"Achieving Pedestrian Mobility Planning Through Sustainable Transportation"

Ashutosh Upadhyay[1], Ananya Tripathi[2], Indrani Chakraborty[3]

[1]Student, Faculty of Architecture & Planning, AKTU, Lucknow
[2] Research Scholar, Faculty of Architecture & Planning, AKTU, Lucknow
[3] Associate Professor, Faculty of Architecture & Planning, AKTU, Lucknow

Abstract: This research Paper describes the current trends of the "Pedestrian Mobility planning" with various methods, techniques, and their social, economic, and environmental impacts on society through "Sustainable transportation." I examine the perspective of the pedestrian tools for familiarity with the ease of navigation in the urban environment, and the effects of unique individual transportation methods.

A relevant objective in developing sustainable mobility patterns is thought to be in promoting and creating NMT in our cities. Even though there has been an increase in interest in the recent years regarding the creation of new tools and planning concepts related to the mobility of pedestrians, the pitfalls has not filled. Through an analysis of the characteristics that determine pedestrian mobility environments (PME) and pedestrian mobility planning (PMP) and to evaluate their effectiveness, this research seeks to shed light on this issue.

Overall, this study emphasizes the need for a more complex understanding of pedestrian mobility planning in India, according to the needs of the city, which considers the various social, economic, and environmental factors, the case studies, and various government policies that affect the project's success.

Keyword-- Pedestrian Mobility Planning, sustainable transportation, non-motorized transport, pedestrian mobility environment.

INTRODUCTION

The evolution of technologies dedicated to the movement of people and goods has brought about significant changes in people's lives. Forms of mobility that were not only convenient and easily accessible but also healthy and environmentally-friendly, have now been pushed quite literally to the anonymous edges of roadways worldwide. The growing popularity of the automobile in the last century has helped it take center stage in planning for mobility. The problems caused by increasing motorization (namely congestion, accidents and pollution) however, have encouraged people to start reflecting on how Non-Motorized Transportation can become more of an option. NMT refers to all modes of transportation that are not powered by a motor. This includes walking, cycling, and other Non-Motorized Vehicles (NMVs) that can attain limited speeds, i.e., less than 25km/hr. The importance of NMT as an affordable and environmentally friendly transport mode is increasingly being recognized for its great potential in reducing emissions, improving safety, and create more sustainable urban environments.

In Indian cities NMT not only suffers from general neglect and lack of attention from policy makers, urban planners, and engineers, but also suffers from the social stigma brought about by the captive nature of NMT use. NMT, therefore, needs to be understood and encouraged from a policy, institutional, planning, culture, and enforcement approach.

Source – Author (June / 2023)

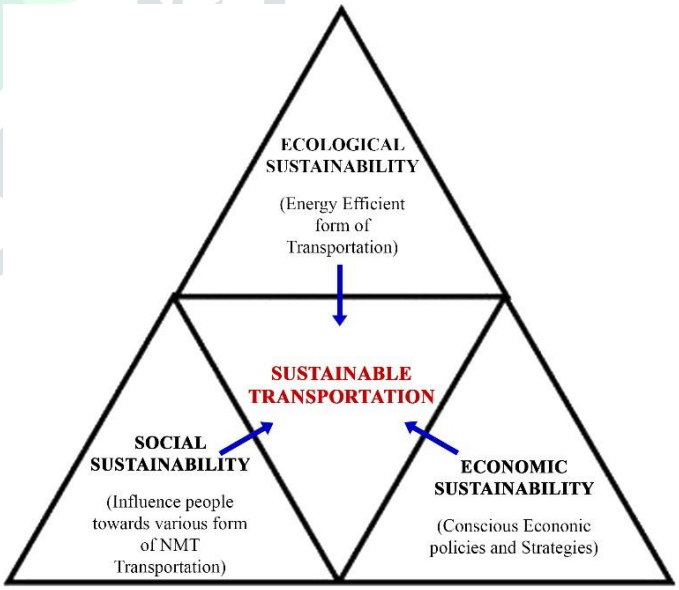


Figure 1 Three Approaches towards Sustainable Transportation

More specially, sustainable transportation covers three approaches, these are Ecological Sustainability, Social Sustainability and Economic Sustainability.

Sustainable Transport: A critical driver to achieve the Sustainable development goals.

