277

ORF OCCASIONAL PAPER

OCTOBER 2020

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ORF OBSERVER RESEARCH FOUNDATION

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ISBN: 978-93-90494-01-9

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Policymaking Towards Green Mobility in India

ABSTRACT

Government agencies at the city, state and central level are paying greater attention to sustainable transport as the way forward for India's mobility sector. However, for sustainability measures to have lasting outcomes in policy and practice, institutional reforms are urgently needed. The National Urban Transport Policy, which governs India's urban mobility policymaking, was amended in 2014 to create city-specific, low-carbon mobility solutions. Six years after, as India's mobility situation has changed remarkably, it is unclear if the current policies still serve the altered scenario. This paper analyses India's existing urban transportation policies, explores how they can facilitate sustainable and green transportation, and examines their weaknesses in promoting green mobility. The paper offers specific recommendations for a cohesive approach to creating a national green mobility framework.

Attribution: Amruta Ponkshe, "Policymaking Towards Green Mobility in India," *ORF Occasional Paper No. 277*, October 2020, Observer Research Foundation.

INTRODUCTION

The lockdowns necessitated by the COVID-19 pandemic and the subsequent slow resumption of transport and other services have highlighted the need for an overhaul of global transportation systems. Worldwide, various cities have initiated efforts to embrace a 'new normal' for transport, focusing on including pedestrian and cycling facilities in their transportation systems.[1] India's urban public transport sector cannot afford to go back to the 'old normal' and grapple with the issues of congestion and air pollution. India must envision policies and create systems that embrace green technologies—electric vehicles (EVs) that run on clean fuel; low carbon fuels; and clean, comfortable and affordable mass transit options that do not burden the taxpayer or drain the public exchequer. The country must prioritise and enhance the adoption of all non-motorised forms of mobility by introducing urgent changes in the design and usability of non-motorised transport (NMT).

Air Quality Indices

According to the 2019 World Air Quality Report, 17 Indian cities rank among the world's 25 most polluted cities.[2] A significant percentage of air pollution in India is caused by vehicles, especially in the big cities. Air pollution leads to shortened life expectancy, respiratory disorders and increases the incidence of cardiovascular diseases.[3] In 2015, vehicle air pollution accounted for 385,000 deaths in the country.[4]

In New Delhi, Ahmedabad, Mumbai and Pune, vehicular air pollution is responsible for 30 percent to 41 percent of all particulate matter 2.5 emissions, which cause cardiovascular and cerebrovascular diseases (See Table 1).[6] The adoption of the Bharat

Table 1: Relative contribution of human-made sources of PM 2.5 emissions across Indian cities

Source of Pollution	Delhi	Ahmedabad	Mumbai	Pune
Transport	41.01	35.27	30.49	40.27
Industry	18.61	18.74	13.08	21.56
Power	4.92	5.28	5.23	Nil
Residential	2.96	10.20	15.52	11.40
Wind-blown road dust	21.52	18.89	14.80	17.20
Others	10.97	11.62	20.88	9.57

Source: Economic Times.[5]

Stage VI (BS6) emission standards[7] will ensure that the Indian automobile industry's emissions norms are on par with global standards. Although the BS6 norms aim to control future vehicular pollution, it does not ensure the mitigation of pollution caused to older vehicles, disorganised mode changes or inadequate route planning, and the severe shortages in public transport availability, especially in the growing cities.

Congestion in Cities

Another issue that plagues India's transportation sector is congestion on roads, which results in economic losses and increases traffic incidences. According to the TomTom Traffic Index, four Indian cities rank among the world's top ten most congested cities. Bengaluru leads worldwide in traffic congestion, while Mumbai, Pune and New Delhi are at the fourth, fifth and eighth positions, respectively. Traffic congestion not only increases air pollution and has a resultant impact on public health, but it also translates to time and workforce losses.[8]

