Studies of Non-motorized Transport & Its Measures To Improve Traffic Flow At A Street

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Abstract: Non-Motorized Transport (NMT) includes mainly walking, cycling, wheelchair travel and cycle rickshaws. All of them are active and green modes of transport.
Non-motorized citizens are vital to sustainable living. The characteristics of sustainable transport are safe, convenient and efficient in terms of economic and energy use and minimise pollution of the atmosphere. It provides strategies to change the choice of transport modes by integrating land use and transport planning for road users of motor vehicles into non-motor vehicles.
Today, transportation infrastructure in most cities are no longer feasible due to the scarcity of natural resources such as oil resources, an rise in the number of deaths and injuries caused by road crashes and traffic delays. In the view of vast number of short-distance journeys, the time lost in traffic jams, the higher cost of parking vehicles and the restrictions in central business districts, many commuters have noticed that non-motorized modes of transport provide feasible and economical transport alternatives. Thus Local governments should also promote and stimulate non-motorized modes of transportation. In return, municipalities must have safe facilities for all modes of travel, and drivers of motor vehicles must respect and coexist with pedestrians and cyclists who are the most vulnerable users of the transport infrastructure. Although current developments in sustainable transport tend to promote and stimulate non-motorized modes of transport that are socially more effective than motorised transport, little or no safety measures for disabled road users (VRUs) have been introduced, primarily in major urban centres. In South Asia, India, as a developing country, has mixed traffic, i.e. a traffic flow consisting of all categories of vehicles, such as cycle, rickshaw, auto, bus, etc.
To improve non-motorized transport and reduce motor vehicle travel by developing pedestrian paths and cycling zone. The use of non-motorized travel, such as cycling and walking, is not only a cut in carbon dioxide, but also a safe lifestyle and physical activity. The effect of non-motorized transport on the intersection capability and stretches of the road between intersections has been significant. But, as per studies, the percentage of motorcycles and other non-motorized vehicles is slightly smaller than that of motorized vehicles. However, traffic parameters such as flow, speed and density are heavily influenced by the presence of non-motorized vehicles. Hence for urban mixed Indian traffic the consideration of the effect of non-motorized vehicles is highly essential for designing and planning of roads for Non- Motorized Transport (NMT).In order to design a roads for non-motorized transport (NMT) it is important to consider the behaviour of the traffic flow. But it is very difficult to understand the behaviour of a traffic stream of mixed traffic.
The aim of the study is to improve the road conditions in Narsighpur District. Two regions of Narsinghpur city where the movement of Non-Motorized Vehicles (NMV) is more are chosen for study. The research was performed on the experience of non-motorized users of safety, visibility, crossing, comfort, convenience. The study was carried out by asking non-motorized users for inquries and their view was gathered as data, and in MS Excel the research was wiped out. Further, the value of the Bicycle Compatibility Index (BCI) is found using the Inverse Variance Method. With the assistance of BCI, each road Level of Service (LOS) is understood. Further, the improvements measures with suggestions are discussed during this paper for correct planning and designing of roads for Non- Motorized Transport (NMT).

Index Terms -NMT(Non-motorised transport),Motorized transport, BCI, BLOS(Bicycle level of services)

1. INTRODUCTION

Non-Motorised Transport (NMT), also known as active transport, refers to modes of transport which are powered by human power rather than other forms of energy like fossil fuels.
NMT involves walking, cycling, rickshaws (both passengers and goods), 4-wheel carts, bullock carts, handcarts (for the transport of goods) and even tricycles used by disabled people, and other non-motorized vehicles (NMVs) with restricted speeds, i.e. less than 25 km/h. All of these modes conflict with a number of motorised modes on city roads, which lead to unsafe and congested conditions. The term cycling in this document is used generically, including all non- motorised vehicle (NMV) types.
Non-motorized modes of transport, particularly cycling and walking, offer numerous benefits , including improved city living, safe physical activity, an effective urban transport system, less traffic congestion, less noise pollution, clean air, less impact on climate change, reduced incidence of vehicle-related diseases, reduced use of fossil fuels, and decreased transportation costs.
Non-motorized vehicles are an integral part of the non-motorized mode of India, acting as the primary source of travel for the bulk of the Indian population. The use of NMVs for the transport of goods is also economically important as an integral part of the supply chain in many cities.
The underprivileged section of the Indian population is completely dependent on non-motorized transportation, particularly in rural areas where non-motorized vehicles dominates both the passenger and goods segment. Non-motorized vehicles are directly connected to public transit networks in urban areas, and they serve as the end transportation network for the poorer section.
Non-motorized vehicles may contribute as high as 80% of the traffic flow in rural areas, whereas in cities its maximum contribution may reach 50-60% of the total traffic flow. Traffic patterns in urban India are somewhat different from those in western cities, with western cities having homogeneous traffic due to the existence of separate bus and non-motorized roads.
In India, traffic is heterogeneous, i.e. it includes both motorised and non-motorized vehicles, again there is no definite demarcation of lanes and traffic regulation for vehicle separation. Non-motorized vehicles have a profound effect on basic traffic parameters in India, especially due to their lower speeds compared to motorised vehicles.