SUSTAINABLE TRANSPORTATION

The transportation methods that use energy efficient, low and zero emission technologies are referred as sustainable transportation. These transportation technologies should also be ecological, social and economic sustainable which may include NMT modes, alternative fuel vehicles, electric buses and domestic fuels. Sustainable transportation methods use batteries, clean fuel, or both. Vehicles with modern technology, such as hybrid power systems and fuel cells, as well as flexible-fuel and dual-fuel vehicles can all run on alternative fuels. Alternative fuels contribute to fuel efficiency and emissions reduction. Transportation that minimizes harmful effects on the environment, economy, and society is referred to as sustainable transportation. This entails using energy-efficient, low-carbon, and fossil fuel-light transportation methods as little as possible. The requirements of various demographic groups, such as the elderly, low-income earners, and persons with disabilities, are also considered.

Economic Sustainability

By lowering the cost of transportation and enhancing access to employment and economic opportunities, sustainable transportation also encourages fiscal responsibility. Walking, cycling, and using public transportation are all low-carbon forms of transportation that are frequently more economical than owning, maintaining, and operating a private vehicle. Through enhancing access to jobs, commodities, and services, it also fosters economic growth, which can aid in lowering poverty and inequality. Life cycle costing also plays a major role in maintaining economic sustainability. It is much easier for transportation agencies to get capital dollars rather than operating dollars. For ex- many cities allow their streets pavement to degrade to the point where the entire street must be repaved. In another economic aspect transportation can be used to increase the value of land which can be sold at a profit.

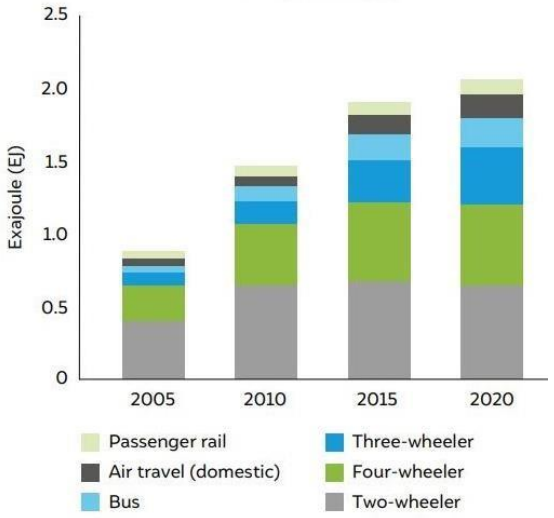
Social Sustainability

Social sustainability by sustainable transportation is promoted by improving access to all members of society in the form of transportation, regardless of their age, ability and income. The transportation modes such as walking, cycling and public transport allows the low-income earners, elderly and the people with disabilities to remove the barriers and access the transport which increase their ability to participate in social, civic, and economic activities. These modes also enhance the equality and social inclusion among these groups. If we plan or transit systems to offer only the most basic mobility to those who have no other choice as do many bus systems today, voter's will not see how transit helps them achieve their larger aspirations, and those voter's will not pass tax measures to support better transit. For ex- In the United States, people for bikes have developed a sophisticated public service announcement campaign, which does not tell us to stop driving our cars because they're killing the planet.

Ecological Sustainability

The relationship between sustainable transportation and environmental sustainability should be driven by green techniques and methods. Transport mainly driven by petroleum and an array of air and water quality problems result from the extraction, processing, shipping, and consumption of petroleum. Transport also requires pavement, which create stormwater absorption problems and agricultural land losses. Finally transport affects human settlement patterns, which in turn have secondary ecological impacts. In terms of greenhouse gas emissions (GHG) in India, contribution of transport sector lies on the 3rd number, where the major contribution dominates from the road transport sector. The transport sector contributes nearly 13% of the total carbon dioxide emissions in India. These emissions have been tripled since 1990. 50% of the oil demand in India accounts for the transport sector (IEA 2021) The increasing demand for mobility, motorization in India have contributed to noise, air pollution as well as congestion. The greenhouse gases emissions have increased in the urban areas.