TRANSPORTATION POLICYMAKING

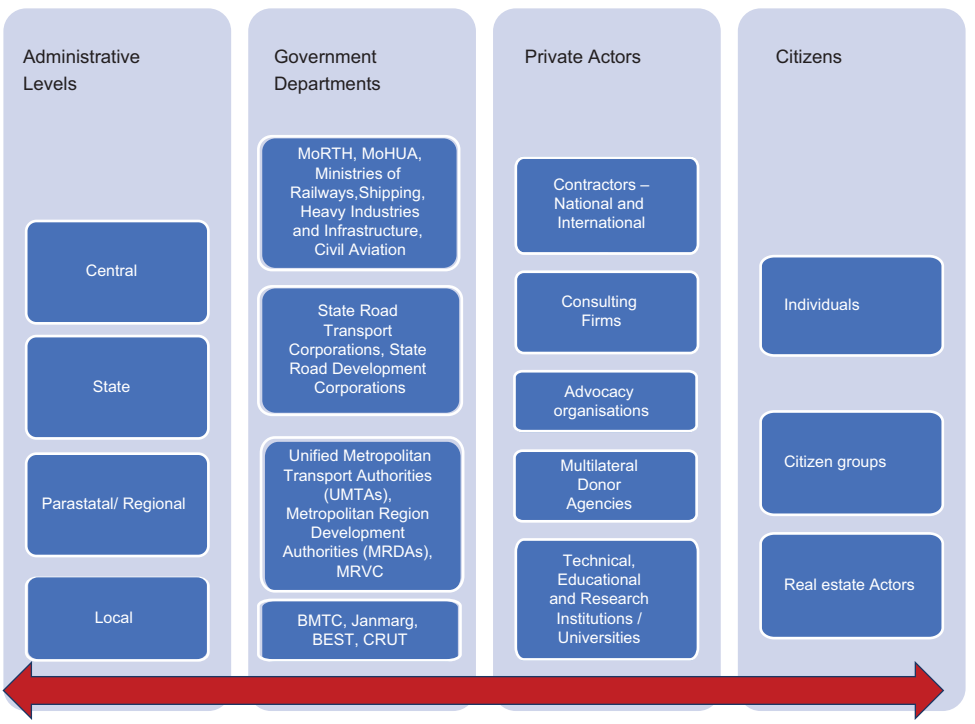
Pollution and congestion are the manifestations of systemic issues in transport provision in India. Huge infrastructure projects provide access to several regions of the country. However, end-to-end connectivity is not done in a planned manner. Various government agencies plan infrastructure as per their geographical mandate but fail to come together to provide end-to-end solutions to complete the transport loop. For example, while the major chunk of the work done by the Ministry of Road Transport and Highways (MoRTH) is aimed at establishing connectivity between two regions through highways and expressways, the onus of providing provisions for adequate parking falls on the city governments, which often have inadequate workforce and enforcement powers at their disposal. In 2018, India was one of the fastest-growing car markets in the world. The vehicle ownership rate is expected to grow at a staggering pace, from 22 cars per 1000 people in 2018 to 175 cars per 1000 people by 2040,[9] and the car manufacturing industry is still one of the major employers in the country. Balancing the commercial interests of the auto lobby, the central government's focus on infrastructure development, and the city governments' need to enable parking provisions and deal with the fallouts from pollution and congestion within the urban space—although the three appear to be unconnected issues—is of importance in effective transport policymaking.[10]

What is the best alternative to provide citywide transportation? Could a mass transit option going through certain areas of the city make all transport woes disappear? These discussions present several conflicting ideas. The political economics of transport policymaking must be understood in greater detail to formulate

strong policies that receive acceptance from all sections. Studying the political economics of urban transport policymaking in India explains how these policies have been formulated and evolved over the years and their on-ground impacts.

India's transportation system follows a federal decision-making structure, while budgetary allocations are primarily top-down. Most of the country's transport decisions are made by the national ministries and government departments, specifically the Ministry of Housing and Urban Affairs (MoHUA) and MoRTH.

Figure 1: Political Economy of transportation in India (stakeholders, implementing agencies, policies and projects)



Source: Author's own

At the various geographic and administrative levels, there are government departments and private actors that have high stakes in creating policies for urban citizens. The largest budgetary allocation and political power rest in the hands of the MoRTH, along with the Ministry of Urban Development, NITI Aayog, and various state and local transport corporations and road development corporations. A significant part is played by the different implementation agencies, such as local, national and international contractors or vendors, consulting firms and donor agencies. Technical and research institutions and advocacy organisations play a role in the formulation of such policies, and building consensus among the different stakeholders for their implementation. Each of the actors or agencies are continuously influencing the actions of other agencies.

The complexity in the number of agencies, levels at which they operate and their capacity to influence decisions in transport policymaking is evident in the various transport policies that exist in India today. The efforts to establish a sustainable transport framework in India will only be maintained through corresponding changes in transport policy and its conscious adoption by all stakeholders involved. It is important to study the existing policies, programmes and projects that impact urban transport in India to help create a green mobility framework for the future. By understanding the sustainable mobility outcomes, or lack thereof, of these policies, it is possible to identify gaps and conflicts, and provide solutions to allow for these policies and agencies to work in tandem.

