Sustainable urban transport to reduce congestion and pollution

Tulasi Anantharamakrishnan
ramtulasi15@gmail.com
Young Leaders for Active Citizenship,
New Delhi, Delhi

Anushka Agrawal
anushka.a0031@gmail.com
Young Leaders for Active Citizenship,
New Delhi, Delhi

Shruti Heda
Shrutiheda6236@gmail.com
Young Leaders for Active Citizenship,
New Delhi, Delhi

Rishi Garhyan
rgarhyan@gmail.com
Young Leaders for Active Citizenship, New Delhi, Delhi

Iyanah Poonawala
poonawalaiyanah@gmail.com
Young Leaders for Active Citizenship, New Delhi, Delhi

ABSTRACT

The paper titled "sustainable urban transport to reduce congestion and pollution" provides an analysis of the non-motorized transport landscape in India using Bangalore as a case study to highlight the gaps, and suggest policies and budgetary allocations to promote the adoption of NMT in cities across the country.

Keywords: Non-motorized Transport, Sustainable Urban Transport, Policy, and Budgetary Allocation Suggestions, India, NMT Policy Scheme In Bangalore, International Policies

1. EXECUTIVE SUMMARY

Non-Motorized transport (NMT) is a form of transport used by the majority of the Indian population and is essential for the daily travels of many people. Although electric cars and other developments in technology are possibly the future of sustainable and eco-friendly transport, non-motorized transport is a great alternative. It has many advantages, such as being more accessible, economical, and environmentally friendly.

Many people use NMT since they do not have access to motorized transport and use cycling, walking etc. for their daily commute. The COVID-19 pandemic has also led to an increase in the uptake of NMT. This may, therefore, be the perfect starting point to normalize the use of NMT for the general public. By analyzing the NMT landscape in India and using Bengaluru - a city known for its issues with congestion and traffic - as a case study, we highlight gaps and suggest recommendations for policies and budgetary allocations to promote the adoption of NMT in cities across the country.

2. INTRODUCTION

Non-Motorized Transport (abbreviated as NMT) includes walking, cycling, and other modes of transport such as push scooters, skateboards, skates, hand carts, rickshaws, and wheelchairs as a method of commuting short distances up to 7 km. Generally, these modes are used either for recreational purposes or for transportation.[1]

As a component of sustainable transportation, NMT aims at providing a clean, healthy, and safe environment for the citizens. Besides having a low carbon footprint, these modes of transport reduce urban road congestion and lower air pollution levels. In addition, NMT has a higher space penetration (access to narrower spaces like conservancy lanes and passageways), door-to-door transport, and provides last-mile connectivity.[2] Despite the advantages that NMT has to offer, majority of transport policies are centered around motorized transport and development of associated infrastructure. Moreover, with the continued increase of per capita income across nations, people are beginning to give more value to time and comfort, thereby switching to faster modes of transport.[2] This trend can be seen in the modal shares of different modes of transportation. For example, as of 2020-21, Bengaluru has a modal share of 15% for walking and only 3% for cycling.[3] These figures complement the poor NMT infrastructure in the city and the biases citizens might have against cycling (by associating it with the poor). Such issues can be addressed by proper budget allocation, practical and implementable NMT policies, and community initiatives, including mass awareness campaigns, to incentivize NMT.

3.   ANALYSIS OF NMT IN INDIA

3.1 Landscape in India

A number of major Indian cities have failed to look after their NMT systems effectively. NMT needs to be inspired from an institutional as well as a cultural level. NMT in India means far more than simply walking and cycling. Instead, it encompasses a wide array of people on streets riding in cycle rickshaws, pulling handcarts, riding handicap tricycles and bullock carts, as well as children being pushed in prams. These modes conflict with several motorized methods on city roads due to substandard infrastructure planning, which leads to unsafe and congested conditions. [4]

Unlike developed nations like New Zealand, where car ownership is exceptionally high, Indian cities are still traversed mainly by foot, cycle, or cycle rickshaw. Statistics show that in major cities like Mumbai, 51% of people use NMT daily. Even in Delhi, which is primarily considered extremely car-friendly, NMT accounts for 38% of all trips. NMT trips in other mega Indian cities with populations over 8 million range between 40-50%.[5] This is partly due to the compact structure of Indian cities allowing shorter trip lengths and the lack of available options for the urban poor. While the high NMT modal shares may have helped to keep Indian per capita CO_2 emissions comparatively low, the trend across most Indian cities mimics cities worldwide – declining NMT use and increasing dependency on personal motor vehicles. Moreover, the number of cyclists is dwindling at a much higher pace compared to pedestrians.[6]

In India, there is a general mindset that associates motorized transport, especially private vehicles, with status and convenience. The current modal share in Indian cities favors non-motorized transport (NMT) and public transport (PT); however, historical trends show a decline in its use. Moreover, existing NMT and public transport infrastructure in Indian cities are of poor quality resulting in growing hazards from road traffic crashes to these users. It is consequently possible that the current NMT and PT users will shift to personal motorized vehicles when they are able to afford them. A 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 an impact on reducing the environmental impacts of the transport system.

