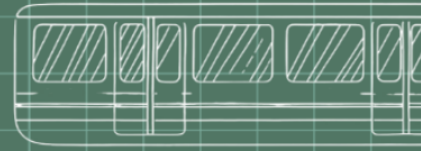
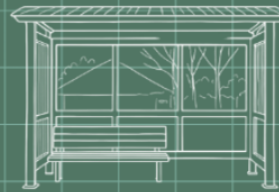
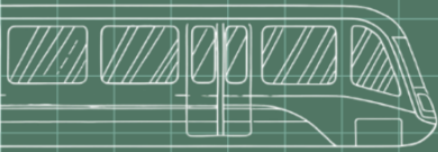




IT for Change



The DPI Turn in India's Urban Transportation Policy: Challenges and Opportunities



Aditi Surie



About IT for Change

Founded in 2000, IT for Change is a Southern NGO rooted in feminist principles and committed to advancing digital justice through the democratization of digital technologies. It holds Special Consultative Status with the United Nations Economic and Social Council (ECOSOC).



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The project aims to advance digital innovation policy and governance rooted in ethical frameworks and social justice.

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Abstract

This report aims to provide an overview of the changes taking place in the urban public transport sector over the last 20 years that will shape a Digital Public Infrastructure (DPI) approach. It does so through a transport justice lens, asking whether DPI-led approaches can serve those who depend on urban mobility most: residents of informal settlements, working-class commuters, and those navigating fragmented formal and informal transport networks. Creating and implementing interoperable, open, scalable digital solutions must contend with existing challenges such as legacy urban governance issues, municipal finance constraints, resource needs of public departments, patterns of urbanization, and income inequality. The report analyses how DPIs can impact the way transport services meet the needs of city residents, noting the significant presence of and dependence on intermediate public transport and private ownership due to insufficient metro and bus services.

The report reviews key issues preventing technology adoption and efficiency in public transport, including commuting patterns and gaps in provision. It traces the role of technology in prior policies like the Smart Cities Mission, National Urban Transport Policy, and the Jawaharlal Nehru Urban Renewal Mission (JNNURM), highlighting legacy issues in city and transport governance that exacerbate service gaps. Changes in municipal governance influenced by technology-first policies are described, including the ‘rescaling’ of governance and persisting gaps in data standardization and sharing amongst government institutions.

Common intentions behind digital public infrastructure initiatives discussed include creating a unified intelligence layer, simplifying user journey planning and ticketing via a single interface, and user-side multimodal integration. The Delhi and Mumbai Transport Stacks are upcoming examples of a ‘unified transport ecosystem’ through secure data highways or open data exchange platforms. Alongside city stacks, open mobility networks – exemplified by platforms like Namma Yatri operating on the Beckn Protocol – represent a decentralized alternative, starting from mobility services and building upward rather than from administrative integration downward. These initiatives aim to leverage transport data and predictive intelligence to improve urban mobility efficiency and enhance services like E-rickshaw/E-auto operations.

I argue that it is necessary to scale questions of the role of the state to urban governance in the context of transport DPIs, recognizing the fragmented nature of decision-making and the varying impacts of city-specific “stacks” versus open mobility networks. Second, the success of DPI hinges on investing in the social and institutional fabric around these digital systems. This involves prioritizing operational efficiency, ensuring equitable data governance, fostering genuine civic participation, overcoming governance fragmentation, and guaranteeing digital infrastructure sustainability.

To move towards transport justice, it is essential to prioritize core service provision by expanding physical infrastructure, such as buses and bus stops, while enhancing service delivery. While DPI aims for efficiency through data and technology, it currently lacks clear intent or policy links to expand this essential “hard” infrastructure, which was a prerequisite for technology’s usefulness in prior missions like the Smart Cities Mission (SCM). Concerns exist that technology vendors might focus on superficial “top-layer” solutions, neglecting fundamental operational issues.

The report also advocates for building systems that explicitly address existing governance gaps to facilitate meaningful multimodal transport integration, including integrating public, private, informal, and intermediate public transport, and establishing clear data-sharing protocols and accountability. Adopting an incremental approach to data integration is key, learning from past challenges under SCM, where public data infrastructure was at risk of privatization. Finally, balancing public and private interests is essential to prevent revenue-driven projects from diverting resources from core public services and to ensure data-driven route optimizations promote equity. The digital transformation also necessitates a just transition for transport workers, prioritizing their rights. These comprehensive recommendations highlight the need for a holistic approach to realize DPI's promise for a more just and accessible urban transport system. The report argues that the transport justice question – whether DPIs can be designed to serve those who depend on urban mobility most – must be built into DPI development from the outset, rather than treated as an outcome that better technology will eventually deliver.

