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NON- MOTORIZED TRANSPORT APPROACH FOR ACHIEVING SUSTAINABLE TRANSPORT SYSTEM

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Abstract: Lack of a clear understanding regarding the economic impacts of non-motorized modes is a major reason why they are excluded from the transportation development agenda of cities in India. Keeping this aspect in mind the present study has been divided in to two parts. The first part tries to understand the non-motorized traffic evolution in India. It focuses on the declination of non-motorized modes, necessity to revamp it, the favorable conditions to promote them in India and the relative problems associated with it. It is found here that there is a necessity for defining the role of non-motorized modes in India for the viable implementation of infrastructure and policies related with it.The second part consists of two case studies of Bangalore city where the economic benefits are worked out. The first case study provides a framework for monetizing the economic benefits of non-motorized modes. Here the economic benefits of congestion and air pollution reduction, accident and vehicle cost reduction are considered and total savings are worked out.

Keywords: Non-motorized vehicle (NMV) willingness logistic regression city India.

I. INTRODUCTION

Non-Motorized Transport in Indian Cities Non-motorized modes include walking, bicycle and cycle rickshaw. In many Indian cities, cycle rickshaw is an important non-motorized mode of intermediate para-transit (IPT). These modes are not dependent on fossil fuels, and have minimal emissions. Thereby, they are truly low carbon modes. Low-income households are dependent on these modes to access employment, education and other essential services. Use of non-motorized transport (NMT) has health benefits, however, with the rise in incomes and poor infrastructure, use of NMT has been declining. Often its users are captive, as they cannot afford other modes of transport. These users are dependent on walking and bicycling, even for commuting longer distances (Mohan and Tiwari 2000). In the 1980s use of non-motorized modes of transport in Indian cities were correlated with income levels. The use of NMT later declined with the increase in income levels (Replogle, 1992). City authorities and state governments have not invested in upgrading NMT infrastructure, resulting in a degrading level of service and increasing risk to pedestrians and bicyclists. This has resulted in a declining use of NMT, with the increasing income levels throughout the years. Nevertheless, NMT dominates the modal share of Indian cities. Even in mega cities, with a population of over 8 million, the modal share of NMT ranges from 40–50% (walking and bicycling). This is attributed to the dense mixed land use patterns in Indian cities, resulting in shorter trip lengths and availability of NMT as the only accessible mode of transport for low-income households. NMT is also a major mode of transportation to access the public transport system, especially by walking and cycle rickshaw. Typically, a public transport (PT) user is a pedestrian for at least one part of the trip – either during the access or egress part of the trip. Approximately 97% of the total bus commuters surveyed in Delhi walk to access bus service (Advani and Tiwari 2006). Provision of an appropriate well-integrated infrastructure for the use of NMT along with PT improves utilization of the system and increases its catchment area. While developing infrastructure for pedestrians does not have a direct impact on their speed, such improvements result in easy, comfortable and safe access. The study conducted by Advani and Tiwari (2006) shows that about 96% of bicycle owners walk to access public transport. By providing appropriate parking facilities for bicycles at or near bus stops, and safe bicycle paths, it is likely that more commuters will be added to the bus service, with an increase to the catchment area.

To achieve the sustainability goals of the transport sector, it is necessary to promote use of NMT.
This would require change in policies, plan implementations and fund allocations, in order to:

• Retain the existing modal share of NMT, and address the needs of captive users.

• Encourage potential commuters to use the NMT.The provision of appropriate infrastructure for NMT provides equal access to all, and is a major factor in determining use of public transport in the city. Thus, a complete network plan must be in place for promoting use of NMT that is also well integrated with the existing and proposed PT system of the city.To achieve the sustainability goals of the transport sector, it is necessary to promote use of NMT.

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II. FOCUS AND SCOPE OF THIS STUDY

As discussed, NMT is a sustainable mode of transport providing accessibility to all, while having minimum emissions. The purpose of the study is to identify lacunas in existing infrastructure, policies and design intervention, and to discuss appropriate policies and design required to encourage use of NMT in Indian cities. The study presents the role played by NMT in providing the mode choice in Indian cities, and trends in changing patronage for NMT modes. The study highlights gaps in data and issues related to infrastructure quality. The impacts of improving NMT infrastructure in other countries have also been studied. Additionally, a detailed study is presented on the impacts of NMT infrastructure provision along the Delhi BRT corridor on three essential indicators: travel time, accessibility and safety. Furthermore, one of the aims of the study is to understand the impact of improving NMT infrastructure on CO2 emissions and fuel consumption. However, this has two limitations:

• Comprehensive and complete improvement of NMT infrastructure has not taken place in any of the Indian cities. Hence, the impact of a project on the resulting change in CO2 emissions and fuel consumption cannot be studied.

• There are other modes of transport and sectors that have an impact on pollution levels. Therefore, the impact of improving only NMT infrastructure cannot be isolated for any city.

Fig(2.1) Non-Motorized Transport in India.