In the early 1980s, NMT in Indian cities, i.e., bicycles and walking, combined, accounted for approximately 40–60% of the total trips. However, a trend study in seven Indian cities shows that the modal share of NMT has been declining in these cities since the 1980s. Perhaps, this is due to the fact that since the industrialization in India has largely increased in the last 40 years, people's per capita incomes have increased, so they move in to buy more cars.
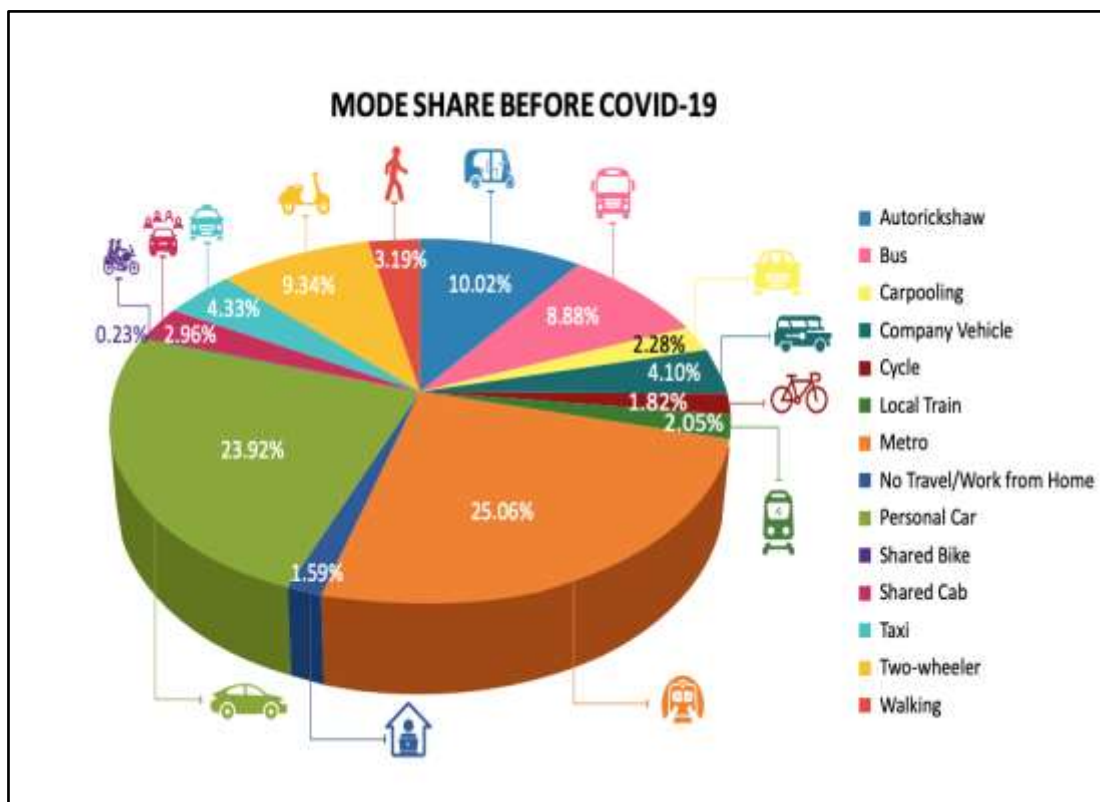
3.2 Covid Impact on the usage of NMT7

Figure. 1: Overall stated modal share for the sample before COVID-19.