In this paper attempts are made to analyze the influence of non-motorized vehicles on safety, comfort, visibility, crossing and convenience of entire traffic flow. There should be a separate track for Non-Motorized vehicles such as in the U.S.A. in order to reduce the consequences of Non-Motorized vehicles or else adequate studies should be conducted on the Non-Motorized vehicles and their impacts on the traffic stream.

In India practically it is not possible to lay a separate track for Non-Motorized vehicles because the Conditions for using these modes of transport are poor in Indian cities with broken roads, lack of cycling paths, poorly lit streets, uncovered manholes and overcrowded pavements being the norm rather than the exception, As a result, a thorough examination of Non-Motorized Vehicles and their characteristics along the mixed stream is needed. In India, there is a growing conflict between motorised and non-motorized vehicles due to a lack of management of non-motorized vehicles and motorised vehicles.

Since a separate lane is not given for NMVs, the traffic flow on roads is disrupted.To avoid conflict it is important to segregate Non-motorised vehicles and motorised vehicles as soon as possible and allowing Non-motorized vehicles to mix with a motorised vehicle to avoid motorised vehicle speed.

In Narsinghpur, the amount of accidents of pedestrians and bicyclists is increasing day by day.A proper study is needed to overcome accidents of Non-motorized vehicles on urban roads as the flow of non-motorized vehicles is more on Narsinghpur roads.

Due to Non- motorized user, the traffic flow is disturbed in Narsinghpur as there is a need for separate lane for safety and efficient flow of traffic stream. So, a proper study is needed by traffic agency to discuss the issues of Non-motorized transport.

1.1 Objective of study

1. Recognize the factors affecting non-motorized transport in the city of Narsingpur.
2. Calculation of the Bicycle Compatibility Index(BCI) to determine the level of service (LOS) of the non-motorized transport study area.
3. Suggest measures to improve road conditions by increasing the level of service.
4. Suggestions to improve non-motorized transport parameters on Indian urban roads.

1.2 PURPOSE OF STUDY

For a better understanding of factors that Non-motorized transport:

1. To provide suggestions for enhancing parameters such as safety, visibility, crossing, comfort and non-motorized transport convenience.

2. Implement an appropriate method for improving the level of service on Indian Urban Roads for non-motorized transport.

3. REPORT ON THE MAIN FACTORS AFFECTING NON-MOTORIZED MOTORISED TRANSPORT IN INDIAN URBAN ROADS

1.3 FUTURE SCOPE

It is clear from the above research study that proper planning and design is required for safe and free flow for non-motorized transport in Narsinghpur cities to prevent accidents and congestion problems.

For potential scope, the following points may be considered: For road improvement, it is possible to increase the sample size of the study area for estimated results. This will lead to road safety for drivers of non-motorized vehicles detailed Non-motorized research the study should be carried out for the accommodation of motorised and non-motorized transport modes, taking into account all further parameters.

2. LITERATURE REVIEW

GENERAL

The amount of traffic in India is growing rapidly, with the rise in traffic accidents and congestion on Urban India Roads. As a consequence, non-motorized vehicles are affected. The study is essential in order to make the flow more efficient, which will be beneficial to users.

PAST RESEARCH WORK.

Some researcher's work, which is useful for work, is discussed below:

Tiwari (1999)- Evaluate the level of segregation of motorised and non-motorized traffic in Delhi, India, on single-lane and multi-lane highways. The investigation revealed that bus stops push non-motorized vehicles to the middle of the lane, thereby reducing lateral separation with motorised vehicles and increasing accidents. Again a report on separate bus and bike lanes shows the value of cycle lanes for the efficient usage of bus lanes.