National Urban Transport Policy

The National Urban Transport Policy (NUTP), launched in 2006 and revised in 2014, paved the way for large-scale reforms in India's urban transportation sector. Currently, the NUTP serves as the base document for several other projects and programmes, such as the Smart Cities Mission's transport initiatives and the National Electric Mobility Policy. Along with the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the 2006 NUTP envisioned and launched several schemes on sustainable transportation, such as the bus rapid transit system (BRTS), light rail projects under the mass rapid transport schemes, and the upgradation of city bus systems in big towns and smaller cities. Metro projects were introduced in Kochi, Jaipur, Chennai, Hyderabad, Bengaluru, Ahmedabad, Pune, Nagpur and Lucknow, while metro routes in Delhi, Mumbai and Kolkata were extended. Metro rail feasibility studies were conducted across over two million cities, and more than 30 cities have introduced city bus services or modernised their ageing fleet as a result of the outlays during the JNNURM.[11] The NUTP, thus, provided a policy framework for the implementation programmes of the JNNURM

In 2014, the NUTP was amended to consider the country's new transportation needs, defining a vision for creating city-specific mobility solutions along a low carbon path. It included factors like integrated land use and transport planning, the creation of comprehensive mobility plans and public transport and NMT plans, and provided guidelines to create multimodal sustainable urban transport systems.

Implications for Green Mobility

The key objectives of the NUTP are—to allocate road space to move people rather than vehicles; to incorporate urban transport at the urban planning stage; to promote seamless, user-friendly and reliable public transport; and to develop walking and cycling as safe modes of urban transportation.

Although the amended NUTP closely followed its previous iteration, its implementation remained on paper. Its non-implementation could be attributed to its primarily descriptive nature, which did not lay down a roadmap for execution. The establishment of a Unified Metropolitan Transportation Authority without any enforcement mechanism for its creation and functioning, has mostly been ignored by the states and parastatals. Although a number of investments and projects as specified by the 2006 NUTP came to fruition, the directives of the 2014 policy were mostly ignored as most cities were more inclined towards the creation of a metro network,[12,13] letting the other sustainable transport alternatives suffer from a lack of funds, attention and other resources. Through the NUTP and using JNNURM funds,[14] huge strides were made to streamline urban bus transportation and mass rapid transportation through light rail and metro routes. However, the policy failed to make an impact on the last-mile connectivity challenge. Though buses and bus fleets were upgraded, connections between residential streets and bus bays were not established or strengthened. Despite the 2014 NUTP talking about enhancing green mobility through good design, it fails to define these good design principles or provide procedures for BRTS operators to better plug gaps between the BRTS routes and last-mile connections.

Atal Mission for Rejuvenation and Urban Transformation

Announced in 2015, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is a revised version of the JNNRUM policy for smaller cities across India. A vehicle for urban transformation in 500 mission cities across the country, AMRUT focuses on specific aspects of urban service delivery and the betterment of water supply, sewerage, storm water drainage and urban transport, and creating green spaces/parks in the mission cities. For urban transport, funds are allocated to enhance NMT alternatives in each city by creating footpaths or walkways, sidewalks, foot overbridges and cycling facilities.[15]

Implications for Green Mobility

So far, only 14 states have utilised AMRUT funds to create NMT options and multi-level parking. Madhya Pradesh, Kerala and the erstwhile state of Jammu and Kashmir have spent the most on these projects, with outlays close to or exceeding INR 200 crore each. However, compared to the total plan outlay of INR 776.4 billion for all the state annual action plans (SAAPs), only INR 14.36 billion (2 percent) has been spent on non-motorised urban transport.[16] A more in-depth study on AMRUT's impacts on individual cities is needed. Despite the programme being aimed at 500 cities, data from most cities have not yet been populated on the website dashboards. The individual SAAPs only give an estimate or proposed expenditure for cities. Moreover, there is little validation or standardisation of street design, its connectivity to other transit modes, and using NMT as a mechanism for completing the transit loop and establishing end-to-end connectivity.

Smart Cities Mission

One of the focus areas of the Smart Cities Mission, launched in 2015 by the MoHUA, is improving transport and connectivity and providing an impetus to walkable communities. It aims to reduce congestion, air pollution and resource depletion, stresses on the principle of 'streets for people', makes design changes and provides amenities within walking or cycling distance for most of the population. It aims to promote transit-oriented development, public transport and last-mile para-transport connectivity, technological upgradations in urban transport with the introduction of citywide command and control centres using Intelligent Traffic Monitoring Systems (ITMS).

The status of transportation systems in the city is a key criteria for the evaluation of smart city projects.[17] Surat, Visakhapatnam, Bhubaneshwar, Indore, Pune and Coimbatore are a few success stories of the Smart Cities Mission for their various urban transport projects.[18] However, being a successor to the JNNURM, the majority of smart city schemes are focused on bus transport projects and the upgradation of the existing bus fleets. Another key component is the creation of data centres and ITMS to coordinate transportation across various modes.