The pandemic has pushed people across the world to realize the importance of this easy-to-use and socially distant mode of transport. Many cities have started building infrastructure to house extra cyclists on their streets. The figure below (Figure.2) shows that 41 percent of initial bus users stated that they would shift to other modes after the pandemic. These other modes include bicycles or even moving around on foot. Like metro services, the most common change was a shift towards private vehicles and intermediate public transport. Additionally, some bus users stated they would shift to non-motorized modes such as cycling and walking.
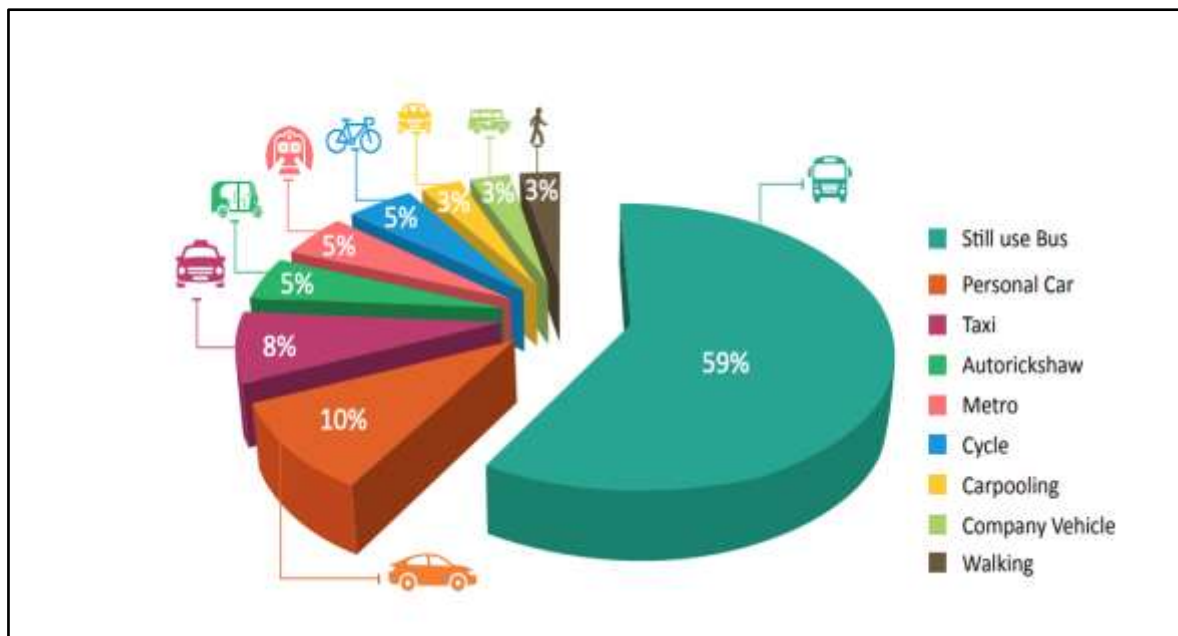
Figure.2: Mode preferences post Covid-19

3.3 Challenges of Implementation
In this section, we delve into some of the challenges that are impeding the sustainable adoption of Non-Motorised Transport.

A 2017 study compared the policy framework and budgets of five different cities in India (Bangalore, Pune, Chennai, Ahmedabad, Nagpur). The analysis highlighted one of the long-standing problems plaguing urban governance: the problem of multiple organizations handling overlapping and indistinct functions. For example, a few modes of transport in Mumbai come under the jurisdiction of local governance bodies, and the Mumbai local comes under the jurisdiction of Indian Railways. Although governments have claimed that this governance structure helps in minimizing the delays in implementation processes, this impacts the overall planning of transport services and reduces the quality of services.

NMT is a sustainable mode of transport that provides accessibility to all while having minimum emissions. Although the benefits are numerous, there are other critical challenges related to NMT in India, which include encroachment of NMT infrastructure, lack of proper street design, and improper divergence of funds for NMT, lack of focus on the appropriate institutional framework, and a lack of integration of different transportation modes.

One critical roadblock in access to NMT is access to credit for non-motorized vehicles. Whereas many cars are bought on credit, there are few credit schemes for bicycles. Although the government has taken some steps in this direction, for instance, the government providing credit to manufacturers of ox-carts, the efforts have been largely fragmented and insubstantial. The Grameen Bank in Bangladesh and "Ciclo-credito" in Bogota are two good international examples where the government is bringing down the barriers for people to take advantage of NMT.

4. STATE OF NMT IN BENGALURU
For most people in Bengaluru, walking is the primary mode of commute. It is estimated that over 28% of all trips in Bengaluru are by walk, one of the highest among the metro cities in India. However, with increasing economic activity and GDP per capita, citizens "move up" into buying cars.

The Comprehensive Mobility Plan for Bengaluru (CMP), unveiled in October 2019, reveals that the average trip length for walking as a mode of transportation in the city is 1.0 km. Footpaths are only available along about 47% of the road length. The options of cycling and walking are largely unexplored and only construction of a 548 km of footpath has been proposed. Footpaths in Bengaluru are largely in a poor state. Safe walking spaces for persons with disabilities are a rarity in Bengaluru with most projects that are not wheelchair-friendly.[8]

When it comes to cycling, the weather and the terrain of Bengaluru provides a favourable environment for cycling. However, the lack of cycling infrastructure, the constant hustle and the risk to life that Bengaluru roads pose has reduced bicycling to a mere leisurely activity. The lack of infrastructure that supports cycling—such as cycle lanes or parking for bicycles—has discouraged prospective cyclists, preventing cycling from becoming a popular mode of everyday commute.

Given the level of congestion and issues with land planning in Bengaluru, there exists a pressing need for adopting NMT.