1. Introduction and Report Roadmap

Urban India's transport sector is diverse, catering to the needs of expanding cities. India's metropolitan cities are large and sprawling, causing urban residents to be disconnected from mass transit systems. In Bengaluru, for example, residents of informal settlements on average are 0.4 km away from the closest bus system but 3–4 km away from the nearest metro. Buses are the backbone of India's transport system – affordable, dependable, and expanded bus services have been an effective mechanism to improve access to labor markets, increasing incomes for workers, and connecting supply chains (Estache & Fay, 2016). They provide affordable travel for approximately 399 million people, accounting for 90% of public transport trips across the country (Mulukutla et al., 2024). Yet, persistent gaps in bus networks create a scenario where a majority of urban India depends on intermediate public transport through informal services, platform services, and personal mobility options like motorcycles (Gadepalli, 2016; Jaiswal et al., 2024). Cars, rickshaws, shared tempos and taxis, motorbikes (both privately owned and taxi services) hold a large share of transport needs. The share of privately owned vehicles, and our dependence on them, varies across city size, but not significantly enough to ignore their need.

Across metropolitan and small-town India, transport services are a patchwork infrastructure, often uncoordinated and unregulated in their pricing. Intermediate Public Transport serves a key function of last-mile connectivity, but also connects those who live outside planned economic zones. Shared tempos, autos, maxi taxis, and minibuses are the backbone of transport infrastructure for the less served, yet fall outside the government's definition of "public transport," leaving these systems to operate in silos, disconnected from public buses and metro systems. This has led to residents in informal settlements, especially, to depend on private ownership of motorbikes (two-wheelers) (Gadepalli, 2016; Mugulur, 2025). These factors have contributed to a crisis-like situation characterized by fragmentation in transport services, city congestion, environmental pollution, road accidents, and inequity, causing an accessibility crisis (Pucher et al., 2005).

Multimodal transport integration has been a key area of transport practice – both with and without technology as a way to ensure that transport users can seamlessly make use of all the modes of transport available in the city even if they are not public services or 'formal' transport options, and for balancing the environmental footprints of different transport options (Groth, 2019; Tanwar & Agarwal, 2025). This, coupled with the expansion of buses – number of buses, the networks they cover, the number of bus stops, and the proximity of bus stops to users – has been key to the work of government agencies, transport practitioners, and activists who are aligned to transportation justice.

Digital public infrastructure (DPI) as India's developmental and policy strategy has the promise and potential to streamline services, promise efficiency, stability, innovation, and better governance of public service delivery. Yet, reforms in urban transport and urban governance through key national urban missions like JNNURM, Smart Cities Mission will hold a role in shaping how DPIs are operationalized, and whose vision is encoded in them. At the same time, the market has supported the creation of open mobility networks that come in response to corporate platforms in ridehailing and transport, and to the needs of sovereign technology options. Namma Yatri and similar options built on the Beckn Protocol will also shape how DPIs are operationalized in transport, though they will be shaped by different forces and integrations with sub-national governance. While this is an overall strategy to multiplex access to digital systems outside large corporate platforms, the transportation space has several paths of potential change from the influx of DPI.

The Delhi Transport Stack, for example, states that it can finally allow citizens to have seamless journey planning, real-time bus information, and single ticket platforms (Delhi Transport Stack, 2025). The usage of DPs in transport can allow public transport to remain dependable through reliable fare and route information. The ability for this information to be shared across other transport actors like operators, technology service providers, and app developers can enable seamless collaboration (Rajeshwari et al., 2024). Specifically for the bus ecosystem, DPs can improve observability for stakeholders, possibly encouraging new solution providers to enter the market with lower entry barriers. India has set forth policies to electrify the bus sector, which needs batteries, charging stations, and a focus on renewable energy, for which a digital ecosystem is needed to manage complexities (Press Information Bureau, 2024). Integrated mobility needs interoperable systems and open standards, which are the heart of using DPs as a national policy mechanism (WRI India, 2025).

These two approaches to DPs – city stacks and open mobility networks – will be important for consumers who will interface with technology while using public transport. This report aims to provide an overview of the kinds of changes taking place in the public transport sector over the last 20 years that support and challenge a DP approach.

Creating and implementing interoperable, open, scalable digital solutions will have to contend with legacy urban governance issues, municipal finance, resource needs and constraints of public departments, patterns of urbanization, and income inequality. This report analyzes how digital public infrastructure can stand to impact the way in which transport services meet the needs of city residents. Section one introduces DP development for national transportation areas such as the railways and highways, and contextualizes what local or urban transport priorities are for DP development. Section two describes key features of Indian urban transport: the presence and dependence on intermediate public transport (formal and informal economy options) and private ownership of vehicles, indicating a supply deficit. Section three elaborates on the imagination of change that DPs can create in the transport sector, and where public, private, and intermediate transport fit into this vision.

Section four traces the role of technology in efficiency, coordination, and expansion of transport services through previous but important policies like the Smart Cities Mission, National Urban Transport Policy, and the Jawaharlal Nehru Urban Renewal Mission (JNNURM). This brings out the legacy issues in city and transport governance, exacerbating gaps between transport and its service to transportation for all. Section five describes the changes in municipal governance through technology-first city policies, from these policies including the ‘rescaling’ of governance, persisting gaps in data standardization and sharing amongst government institutions in these policy approaches. Section six concludes with a discussion of potential improvements and challenges that DPs can bring.