Figure 2 Energy consumption by passenger transport



Source- Puneet Kamboj, et.al, India Energy Transport Outlook ((June / 2022)

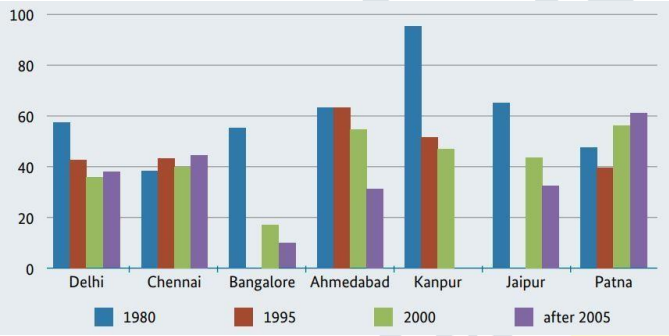
What is NMT?

NMT (Non-motorized transport), also referred as active transport, is a means of mobility which means that the mode of transport is driven by the human power rather than the other forms of energy such as fossil fuels. NMT includes walking, cycling, cycle rickshaws, 4-wheel vendor carts, handcarts etc. NMT Implementations can be done through various guiding and supporting principles.

NMT scenario in India

In Indian cities in the early 1980s, the share of NMT (combined walking and cycling) was in the range of 40-60% of the total trips. With few exceptions, a recent study for seven Indian cities revealed that the share of NMT has been falling in recent years (such as Chennai or Patna)

Figure 3 Trends in modal share of NMT (Walking and Bicycle) Since the 1980's.



Source- DMRC 2011, State Level Committee on Road Connectivity NMT Infrastructure in India (August / 2013)

NMT must for cities?

Walking and cycling are the 2 most popular transport modes in Indian cities. Everyone walks, even the motor vehicles and public transport users have to walk for the first or last kilometer. Planning for NMT not just only is economic viable but also socially viable as it provides accessibility to jobs and houses. NMT modes are completely nonpolluting and hence reduces the carbon burden on cities.

Should NMT require special attention in sustainable transportation planning?

Conventional approaches for planning have focused on the movement of vehicles rather than the audience. In the length between 3-4 kms, people generally prefer cycling or walking. Focus should be on passenger movement rather than vehicles. NMT modes provides healthy lifestyle by boosting metabolism and economic interdependence.

NMT also contributes to the social equity by providing increased accessibility to all economic classes. There is a severe need for aligning the planning priorities and pay special attention to the NMT in transportation planning.

Why do we need to plan for NMT, if there are already high models shares of NMT?

Cyclists and pedestrians are the most vulnerable to road accidents. The physical road conditions for walking and cycling in Indian cities are abysmal. Shift can be towards private vehicles in search of better infrastructure facilities. This is why economic development is leading to increased motorization our cities. The primary challenge for NMT in our cities is to captive this choice to use planning and designing better road infrastructure, policies, and priorities for them. Even though policies have been suggested for prioritizing NMT in cities, the implementation is still in question.

Will provision of cycling facilities be beneficial?

The lower income households group majorly contributes towards the captive cycling population. Owning a motor vehicle is seen as a sign of good economic condition in our society. It is very important to segregate the social stigma and promote cycling as a sustainable transport measure. Introducing new road facilities, better infrastructure, new user friendly and high-quality cycling facilities can also be considered as a comprehensive NMT upgradation plan. Provision of cycling facilities can also help in reducing the per capita CO_2 emission. CO_2 emission per capita in India is approximately one- fourth of the world's average.

Will NMT users utilize the provided infrastructure?

Based on the allocate space to pedestrians, bicyclists with good physical infrastructure road facilities, the users will definitely use the facilities. Through the help of sustainable transport policies, public service announcement and fine the NMT facilities can be utilized. Long- and short-term benefits can only be achieved when appropriate infrastructure and urban environment for pedestrians are developed. Encroachment of the NMT infrastructure facilities by other users should also be avoided for proper utilization. For ex- car parking on the footpath and pushing the NMT users out of the cycle track.