4.1 NMT Policies in Bengaluru 9
In May 2016, The Ministry of Urban Development, Government of India, released a comprehensive guidance document to help States to develop Non-Motorized Transport Policies (NMT). This document laid out various strategies and a 5-step planning process for local authorities to follow. The document clearly states that the following aspects need to be taken care of if NMT plants are to succeed.10

1. **Complete streets: 11**

Comprehensive guidelines (road and its facilities – road hierarchy) have been formulated to design a street with space provided for pedestrians, cyclists, and motorized traffic. The scope covers arterial roads, sub arterial roads, collector roads, and local streets. The policy also covers subsurface utility lines, clearly covering sewage lines, water supply lines, electricity cables, gas lines, telecom, and optic fiber cables.

2. **Comfort, safety, and walkability:**

The guidelines also recommend an ideal design to promote comfort, safety, and walkability, such as a frontage zone to provide adequate distance between the building and the pedestrian, a walking area and a footpath/furnishing zone – for planting trees, furniture, etc., gradients on sidewalks provided, and zebra crossings adequately designed. Similarly, bus shelter guidelines have been provided to standardize the design and costs of procurement.

3. **Protection from encroachment:**

The guidelines recognize that street hawkers are a way of life in India and play a key role in encouraging citizens to walk around and shop while ensuring that the street vendors don't encroach onto the sidewalks.

4. **Universal accessibility:**

Design suggestions have been made to make crosswalks more accessible. Opening of sidewalk railings at regular intervals, sloped ramps, and innovative street corner designs are some of the suggestions made to encourage universal accessibility.

Bike friendliness:

Encourage the active use of cycles through schemes such as Public Bicycle Sharing (PBS). Develop policy guidelines to encourage private operators to operate a 4th generation dock-less, app-based bike-sharing system, which is GPS enabled with smart locking capabilities.

Based on these guidelines, a draft for public consultation of the Comprehensive Mobility Plan (CMP) for Bengaluru was released in Oct 2019. The section on NMT in the CMP covers three major areas.[12]

1. **Area Mobility Improvement Plan (AMIP):** for enhancing capacity and resolving safety issues in 4 key economic areas, i.e., Majestic area, Malleshwaram, Whitefield, and Indiranagar.

2. **Station Area Access Plan (SAAP):** Under this plan, 4 terminal stations and 11 other stations with a high population density have been chosen for improvement. Improving safety, easing traffic congestion, and improving the road network through Tendersure specifications are part of the SAAP. The idea is to take such actions so that commuters don't have to use public transport for last-mile connectivity but can rely on their personal NMT.

3. **Pedestrian streets:** 8 streets with high pedestrian traffic and a high density of commercial establishments, mostly near metros or upcoming metros, have been identified. The plan is to convert them to 'pedestrian only' streets on weekends, holidays, and other special days. Development of off-street parking near these areas is also recommended near these identified areas.

4.2 Gaps in policies

While the CMP does mention NMT on several occasions, the plan lacks on several fronts. Under the CMP, 192 km of road were to be widened. Broader roads ease traffic congestion for the small percentage of vehicle owners. However, this narrows space available for pedestrians and cyclists, affecting universal accessibility in an equitable manner to all members of society. Moreover, widening of roads is only possible by cutting down surrounding trees. This means pedestrians are no longer protected from the sun, causing them to stop walking along these stretches.[13]

The CMP is based on traffic surveys. Traffic surveys assess the traffic and its characteristics in a given area. The acquired data is used to frame transport models.[14] However, these surveys did not include any NMT related data, such as the state of footpaths and cycle lanes. Nor did it include encroachment, debris, and illegal parking, all of which adversely impact NMT usage. Similarly, household surveys that were undertaken did not include lower-income level groups that use NMT and public transport.[15]

Under the Non-Motorized Transport Plan, the CMP states that 174 km of cycling tracks will be constructed. Cycling tracks and footpaths can be built on roads that are at least 12m wide. Within the BBMP area itself, 1500-2000 km of roads exist where cycle lanes can be created. Considering the larger area that comes under the CMP, the proposed cycle lanes are only 4% of what they could be. Similarly, the cycle hubs provided under the PBS scheme accommodate only 2-4% of the ideal number of shared cycles.[16]

Poor implementation of cycling lanes in Bengaluru has caused other issues. In certain areas like the Outer Ring Road, narrow cycle lanes have caused pedestrians to trespass, thus causing safety hazards to cyclists. In other places like the Basaveshwara circle, the cycle path is incomplete, thus causing cyclists to have to dismount and crossroads with heavy traffic.[17]

There have been a number of efforts to pedestrianize certain streets in the city, however, they have happened without a holistic approach. For instance, initiatives to add footpaths and lanes have received a lot of opposition from the traders on the streets, who fear that the lack of parking spaces would negatively impact the footfall at their business establishments. With all these developments the authorities are working towards an urban design in the city that make the streets pedestrian-first instead of pedestrian-only.