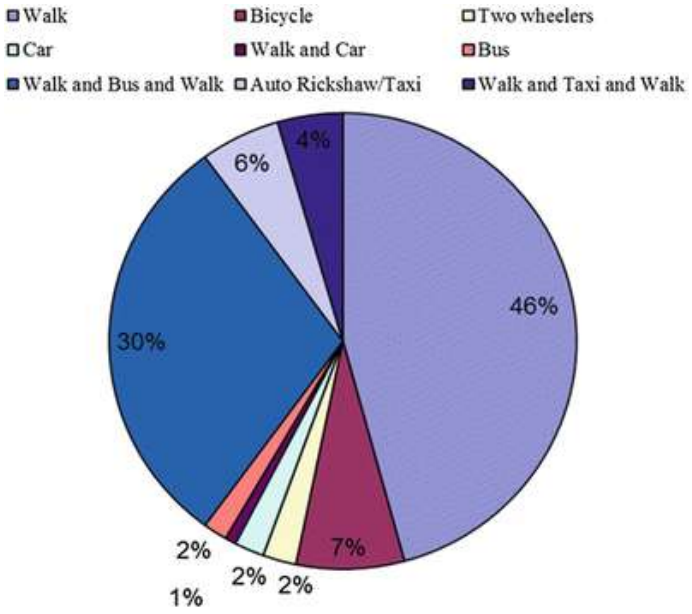

Fig (2.2) Categories of Non-Motorized Transport.

III. LITERATURE REVIEW

Q. Zhou: Sustainable and eco-friendly mobility is of great significance to alleviate urbanization pressure and to improve urban quality of life. Providing good non-motorized transport (NMT) facilities for active mobility (covering principally walking and cycling) is an effective way to promote bicycle use which in turn improves one's physical health. Singapore, with a tight space constraint, has been focusing strongly on active mobility developments over the recent decade which can depress motorization growth and thereby alleviate road traffic congestion.

Methods: In order to evaluate the effects of upgrading a cycling infrastructural network on activemobility in a residential township in Singapore, a before-and-after study was applied to evaluateNMT infrastructure developments. Three rounds of perception surveys and traffic count surveyswere conducted before and after the upgrading of the cycling network. The number of cyclists and pedestrians was enumerated and spatial distributions of cyclists and pedestrians in AMK town are presented using Geographic Information System (GIS).

Sanjay Gupta: Freight transport plays a vital role in metropolitan economy of Delhi. The goods traffic moving in and out of Delhi is increasing at an average annual growth rate of 10.97%. While LCV forms the backbone of goods movement along with goods auto rickshaws in Delhi for longer leads the non-motorized modes are increasingly becoming important for shorter leads for distributing goods particularly in wholesale markets located in the Walled city besides selected wholesale markets located outside the walled city. This present paper is an attempt to highlight the role of NMT modes such as cycle rickshaws, handcarts, animal carts, cycle rickshaw and head loads in five case wholesale markets located in walled city of Delhi dealing in foodgrains, textiles, autoparts, electrical and hardware respectively besides two wholesale markets of timber and fruits & vegetable market at Kotla and Okhla in South Delhi respectively.

T.M. Rahul: Lack of a clear understanding regarding the economic impacts of non-motorized modes is a major reason why they are excluded from the transportation development agenda of cities in India. Keeping this aspect in mind the present study has been divided in to two parts. The first part tries to understand the non-motorized traffic evolution in India. It focuses on the declination of non-motorized modes, necessity to revamp it, the favorable conditions to promote them in India and the relative problems associated with it. It is found here that there is a necessity for defining the role of non-motorized modes in India for the viable implementation of infrastructure and policies related with it. The second part consists of two case studies of Bangalore city where the economic benefits are worked out. The first case study provides a framework for monetizing the economic benefits of non-motorized modes.

Here the economic benefits of congestion and air pollution reduction, accident and vehicle cost reduction are considered and total savings are worked out. A savings of Indian Rupees (Rs.) 250,000 was found for an assumed 1% shift of travelers to non-motorized mode in a single day. The second one enlists the expected economic benefits associated with pedestrianization of a major arterial called M.G road in Bangalore and estimates a savings of 1611.4 Rs./day due to air pollution and accident reduction. The economic benefits thus found could be used to convince the policy makers and also to form a framework within which decisions can be made regarding non-motorized modes.

S.L.N. Sarma Sadhu: Cycle rickshaw trolley (CRT) is a widely used non-motorized mode of intra-city freight transport in Delhi. While a number of studies are available for non-motorized passenger rickshaws, role of CRT in urban goods movement has not been studied adequately. This paper presents findings from a survey of 2000 CRT drivers in Delhi in 2011. The paper highlights the contribution of CRT in city goods movement, savings in fuel and emissions and benefits to CRT drivers. If CRT s are replaced by motorized vehicles, CO2 emissions from vehicular traffic will increase by over 3% and hydrocarbon emissions will increase by over 8% and six to seven hundred thousand people will have to find alternate employment. The findings have a direct impact on various urban freight policies and welfare policies for the poor.