Urban transport systems distribute access to work, education, health, and social life unevenly across city residents, and are not neutral in how they do so. This report uses transport justice as its evaluative lens for assessing the DP turn in urban transport policy (encapsulated in Sustainable Development Goals 11.2). A transport justice perspective asks whether transport systems serve those who depend on them most: residents of informal settlements who are spatially disconnected from formal transit nodes, working-class commuters for whom reliability and affordability determine modal choice, and those whose livelihoods require navigating a fragmented patchwork of formal, informal, and intermediate modes.

It also asks who gets to shape these systems, and whether governance structures are accountable to precarious urban residents or to coalitions of consultants, vendors, and bureaucratic actors. These four dimensions – spatial access, reliability and affordability, multimodal integration across formal and informal modes, and accountability in governance – run through the analysis in this report.

2. Policies and Purpose: Mapping DPI Development to Macro Policy

Transportation policy for any country, including India, plays a key economic, social, and environmental role. To understand how and why a sector is transformed through digital-first thinking, the creation of multi-sided platforms, and digital networks, and what impacts these have, it's vital to understand where transport policy is created and how it filters down to metropolitan areas and towns. This is the intent of this report. Transportation policies integrate water, air, and road transport to facilitate key trade flows across borders, enable new types of demand and supply between sub-regions, create employment, and facilitate better access to health and education (Jacobs & Greaves, 2010). Creating economic corridors through urban agglomerations, for example, has been a strategy spearheaded by the Indian government to create economic zones since cities are seen as engines of growth (Sami & Anand, 2015). The creation of the Delhi-Mumbai Industrial Corridors, National Capital Region of Delhi, the Mumbai Metropolitan Region, and the Greater Bengaluru Metropolitan Region combine land use, transportation planning, and highway creation services to enable better regional governance, economic coordination, and services (Mathews et al., 2023).

Transportation in India cuts across national, state, and city interests. This section gives a brief overview of the national interest in transportation alongside the development of DPIs. This is intended as a basis for seeing the differences between DPIs, agencies responsible, and goals.

Road Transport Infrastructure & Vehicle Regulation

Initiative	Description	Lead Entity	Scale	DPI Element
FASTag	RFID-based toll collection system	National Highways Authority of India + National Payments Corporation of India	National	Digital payments, open APIs
VAHAN	National vehicle registration database	Ministry of Road Transport and Highways (MoRTH)	National	Shared digital registry
SARATHI	Driving license issuance and services	MoRTH	National	Linked digital identity
mParivahan	Public app for accessing vehicle data	National Informatics Centre	National	Government-to-citizen interface

Railways and Intermodal Integration

Initiative	Description	Lead Entity	Scale	DPI Element
Indian Railway Catering and Tourism Corporation (IRCTC)	Online ticketing and travel services	Ministry of Railways	National	Core travel infrastructure
National Train Enquiry System, RailMadad	Real-time info and complaints	Indian Railways	National	Public-facing information DPI
UTS on Mobile	App-based ticketing for suburban trains	Centre for Railways Information System	Metro cities	Mobile-first citizen service

DPI development and deployment are reported and discussed outside the macro policies present in the sector, reinforcing technological determinism. This section seeks to match policies with DPIs created.

Transport, unlike commerce, identity, and payments, where DPIs have already been established, has a complex center-state division of responsibility, financing, and intent. The National Logistics Policy, for example, is key to reading the development of railway, highway, and inter-state movement. The suite of FASTTag, GST e-way billing, e-sanchit, and Open Network for Digital Commerce (ONDC) can be seen together to understand the digitization of logistics to enable tracked and faster delivery of goods (Rajan & Krishnan, 2024). Digital master planning using Geographic Information System (GIS) is also seen as an extension of digitization to promote quicker, faster, and more controlled spatial planning to integrate land use, with economic uses of land. Combined with the digitization of land records and management, it indicates a holistic and expansive set of digital and policy tools to create transformations (Town and Country Planning Department, 2018). The body of research on DPI and inclusion has largely examined individual-level systems, asking whether identity, payments, and financial infrastructure reaches underserved citizens; this report is concerned with a different scale, asking whether foundational data layers for city-based transport systems can be designed to serve those who depend on urban mobility most.

At the city level, the unit of governance shifts to state and municipal governments whose share of power in policymaking, public finance, and political participation comes with legacy opportunities and constraints. The important question for this report is: what are urban transport concerns, and how do urban governance units relate to these concerns? Urbanization and urban development was a low-priority sector, urban transportation was still lower at the national level, until the National Urban Transport Policy in 2006, explored in detail in a later section. Mobility flows are key to rapid urbanization, where urban transport infrastructure is the skeleton of the urban form (Amin et al., 2013).

Urban transport governance has undergone significant shifts, moving from a low-priority national sector to one with evolving policy frameworks. The central government's role in urban transport was limited to enabling rural-urban connectivity until the mid-1990s, which created an institutional gap where state policies dominated over urban units, creating a misalignment of local interests (Indian Institute for Human Settlements, 2015).