Finally, inconsistency in policy efforts have further hampered the development in this space. To encourage walking and cycling, the presence of an NMT policy is essential. While Chennai and Delhi already have an NMT policy in place, Bengaluru is yet to have one. In 2019, Karnataka Non-Motorized Transport Agency (KNMTA) was formed under the DULT— a dedicated body for financing and monitoring of NMT operations in Karnataka, responsible for preparing the NMT policy. The policy aims to create a

safe environment for walkers and cyclists and also to reserve significant budget to undertake NMT projects. However, there hasn't been much discussion on when such a policy will be introduced. In the absence of such a policy backing, only a small fraction of roads (651 out of 10,200 km as per the CMP) is being planned to be NMT-friendly. This, in turn, only allows a tiny portion of Bangalore's population to be able to use NMT safely; thus, motivating people to use other forms of transport such as cars, buses, motorbikes, etc. [18]

4.3 Budgetary Focus on NMT in Bengaluru

For the majority of Indian cities, NMT is one of the lower priority areas in terms of budget allocation. In Bangalore alone, NMT infrastructure was only given 2% of the total transport budget[19], which is far less than what is necessary for the required NMT infrastructure[20]. The vast majority of funds are used for motor vehicles and general infrastructure, including streetlights, labor, administration, electricity, drain maintenance, traffic lights, and more, most of which primarily affect motor vehicles. According to our stakeholders, the budget required to create 600 km of cycle lanes and footpaths in Bengaluru is 36 Billion INR.

Recently, the funds for an NMT corridor in some streets were cut in half and are now being used for motorized transport and being re-allocated for general transportation.[21] As Covid-19 has caused fewer people to use their motor vehicles and NMT is becoming more popular in many urban cities, more funding is being utilized to create bicycle lanes, but not much is being done in developing footpaths and pedestrian infrastructure.[22] The transport sector is hoping for a more significant part of the Karnataka state budget since they have not received the funds that they require to create the necessary NMT infrastructure.

4.4 Community Efforts

Besides Government policies, there have been initiatives undertaken by the active community in Bengaluru to promote NMT transport, particularly cycling. While the citizens solely undertook some, others partnered with the authorities to bring about long-term solutions.

1. Cycle Day

Cycle Day is an initiative by the BCOS (Bengaluru Coalition for Open Streets) collectively with the DULT, Praja RAAG[23], ESAF, and individual citizens. The initiative aimed to promote cycling and other forms of NMT for short-distance commute, last-mile connectivity, and a healthier lifestyle. Through open street events organized on the last Sunday of every month, the event focused on raising awareness on NMT user's safety, the importance of bicycling infrastructure, and bike-sharing. With the inclusion of DULT, cyclists now had access to better infrastructure like cycling tracks and stands. Bangalore traffic police were also involved in the initiative. They blocked the roads, making it safer for cyclists and pedestrians, and encouraging citizens to cycle. Cycle Day spread across the city with more partners, making it a local affair, increasing social interactions within the neighborhood.

The success of Cycle Day was felt in 45 neighborhoods of the city. Recognizing this, the State Government invested 801.8 Million INR to fund 6000 cycles and 360 docking stations under Phase I of the Public Bike Sharing (PBS) Program.[24] Cycle Day also created a demand for cycling schools. Here, people were taught cycling for 4-5 hours weekly. In addition, Cubbon Park- one of Bangalore's landmarks, christened the 'lung area'- was closed by the Horticulture Department on Sundays, second Saturdays, and public holidays to encourage cycling and walking in the area.

2. Cycle To work

The Cycle to Work program was initiated by the BYCS Cycle Mayor Sathya Sankaran in Bangalore. The scheme targeted employees of firms commuting to their workspace via cycles instead of private vehicles. Cycling to work implied a faster commute time, better lifestyle choices, and a step towards sustainable transportation. The initiative had a credit system to provide incentives to firms and employees. In addition, a leaderboard was maintained so firms could compete in terms of the percentage of employees cycling. As a result, the initiative saw tangible results. One thousand nine hundred fifteen users were registered as cycle riders, covering a total distance of 618351 km and reducing the Carbon-dioxide by 154588 kg as per ECF (European Cyclists' Federation) standards.[25]

3. Walkable Malleswaram

Walkable Malleswaram is a recent project by Malleswaram Social [26] and Sensing Local [27], supported by the Sustainable Urban Mobility Accord (SUMA) by DULT. The project focuses on developing existing conservancy lanes and footpaths. To understand the problem of low NMT users in this area, Sensing Local undertook a survey of Malleswaram residents in 2020. The study revealed that besides heavy traffic, factors like footpath encroachment, unsafe junctions, missing first and last-mile connectivity, and poorly designed footpaths discouraged people from walking. The project was then launched to increase the walkability of these regions. Again, the community played a crucial role. Members actively participated in ideating footpath designs in project awareness campaigns (such as street art) and will further be included in the program implementation phases. Volunteers also undertook a walking audit, necessary for designing infrastructure.