Source – NMT Guidance Document (May / 2016)

Figure 4 NMT Guiding principles

Implementation of Guiding principles at National Level

Over the last decade, Cities have recognized the importance of NMT in the Urban mobility systems. Some of the Strategies are implemented at National Level are:

The Delhi Busway Corridors Facilitates the use of non-motorized by introducing segregated NMT facilities. The NMT Corridor measures 2.5M in width allowing bidirectional flow. Poor condition of footpaths and encroachment have forced pedestrians to walk on NMT or Vehicular lanes. To make environment friendly the city of Nanded has designed 50km of streets to provide better services for different users**. "Dial-a- Rickshaw"** also known as Ecocabs (new scheme) has started in Fazilka, which promotes cycle rickshaws as a public transport mode using mode technology. On a single phone call, service enabled cycle rickshaws originates their destination from resident's doorsteps. The success of Ecocabs results in the need for investment and research in the development of NMT based transit services. Ecocabs is also associated with the BSNL as a telecom partner to provide free pre-paid mobile connections to the rickshaw pullers.

The **TENDER S.U.R.E.** is an initiative of the gov of Karnataka and Bangalore city connect for the urban roads. They are generally based on the specifications ROW of the roads, which includes NMT such as pedestrians and cycle paths, solo lane for vehicles, public transport lanes etc. It generally applies to to the ROW of 2M-80M, which makes it universally applicable. Another Implementation of NMT is the **Naya Raipur** masterplan which ensure that the entire alignment of roads and streets should be optimum for using the ROW for accommodating all the functions from the route. It focuses on the dimensions of cycle tracks, pedestrian movement and expected all types of vehicles.

Source – NMT Guidance Document (May / 2016)

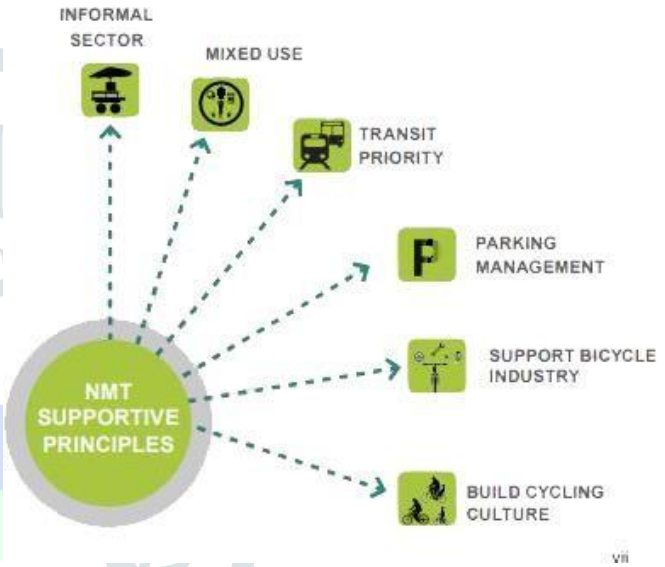


Figure 5 NMT Supportive principles

ATCAG is a private based based enterprise in Bangalore, which provides bicycle hardware and technologies for short term and long-term cycle rentals. ATCAG has been constantly been supported by the BMRC and Directorate of urban land transport. The bicycle provide by the ATCAG enterprise is limited to the recreational areas only.

Source –Pedestrian mobility Environment (July / 2013)

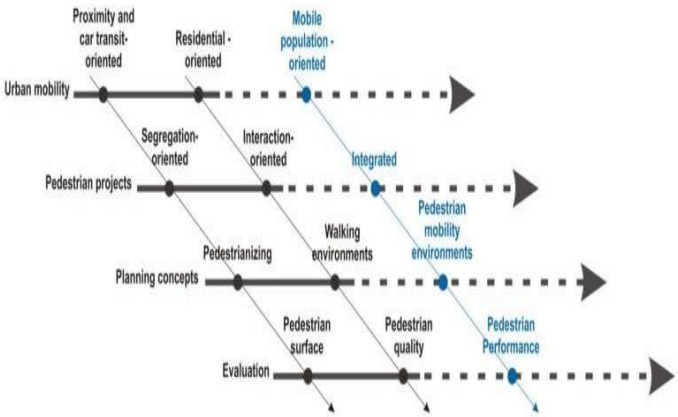


Figure 5 Pedestrian Mobility Environment

CASE STUDIES - (CHENNAI)