Implications for Green Mobility

An analysis of the Smart Cities programme in 20 cities shows that the key NMT projects were public bicycle sharing schemes, electric bus and electric rickshaw fleets, IT-enabled fleet tracking for e-mobility options, and EV charging and parking bays.[19] Smart city projects have considerably diversified the transportation options available in India. Yet, compared to intermediate public

transport like rickshaws and taxis, non-motorised options are far less preferable.[20,21]

Between March and August 2020, COVID-19 has forced a greater focus on the need for physically distanced modes of transportation, such as walking and cycling.[22] The MoHUA, through the Smart Cities Mission, has announced a 'CYCLE4CHANGE' challenge,[23] which intends to create extensive cycle networks in Indian cities through various interventions, such as pop-up bike lanes, non-motorised zones in cities and community-led cycle rental schemes. Through this challenge, the ministry aims to promote cycling as a safe (and green) solution to the recovery for cities, businesses and communities post lockdown.[24]

National Transit-Oriented Development Policy

The National Transit Oriented Development (NTOD) policy has various elements that can contribute to creating a green mobility framework for Indian cities. The NTOD stresses on sustainable aspects of mobility, such as encouraging high-density, mixed-use spaces and compact developments with mandatory inclusive housing. It focuses on aspects of transport like traffic calming and universal accessibility with the creation of vibrant public spaces, and encourages the monetisation of these developments through various mechanisms like Value Capture Financing, thus ensuring NMT strategies will have enough funds to be adopted.

Implications for Green Mobility

Since its formalisation in 2017, the NTOD guidelines have been incorporated in the plans of several smart cities. In an analysis of the smart city, city development and master plans of 17 cities

Figure 2: National Transit Oriented Development Principles

Source: National Transit Oriented Development Policy[25]

across India,[a,26] researchers found several applications of the NTOD. While aspects of the NTOD, such as complete streets, first- and last-mile connectivity and multimodal integration, were adopted by all 17 cities studied, several had yet to make progress on creating NMT networks.

For the NTOD policy to be adaptable across all Indian cities, changes must be made in the development control regulations,

a A 2017 study focussed on analysing smart city plans, city development plans and master plans of Agra, Ahmedabad, Ajmer, Amritsar, Bhopal, Bhubaneswar, Chandigarh, Chennai, Faridabad, Guwahati, Gwalior, Hubli-Dharwad, Indore, Jabalpur, Kochi, Nagpur, New Town Kolkata, Panaji, Ranchi, Thane, Ujjain. All had NMT plans incorporated into larger plans, except cities of Faridabad and Kochi.

as well as in the comprehensive design and architectural level to account for floor area ratio guidelines in different areas. Existing high densities along older transit corridors prevent the easy adoption of NTOD norms, especially if these transit corridors undergo enhancements or reconstruction.

National Electric Mobility Mission Plan[27]

The 2020 National Electric Mobility Mission Plan (NEMMP) was first proposed by the Department of Heavy Industries, Ministry of Heavy Industries and Public Enterprises in 2012. Its goal was to encourage the faster adoption of electric and hybrid vehicles in the country through government-industry collaborations, to allow India to emerge as a leader in EV manufacturing by 2020.

Implications for Green Mobility

The NEMMP document includes detailed forecasting and situational analysis, projecting India's potential to emerge as a global EV market leader by 2020. Unfortunately, these predictions have fallen short; India does not even in the top 10 countries in the EV market or in EV production.[28] However, the NEMMP document presents interesting links between the use of EVs in public transportation, such as buses, and as intermediate public transport options such as three-wheelers. Some of these have been utilised and incorporated into various schemes, such as the adoption of e-autorickshaws in Bhubaneshwar under the Smart City Mission.[29,30]

Sustainable Urban Transport Project

The Sustainable Urban Transport Project (SUTP) was launched in 2010 by the MoHUA in coordination with the United Nations

Development Programme through funding by the Global Environment Facility. The MoHUA aimed to push the NUTP principles through capacity building in urban and sustainable transport, and create regulations to protect Indian cities from pollution and emissions and through city-level projects. The SUTP created demo projects in ten cities across India and created guidelines and model documents for various aspects of sustainable transport, such as bike-sharing, city bus operations, transit-oriented development and NMT. The SUTP ended in December 2018.

Implications for Green Mobility

The SUTP generated a lot of interest in different cities since it encouraged the creation of sustainable transport options. Projects executed in the ten demo cities included those focusing on BRTS and NMT, as well as capacity building initiatives to create awareness about NMT principles among city governments and officials from implementation agencies and parastatals. Cities like Hubli-Dharwad, Indore and Pimpri Chinchwad began BRTS, BRTS lite and NMT projects based on the SUTP.[31] Since the project ended, there has been little understanding of its impact on India's green mobility space. But the training modules and guidelines developed as part of the SUTP will be of great value for future sustainable mobility projects in the country.