Community initiatives to encourage NMT have been successful on two fronts. The first one is the change in people's mindset about using cycles and other forms of NMT compared to private vehicles. Fests and activities like Cycling Day normalized cycling, disassociating cycles with the concept of 'being poor.' The second impact of these programs was an increased awareness regarding poor NMT infrastructure among the public, making them advocate for change. The change was seen through better-constructed pathways, cycle lanes in some areas of Bangalore, and increased safety for NMT users.

5.   GLOBAL BEST PRACTICES AND INFERENCES

A number of countries around the world have implemented policies and introduced infrastructure design guidelines for promoting NMT which have led to immense progress in the wider adoption of sustainable modes of mobility.

COUNTRY/ PROGRAM	INITIATIVES TAKEN	INTENTION/EFFECT	INFERENCE FOR BENGALURU
BRAZIL- Active Mobility Plan and Urban Mobility Policy	● Mini-city education campaign for children	● Educating people about road safety ● Encouraging them to move on foot safely. ● One of the education actions is a brochure with behavioral tips for cyclists and car drivers to make bike rides safer.	Similar programs can be undertaken in Bengaluru to enable children to move on foot from a young age.
	● In 2012, Brazil implemented the National Urban Mobility Policy, which requires cities with more than 20,000 residents to develop an Urban Mobility Plan to improve mobility and promote sustainable development.	● Comprehensive country-wide policy which requires cities with more than 20,000 residents to develop an Urban Mobility Plan	A clear policy framework can lead to better diagnosis of the problems and efficient management by legally accountable authorities
Malmo, SWEDEN	● Bike radar detection at the busiest intersections installed.	● Prior to this, cyclists were forced to stop/ get very close to car traffic to press the buttons, which exposed the cyclists to potentially dangerous situations.	In highly congested areas, such as Mekhri Circle/ Outer ring road in Bengaluru, such developments would increase cyclists' safety.
	● Infrastructure policies ● Braille boards (The boards have a tactile diagram for those with impaired vision to inform them of the number of lanes they must cross) ● Bike lounges have been set up at metro stations ● Public pumps ● Signal rails (hand and foot railings at traffic signals are the bicycling equivalent to the cup holder on a car's dashboard) ● Bicycle barometers were installed at junctions	● Braille boards help in providing support to PWDs. ● Bike lounges offer a repair station and waiting room for those who arrive by bicycle ● Public air compressors are placed at strategic locations as service stations for people on bicycles. ● Signal rails offer comfort and convenience on bikeways. ● Bicycle barometers count passing cyclists and allow them to see the change in cycling numbers throughout the year.	These are relatively low-cost additions to roads that can make travel more accessible and more convenient for pedestrians and cyclists and can be adapted in the context of Bengaluru.
NETHERLANDS	● Education to motorized drivers-Dutch motorists are trained for interaction with cyclists as part of training to obtain their license.	● For example, trainee motorists are trained to check and re-check their right-hand side for cyclists before making a turn to the right	Similarly, cyclist interaction training can be included in the curriculum of obtaining one's driver's license.
	● **Legal protection for NMT users:** NMT users are protected legally in case of a crash.	● "In a collision between a car and a cyclist, the driver's insurer is deemed to be liable to pay damages to the cyclist's property and their medical bills as long as the cyclist did not intentionally crash into the motor vehicle, and the cyclist was not in error in some way."[28]	Legal protection will also add accountability. This will reinforce the legal position of non-motorized travelers and may induce a more careful driving behavior from motor vehicle drivers.

	● Confinements have been set on the use of MV in certain parts of the city ● Urban infrastructure is constructed openly, without hard borders between public and private premises, e.g., minimal use of walls, fencing, dead-end street	● Motor free zone allows added mobility to users of non-motorized transport ● Continuous, direct cycle routes can be provided due to open planning of urban spaces	In a highly congested backdrop, especially areas such as Whitefield/ KR Puram in Bangalore, imposing restrictions on the use of MV and establishing "Motor free" zones may help to promote the use of NMT
EUROPEAN UNION	● Velocity conferences	● In many cities in the Netherlands, Germany, and Switzerland, experienced planners are available; they often know about the infrastructure and the technological aspects.	"Velo-City" type conferences could be organised in India to learn specific experiences from other countries. Indian cities who are leading the way in the NMT landscape, such as Delhi, can engage in twin partnerships with other cities, such as Bengaluru, to hold such events.
JAPAN (TOKYO)	● National Bicycle Law enacted in 1980	● Local governments provide bicycle lanes and parking facilities near railway and metro stations.[29]	As of Sep 2019, BMTC operates around 6000+ buses in the city. 30 Adding bicycle stands to these public modes of transport will help improve last-mile connectivity.