Crider (1999) - Set up a framework to assess the "point" level of service. According to him, it was useful because, in terms of geography, many of the problems a bicyclist normally encounters are small. There could be a bus stop that does not allow bicyclists on board, a narrow path under a bridge, a particularly dangerous intersection or a lack of bicycle parking, all of which would definitely tarnish a cycling experience.

Md. Mizanur Rahman, Izumi Okura, and Fumihiko Nakamura (2003): Performed a report on the "Analysis of the Effects of Non-motorized Vehicles on Urban Road Traffic Characteristics" for the research study carried out by Bangladesh's rickshaws and rickshaw vans. In many towns, Rickshaws plays an important role in carrying people and goods from one location to another. In Dhaka, 70% of total traffic is non-motorized vehicles and the use of bicycles is more than any other Asian country. No methodology is given in the Highway Capability Manual for non-motorized vehicles in mixed traffic flow taking into account traffic parameters. As a result of this research on factors affecting non-motorized vehicles for traffic parameters, the purpose of this study is to present an analytical method for heterogeneous traffic flow and to develop models for passing/overtaking and lane use for heterogeneous traffic flow.

Rahman et al (2003): Analyzed impact of non-motorized vehicles on the characteristics of urban traffic in Bangladesh. They found that non-motorized vehicles had a negative effect on the basic traffic parameters of speed, flow and density. There was a linear relationship between overtaking volume and total volume; however, no clear pattern on the impact of non-motorized vehicles on overtaking volume was found.

Rahman et al (2005) :conducted research on The Effect of Rickshaws and Auto Rickshaws at Signalized Intersections" in the city of Dhaka. It obtained data from four signalled intersections where there is a minimum proportion of rotating vehicles, no parking

space and a high amount of traffic. Later, he developed a model for locating passenger car equivalents of rickshaws and auto rickshaws at signalised intersections that do not affect the PCE of rickshaws and auto rickshaws, the proximity of rickshaws and particles. He concluded the result as the green light time, the width of the signalled intersection and the auto rickshaws in the mixed traffic lane had a substantial effect on the traffic flow. The number of rickshaws is the less the impact, and vice versa.

Tiwari et al (2007): The difference between homogeneous traffic flows with strict lane control in Western countries and heterogeneous traffic flows in Indian cities was investigated. Basic traffic parameters and curves are analysed by classifying vehicles as: motorised four-wheelers, motorised three-wheelers, motorised two-wheelers and non-motorized vehicles. They proposed a methodology for the verification of continuity equations as well as modifications in passenger car units to better understand traffic flows under Indian conditions.

Pan and Kerali (2007): Analysis of the relationship between the non-motorized movement of traffic and the speed of motorised vehicles under different traffic conditions. There is a linear relationship between the speed of motorised vehicles and the amount of non-motorized traffic flow. Finally, the model was calibrated to test the speed of motorised vehicles under congested conditions and varying non-motorized flow volumes.

P. Baji Babu, M. Srinivasa Reddy (2017) :Conducted research on "Non-Motorized Vehicle Characteristics and its Effect on Mixed Traffic" This paper establishes a technique for non-Motorized vehicle routing in a mixed traffic stream. In India, South Africa, Sri Lanka and so on, we mostly find mixed traffic flowing, such as developing countries. In India, we find that the traffic flow consists of all vehicles such as cars, cycles, pedestrians, bullocks, heavy vehicles, etc and also uses non-motorized vehicles (NMT) for the transport of goods and for travel. The NMT flow is very strong in peak hours. The NMT analysis is done for simulation results on paths. Virtually using square calculation, the speed value is obtained experimentally. According to the study, speed influences the mixed traffic flow of all three traffic parameters. It has been shown that the speed decreases with an increase in the number of PCUs in the same strip, the speed decreases with an increase in the number of PCUs in the neighbouring strips and the speed increases with an increase in the distance from the road edge.

