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A Review on Impact of Non-Motorized Transport on Traffic Flow

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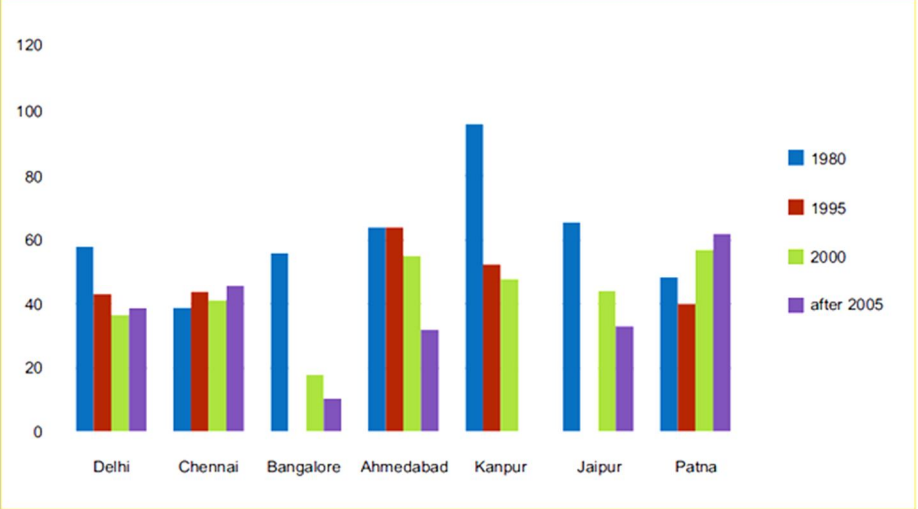
Abstract: ***With the advancement in automobile sector it has been observedfrom the past couple of years that maximum countries are getting dominated for using Motorized vehicle (MV) as their primary mode of transport and MVs are penetrated in every urban area. Factors influencing mode choice are journey time, safety and overall quality of transportation system. Hence they are evaluated from time to time to make the system reliable and to satisfy the demands of the future needs. But unfortunately Non-Motorized Vehicle (NMT) is neglected in the planning of transportation system, which triggers the need to revolutionize the NMT completely. Due to increase in traffic of motorized vehicles on the road, environment witness adverse effect, increase of carbon footprints, climatic changes and contribution towards pollution; also the level of serviceability is hampered as there is limited width and lane available for MV on urban roads compared to NMTs which require relative less space for facilities including roadways and Parking bays also less road maintenance This review paper aims to represented different works, studies and implementation of policies which will highlight the needs of NMT and their supporting infrastructure.***

Keywords: ***Non-Motorized Vehicle, Bicycle, NMT, Pedestrians***

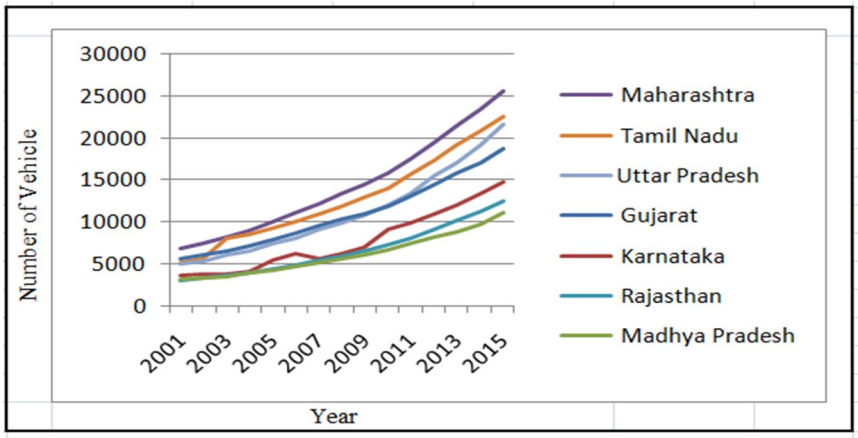
I. INTRODUCTION

Non-Motorized Transportation (NMT) a mode that involves walking, bicycling and cycle rickshaw is often a key of successful element boosting the clean urban transport. It proves to be efficient mode of transport for relative shorter distances which is cost effective strategy and brings many perks in social, health and economic benefits for the urban citizens. Walking is the Global form of transport, every travel opt in public transport starts and finishes with walking no matter how short or long. Urban middle class and Rich do not consider NMTs as they interpret it to uncomfortable dangerous and low in Status, due to which we see inclination in the modal share percentage of NMTs whereas it proves to be life line for low income households, as they are not only dependent for their conveyance but also generation of income if such modes are provided with better infrastructure and system these mindsets can be changed and get them using such eco-modal approach. In 1980's the share of non-motorized transportation was in the range of forty to sixty percent of the total trips. A recent study for seven Indian cities has shown that the share of non-motorized transportationhas been hampered in recent years as shown below (Graph No 01).