In the mid-1990s, the Planning Commission recognized the value of urban transport by calling for a unified coordination body and dedicated financial institution in the Eight Five Year Plan (Ministry of Urban Development, 2012). The Ninth Five-Year Plan called for creating urban transport institutions to create an active collaboration between central, state, and urban governments and the National Urban Transport Fund. This plan was key in recognizing urban transport as an institutional orphan and setting up the metro rail systems thinking. The Tenth Five-Year Plan recognized the need to upgrade urban infrastructure as a responsibility to support the natural urbanization taking place around the country. The Twelfth Five-Year Plan suggested strengthening (2012–17) the urban ministry and establishing state-level urban transport departments, advocating for public-private partnerships and other such funding mechanisms.

The National Urban Transport Policy (NUTP) of 2006, issued by the then Ministry of Urban Development, Government of India (now renamed as the Ministry of Urban Affairs and Housing), aimed for safe and sustainable urban transport by promoting public transport efficiency and traffic management, though it designated states as key facilitators. The Jawaharlal Nehru National Urban Renewal Mission, launched in 2005, sought to empower Urban Local Bodies (ULBs) and address distortions in urban land markets through mandated state and municipal reforms. It funded public transport and required the preparation of Comprehensive City Mobility Plans and City Development Plans to promote integrated planning. These policies are discussed in detail in the section below.

The Smart Cities Mission and the National Digital Urban Mission contribute to the vision, infrastructure, and policies for the digitization and platformization of urban governance. The Smart Cities Mission (2015–2025) sought to retrofit and develop smart solutions to urban service delivery, communication, and interaction between citizens and government, between government departments at a sub-national scale, using proprietary and closed technology partners like IBM. This mission created the hardware, software, and policies to ‘smarten’ or digitize various parts of urban service delivery. The National Urban Digital Mission (NUDM) was launched in 2021 to make shared digital infrastructure available to all states and UTs. This included foundational digital building blocks, ready-to-use platforms, standards and specifications, and frameworks for the delivery of municipal services (Press Information Bureau, 2021). The implementation of this is through the National Institute of Urban Affairs, while the Smart Cities Mission was run centrally by the Ministry of Urban Development.

Scholars have argued that to understand the way in which digitization strategies have been implemented it is useful to differentiate between policies that ‘platformize’: processes where governance functions are fulfilled by or transferred to various platforms developed for city or state agencies; ‘infrastructuring’: the practices, materials, and settings of digital infrastructures deployed in the cities, and ‘datafication’ refers to the collection and utilization of data by administrators or platforms to fulfil governance functions (Parkar et al., 2023). Like in other sectors of the market or government and even the web, the processes of making social and political phenomena machine-readable need devices to capture identifiers, to capture and store these into sharable data objects, and the institutions that can process them (Hellmond, 2015; Plantain et al., 2019; Blanke & Pybus, 2020; Srinivasan et al., 2025). In doing this, the NUDM aims to create the National Urban Innovation Stack, whose stack approach includes design principles, standards, and architectural layers to promote interoperability and reuse of digital solutions. Key components are user-centric, ensuring scalability, data privacy, and security through the creation of five platforms, such as the India Urban Data Exchange, National Urban Learning Platform, Urban Platform for Delivery of Online Governance, City Innovation Exchange, and Smartnet (NUDM, n.d.).

The DPIs presented in the current day as answers to contemporary transport challenges come in two forms – relating to urban public transit systems and the creation of open and decentralized networks that can operate as private sector or cooperative models.

DPIs relating to urban public transit systems encompass initiatives like the National Common Mobility Card (NCMC), designed as an interoperable transit payment card for nationwide use, alongside city-specific transport stacks such as the Delhi Transit Stack, which provides open APIs and data to facilitate multimodal integration and improve urban mobility efficiency. This category also includes local smart card systems like Bengaluru Metropolitan Transport Corporation (BMTc) Smart Cards in Bengaluru for ticketing, and private sector applications such as Ridlr, Tummoc, and Chalo that act as civic mobility data intermediaries for journey planning. The second form of DPIs focuses on open, decentralized networks, exemplified by the Beckn Protocol, a national-scale open-source digital protocol. This protocol underpins efforts like Namma Yatri, an open protocol-based auto-rickshaw app demonstrating a cooperative governance model in cities like Bengaluru and Kochi, and Kerala Savari, a state-run ride-hailing app providing an alternative public platform.