Green Urban Mobility Initiative

To boost green and sustainable alternatives under the Smart Cities Mission, the Indian government launched the Green Urban Mobility Initiative (GUMI) in 2017.[32] The thrust of the initiative is on two components:

- Sustainable urban mobility: This provides impetus to solutions like public transport and NMT, and increases the adoption of technological solutions for transport integration, using BRTS, walking and cycling tracks.

- Sustainable vehicles and fuels: This advances the adoption of EVs, and clean and renewable alternatives to fossil fuels for public transport projects. It aims to create over 1000 kilometres of BRT networks and redevelop 550 buses, 20,000 paratransit services and 6,000 buses on alternative fuel/electric systems.

Both components of the initiative aim to bring about public transport interventions and will involve local government through a Green Mobility challenge on the lines of the Smart Cities Challenge. The initiative targets different zones in India amongst the 103 smart cities so far.

The GUMI was expanded to include the following components:

- Establishment and operationalisation of Unified Metropolitan Transport Authorities
- Adoption and implementation of transit-oriented development
- Adoption and implementation of travel demand management measures
- Adoption and implementation of policy for urban street vendors
- Establishment of an urban transportation fund
- Adoption of an anti-encroachment policy to reclaim the right of way
- Preparation of comprehensive mobility plans and their integration with the city master plan

Implications for Green Mobility

Although GUMI focuses on 'greening' various aspects of mobility, the later addendums to the policy document bring in a host of different measures that are not necessarily 'green' or sustainable in themselves. For instance, measures like travel demand management and transit-oriented development can be established without enhancing a city's green mobility quotient. Further, if diesel buses for last-mile connectivity are purchased through an urban transport fund, it will create more pollution for the city, even if the project allocations are done through GUMI.

Table 2: India's existing green mobility policies

Policies/ Programmes	Key Features	Green Impact
National Urban Transport Policy	Focus on moving people, not vehicles To provide seamless connectivity to metro regions Guidelines to create multimodal and sustainable urban transport systems	Huge strides in providing efficient bus transport, in major cities Create comprehensive mobility plans More focus on bus, light rail and intermediate public transport connections, still the walking and cycling last-mile connectivity options were neglected.

Policies/ Programmes	Key Features	Green Impact
Atal Mission for Rejuvenation and Urban Transformation	Revised version of JNNURM for 500 smaller cities Focuses on various aspects of urban service delivery, and has specific fund allotted to create and enhance NMT	Most of the states (and cities) have utilised AMRUT funds for other urban renewal aspects, NMTs have seen only 2 percent of total AMRUT outlays. Poor validation and follow up on the part of the national mission as to how each city is spending its intended funding.
Smart Cities Mission	Providing impetus to walkable communities is one of the focus areas. Promote transit-oriented development, public transport and last-mile para-transport connectivity. Furthers technological upgradations in urban transport through Intelligent Traffic Monitoring Systems.	Has furthered the green mobility cause through programmes and challenges aimed at cities. Since the COVID-19 outbreak, has brought out programmes like cycles4change and complete streets, that aim to enhance walkability and bike infrastructure and adoption in Indian cities Scope for standardisation of the programmes and to ensuring that their outcomes continue to impact even after the programmes/ challenges themselves are over.
National Transit Oriented Development Policy	Comprehensive approach to creating sustainable mobility options in cities Covers various aspects of transport policy and practice, including finance and urban planning	To be implemented successfully across cities, changes must be made in the urban planning mandates. This is the most comprehensive policy to be adopted into a green mobility framework in the future.

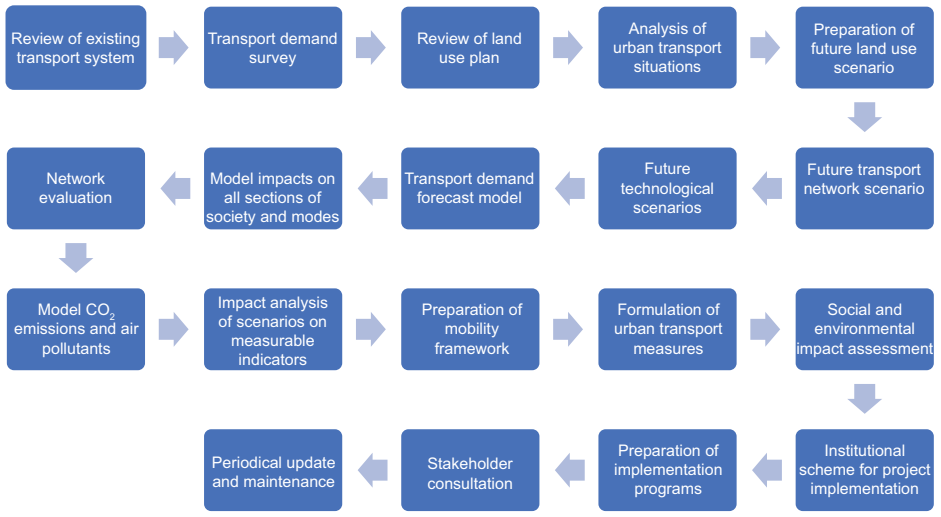
CREATING LOCAL TRANSPORT POLICIES AND PLANS