6. RECOMMENDATIONS AND CONCLUSION

Based on the analysis, this paper provides recommendations to improve the NMT landscape in Bangalore. The recommendations have been categorized for government and communities.

Government:

Changes in policy and infrastructure design are among the most important in creating a substantial change in NMT usage in Bengaluru and India as a whole. However, both policy and design have very different requirements targeted towards different parts of the government. Hence, we have divided our government recommendations into two categories:

Policy:

● A **complete network plan** must be in place that is well integrated with the city's existing and proposed public transport.

● The **re-allocation** of a more significant portion of the budget towards developing NMT infrastructure is possibly the most important next step. Currently, the CMP allocated INR 261 crore for cycle tracks over the whole plan period. However, a budget of INR 6,000 crore is required.[31]

● **Subsidies** to private operators who are creating NMT infrastructure should be provided to encourage more players to participate. The moment businesses find NMT a lucrative business proposition; they will invest in this area. This could come in the form of tax reductions on their material costs.

● **Incentives should be put in place for improving the adoption of NMT.** The Karnataka government should invest resources in improving the access to NMT, such as improving credit flow etc. A promising approach is that of bicycle loans for employees. In a pilot project in El Salvador, it was proven that there is a significant interest in bicycles if low-income earners can pay in monthly installments. In Ghana, the World Bank has implemented a "hire-purchase" program for women to get access to bicycles and trailers in which even a bicycle ambulance was put into operation.

● Providing adequate **security** measures, like security cameras on streets and accessible alarms, would also encourage people to use NMT. Improving the lighting of bicycle lanes and footpaths will prevent black spots, making them safer for NMT users. Social safety must be included as a designing criterion for planning infrastructure.

Design:

● To improve **last-mile connectivity**, public transport systems should adapt to integrate NMT infrastructure. This can be done by-

1. Creating bicycle parking spaces near places such as train stations and bus stops.
2. Multi-functional, full-service bike stations which can fill tires with air and oil gears.
3. Bike Rental facilities made openly available near airports, train stations, and other places where people need to travel from.
4. Bike paths, lanes, and on-street bike routes that lead to public transit stations would facilitate the bike's role as a feeder to transit which would increase last-mile connectivity.

● The design of **crosswalks** should be improved to make them more accessible and visible Adding pedestrian traffic signals will also ensure safe pedestrian crossings.
● The pedestrianization of more streets would also further foster walkability and cycling.
● The addition of greenery in the form of trees and bushes to make the sidewalks more appealing and comfortable to use, which could increase the number of people who use NMT.

Community:
Destigmatizing the usage of NMT to the general public is vital to encourage more people to use NMT and take steps to decrease pollution. Furthermore, the private sector plays a crucial role in incentivizing people to use NMT by providing necessary facilities as they hold a high weightage on society.

General public:
● Change in **public's perception** of bicycle usage through ways such as, but not limited to:
○ Popularizing more community initiatives like "cycle to work" (as previously mentioned). Other initiatives to increase bicycle status should be taken to overcome the car addiction of the urban elites. The Ciclovías Dominicales held in Bogota, where every Sunday 80 km of Avenidas are made available for cyclists only, is an excellent way to encourage the urban middle class to ride bicycles.
○ Including cyclist safety in the curriculum of driving education.
○ Encouraging colleges and schools to incentivize NMT commute by maintaining a leaderboard of institutions with rankings based on the number of students using NMT to travel
● The **sensitization** of the public to the enormity of the congestion, pollution, and economic problems that fast-growing cities like Bengaluru face would result in better community engagement.

Private companies:
● Provide adequate **cycle parking facilities** and shower/changing rooms to motivate employees to commute on cycles.
● Subsidize parking space for the employees since car parking facilities take more space (and hence are more expensive) than bicycle parking facilities.
● Extend a part of **Corporate Social Responsibility funds** beyond humanitarian activities and use it to fund sustainable urban development programs such as NMT infrastructure development programs.
● Market and sponsor NMT more appealingly and inclusively to increase the **ownership** of cycles among the public, in turn increasing overall NMT usage.

From sensitization of issues faced by NMT users to the provision of better NMT facilities at corporate offices, the public can be encouraged to switch to Non-Motorized forms of transport. Through efforts such as those listed above, there lies hope to see a future with clean, green, and sustainable modes of transportation.