Hemant Kumar Sharma, Mansha Swami, Bajrang Lal Swami: Conducted "Speed Flow Analysis" research on disrupted oversaturated traffic flow with heterogeneous structures for urban roads and developed a model for heterogeneous traffic under the constraints of vehicle characteristics, road layout, traffic control and driving behaviour. The developed model will provide speed, delay, maximum and average queue estimates for urban traffic and calculate congestion for oversaturated conditions. Flows in this paper are listed as disrupted and continuous sources. The position for data collection is chosen in such a way that it consists of two signalised intersections and one un-signalised intersection. Built curves by drawing graphs between travel power, travel time, speed versus flow rate so that the speed drop due to traffic delay, free flow time and traffic delay is obtained, respectively. Capacity can be calculated from the delay flow curve as the point at which the oversaturated flow begins. The obtained speed vs. the flow rate curve is compared to the BPR, the Akcelik speed curve and resembles the same form. However the curve obtained in this paper more realistically forecasts the efficiency of an urban network with heterogeneous traffic and disrupted flow.

Dr. Rakesh Kumar Jain): study performed on ". Non-Motorized Transport and Sustainable Urban Planning: A Metropolitan Area of Pune Case Study in Pune District. With the changing trend of urbanisation and socio-economic development, the demand for transport in India's urban areas is rising rapidly. In catering to transport demand and ensuring a sustainable transport system for India, non-motorized modes of transport play an important role. The situation in India is very different. India is low in hydro-carbon and capital resources, but abundant in power for humans and power for animals. A sustainable transport system must meet the needs of people for mobility and accessibility through the provision of healthy and environmentally friendly means of transport. Non-motorized transport (NMT) fulfils these sustainability goals by using indigenous human and animal resources, which is non-polluting, clean, accessible and user-friendly and needs only a small fraction of the capital needed for motorised transport. In this paper, various factors affecting the demand for NMT are addressed. The paper also addresses in brief the problems of traffic and transport in the Pune Metropolitan Region and the prevailing non-motorized situation (PMR). Deliberations have illustrated the concomitant problems relevant to NMT resulting from this study.

Botma - proposed level of service methodologies for pedestrian paths and bicycle paths. Both specified levels of service in terms of events. An occurrence occurs when one user moves through another user travelling in the same direction, or when one user meets another user travelling in the opposite direction. The level of service deteriorates from A to F as events become more frequent.

Hunter et al. - Research the differences between the wide lanes and the bike lanes. They're Observed videotapes of around 4,600 bicyclists and analysed organisational features and interactions between bicyclists and motorists. They concluded that the type of bicycle facility had much less impact on safety and operations than the other characteristics of the site and proposed that both wide curb lanes and bicycle lanes be used to improve riding conditions for bicyclists.

Harkey et al. -Established a Bicycle Compatibility Index (BCI) for suburban and urban areas Roadways in mid-block areas. The BCI was created by bicyclists watching video tapes of different road segments and giving ratings of how comfortable they would feel to ride on each section. Examples of these variables are traffic volume, lane width, and vehicle speed. The BCI values were then converted into the service level of the bicycle. LOS A (corresponding to BCI < 1.50) suggested that the roadway is extremely compatible with the average adult bicyclist. . LOS F (corresponding to BCI > 5.30) proposed, on the other hand, that the roadway is highly incompatible with the average adult bicyclist.

3. METHODOLOGY

1. Recognizing the objectives
2. Selection of the study area- for study the topic of my thesis I chose the two junction (Gandhi chowk crossing and kareli crossing) and stretch between two junction.
3. Primery data collection - data regarded the study is collected first hand from the direct observation of the traffic movement at both junction .Data are also collected by consultation with the transport users and traffic police . Data are collected for both peak and off peak hour for two consecutive days.
4. Secondary data collection- different websites, journals and books and previous thesis work were viewed in urban city, different measures that are taken to controlled traffic congestion in the city .
5. Presentation of the collected data:- Tables, line charts, column charts are used to present the data collected from the directed observation.

6. Analysis and calculation of collected data
7. Results, Conclusion, Suggestion and future scope

For the research work, the three areas were of Narsighpur city where the flow of Non-motorised vehicles is high was taken. The following are two areas were survey were carried out by asking questions by paper format to the public which includes pedestrians and bicyclists only.

1) **Kareli main road crossing**
2) **Gandhi chowk, Narsinghpur**

In this project, a survey was taken by asking questions on paper. The question consists of problems facing by Non-motorized users on the selected study area in Narsighpur city. The questions were rated from 1 to 5 ranges. The questions are divided into five parameters that is Safety, Visibility, Crossing Comfort and Convenience and these parameters are used to calculate BCI.