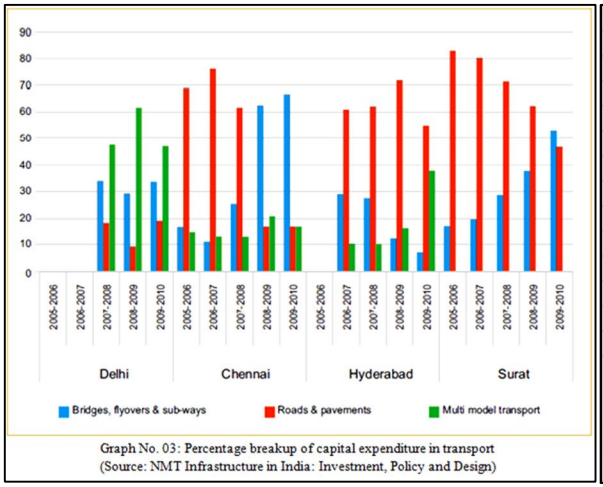
Graph No. 01: Trends in modal share of NMT (Walking and Bicycle) since the 1980
(Source: NMT Infrastructure in India: Investment, Policy and Design)

The scope is very high, higher the population, higher the road network, higher the number of commuters. Beyond the scope, there is a significant need to evaluate Non-Motorized Transportation which will not only reduce the load on environment and traffic congestions of motorized transport, but also will encourage people to use a cleaner and low cost mobility, thus developing Sustainable Transportation. To get some place in Indian Cities riding a bicycle the chances are we have to ride in traffic on busy roads due to inadequate infrastructure and poor planning for Non-Motorized Transportation where it triggers the interaction between motorized with non-motorized transportation creating a mixed traffic condition , as the speed of maneuvering for NMTs is significantly lower than that of mortised vehicles, results in hampering of level of serviceability referred to speed and comfort of mobility where we can see a major drastic change in driver's perseverance and reaction time and movement in such mixed traffic flow. As per Motor Vehicles - Statistical Year Book India 2017 there is continuous increase in motor vehicles especially in Maharashtra the graph (Graph No 02) showing state wise increasein motorized vehicles.

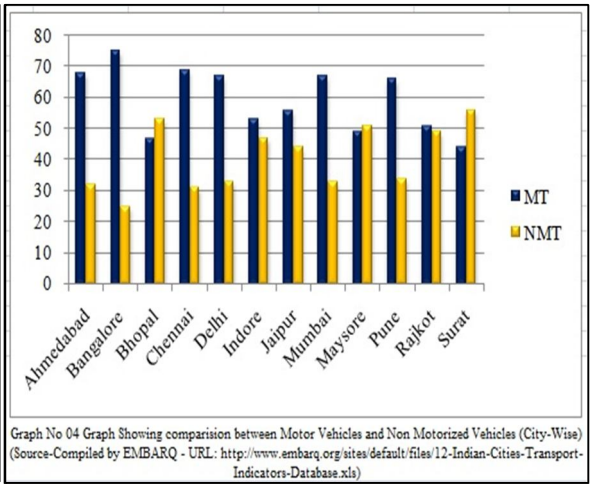


Graph No 02 Graph Showing Total Registered Motor Vehicles in India (State-Wise)
(Source-Motor Vehicles - Statistical Year Book India 2017)

A report submitted by the National Transport Development policy committee (NTDPC) to Ministry of Urban Development Govt. of India, purely emphases that the NMT should get first priority in Infrastructure development and funding, also the share on public transport should be aimed to 50% for motorized transport and 35% for NMTs which will result in efficient utilization and balance of road share, but unfortunately Non- Motorized transport are neglected in the planning process. It is important to develop the infrastructure for NMT to motivate the road users to decline the use of MV's and encourage the users to adopt the multimodal transportation system. According to the NMT Infrastructure in India: Investment, Policy and Design analysis for the city budget has been carried out for the four cities Delhi, Chennai, Hyderabad and Surat(Graph No. 03) as outcome they are only considering development of pavements, multimodal transportation, bridges, flyovers, subways and neglecting the improvement of infrastructure for the NMT in city budget. Mysore and Rajkot has approximately same count of NMT to that of MT as compared to other cities (Graph 4)



