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NMT Infrastructure

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Abstract – *NMT is an essential aspect of city mobility, yet it is sometimes overlooked when developing transportation networks. The research compares an Indian city (Chandigarh) with a model city for NMT infrastructure utilization (Amsterdam) to identify inadequacies in NMT infrastructure in Indian cities. The study assesses policy and design initiatives for NMT infrastructure development in Indian cities, as well as their influence on road users. Although the type and application of NMTs in India may differ from those in other nations but the fundamentals remain same. The Netherlands is usually cited as a model country for encouraging high levels of cycling. Our findings suggest that, in India rules and legislation governing the development of NMT infrastructure are urgently needed.*

Key Words: **Non-Motorized Transportation, Bicycle plan, Cycle tracks, Accessibility, Safety, Comfort**

1.INTRODUCTION

Non-Motorized Transportation (NMT) refers to any mode of transportation that does not rely on the use of an engine or motor to move for example-walking ,bicycling , small non-motored transportation like hand carts , push scooters, wheelchairs etc. .(TRIPP) Non-Motorized transportation can be used for transportation and recreation. In multimodal conveyance routes, non-motorized modes are critical.

Non-motorized transportation is essential for long-term sustainability. Sustainable transportation has the following characteristics: it is safe, comfortable, and efficient in terms of cost and energy usage, and it reduces pollution. As a result, city planners must consider innovative sustainable urban design and Non-Motorized Transportation (NMT) options to ensure smooth mobility and accessibility for all.

1.1 Non-motorized transport benefits

a) **User benefits :-** Convenience, comfort, safety, accessibility, and enjoyment for users, as well as cost savings from reduced automobile ownership and usage.

b) **Equity objectives:-** People who are economically, socially, or physically deprived benefit from this.

c) **Congestion reduction :-** Reduced private vehicle traffic congestion on congested highways.

d) **Land-use impacts :-** Encourages additional infill development that is more accessible, compact, and mixed (smart growth).

e) **Energy conservation :-** Reduced energy use has economic and environmental advantages.

f) **Pollution reduction :-** Reduced air, noise, and water pollution has economic and environmental benefits.

2. NMT PLANNING PRINCIPLES AND PROCESS

2.1 Non-motorized transport principles

Bicycle-friendly infrastructure must meet five basic criteria that must be taken into account throughout planning, detailed design, implementation, and management.

NMT planning has five key requirements also called **SPACE.** (Singh, 2018)

1. Safety: The number of conflicting points or intersections with motorized vehicles is kept at a minimum, or the level of conflict between cyclists and motorists is kept to a minimum (such as removing parking spaces from cycling lanes). (Singh, 2018)

2. Priority/Directness: Detours and stops are kept to a minimum on these routes (such as intersections with exclusive right of way for cyclists) (Singh, 2018)

3. Accessibility/Coherence: To connect origins and destinations, a full network with a dense mesh of cycle lanes is needed. (Singh, 2018)

4. Comfort: Affluence of finding and selecting simple routes with minimum annoyances such as noise, pollution, congestion, and motorized intrusions. (Singh, 2018)

5. Enjoyable/Attractiveness: The degree to which the ride provides a visual and spatial experience to the user during their journey. (Singh, 2018)

2.2 NMT Planning Process:-

The city planners should place a strong emphasis on NMT planning and collaborate across a number of stages, including regulation, planning, data and network identification, design, and implementation. (TRIPP) Fig-1 shows NMT planning process.