Below is questions pattern ask for research work-

Questionnaire

NAME –
AGE –
TIME –
AREA -

SAFETY

1) According to you do you feel that drivers are sticking driving rules and regulations? (Yes/No)
2) How would you rate the road in terms of accident frequency? (Rate 1-5)
3) How comfortable or safe you feel while riding bicycle?
4) While riding do you prefer to wear safety kit? (Yes/No)
5) Is this carriageway suitable for pedestrians and bicycles?

BICYCLE AND PEDESTRAIN VISIBILITY

1) Is the road width adequate for you? (Yes/No)
2) Would you prefer a specific bicycle lane? (Yes/No)
3) How would you rate the surrounding and cleanliness of the area? (Rate 1-5)
4) How would you rate the pedestrian traffic on the road? (Rate 1-5)
5) How would you rate the motor vehicle traffic on the road? (Rate 1-5)
6) Is there proper lighting during night to have a clear view of road? (Rate 1-5)
7) Can you view the bus stop clearly? (Yes/No)
8) Is the sight distance to bus stop adequate for you? (Yes/No)

CROSSINGS/INTERSECTION

1) How unsafe do you feel about the crossing? (Rate 1-5)
2) Are you able to clearly see the approaching vehicles when crossing or turning? (Yes/No)
3) Are there speed bumps prior to the crossing? (Yes/No)
4) Are the turnings at intersections sharp /curved and rate it. (Rate 1-5)
5) Is there any traffic signs and traffic signals available on road (Yes/No)

ROAD COMFORT

1) How would you rate the vehicular traffic speed? (Rate 1-5)
2) Is median present? (Yes/No)
3) In terms of safety how would you rate the width of road? (Rate 1-5)
4) Do you think setting a speed limit for the road will make it safer? (Yes/No)
5) Is there any bicycle lanes available? (Yes/No)
6) How relaxed do you feel when the following vehicles approach while crossing (please provide ratings) -:
7) When a heavy vehicle like bus/truck is approaching. (Rate 1-5)
8) When lighter vehicle like car approaches. (Rate 1-5)
9) When a bicycle/bike approaches. (Rate 1-5)

CONVENIENCE

1) How would you rate the time consumption by their own non-motorized vehicle to reach their destination?
2) How would you rate the fare cost applicable for your travelling?
3) How would you rate mechanics near your area?
4) How would you rate the condition of the sidewalk
5) How would you rate the maintenance of sidewalks, cycle paths, bike lanes and green lanes?
6) How would you rate the parking facilities for non-motorized vehicles?
7) Is there any bicycle parking facility available where you work or study? (Yes/No)

Development of Bicycle Compatibility Index:

Bicycle compatibility index is found by the calculation of answers rated by the public on study area where questionnaire format was designed in such that it could easily understood by majority of the public. All questions were either a simple Yes/No answers or rating based, where rating was done on a scale of 1-5:

Very Poor	1
Poor	2
Normal/Ok	3
Good	4
Excellent	5

The weights of various quantities are taken against their ratings on the basis of this, and the compatibility index is found. The statistically calibrated mathematical equation used for Bicycle Level of Service is often used for the analysis of roads as well as bicyclists conditions. The weights are determined using the method of inverse variance (from Daniel L. Carter's Bicyclist Intersection Safety Index), according to which the rating of surveyed answers are equal to the inverse of the variance. . The questions are divided into five parameters, which are listed above: safety, visibility, crossing comfort, and convenience, and these parameters are used to calculate BCI. D. The weights or constants are equal to the inverse of the variance of the parameters surveyed. Bicycle compatibility index is denoted by "Y"

BICYCLE COMPATIBILITY INDEX (y) = AX1 + BX2 + CX3 + DX4 + EX5

Where:

A, B, C, D and E are constants calculated by finding the inverse variance of their respective observations.

X1, X_2, X3, X4, and X_5 are the mean of their respective observations.

$$\text{Variance} = \sum(x - \tilde{x})^2/(n-1)$$

$$\text{Interval} = (y_{max} - y_{min})/6$$

MS Excel is used for all data collection calculation and analysis.