Urban Public Transit Systems

Initiative	Description	Lead Entity	Scale	DPI Element
National Common Mobility Card	Interoperable transit payment card	National Payment Corporation of India	National	Open payments infrastructure
Delhi Transit Stack	Open APIs and data for multimodal integration	Government of the National Capital Territory of Delhi + partners	City (Delhi)	Open data, mobility integration
BMTc Smart Cards	Smart ticketing for buses	Bengaluru Metro Transport Corporation	City (Bengaluru)	Interoperable fare system
Ridlr/Tummoc/Chalo	Journey planning and ticketing apps	Private	Multi-city	Civic mobility data intermediaries

Decentralized Platforms and Open Protocol Initiatives

Initiative	Description	Lead Entity	Scale	DPI Element
Namma Yatri	Open protocol-based auto-rickshaw app	Juspay	City (Bengaluru, Kochi)	Beckn Protocol, cooperative governance
Beckn Protocol	Open-source digital protocol for commerce	Beckn Foundation	National	Protocol layer DPI
Kerala Savari	State-run ride-hailing app	Kerala Government	State	Alternative public platform

Despite the promise of DPI to streamline services, enhance efficiency, and improve public service delivery through innovations like interoperable payment cards, open APIs for multimodal integration, and decentralized protocols for ride-hailing services, India's urban transport sector faces significant underlying challenges.

These challenges include legacy urban governance issues, municipal finance constraints, and issues arising from patterns of urbanization and income inequality. The persisting gaps in formal public transport networks, such as insufficient metro and bus services, compel a majority of urban India to rely heavily on intermediate public transport and private ownership of vehicles. The next section will delve deeper into these diverse and unequal realities of intermediate public transport and private ownership, examining their role in urban mobility and the complexities they add to achieving equitable transportation outcomes, even with advanced digital interventions.

3. Transport Justice: Trends in Intermediate Public Transport and Private Ownership

Transport justice, as a lens, is not built from abstract principles alone. It emerges from the realities of how urban residents actually move through cities, what modes they depend on, and which of their needs formal systems fail to meet. This section traces those realities: the spatial disconnect between where low-income residents live and where formal transit reaches, the conditions under which private ownership becomes a necessity rather than a choice, and the patterns of public investment that have shaped the urban transport landscape over two decades. Together, these trends explain what transport justice requires in the Indian urban context, and what any digital intervention must contend with.

While buses are recognized as the backbone, providing affordable travel for a large proportion of the population, persisting gaps in bus networks and the limited reach of metro systems necessitate reliance on other modes, particularly Intermediate Public Transport (IPT) and private ownership. This dependency is particularly pronounced for precarious urban residents, including the self-employed and daily wage workers, whose livelihoods are directly tied to reliable and accessible transport. Their housing arrangements, often in informal settlements, frequently place them at considerable distances from formal transit nodes. For example, in Bengaluru, the average walking distance to a bus stop from informal settlements is relatively low, but the distance to a metro station is significantly higher. Bus commuters overwhelmingly walk to bus stops (The Hindu, 2023). This combination of livelihood requirements demanding mobility and spatial disconnect from formal networks drives demand towards alternative transport options. The spatial dimension of this gap is a justice concern in its own right. When formal transit infrastructure is concentrated in planned, better-serviced parts of the city, residents of informal settlements bear a disproportionate cost of access, in time, money, and the risks of depending on unregulated alternatives.

Most Indian urban residents walk as a means of transport. The usage of cycles has reduced over the years as road usage for private transport services has increased, and road fatalities have increased. Given the limitations of formal public transport, personal mobility, especially the two-wheeler, emerges as a preferred mode for many working-class residents seeking to navigate the urban landscape for their livelihoods. Studies show that the availability of public transport leads to less private two-wheeler ownership, making the policy focus of bus networks, bus services, and pricing key to reducing road congestion (Vasudevan et al., 2021).

Studies such as Aneesh Mugulur's study of Bengaluru's informal settlements highlight that despite the proximity of bus stops for a significant percentage of residents, two-wheelers offer crucial advantages like speed, affordability, reliability, and manoeuvrability, which are particularly valuable for those with multiple job sites or whose work requires constant movement across the city (Mugulur, 2025).

The reliance on two-wheelers is substantial, accounting for a large percentage of vehicles on city roads, though this prevalence also contributes to negative externalities such as pollution and safety risks. This is despite empirical studies across major metropolitan cities that indicate that people are willing to give up private bike ownership (not cars) if there is safe and reliable public transport available (The Hindu, 2023; Jain et al., 2014; Vasudevan et al., 2021). The transport choices of these residents reflect a pragmatic response to the existing gaps and complexities of urban mobility, underscoring the need for integrated planning that considers the diverse needs and existing travel patterns across the city.

Addressing urban mobility challenges in Indian cities has historically included a significant focus on developing road infrastructure. For example, under the Jawaharlal Nehru National Urban Renewal Mission, launched in 2005, over 70% of program funds allocated for urban transport were spent on roads and flyovers, which was noted for demonstrating an inequitable allocation of resources compared to sustainable transport modes like Non-Motorized Transport (NMT) and public transport (Dawda, 2024; Ministry of Urban Employment and Poverty Alleviation & Ministry of Urban Development, 2015). Conventional interventions often favor public funding and investments for private transport instead of public modes, and simply adding more roads, rail, or vehicles is not seen to achieve improved accessibility. The allocation of public investment between road building and public transport provision is itself a justice question, one that determines, over time, which residents can access the city on affordable terms and which are left to bear the costs of a motorized but poorly served urban landscape.