Graph No. 03: Percentage breakup of capital expenditure in transport
(Source: NMT Infrastructure in India: Investment, Policy and Design)



Graph No 04 Graph Showing comparision between Motor Vehicles and Non Motorized Vehicles (City-Wise)
(Source-Compiled by EMBARQ - URL: http://www.embarq.org/sites/default/files/12-Indian-Cities-Transport-Indicators-Database.xls)

II. LITERATURE REVIEW

M. R. Mat Yazida*, R. Ismailb, R. Atiqa (2011) [1]In this paper the authors studied and evaluate the behavior of NMT's in Malaysia. They carried out the survey in a city of Malaysia where they found out that today's society is very much dominated by cars, buses, motorcycles trucks etc., thus increase in no of vehicles. It leads to not only motor vehicle accidents and traffic congestion but also contributing towards carbon emission, climatic changes and environmental pollution. Therefore, they suggest improving walkways and cycling areas to increase non-motorized transport.

Santhi J Bedadala, Mallikarjuna, (2016) [2] This paper discus on different factors influencing the user to choose the NMT modes. The main emphasizing is that there is a severe decrease of usage of Non-Motorized vehicles in a developing country like India due non implementation of effective infrastructure and transport system for NMT. Indian conditions are compared with other countries' socio demography where we can see that the main thing for which the NMTs are not considered is because of increase of trip length, and traffic congestions which discourages the users as it increases the efforts and Journey time, it is necessary to make use of the multimodality behavior of non- motorized modes in order to reduce severe traffic congestion thereby improving the journey speeds. They have advised to adopt some regulation measures from developed countries to boot the NMT.

Yanfei Zhang*, Ting Pan, Yuchen Zhang [3]The research has been carried out on Bicycle Traffic Microscopic Behavior in China, based on Based on Car-Following Model, Cellular Automaton Model and Two-Dimensional Social Force. They have compared the traffic microscopic characteristics such as vision, speed, acceleration, trajectory and psychological characteristics of bicycle, Motor vehicle and pedestrian. Therefore, on the basis of studies on the microscopic behavior of bicycle traffic, the influence of human, vehicle, environment of multi-source dynamic information of the rider and future development trend of bicycle traffic are considered.

Winnie Daamen, Serge Hoogendoorn (2003) [4] The paper deals with the detail study of pedestrian crossing behavior at signalized intersection. The researchers have collected data with the help of cameras at different signalized intersection which were located in highly populous city Mumbai, India. The data offered information about crossing time, pedestrian volume, crossing behavior, appearance, crossing locations and pedestrian-vehicle interaction in crosswalks. To study the significant influence factor on pedestrian crossing behavior they have executed a one-way investigation of variance (ANOVA), student test and Pearson's correlation coefficient. They have determined the pedestrian crossing speed for adult and old pedestrian at 1.12 m/s and 0.95 m/s respectively. This paper offer analysis of various pedestrian crossing behaviors at signalized intersection at mixed traffic conditions to develop good infrastructure and to improve safety of pedestrian.

Marisamynathan ., Vedagiri Perumal (2014) [5] In this paper investigational study of non-motorized vehicle characteristics and its effect on heterogeneous traffic . To design and plan traffic facility for a city it is necessary to understand the behavior of traffic stream, but when it comes to mixed traffic it is quite complex. They have collected data with the help of video cameras and decoded it as per the requirement, for every 1 min interval the flow of vehicles, passing the line in both direction was noted. Researchers have observed and computed parameters such as Speed, Flow, Density, Fundamental diagrams of traffic Flow and Relative Lateral Occupancy. They have also studied Speed versus Various Parameters of Road and concluded that the speed of Non-Motorized vehicles decreases when number of PCU in same and adjacent strip increases. Speed increases when distance from road edge increases.

Siddharth Purohit, Ujjal Chattaraj, Mahabir Panda (2014) [6]In the paper they have discussed the experimental design, given the identification of the process variable of interest. For the study four process variable were considered

A. Free Speed
B. Walking direction
C. Density
D. Effect of bottle neck

To study the process variable, they have performed 10 experiments in which approximately 80 pedestrian participated and the results were analyzed using specially designed pedestrian detection and tracking software, which results into detailed microscopic pedestrian trajectories. Considering the narrow bottleneck situation, it was observed that during near-capacity and capacity flow situations, the bottleneck is used differently than in case of free flow condition, in case of free flow condition the pedestrian will walk in the center of bottle neck and during capacity condition two lanes are formed, they tend to walk diagonally behind each other, reducing the headways and maximizing use of infrastructure.