The final equation's Bicycle LOS score is pre-stratified into service groups "A, B, C, D, E, and F," based on the ranges shown in Table-3.1, representing users' perceptions of the road segments' quality of service for bicycle travel. The Model is particularly sensitive to statistically significant factors. The final result will give a similar table-3.1 as below but with different values.

Table-3.1 Level of service is determined by the range of Compatibility

LOS	BCI RANGE	COMPATIBILITY LEVEL
A	< 1.50	**Extremely high**
B	1.51-2.30	**Very high**
C	2.31-3.40	**Moderately high**
D	3.41-4.40	**Moderately low**
E	4.41-5.30	**very low**
F	**>5.30**	**Extremely low**

(Note: For calculation purposes, Yes/No are replaced with 1 and 0, respectively.)

By using Bicycle Compatibility Index, Level of service is determined by the range of Compatibility.

If the LOS is "**LOS A**," the compatibility level is "Extremely High," and the flow is "Free flow."

If the LOS is "**LOS B**," the compatibility level is "Very High," and the flow is "Reasonably free flow.

If the LOS is '**LOS C**,' the compatibility level is "Moderate High," and the flow is "Stable flow."
If the LOS is "**LOS D**," the compatibility level is "Moderate Low," and the flow is "Approaching Unstable flow."
If the value is "**LOS E**," the compatibility level is "Very low," and the flow is "Unstable flow."
If the value is "**LOS F**," the compatibility level is "Extremely Poor," and the flow is "Breakdown flow.

4. ANALYSIS OF DATA AND RESULTS

At the survey area, total of 300 questions were asked that is 150 at each area.

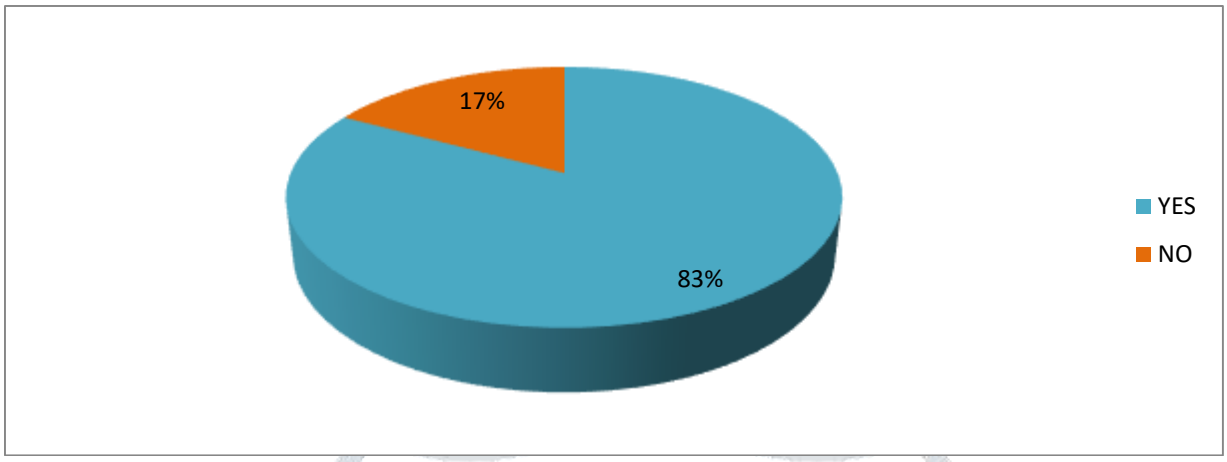

Fig.5 1: Specific NMV lane preference

According to survey taken 83% of Non-motorized vehicle users faced problem on Narsinghpur roads and want separate lane for pedestrian and bicyclists where as17% of Non-motorized public is okay with the condition of roads shown in figure 5.1.