This emphasis on road infrastructure coincides with a trend of rapid motorization in India. Since 2001, the number of vehicles per 1,000 people in Indian metropolitan cities has grown considerably. Between 1991 and 2009, the total registered vehicles in the country grew at a Compound Annual Growth Rate (CAGR) of 9.8%, with personalized vehicles like cars and two-wheelers growing at 9.6% and 10.3%, respectively (Tanwar & Agarwal, 2025). This growth rate for registered vehicles in million-plus cities has been significantly higher than in the rest of India, and annual growth in the overall motor vehicle population in India was around 10% in the decade leading up to 2014 (Surin & Dave, 2024). Sprawling settlement patterns that characterize the expansion of Indian cities also render public transport systems ineffectual and have consequently led to rapid growth in car and motorcycle ownership and use (Indian Institute for Human Settlements, 2015).

Transportation justice advocates and law and order officials commonly ask for reliable and accessible transportation services to reduce city congestion, ease pressure on roads, and enable citizens to reduce the costs of transport in their household expenditure (Dayandana et al., 2025; Lalwani, 2019; Singh, 2010). Making transport more demand-led necessitates adding buses, and the governance integration of many forms of intermediate public transport or multimodal integration which involves the physical, operational, and institutional integration of various modes, such as public transport, non-motorized transport, and shared mobility services, creating wider networks, and expanding bus fleets (Gadepalli, 2016; Saldanha, 2017; Surin & Dave, 2024; Tanwar & Agarwal, 2025). Multimodal integration across public, private, informal, and intermediate modes, and the governance structures that enable it, are therefore not technical coordination problems alone. They are the institutional expression of whether a city's transport system is designed to serve those who depend on it most, or to optimize for the users and corridors that are easiest to serve.

4. Focal Points: City Stacks and Open Mobility Networks

In understanding how DPIs refocus or reiterate transport policy, it's imperative to assess whether this approach decentralizes decision-making on transport policy, reduces frictions for multimodal integration, creates quality data that can be made sharable, and what forms of government, market, and technology relations ensue. These factors can directly influence whether transportation justice can be advanced through a DPI-led approach to public transport. The first approach that DPIs enable is for city-based stacks to be created. Delhi and Mumbai are in focus for having city-specific DPI plans, while there are smaller cities like Kochi and Kolkata that are experimenting with products and services from DPIs. Delhi and Mumbai have city-wide 'transport stacks' being created and operationalized by actors like Transport Department of the Government of the National Capital Territory of Delhi (GNCTD), Foundation for Innovation and Technology Transfer at IIT Delhi, Mumbai Metropolitan Regional Development Authority (MMRDA), Japan International Cooperation Agency, and a slew of technology creators and vendors. These two cities stand out for bringing together public transport and land-use planning agencies, along with technology and infrastructure financiers.

The Delhi and Mumbai Transport Stacks focus on creating a 'unified transport ecosystem' through secure data highways or open data exchange platforms (Delhi Transport Stack, 2025; Mumbai Transport Stack, 2025). This layer is designed to leverage transport data and create interoperable systems for new data generation, improving existing infrastructure such as cameras and mobile devices. A core objective is to use data and predictive intelligence to improve traffic flow, reduce congestion, and generally enhance urban mobility efficiency (Delhi Transport Stack, 2025; Mumbai Transport Stack, 2025). This can extend to specific use cases, like enhancing E-rickshaw/E-auto services with route optimization, digital booking, and shared last-mile options for better accessibility and operational efficiency. In addition, the stacks aim to leverage non-fare revenue like advertising, for example (Mumbai Transport Stack, 2025). Leveraging transport data to drive innovation across healthcare, insurance, and other smart city solutions is also part of the promise (Delhi Transport Stack, 2025).

Bengaluru, Kochi, and Kolkata, on the other hand, are seen as new markets by existing market players that use open, interoperable software and business models such as Namma Yatri, which provides a platform for intermediate public transport like bikes and taxis, and for public autorickshaw services in cities. In these cases, there are common areas of creation and intention: creating a unified intelligence layer, simplifying how users plan their journeys by accessing information and tickets from a single interface, creating user-side multimodal integration for service access, and bringing high technology services like AI to public decision-making on driver choice in buses, like capturing fatigue through retinal scans.

It begs the question whether there is integration in imagination, coordination, and implementation of digital missions in urban governance with the development of these city stacks. The National Urban Digital Mission was launched as a pilot alongside a digital-focused government budget. The mission was to create the groundwork for the digital transformation of municipal systems beyond those involved in the Smart Cities Mission. For example, for cities and towns with no or nascent digital systems, the UDYOG platform developed through NUDM allows a platform service model to carry them through, facilitating other digital systems integrations in the future. For cities that have digital systems developed under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), they can use NUDM standards and APIs to integrate services.

