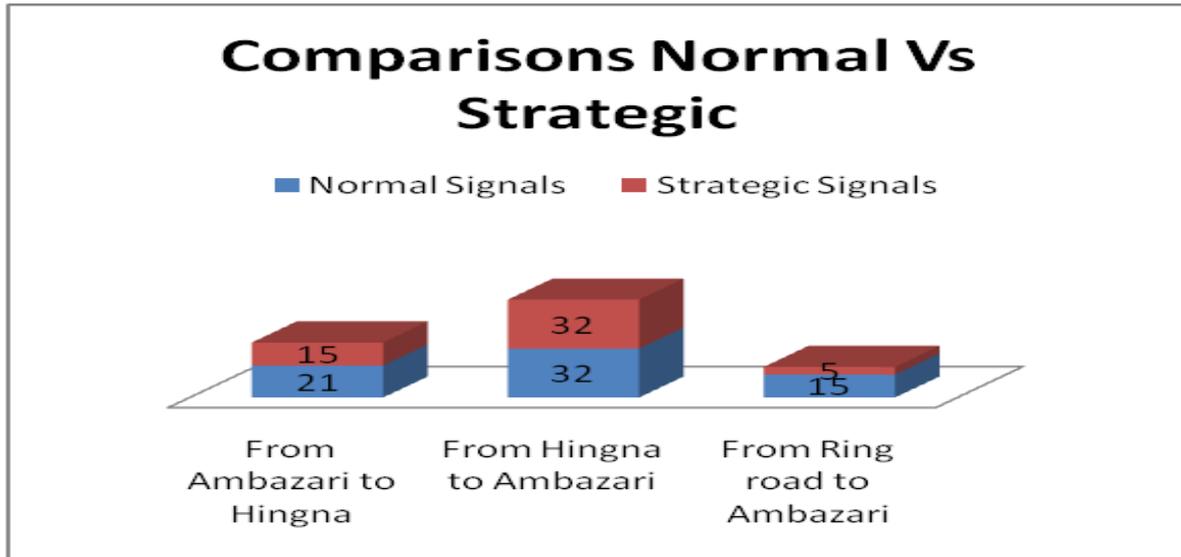
1. Collection of data regarding signal timings at T-Point & Pratapnagar Junction, Nagpur.
2. Counting survey of vehicles passing per hour from the Junctions during peak hour.
3. Determination of required time to be taken by the vehicles.
4. Reduction in the green signal timing as one of the strategy to be followed.
5. Creation of model in Visual Studio.
6. Data entry.
7. Calculation of reduction in delay to the traffic.
8. Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Microsoft Windows superfamily of operating systems, as well as web sites, web applications and web services.
9. In Visual studio a model of an intersection was made. Two sensors RSU (Road safety unit) and TCU (Traffic control unit) were used.
10. TCU is fixed at the center of an intersection and RSU is fixed beside each route of an intersection. RSU communicates with TCU and provides information regarding traffic flow coming from respective direction. So, the strategy includes reducing signal time according to the data received by RSU to the TCU about volume of traffic.

VI. Study area and Survey

T-Point Junction				
Direction of rout	Green Signal time per cycle		Vehicle count per cycle	
	Existing value	Modified value	Existing value	Modified value
From Ambazari towards Hingna naka	21	15	25	25
From Hingna naka towards Ambazari	32	32	85	85
From Ring road towards Ambazari	15	05	02	02

T-Point Junction				
Direction of rout	Green Signal time per hour		Vehicle count per hour	
	Existing value	Modified value	Existing value	Modified value
From Ambazari towards Hingna naka	1113	2240	1325	1750
From Hingna naka towards Ambazari	1696	1050	4505	5950
From Ring road towards Ambazari	795	350	106	350