Chennai has been transforming its streets for safety and comfort. Chennai is the first city in India to adopt NMT policy in 2014. Chennai allocated 60% of its transportation budget to NMT networks. Policy aimed to arrest the current decline in walking and cycling by creating a pleasant atmosphere of footpaths, cycle tracks and greenways. Despite over poor pedestrian and cycling Infrastructure, nearly over Six million trips are made on foot and cycle every day. For solving this issues various Initiatives have been launched till now for the implementation under NMT policy such as- **Pondy bazaar pedestrian** plaza as model of people friendly public space. Public Bicycle sharing system (PBS) with 5000 bicycles and a progressive on street parking management system (SPM) have also been launched with the support of ITDP India. Chennai has also built the capacity for municipal engineers through study tours, workshops and training programs. Chennai has also launched a program called **"Car free Sundays"** for the idea of celebrating streets as public spaces. Chennai has also adopted complete street guidelines

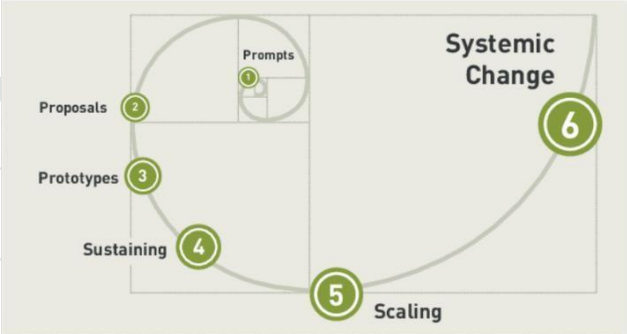
Source – ITDP India (July / 2014)

Figure 7 Transformation of Chennai streets

Impact of the Policy

The Initiative has helped in transforming over 120 kilometers of street to be safe and accessible for the pedestrians of the city. The project has also improved access to roughly 300 bus stops over 60 schools. It has also helped in effective implementation of parking management system over 500 kms of streets. Chennai has acted through **Mega Street program** to create streets web with a span of 30 years for 'Utility. Mobility& Livability. Under this program Authority aims to transform over 1600 kms of streets over state.

Figure 8 Social Innovation Regimes of NMT



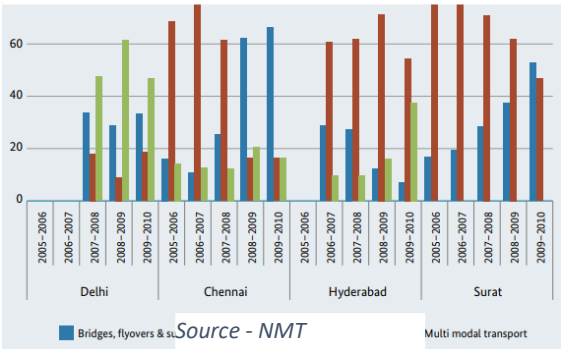
Source –ITDP India

Shining example for Indian cities

Chennai's initiative of implementing NMT or streets for the people can be a gamechanger for transforming cities in terms of mobility and people friendly urban spaces. Under the smart cities mission which has emphasized on the creation of pedestrian- friendly infrastructure, Walkability and complete streets, nearly top 100 Indian cities need to redesign and transform over 40,000 km of city streets into complete streets by 2030.

Vision of NUTP and ITDP has to be implemented in across all the Indian cities by the local government as it has been in Chennai. Basically, NMT should play the role of last mile connector for urban transport system. The

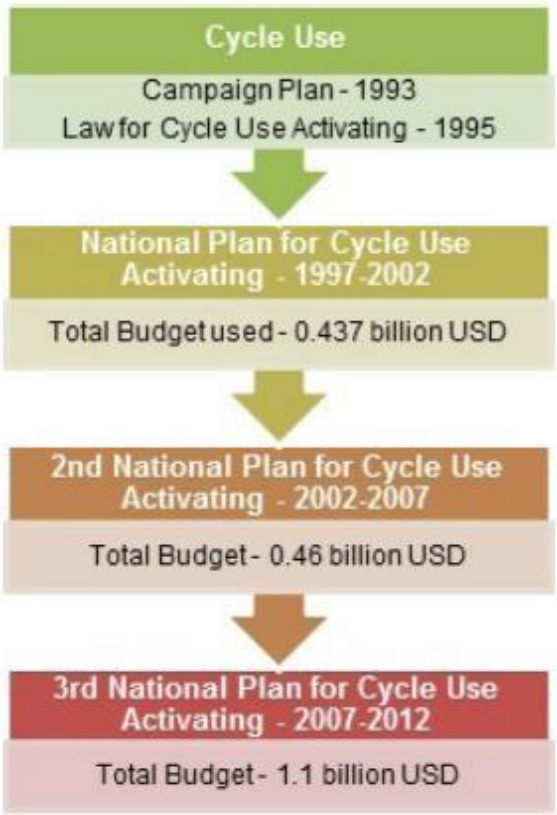
Figure 9 Capital expenditure in terms of transport