III. CONCLUSION

The share of NMT is declining and consumers are getting discouraged to use the mode, there is a serious need in development of NMTs as a sustainable transportation system. The challenged faced in development are: the urban structure, Safety, People's mentality and lifestyle, Planning and design fault, Inconvenient Public Transport and Quality Infrastructure of NMT. Objectives while planning the NMT should be safety and mobility for all road users and avoid conflicts by providing satisfactory and sufficient facilities. Currently in India our Practices for Non- Motorized Transportation is very poor and the roads are not very bicycle/ Pedestrian Friendly, People are losing out the most essential asset the public has got that is their public space is reduced and the evidences are from developing countries were more and more spaces are reducing exponentially and going to Road Networks, Physical Infrastructures, but most importantly the Motorized vehicles are taking a lot of our cities

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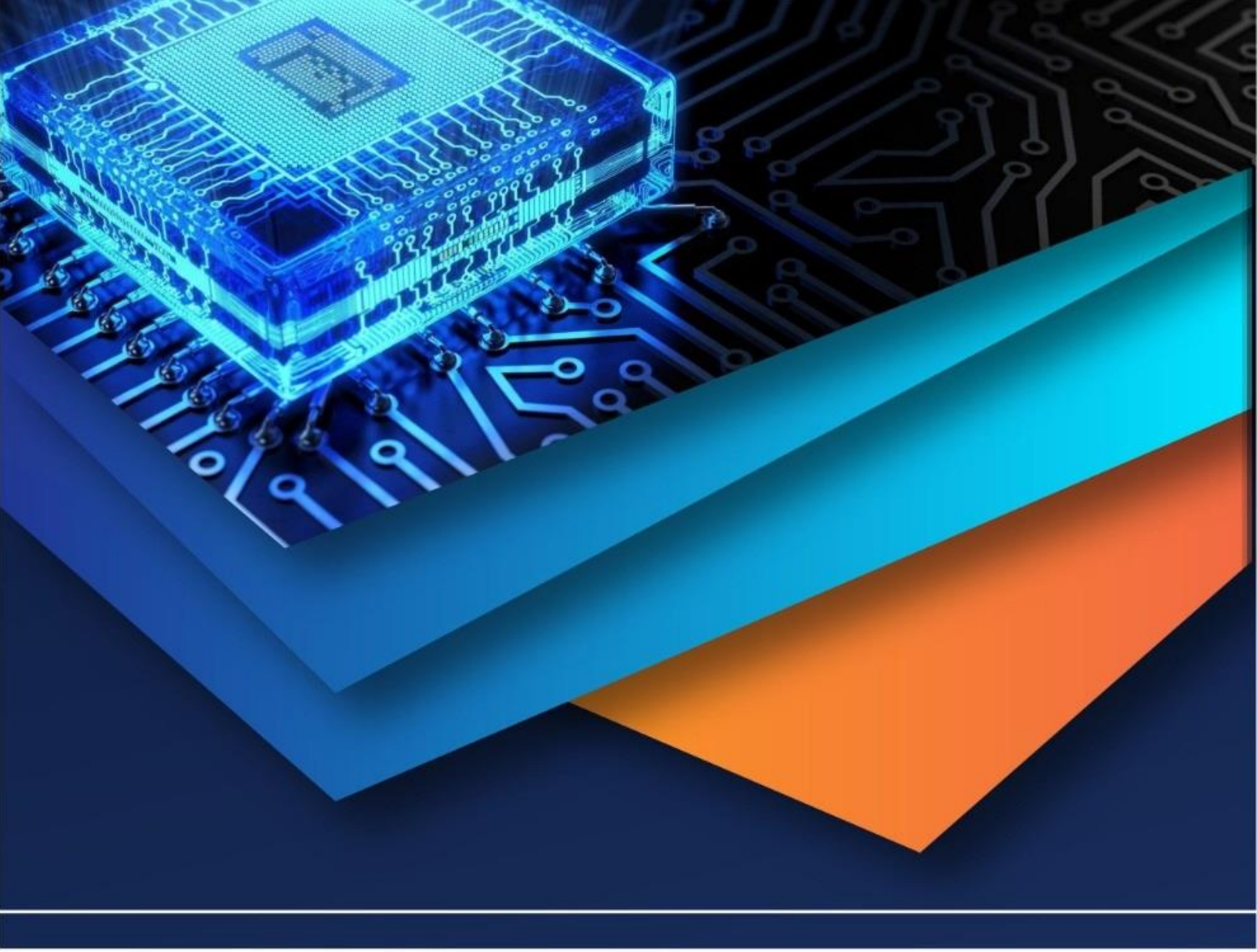

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