The policies, programmes and projects analysed are national-level directives on urban transportation geared towards metropolitan governments. Cities analyse their existing transport conditions through comprehensive mobility plans[33] and city traffic and transport studies, based on which they create policies as per their local requirements. Since the state of a city's transport services is a key component in smart city plans and for receiving funding through the Smart Cities Mission, several cities have created comprehensive mobility plans and city traffic and transport studies to set 20-year mobility goals. The process of creating a comprehensive mobility plan, with an emphasis on connecting different city departments to the transport department, allows for the emergence of a cohesive structure for transport decision-making and implementation at the city level. In 2014, the Institute of Urban Transport published guidelines for the creation of the comprehensive mobility plans under the SUTP.[34]

So far, at least 25 cities have prepared comprehensive mobility plans,[36] which have been used to prepare subsequent smart city plans and city development plans.

Several of the analysed policies and programmes, such as the Smart Cities Mission and AMRUT, have a wide-ranging scope and work on various aspects of urbanisation. They have multiple directorates that focus on specific aspects of programme monitoring and provide funds to cities based on aspects like mobility or e-governance.

Figure 3: Task list for the creation of a comprehensive mobility plan



Source: Toolkit for Comprehensive Mobility Plan[35]

Yet, other policies discussed, such as GUMI, NTOD and NEMMP, are merely documents that support the decision-making framework and budget allocations to projects in cities. These policies are toothless and lack clear directives for implementation. Although it is up to the local and state governments to interpret and implement policies, issues like lack of technical expertise, inadequate resources and issues with implementation and monitoring derail processes at the local level. Policy implementation is thus subject to the city's political economic climate and its geography, and is controlled by the people or team responsible for its implementation, among other factors. Contracts for local project works may be biased, and changes in a city's political-economic landscape could translate into turbulent engagement among stakeholders, and cause project delays and economic losses for the city.[37] Hence, clear policy directives are necessary for smoother implementation.

At the same time, for mobility projects implemented via a challenge or through crowd-sourced effort, what happens once the 'challenge' and the buzz around it ends? Such mission-based projects often fail to make it to the next iteration of the funding cycle or the next election cycle when there is a change of political leadership. The SUTP, for instance, failed to sustain beyond the election and funding cycle. As a result, the knowledge base that was created under the SUTP is in danger of being lost. Currently, the SUTP website is nonfunctional. The MoHUA's latest Cycle4Cities challenge does not adopt any directives from the SUTP cycling guidelines. Hence, mission-based programmes and ambiguous policies have often been detrimental to the work done on creating lasting impacts in the urban green mobility space.

Gaps and Limitations

Besides the political-economic issues, there are several gaps between the policy vision and the actual practice of transportation project execution:

Focus on short-term gains at the local level

City budgets, barring those of the large metropolitans, have little scope to incorporate long-term solutions, such as open streets and NMT options. The decisions are often made by local corporators who are elected based on their promises to construct new roads, widen existing roads and build flyovers. [38] Providing more space to NMTs—and consequently less space to cars—is considered an unpleasant solution and is disregarded by local politicians in many cities in India.[39] Hence, budget decisions are often focused on roads, with only lip-service to NMT infrastructure,[40] thus hampering the progress of green mobility policies.

Administrative challenges

Administrative challenges have directly impacted the implementation and monitoring of transportation policies. As of now, Pune is the only city with a combined city and transit agency budget, although this is likely to change in the coming years with the introduction of a separate entity to shore-up losses using NTOD principles.[41] In non-metro cities, the city governments have little administrative and enforcement powers. Here, even the function of public transport provision is not mandated, or it is outsourced to private actors through partnerships or lease agreements. In such scenarios, the will to invest time, effort and resources in a politically unpleasant decision to implement an NMT project dwindles.

Inferior NMT design and implementation flaws

BRTS projects, which were started with great enthusiasm and fanfare in several cities, have lost their sheen within a decade. The examples of Delhi[42] and Pune,[43] as well as other cities in the Global South,[44] highlight huge gaps in funding and coordination between agencies, lack of political will, administrative power, capacity constraints and poor physical design as some of the key issues plaguing BRTS systems in post-colonial societies. In contrast, in cities like Hubli-Dharwad and Ahmedabad, a well-designed BRTS has great support from citizens and the political leadership.