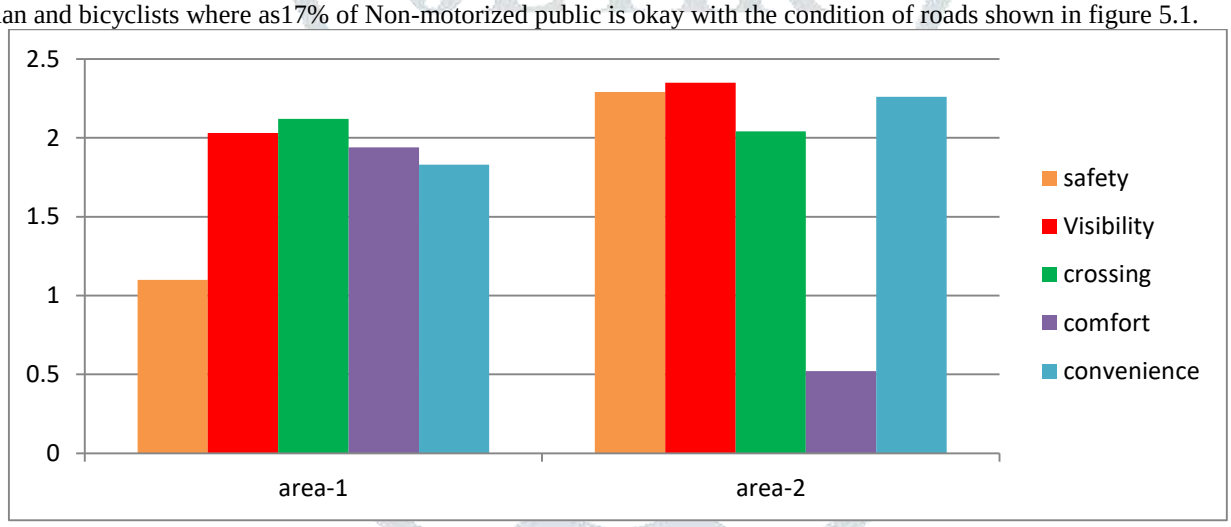

Fig.- 5.2. Area wise data comparison

5. CONCLUSIONS

I hope that the proposals and the recommendation that are made to make the thesis objective successful are feasible enough to apply at both kareli street and Gandhi chowk intersection and the stretch between two junction .If the suggestion made in this thesis are properly implemented then the traffic flow will become smooth and there will have no congestion. From the above Analysis and Results, all the Narsinghpur area which was taken for project study needs improvement. Area 1 needs more parameters to update. As both the areas LOS is low, level of service has to be increased to LOS A. The following developments would occur as a result of improvements in parameters such as safety, visibility, crossing, comfort, and convenience:

1. Risk reduction, and therefore a reduction in the number of injuries.
2. In urban traffic, the complexity of traffic for NMT users is reduced.
3. Increasing the number of route options for cyclists/pedestrians
4. Improving the competitive position of the bicycle/pedestrians in relation to car traffic
5. Road Safety Measures like speed control, road design, vehicle design.
6. Education and awareness raising.

SUGGESTIONS FOR IMPROVEMENT IN NMT

One of the key reasons for the issues of pedestrians and bicyclists affecting the movement of traffic streams in Narsinghpur is ignored. There is a need for non-motorized planning to prevent collisions and issues with congestion because the traffic flow is interrupted for these reasons. The effective and convenient use of non-motorized modes of transport will take place due to the proper preparation of the NMT.

Higher authorities such as the police, the public works department, the transport department, the road traffic agency, the city council, the city planning agency, as well as civil society should also take measures to design and enforce the construction of non-

motorized vehicle facilities and public education, promotion and safety initiatives.

SUGGESTIONS: The following measures should be taken in non-motorized planning:

(1).**SEPERATE LANE FOR** BUSES

A bus lane, also known as a bus only lane, is a lane that is limited to buses on specific days and times, and is usually used to speed up public transportation that would otherwise be slowed by traffic congestion. Other automobiles, such as taxis, high occupancy vehicles, motorcycles, and bicycles, should frequently be limited. Bus lanes are an important component of bus rapid transit.

In this area the bus lane is not necessarily has to be very long, as it may only be used to bypass a single congestion point such as the both intersection. Strict rules and regulation should be there to maintain the bus lanes so that no other vehicle can share dedicated lane. Even buses should follow their own way. For that one suggestion can be use of electric buses with rubber tyres.

Pros:

- Bus lanes offer buses priority and reduce travel times when roads are congested with other traffic..
- The introduction of bus lane can significantly assist in reduction of pollutants .

Cons:

- All other road users must give way to the bus lane, resulting in long bus lines.

(2).SEPERATE LANE FOR NON-MOTORIZED VEHICLES

Like the buses the non motorized vehicles should have their own lane for movement .Non motorized mode are environmentlly friendly and have to be given their due share in the transport system of a city .the problem being forced by them would have to be mitigated.