The Open Mobility Systems, like Namma Yatri and Kochi Open Mobility Network, have come out of the systems thinking of actors like the ONDC and Foundation for Interoperability in Digital Economy (FIDE), who created the Beckn Protocol. FIDE and the Beckn Protocol have been developed by private developers seeking to use decentralized internet thinking to solve urban issues and the market dominance of corporate transport platforms like Ola Cabs and Uber. Open mobility developments in Karnataka, Kerala, and West Bengal have notably been stakeholder-led developments – the early governance relationship between Namma Yatri and the Auto Rickshaw Drivers Union in Bengaluru, MOUs between ONDC and Kochi Metropolitan Transport Authority (MSME Desk, 2022; Philip & Dilipkumar, 2023).

City stacks and open mobility networks start with different end goals. City Stacks are aimed at rationalizing public administration with digital infrastructure and to make administrative systems available to engage with mobility services in the public or private market through data exchange and software harmonization. Open mobility networks start at mobility services and build up to meet the ways in which city stacks are evolving. Since both of these are happening in parallel, their convergence and divergences, and consequences for the end user will take time to reveal. What remains to be seen is whether either trajectory builds in transport justice considerations from the outset, or whether equity concerns arrive, as they often have in previous urban missions, only after the architecture has already been set.

5. Urban Data Governance and Standards

In the imagination of innovation challenges, the development of city stacks and open mobility networks can integrate the formal public transport sector with intermediate public transport that may be informal or delivered on digital platforms. The free and unencumbered exchange of data across transport agencies and the market has been attempted before through the Smart Cities Mission (SCM), which was initiated in 2015. The Smart Cities Mission creates city-level Smart Cities Open Data Portals to collect and host city-wide data, and a national 'India Urban Data Exchange' to enable data sharing (Press Information Bureau, 2024). The SCM instituted a DataSmart Strategy that created Data Maturity assessment frameworks, City Data Officers, data champions, and data coordinators – creating a new set of technocratic actors, as well as institutions and processes that operationalized the policy (Parkar, 2021). In the case of city transport stacks – the transport departments ostensibly will own and steward the data – though this is currently undefined in the policy documents. In contrast, the open mobility networks have used supply and demand on their network platforms to generate data on transport patterns, pricing, and user interests.

Smart City Mission data infrastructure will continue to be governed by the National Urban Digital Mission, which is holding open consultations on the nature of urban data standards and sharing in mid-2025. There is likely to be a big gap in protocols and standards set between the mission and the stack owners and developers that has been observed as a key issue with the SCM (Parkar & Purandare, 2023; U. Singh & Upadhyay, 2023).

The increased adoption of intelligent transportation systems (ITS) is meant to enable real-time monitoring and optimization of public transport operations (Sharma & Rajput, 2017; Vyas & Patel, 2024; Kovvali, 2023). Most services in this bucket include consumer-facing ticketing and routing applications, much like what on-demand private mobility services provide for bike, autorickshaw, and car taxi services.

Integrated Journey Planning envisions that transport users will have a single source of information to plan, book, and ride: ticketing with real-time updates on bus and metro movements, integration with intermediate public transport like feeder buses, and autorickshaws for last-mile connectivity. Official documents state that most efforts to deliver solutions are stalled by a lack of agencies (public and private vendors) readily sharing real-time transport data, creating obstacles in travel forecasts, leaving out the idea of a single user identity in local transport (Ministry of Housing and Urban Affairs, 2022).

It is useful here to see a distinction between city-stack systems that are developed with transport agencies and large-scale infrastructural financing versus those developed under the open mobility thinking. For the former, connectivity between SCM and NUDM and their subsequent platforms and databases will enable technologists to innovate using these layers. Open mobility networks like Namma Yatri have developed data dashboards of consumer patterns, driver availability, earnings, and pricing dynamics through day-to-day usage of their smartphone applications (Namma Yatri, n.d.). As mobility networks based on open protocols integrate with different agencies through partnerships and MOUs, there are more public transport options available, thereby creating an integration. Rapido and Namma Yatri, for example, enable access to metro rail services and interactive journey planning options. There is a potential convergence of the services offered through these two different approaches.

6. Challenges to Equitable Urban Transport: Governance Fragmentation, Financing Shifts, and the Hybrid Infrastructure Dilemma

Digital Public Infrastructure presents a vision for transforming urban transport systems, particularly for enhancing intelligent systems and promoting integrated mobility. But this ambition confronts significant legacy challenges rooted in the historical evolution of municipal governance, fragmented institutional landscapes, and established practices in technology procurement and deployment. The introduction of DPIs does not occur in a vacuum; it must navigate complex, pre-existing realities within Indian cities.

This section highlights the existing challenges to transportation justice that DPI efforts must contend with. Firstly, urban transportation in India has historically been reduced to an “institutional orphan” due to a deeply fragmented institutional environment across central, state, and city governments, leading to diffused responsibility and coordination difficulties. A legacy of separate ministries for different transport modes and legislative gaps has created a fragmentation, roadblocking a more holistic approach to urban mobility. Secondly, the limited role for urban local government in transport planning and service delivery created accountability problems for local populations since most decisions are centralized at the state level. Smart Cities Mission, too, has been criticized for sidelining elected officials and centralizing control within bureaucratic structures. A pervasive reliance on coalitions of elite actors with government and external consultants also outsources municipal capacity-building, prioritizing external expertise over local knowledge (Sami, 2012). The increasing adoption of Public-Private Partnership (PPP) models for services like multimodal integration and electric bus fleets further shifts operational control away from state entities (Gadepalli & Bansal, 2022; Kharwal & Khandelwal, 2021).