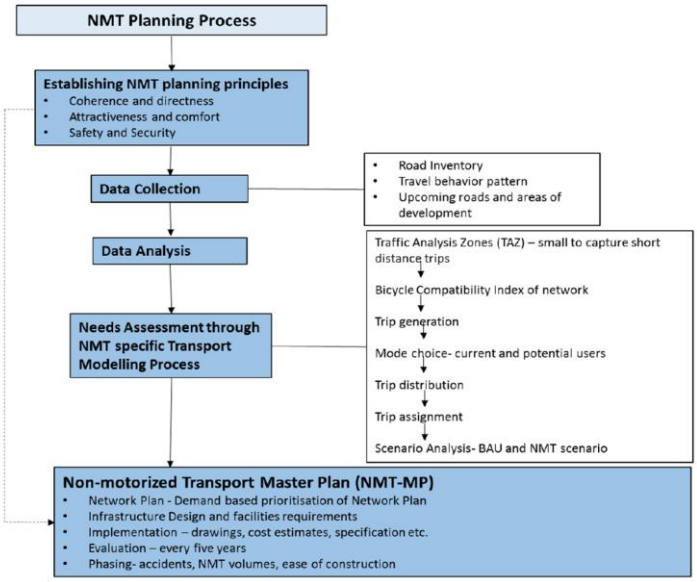

Fig -1: NMT Planning process
(Source: Planning and Design guidelines for Cycle infrastructure)

3. CASE STUDIES

3.1 Chandigarh, India

Chandigarh has introduced separated NMT facilities to encourage the usage of non-motorized transportation (footpaths and cycle tracks). The broad rails also allow cycle rickshaws and other non-motorized vehicles to use them. However, traffic congestion induced by inefficient traffic signal cycles is a substantial obstacle to NMT usage of the intended facilities in a free and safe manner. Despite the presence of pedestrian amenities along the route, the city need a complete system of disabled-friendly walkways. Motorized two-wheelers are frequently observed encroaching into NMT routes. On the other side, pedestrians are forced to walk on the NMT or traffic lanes due to poor footpath conditions and encroachment. This has decreased the impact of NMT facilities on Chandigarh's overall traffic situation.

Key facts about Chandigarh's NMT and transportation

- **Pedestrian paths-** Pedestrian pathways may be found on 90% of the entire municipal road length (approx.. 570km).
- **Bicycle track-** Between 2001 and 2003, 160 km of broad bike lanes were built. The NMT lanes are 2.5 metres wide with bidirectional flow.
- **Vehicular density-** The city's vehicle density of 956 persons per 1000 people is one of the highest in the country, resulting in worsening traffic congestion.
- **Vehicle Ownership-** At least one car is owned by 86 percent of households.
- **Fatality for NMT users-** The percentage of cyclists casualties has steadily risen from 14.49 percent to 30.77 percent (2010-13). Up to June 2014, fatal accidents accounted for 14.9 % of bike deaths and 32.8 % of pedestrian fatalities, for a total of 67 fatalities.

3.2 Amsterdam (the Netherlands)

The city of Amsterdam (Netherlands) has a high rate of bicycle use and a low fatality rate from traffic accidents. The high modal shares were made feasible by decades of non-motorized transportation infrastructure investment. This involves large-scale upgrades to pedestrian and bicycle facilities, the creation of intermodal connection infrastructure, and, when possible, the adoption of comprehensive pedestrian and bicycle design standards.

- Bicycles account for 19 percent of all journeys in the Netherlands, with an average of 1,000 kilometers cycled each year.
- Walking accounts for 27 percent of all journeys, with an average of 250 kilometers walked each year.
- A well-integrated NMT infrastructure with public transportation, as well as strong cultural and political will.
- In the event of a collision, NMT users are legally protected, and NMT traffic is given priority at junctions.
- In several areas of the city, the usage of motor vehicles has been restricted.

- Municipal governments are incharge of creating NMT infrastructure, and they can take a variety of tactics.