Metro mindset

Between 2010 and 2020, 14 Indian cities established or expanded their metro routes,[45] with several still in the construction stages and only likely to begin operations by the mid-2020s. Most metro

corporations are formulated as special purpose vehicles to get past the administrative, political and budgetary challenges of municipal corporations, and have a single entity accountable for the project. Although metro projects have run into losses once the initial funding is extinguished, they have emerged as status symbols for cities[46] and are exploited for political ends.[47] The focus on metro projects has deeply impacted other transport modes in the cities where metros have been implemented.[48] Across cities and transit modes, cheaper alternatives to the metros, such as buses and trains, have seen fleet stagnation and falling ridership in the past decade.[49] Although buses and trains have the potential to meet the same level of service criteria as metros, over the 2014-17 period only INR 1,236 crore were allocated for procurement of buses across the country under the AMRUT programme. Over the same time, the MoHUA allocated INR 263.77 billion crores for metro projects nationwide.[50]

Private motor vehicle boom

The widespread and increasing demand for private transportation options is another factor impacting transportation policy implementation. Most of the analysed policies focus on supply-side provisions, such as how the government can enhance sustainable green transport options. There is no acknowledgement of the pressures that public transport in cities face from private motor vehicles. Motor vehicle sales in India have risen from 14,40,455 in 2005 to 38,16,891 in 2019.[51] A 2018 study on Indian vehicle ownership estimates that between 2015 to 2035, the per capita vehicle ownership will rise by 5.7 percent annually[52] in the sampled cities of Delhi, Bengaluru and Kolkata.

India has a 5.5 million-kilometre road length, which transports more than 60 percent of its goods and over 90 percent of its passengers. While the road length has increased, the vehicle density (number of vehicles per kilometre of road length) has also risen, from 28 vehicles in 2010 to 41 in 2016. Most cities above the million-population mark see a considerable number of productive hours lost due to congestion each year. [53]

Congestion on the roads shared by public transit and private vehicles negatively impacts public transport users.[54] It increases the time taken to reach a destination and the probability of traffic incidents, and makes public transit unreliable and unpredictable, leading to loss of ridership. Congestion due to a huge number of private vehicles on the road, thus, undermines the capabilities of public transport providers in the country to operate at their full potential.

Recommendations

Although India has various policies and programmes that aim to enhance green mobility outcomes, there needs to be a definitive purpose and plan to bring about a functional green mobility policy. Most of the existing policies work according to their individual mandates but are bereft of any inter- or intra-agency coordination, despite the overlapping and common aims. A top-down approach to policymaking may not be the best way to produce an overarching policy framework that addresses the limitations of existing policies and creates one with sustainable impacts. To create a policy that has strong directives and actionable programmes and that lasts beyond election cycles and bureaucratic changes, it must receive public approval. What are the elements of such a policy? How can the gaps

between land use planning and transport development be bridged in the new policy? In a post-COVID-19 world, there is an increased awareness about the impacts of transportation on the environment. Hence, it makes sense to incorporate all transportation under a green and sustainable ambit.

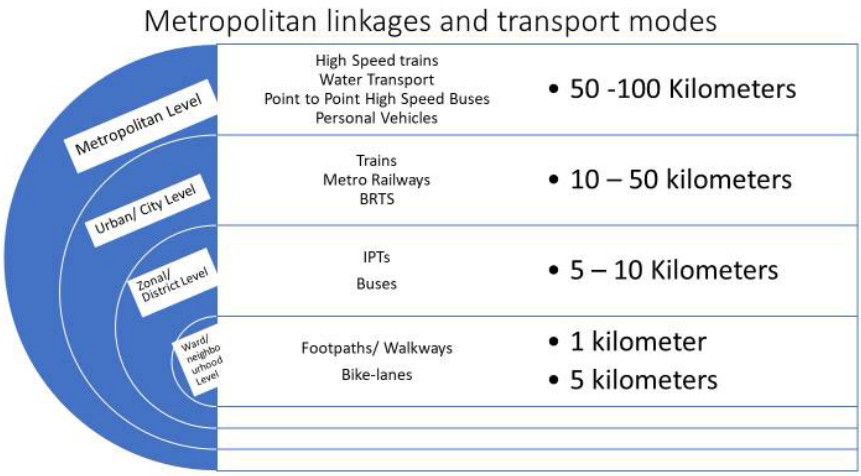
The following are the pillars of a sound and sustainable green mobility framework:

Spheres of Action

Transport is linked to the way a city evolves physically, with transit routes often connecting key points of interests, such as commercial, business, tourist spots and residential areas. This is called urban form. Planning new transport routes and maintaining existing transport routes are often connected to how cities and citizens use that urban form.[55] The mode of transport is also often determined by distance, travel time and ease of use. To determine people's participation, the planning authority and implementation agency, it is important to place the transit decision-making in the local context. These spheres of action are key to ensure a project serves the needs of the people, is accepted by local planning agencies, and is executed with intent and precision.