7. REFERENCES
[1] Promotion of Non Motorized Transport, Climate Technology Centre And Network, https://www.ctc-n.org/technologies/promotion-non-motorised-transport
[2] Biking and Walking: The Position of Non-Motorised Transport Modes in Transport Systems, Piet Rietvield, pg – 2-3, (C:\TEMP\dp 111.prn.pdf (econstor.eu)
[3] From conversations with stakeholder from BYCS India
[4] How to plan and develop a pedestrian network, Sustainable Urban Transport Project, https://www.sutp.org/publication/how-to-plan-and-develop-a-pedestrian-and-cycling-network/
[5] Transforming India's Mobility, NITI Aayog, http://niti.gov.in/writereaddata/files/document_publication/BCG.pdf
[6] Transforming India's Mobility, NITI Aayog, http://niti.gov.in/writereaddata/files/document_publication/BCG.pdf
[7] [1]Survey on Impact of Covid-19, The Energy and Resources Institute, https://www.teriin.org/sites/default/file/2020-05/behavioural-effects-covid19.pdf
[8] BBMP to consider accessibility for differently-abled citizens, 14th September, 2019, Link
[9] NMT Guidance Document, SUTP (Sustainable Urban Transport Project) India, https://smartnet.niua.org/sites/default/files/resources/nmtguidancefinal.pdf
[10] [1] Permits to set up and operate Public Bicycle Sharing Scheme(PBS) and Shared Micro-Mobility System (SMMS) in Bengaluru, Directorate of Urban Land Transport (DULT), http://urbantransport.kar.gov.in/CMP%20Report%2005%2012%202019.pdf
[11] Comprehensive Mobility Plan for Bengaluru, Directorate of Urban Land Transport, https://kannada.bmrc.co.in/FileUploads/2e1d9d_CareerFiles.pdf

[12] Comprehensive Mobility Plan for Bengaluru, Directorate of Urban Land Transport, https://kannada.bmrc.co.in/FileUploads/2e1d9d_CareerFiles.pdf
[13] From conversation with our stakeholder from ALTLAW Forum
[14] Comprehensive Mobility Plan for Bengaluru, Directorate of Urban Land Transport, pg-67,https://kannada.bmrc.co.in/FileUploads/2e1d9d_CareerFiles.pdf

[15] Comprehensive Mobility Plan ignores environmental impacts, sustainable solutions, Varadarajan Raman, https://bengaluru.citizenmatters.in/bengaluru-draft-comprehensive-mobility-plan-environment-issues-nmt-elevated-corridors-road-widening-39839

[16] Bengaluru's Mobility Plan: "Proposed cycling tracks are just 4% of what could be built", Sathya Sankaran, https://bengaluru.citizenmatters.in/cycling-allocation-comprehensive-mobility-plan-bengaluru-modal-share-cycling-tracks-pbs-39905

[17] Pedestrian edged out by peddlers, Sridhar Vivan, Bangalore Mirror, https://bangaloremirror.indiatimes.com/bangalore/others/pedestrians-edged-out-by-pedallers/articleshow/80677059.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

[18] Comprehensive Mobility Plan for Bengaluru, Directorate of Urban Land Transport, https://kannada.bmrc.co.in/FileUploads/2e1d9d_CareerFiles.pdf

[19] Transport Budget Analysis in 5 Indian Cities, SUM NET India, https://shaktifoundation.in/wp-content/uploads/2017/11/Transport-Budget-Analysis-in-5-Indian-cities.pdf

[20] Karnataka budget: Transport sector hopes for bigger budget slice, Christin Philip, https://timesofindia.indiatimes.com/city/bengaluru/karnataka-budget-transport-sector-hopes-for-bigger-budget-slice-this-time/articleshow/67858031.cms

[21] NMT corridor budget halved, Arvind Bishnoi, https://timesofindia.indiatimes.com/city/bangalore/nmt-corridor-budget-halved/articleshow/82154863.cms

[22] On track with cycle lanes, The Hindu, https://www.thehindu.com/news/cities/bangalore/on-track-with-cycle-lanes/article33700276.ece

[23] Group for advocacy based on civic research (http://praja.in/en/groups/praja-raag)

[24] Promoting Cycle Day initiatives as a way to adopt non-motorized transport policies in the city to make cities inclusive, safe and sustainable, United Nations Sustainable Development Goals Partnership Platform https://sustainabledevelopment.un.org/partnership/?p=30645

[25] Cycle to Work, https://cycleto.work/leaderboard?city_id=1

[26] A Community of citizens working on forming social ties and improving public amenities

[27] A do-tank with focus on improving public health and environment (https://www.sensinglocal.in/)

[28] "Strict liability in the Netherlands", Mark Wagenbuur

[29] Asian development bank, https://sti-india-uttoolkit.adb.org/mod5/se2/002.html

[30] "Bengaluru: BMTC daily ridership drops to 36 lakh as commuters shift gears", The Times of India,https://timesofindia.indiatimes.com/city/bengaluru/as-commuters-shift-gears-bmtcs-daily-ridership-drops-to-36-lakh/articleshow/71238762.cms

[31] Bengaluru's Mobility Plan: "Proposed cycling tracks are just 4% of what could be built", Sathya Sankaran, https://bengaluru.citizenmatters.in/cycling-allocation-comprehensive-mobility-plan-bengaluru-modal-share-cycling-tracks-pbs-39905