  Bicycle plan:- The Bicycle Plan's major goal was to enhance cyclists' safety, directness, and comfort throughout the Netherlands. The focus was on having a bigger influence through a well-connected network. (IBI Group, in association with iTrans, 2016)

An urban network, a district network, and a neighbourhood network were specified in the Plan as three sub-networks of a hierarchical network

The master plan was built around two main ideas:

1. Make use of existing cycling paths.
2. Propose new initiatives to heal the current network.

4. COMPARATIVE ANALYSIS OF BOTH CASESTUDIES

Table-1 : Comparative analysis of both casestudies (Source: Analysis done by author)

COMPARATIVE ANALYSIS		
Parameters	**European city (Amsterdam)**	**Indian city (Chandigarh)**
Physical Attributes	A strong focus on bicycle-friendly policies and cycling infrastructure around the origin and destination point of prospective routes is a major facilitator for boosting riding in Amsterdam.	Bicycle is discouraged in Chandigarh due to a lack of cycling infrastructure, rules, regulations, and car-oriented city design.
Socio-Economic and Cultural Attributes	Cycling in Amsterdam is a gender-neutral activity that is enjoyed by people of all social classes and economic backgrounds. As a result, cyclists of all genders, cultures, and financial backgrounds love riding it.	Cycling is considered dangerous and a "poor man's" form of transportation in India, and there is a gender division pattern (for females especially) that inhibits the usage of bicycles.
Climatic conditions	Summers in Amsterdam are mild, with average high temperatures hardly exceeding 22.2°C. (Cyclist-friendly conditions) encouraging people to ride more.	The average temperature is 37°C, with the maximum temperature being 44°C (uncomfortable for cyclists), discouraging cycling.
Bicycle corridor	The length of the bicycle track, as well as its accessibility from residential land use, both are good indicators of the network's overall quality.	Chandigarh's disjointed bicycle lanes, as well as the lack of a cycling track accessible from each residential plot, discourage cyclists..
Land use distribution	Within a neighborhood, a more diverse land use mix encourages short trips and bicycle riding. A shorter trip for shopping encourages consumers to ride more, while shorter trips in Amsterdam encourage cyclists to cycle more..	It is well acknowledged that Chandigarh has a high proportion of residential land use and a low proportion of business and mixed land use, prolonging the necessary commercial and retail journeys that start in residential zones.
Usage of NMT by Female Population	Bicycle friendliness is influenced by the larger percentage of female population in Amsterdam and Copenhagen.	Due to long travel lengths, unsuitable health conditions, and cultural issues, ladies in Indian cities are hesitant to ride bicycles.

5. PROPOSALS

- **A citywide linked network of bicycle tracks** with adequate environmental protections allows cyclists to pedal in a seamless network while maintaining their preferred comfort.

- For environmental protection, **dense trees or covered green spaces** (shed covered with climbers) can be utilized often.

- In moderate and hot-dry regions, **covered bicycle paths with intermittent mist** can be utilized to cool down excessive summer heat. Easy access to bicycle tracks, nearby parking, and cooling facilities at businesses and commercial hubs are among these initiatives. (An ideal weather condition is when

there is no severe rain or snowfall and the temperature is below 35 degrees Celsius.)

Fig.2 : Cycle tracks shed with climbers and trees

(Source: Sketched by author)

- **Elevated cycle tracks :-** If there is no space for NMT infrastructure development on the current road, elevated bike tracks and NMT infrastructure can be developed (due to less width ,etc.)

Fig. 3 : Elevated cycle tracks and NMT

Source: (Politiken, 2016)

- **Improved infrastructure** and a gradual shift in **social attitudes regarding the usage of bicycles** may encourage more individuals to utilise bicycles as a regular form of transportation. Bicyclists who are more gender neutral may help India's predicament.
- For the protection of NMT users, a **speed limit for motorized vehicle** users might be enforced in congested streets.

6. CONCLUSIONS

Non-motorized transportation (NMT) may increase mobility for a large portion of the population, offer access to otherwise urban places, as well as allow wealthy and impoverished, adults, children and elderly, to move freely.

In India, city governments have failed to offer NMT users with safer roadways. This is due to a lack of care in many Indian towns for pedestrians and cyclists. Potential NMT users are also deterred by a lack of safe infrastructure and a high rate of bike (TRIPP) deaths. As a result, regulations and legislation governing the development of NMT infrastructure are urgently needed.

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