Figure 4 depicts the tiered administration levels, transport modes and the area of influence of these transport modes. In a well organised and managed city, the ward/borough/neighbourhood problems and administrations will inform the issues to be taken up at the zonal/district levels. These, in turn, will inform decision-making at the city level, and the individual cities/villages/district administrations in a metropolis will inform planning and decision-making at the metropolitan level. In parallel, user demand for

Figure 4: Linkages between urban planning, sustainable transportation and metropolitan governance



Source: Metropolitan Intermodal Transport Structure[56]

a particular form of transportation mode should ideally spur planning, provision, construction and the maintenance of the requisite transport infrastructure and fleet at the different administration levels. This will require a cohesive approach by all agencies involved. However, this is not the lived experience in most Indian cities.

The 74th Constitutional Amendment Act gave directives to formulate ward committees and area committees, going up to district and metropolitan planning committees in the metropolitan region. It is time to bring these participatory planning tools into the mainstream for transportation route planning. Participatory planning through ward committees needs to be the cornerstone of decision-making—especially for sustainable transport staples like bicycle lanes and pedestrian infrastructure, and for transport route

and mode planning—as it is the community that will ultimately use or neglect the transport infrastructure.

15-minute neighbourhood

Given the impact of COVID-19 and the citizens' need for a hyperlocal space with easy access to services and amenities, there is likely to be renewed interest in creating '15-minute neighbourhoods' in all areas of the city.[57] The 15-minute neighbourhood, a concept that is gaining popularity in countries like Canada and France,[58] aims for everything that people need to be within a 15-minute walkable distance. Dense Indian cities with traditionally mixed-use spaces are no stranger to the 15-minute neighbourhood concept. However, the new residential developments in far-out suburbs have work to do in this regard. To create such a hyperlocal space that is accepted and used by all, it is essential to understand the needs of those who will use the space. It must reflect the social, cultural, economic and political aspirations of the people, displaying a microcosm of city life, yet uniquely belonging to the people. Such a walkable, bike-friendly neighbourhood can then be connected to larger, similar city blocks using intermediate public transport and short route buses[59] to create a 'superblock'[60] that can further be connected to the other parts of the city using trains, buses, BRTS and metros. At the metropolitan level, to connect different cities within the same metro region, high-speed train networks, waterways, personal vehicles and point-to-point high-speed buses can be used.

Metropolitan transport fund

Urban life is likely to radically transform in the aftermath of the COVID-19 pandemic. Adherence to social distancing norms for a

prolonged period and a lingering fear of crowds are likely to keep people from public transport systems in the coming months. Most public transport systems will experience financial difficulties from a fall in revenue due to lower ridership and people's weakened ability to pay, a shift to private vehicles and government spending cuts. The concept of an urban transport fund was introduced by the SUTP with a detailed operations document in November 2016.[61] So far, seven cities—Jaipur, Lucknow, Bhopal, Hyderabad, Kochi, Tiruchirappalli and Amaravathi—and several states have 'urban transport fund' documents.[62] However, only Punjab has enacted a law (Punjab Urban Transport Fund Bill, 2019[63]) that puts a cess on private vehicles to fund public transport. Through this Bill, the local government bodies in Amritsar, Ludhiana, Bathinda, Jalandhar and Patiala will be able to fund their city bus projects by imposing a cess of INR 10 paise per litre on petrol and diesel in urban areas, and an additional cess of 10 percent on the auction of VIP number plates, which is expected to generate around INR 25 crore annually.[64]

CONCLUSION

The framework for a green mobility policy focused on participatory transport planning envisions stronger transit decisions to be enacted by a metropolitan unit—a group of urban governments working on common objectives of connectivity, increasing economic capabilities, and maximising gains from transportation. By combining the spheres of action, 15-minute neighbourhood, and metropolitan transport fund concepts, a green mobility framework should have geography-specific plans as per the unit of planning involved. City-specific or target-specific plans, depending on the city's requirements according to its comprehensive mobility plan,

will enable the urban unit (the city or the neighbourhood) to set time-bound transit goals to work towards with administrative units that are responsive to their demands.

Other steps, such as the revival of the SUTP and creating a strong deterrent to private vehicle ownership to curb demand-side issues, will make the green mobility policy framework a reality. Existing mobility policies must be amended to reflect an altered capacity to own, operate and utilise private vehicles in Indian cities in keeping with the country's sustainability goals. If the demand for and use of private vehicles in Indian cities is not curbed, these projects may go the way of the NUTP—filled with good intentions but weak in implementation and acceptance.

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