In the Gandhi chowk street area their should have path in between the book market and the many street for the ban rickshaws, hand pulled rickshaws so that they don't share the traffic with motorized vehicles thus reducing traffic congestion , restriction are to be made strictly for the motorized vehicle (specially 4 wheelers) for those path.

The safety concern of the cyclist and pedestrian have to be addressed by encouraging the construction of segregated right of way for bicycle and pedestrian.

Pros:

- Safety can be improved for non motorized vehicle
- The segregation of vehicle moving at different speed would help improved traffic flow, increased the average speed of traffic and reduce emission resulting from sub-optimum speed .
- This approach will encourage the use of non motorized vehicle for short trips resulting and reduce pollution .

Cons:

- • If the dedicated route is not well maintained, it can become congested as well.

(3).SEPERATE LANE FOR HEAVY FREIFGHT TRAFFIC

As cities' economic activities expand and their populations increase, a significant amount of freight traffic will be generated. The timely and smooth movement of such freight is critical to the people's well-being and the profitability of the economic activities they engage in. However, with limited capacity of transport system, it is essential the freight traffic and passenger traffic are so staggered as to make optimum use of transport infrastructure.

One alternative is to transport freight during off-peak passenger travel times. Many cities have designated late night hours for freight movement and prohibited heavy vehicles from entering cities during the day.

Furthermore, some cities have by-passes that allow through traffic to bypass the city and avoid adding to traffic congestion. These practice are sound and would be encouraged in this area.

(4).PROPER PARKING FACILITY

Parking cars have taken over a large portion of the roads in this city, disregarding the importance of land use. Impose a high parking charge that accurately reflects the value of the land occupied.

A land should be used away from the streets for parking the cars; moreover the parking should be restricted for street area only, not for other areas as it will increase the traffic volume. Preference in parking space allocation for public transportation vehicles and non-motorized modes, as well as better access to and from work places, will go a long way toward promoting the use of sustainable transportation systems. This can be accomplished by designating specific lanes and highways for public transportation and non-motorized modes of transportation.

Similarly lane could be reserved for vehicles that carry more then 3 persons (popularly known as high occupancy vehicles lanes).

Pros:

- If users of personal cars can be encouraged to switch to public transportation, it helps to minimize traffic and emissions.

(5). FACILITY FOR PEDESTIAN:

The width of the footpath should be available for the pedestrians. Proper action should be taken for illegal encroachment. The book of on the footpath should have left a sufficiently space for pedestrians if they are legal. The random plantation also occupies the space for pedestrians. It should be in a more planned manner.

Pros:

- Pedestrians will not use road spaces, allowing for smooth traffic flow
- Reduce the chances of accidents.

(6). TIMING VARIATIONS OF EDUCTIONAL INSTITUTIONS AND OFFICES:

Normally the timing of educational institutions and offices are same so that during that particular time traffic get congested. If the timing can be changed then there can be a shift of traffic over a long time period which reduce the traffic congestion.

(7**). IMPROVED SIGNAL SYSTEM:**

It is observed that the traffic signal is not well organized based on the volume of traffic at the both intersection. There should have frequent survey over the traffic volume so that signal system can be changed accordingly for a fixed period of time.

The signal should be flexible, meaning it should work both automatically and manually. But the automatic signal is preferred more then the manual systems as it can human error which can lead to accidents or traffic congestion.

(8). IMPROVED TRAFFIC MANAGEMENT BY PROPER TRAFFIC POLICE TRAINIING:

(9). SPECIAL MOBILE TEAM OF CITY TRAFFIC POLICE TEAM FOR ANY SUDDEN TRAFFIC CONGESTION DUE TO ACCIDENTS OR ANY OTHER REASONS.

(10). NEED FOR PUBLIC AWARENESS AND COOPERATION:

Without the full support of all city citizens, urban transportation strategies will fail. The best way to ensure such cooperation is to make the aim of every project clear to them. As a result, extensive public awareness campaigns educating people about the negative effects of growing urban transportation problems, especially on their health and well-being, are needed.

The campaigns would seek their support for initiatives like greater use of public transport and non motorized vehicles the proper maintenance of their vehicles, safer driving practices, such campaign would also encourage individuals, families and community to adopt “green travel habits” that would make travel less polluting and damaging.

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