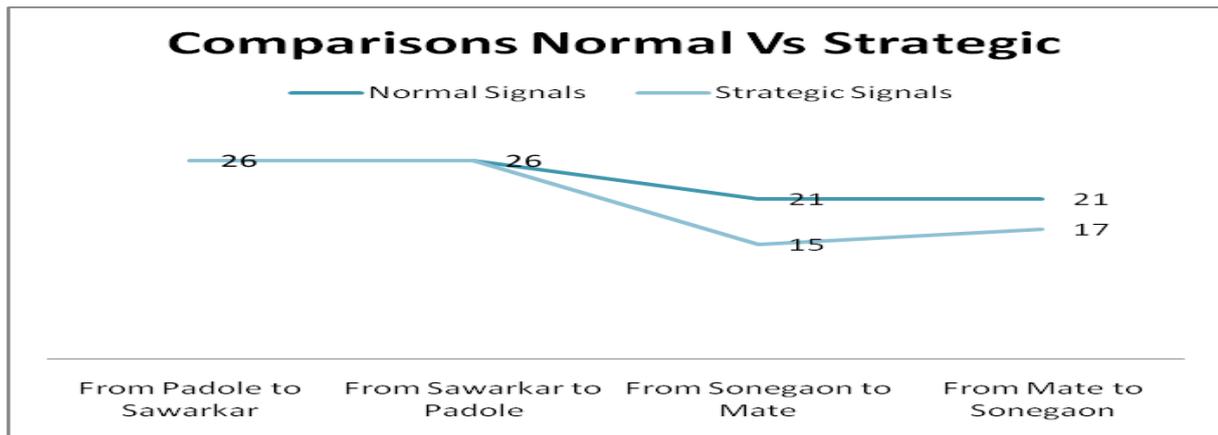
The study area was carried out at Hingna T-Point and Pratapnagar, Nagpur. At T-Point intersection, the total green time was found out to be 68 sec per cycle and volume of traffic counted is 112 per cycle. At Pratapnagar intersection the total green signal time is found to be 94 sec per cycle and volume counted is 155 per cycle. Also the green time of each direction of an intersection are different. From survey it was observed that green signal was running un-necessarily even after crossing all the vehicles which results in the delay to the traffic flow of other routes connected to the same junction. Thus data entry of existing values put in the model made in Microsoft visual studio.



The plot is showing comparison of normal signal verses strategic signal per cycle for T-Point . It shows that existing green signal time from Ambazari to Hingna is of 21 sec which can be reduced to 15 sec for passing same amount of traffic volume. Thus delay to the traffic for other direction connected to the Junction can be reduced to some extent. While From Hingna to Ambazari 32 sec of signal is sufficient as the traffic flow from this direction of route is more. Thus it has not taken into consideration. From Ring road to Ambazari delay can be reduced to great extent as the traffic flow is minimum. The analysis part was done using Microsoft Visual studio.

Pratapnagar Junction				
Direction of route	Green Signal time per cycle		Vehicle count per cycle	
	Existing value	Modified value	Existing value	Modified value
From Padole towards Sawarkar square	26	26	45	45
From Sawarkar towards Padole square	26	26	50	50
From Sonegaon towards Mate square	21	15	20	20
From Mate towards Sawarkar square	21	17	40	40

Pratapnagar Junction				
Direction of route	Green Signal time per hour		Vehicle count per hour	
	Existing value	Modified value	Existing value	Modified value
From Padole towards Sawarkar square	1014	1118	1755	1935
From Sawarkar towards Padole square	1014	1118	1950	1935
From Sonegaon towards Mate square	819	645	780	860
From Mate towards Sawarkar square	819	731	1560	1720



The plot above is a comparison between Normal signals and strategic signal per cycle for Pratapnagar junction, Nagpur. From per cycle, Analysis of per hour cycle can be concluded.

VII. Result

1. Minimizing the green signal timing of congested junctions of Nagpur city helps to reduce the delay caused to the traffic at congested intersections.
2. Reduce in delay helps to minimize the emission of fuels from the traffic.
3. Strategy of change in signal time can be easily implemented in a city.

VIII. Conclusion

Traffic congestion is a serious issue in Congested cities. In this paper we make a small effort to put together some ideas and strategies. From the analysis work, it was found that sustainability concept can minimize congestion and emission problem to some extent only.

References

- [1] Elizabeth deakin,(2003) “ climate change and sustainable transportation: the case of California”
- [2] A.D. May (2005), optimal land use transport strategies: methodology and application to European cities. Transportation research record, washington national academy of sciences.
- [3] P.M Timms (2000) , A.D May, S.P Shepherd The sensitivity of optimal transport strategies to specification of objectives institute for Transport Studies, University of Leeds, Leeds LS2 9JT, UK
- [4] Todd Litman (2006), David Burwell Issues in sustainable transportation Victoria Transport Policy Institute, 1250 Rudlin Street, Victoria, BC, V8V 3R7, Canada.Project for Public Spaces, New York City, USA
- [5] Deakin, Elizabeth (2003), “Sustainable Development and Sustainable Transportation: Strategies for Economic Prosperity, Environmental Quality, and Equity”, Department of City & Regional Planning and UC Transportation Center,University of California, Berkeley
- [6] Ogunsanya, A. A. (1984): Traffic Congestion in an Urban Centre: The Case of Ilorin, Nigeria. The Nigerian Geographical Journal
- [7] Salter, R. J. (1974): Highway Traffic Analysis and Design , London: Macmillan.
- [8] Shilpa S. Chavan , Dr. R. S. Deshpande, J. G. Rana “Design Of Intelligent Traffic Light Controller Using Embedded System”, Second International Conference on Emerging Trends in Engineering and Technology, ICETET
- [9] Emission standards for new vehicles (light duty). CAI- YJMAAsia,2008.http://www.cleanairnet.org/caiasia/1412/articles58969_resorurce_1.pdf, (accessed on 4 October 2011).European status