Source - NMT

Prioritize people over cars

Chennai has set an example by implementing NMT policy in 2014 by prioritizing people over car. Chennai has taken greater efforts to create safe, walkable, and livable streets that can cater all the groups of the society. The NMT masterplan will ensure the promotion of environmentally friendly nodes that encourages healthy lifestyle. Social equity will also be enhanced by improving accessibility to work and home for all the sections of the society. Chennai is under the complete street toolkit framework from the ITDP Department of India.



Ministry of urban development has developed service level benchmarks for urban transport to be undertaken byIndian cities

SOUTH KOREA

South Korea has a population of approx. 50 million. It is the first Asian country to implement NMT through a national plan for cycle use. The impetus for NMT implementation was provided by the urban issues of traffic congestion as well as the Metrological department regarding the climate change.

Figure 10 Chronology of the cycle use national plans

Source - NMT Policy

NMT was implemented in South Korea in the 3 National plans. The first National plan oversaw a construction of 4,419 Km of cycling path and cycle parking of more than 19,000 cycles. This resulted in an increased share of 2.5% in the cycle mode in the 5 years. The Second National plan oversaw a construction of nearly 4000Kms of cycling paths and cycle parking of more than 80,000 Cycles.

A part of National plan of the budget was allocated towards awareness and advocacy campaigns related to cycling. The Third National plan also called “Comprehensive bicycle plan for Korea” includes a modal share of 5%. The plan focused on following components for the infrastructure development, such as Utility bicycle routes, National Bicycle Network, Bicycle Industries. The Comprehensive plan focuses on 5E framework: Encouragement, Education, Engineering,Enforcement and Evaluation.

DELFT, THE NETHERLANDS

The first National and Transport structure scheme and the programme for personal transport gave high priority to the encouragement of bicycle use and the improvements of traffic safety by providing better facilities for bicyclists. Delft was the first Dutch city to implement the NMT with the officially adopted Bicycle plan. The NMT was officially introduced to fulfill the gap between the existingnetworks.

Figure 11 Bicycle Lane in Netherlands well defined using streetpavers

Source - Win Mulder

This plan consists of a three sub – networks- District network, Neighborhood network and Urban network. Basically, it is a well-defined hierarchical network. At a approx. distance of 400-600 m **Urban network** would connect cyclists to the regional cycle network. It generally connects important destinations such as trains stations, library and main shopping center. For every 200- 300 m the **district network** works as a distributer or collector network. The plan proposed various investments projects such as bridges, tunnels, which would eliminate the cycle barriers. The bicycle roots in this network would establish connections between the neighborhood routes and the urban routes. This district network plan focused on creation of bicycle lanes, smaller bridges, pedestrian lanes, and improved intersection design. Each network is improvised with its own design.

Nearly 95% of the 3 sub networks already existed before the bicycle plan was launched. The plan was a useful exercise to identify the gaps in the network and thus closing them. The concept of Woonerf was also originated in Delft. Woonerf generally means 'Residential backyard'. It also means a residential street that is used cooperatively by all types of users without any segregation. The Intent of this approach was not to make the cars disappear, but to integrate them with other users to make a friendly environment.

CONCLUSION

This Study shows that despite considering NMT as a separate base there are various others factors and principles which build the sub structure for NMT. NMT is used as a tool for creating Vibrant, Healthy and Resilient Communities. They may be related to Environment, Economy, Sustainability etc. What are the various factors that has led to the increase of carbon footprint in India and all over the world and how it can be controlled by using NMT. NMT has also played an important role in achieving Sustainable transportation planning. The scenario of NMT in India in some cities has been increased in the last few years, due to proper allocation of budget and plans. Various case studies have shown that for Implementing NMT at root level, there needs to be proper planning and budgeting. Special focusis laid on pedestrian lane and bicycle lanes.

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