Geetam Tiwari: Current modal share in Indian cities is in favor of non-motorized transport (NMT) and public transport (PT), however historical trends shows decline in its use. Existing NMT and PT infrastructure in Indian cities is of poor quality resulting in increasing risk from road traffic crashes to these users. It is therefore likely that the current NMT and PT users will shift to personal motorized vehicles (PMV) as and when they can afford it. Share of NMT and PT users can be retained and possibly increased if safe and convenient facilities for them are created. This shall also have impact on reducing environment impacts of transport system. We have studied travel behavior of three medium size cities – Udaipur, Rajkot and Vishakhapatnam. Later the impact of improving built environment and infrastructure on travel mode shares, fuel consumption, emission levels and traffic safety in Rajkot and Vishakhapatnam are analyzed. For the purpose three scenarios are developed – improving only NMT infrastructure, improving only bus infrastructure and improving both NMT and bus infrastructure. The study shows the strong role of NMT infrastructure in both cities despite geographical dissimilarities. The scenario analysis shows maximum reduction in CO2 emissions is achieved when both PT and NMT infrastructure are improved. Improvement in safety indicator is highest in this scenario. Improving only PT infrastructure may have marginal effect on overall reduction of CO2 emissions and adverse effects on traffic safety. NMT infrastructure is crucial for maintaining the travel mode shares in favor of PT and NMT in future.

DeeptyJaina: Transport sector is one of the major consumers of energy and contributor to pollution levels. The corresponding impact on environment is determined by the travel demand i.e. the city size and the transport infrastructure. In the study, we have explored three scenarios – improving bicycle infrastructure, improving bus infrastructure and improving both bicycle and bus infrastructure for three Indian cities – Delhi, Pune and Patna on travel behavior, fuel consumption and equivalent CO2 emissions. The impacts are studied on the existing travel patterns to understand what would have been the fuel consumption pattern and emission levels had the infrastructure improved some years back. With the help of building scenarios for existing situation we have therefore tried to reduce uncertainties and draw sole attention toward improving basic infrastructure in Indian cities. Even though same scenarios are assumed for the three cities the studied impacts vary with respect to the population size. The study therefore highlights the need to adopt different strategies according to city size. The study has shown that improving bus infrastructure along with bicycle infrastructure results in maximum decrease in equivalent CO2 emissions.

M Vanderschuren: During 2013, the Department of Transport realised that one of the issues contributing to the lack of appropriate Non-Motorized Transport (NMT) infrastructure, is the fact that the 2003 Pedestrian and Bicycle Facility Guidelines were outdated. Although the Pedestrian and Cycling Facility Guidelines (DOT, 2003) included some very good information, there were gaps that needed to be addressed. One of these gaps was the lack of design examples. Furthermore, the DOT realised that Universal Access principles need to be adopted, and that implementation will only follow if guidelines are all inclusive. The new guidelines provide guidance on the accommodation of NMT under all conditions. This includes NMT only routes (which follow the NMT desire lines), completely separated NMT (for example along freeways), adjacent NMT facility on arterials and collectors and party mixed motorized and NMT traffic (specifically for cyclists and the likes) at local streets. Other aspects included in the guidelines are the integration with public transport (PT) and the need for facilities (for example bicycle

parking) at the trip ends. Furthermore, surface design, maintenance and operations of NMT facilities are now included in the NMT Facility Guidelines (DoT, 2014).

Piet Rietveld, The Position of Non-motorized Transport Modes in Transport Systems: Long run developments such as income growth and urban sprawl lead one to expect a continuous decline of the contribution of non-motorized transport modes to the performance of transport systems. In terms of the total number of trips, non-motorized transport modes have retained high shares, however. The potential of non-motorized transport modes to contribute to the urban quality of life is increasingly being recognised. In this paper the possibilities of substitution between non-motorized and motorized transport are discussed. In addition, attention is paid to the issue of complementarity between motorized and non-motorized transport modes.

IV. CONCLUSION

The use of sustainable non - motorized transport in Malaysia may elevate the environmental awareness in the country. How ever is not easy to implement due to the clogging up of central business districts with cars, and the recent economic crises. Sustainable transportation seems to mean that it is the right time now to implement non-motorized transportation as an integral part of the transportation system. The decision will also be an opportunity for the design and development of as well as motorized nonmotorized facilities including the layout of buildings and infrastructure. Traditional road infrastructure planning in India is focused on the accommodation of uninterrupted flow for MT. This, combined with the large amount of NMT users, especially pedestrians, leads to unacceptable road fatalities of vulnerable road users. The above has led to the realisation that India needs to improve NMT facilities implementation. As a first step, the Department of Transport commissioned the NMT Facility Guidelines project that provides a design philosophy, principles and detailed cross sections and intersection designs, as well as designs for special facilities at destinations. This paper provides a summary of the NMT facility guideline principles, which should be applied by all involved with transport facility planning and implementation to effect a reduction in accidents while, at the same time, increasing the use of this most sustainable mode of transport. Selected issues are highlighted in the paper, which attention when implementing road infrastructure for NMT and MT. At the core of planning and designs, speeds and volumes (absolute and the differential) for both NMT and MT, conflicts between NMT and MT and desire lines of NMT need to be considered. At the same time maintenance and operations need adequate attention to ensure that facilities, usage and safety are all continuously improved.

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