Lastly, a turn to hybrid infrastructures introduced by SCM blends physical assets with digital technologies, yet they often carry forward classic infrastructure problems like maintenance failures and poor contracting, along with a lack of clarity in hardware and data standards. This often leads to technology vendors focusing on superficial “top layer” solutions that neglect core operational problems and fail to genuinely empower precarious urban citizens in transport planning.

6.1. Institutional fragmentation and moving away from government-owned transport infrastructure

The challenge for DPs begins with how relatively new the transport policy is in India; until 2006, India did not have a unified transport policy. The National Urban Transport Policy has been the guiding policy at the national level to streamline urban Indian transport needs and overcome a deeply fragmented institutional environment (Ministry of Housing and Urban Affairs, 2006). A fundamental challenge lies in urban governance and institutional fragmentation. Urban transport is a complex domain involving multiple agencies across central, state, and city governments, which historically have not worked together effectively (Indian Institute for Human Settlements, 2015). Responsibility is often diffused, leading to situations where urban transport planning can be seen as an “institutional orphan” (National Transport Development Policy Committee, 2013). The legal framework itself is fragmented and based on legacy acts, with gaps in comprehensive legislation covering all transport modes beyond metro systems, resulting in incoherence and coordination difficulties. It is noted that India has had a legacy of separate ministries owning and operating different modes of transport, which is an anomaly in global practice. Inter-governmental coordination in integrating networks has not been institutionalized before the SCM (National Transport Development Policy Committee, 2013).

Urban local government has a very limited role in imagining, coordinating, and deciding local and regional transport planning and service delivery since most decisions are taken at the state level. This stems from the allocation of powers by the Government of India, which gives the responsibility of planning and coordination of urban transport systems to the Ministry of Urban Development, State Transport Departments, and Urban Development Authorities – which are plagued by “severe horizontal and vertical coordination...making accountability very difficult” (Indian Institute for Human Settlements, 2015). The SCM and now city-wise DPs are trying to change this, as most cities around the world that are comparable in economic and demographic size have more autonomy to shape their transport infrastructure for development.

To overcome these coordination challenges, the SCM significantly reshaped urban governance in India, notably through the mandatory creation of Special Purpose Vehicles (SPVs) in each selected city. These SPVs were governance structures, typically registered under the Companies Act, 2013. The SCM guidelines stipulated that the majority of the SPV’s capital must be owned by the state and local governments, although private investors could acquire a stake. If private equity is involved, typical share distributions could be 40:40:30 or 30:30:40 (State Government: Urban Local Body: Private Investor) (A. Anand et al., 2018). Private investors were not allowed to be majority shareholders; their role is primarily envisioned for financing, capacity-building, and ensuring autonomy in decision-making and implementation.

A significant critique highlighted in the sources is that the SPV structure effectively sidelines elected officials from decision-making processes (Ghosh & Arora, 2022). SPVs are often primarily owned by the bureaucratic wings of local or regional governments. Federal government representatives can also influence SPV directors, and with many states being aligned with the central government, this enables a degree of centralized control over SPV decision-making processes, despite SPVs technically being owned at the state and local levels. This structure raises concerns about the hollowing out of local governance and a potential threat to local democracy (Khan et al., 2018). The creation of the SPV is seen as a critical instrument of institutional restructuring that reorients powers between local elected representatives and the state government.

The SCM also assumes limitations in the capacity of municipalities to make independent decisions. The guidelines for project preparation often refer to the potential for external support from consultants or technical assistance to help municipalities interpret national directives and draft plans (Prakash, 2025; Pudradre, 2021; Chakravorty, 2022). The central government even facilitated this by creating a list of vetted consultants and providing cities with a budget for this assistance, effectively outsourcing capacity-building processes to consultancies. This reliance on external experts contributes to the dynamics where external expertise is prioritized over local or “layman” knowledge, despite the SCM’s stated emphasis on participatory approaches and understanding demand.

This transformation can be viewed through the lens of bureaucratization through rescaling, where privatized governance mechanisms are integrated into existing city government structures (Anand & Sami, 2016; Taraporevala, 2024). While proponents might frame these changes around efficiency and attracting private finance, critics argue that it represents a shift in bureaucracy, influencing who performs governmental functions and what can be controlled.

6.2. Financing infrastructure and provision of transport fleets, sensors, and physical assets

The Jawaharlal Nehru Urban Renewal Mission represented an important moment in India’s urban transport services, marking the first comprehensive transportation strategy focused on moving people rather than vehicles in urban India. This preceded the Smart Cities Mission, so it created the first layer of urban policies that subsequent missions built on.

JNNURM was also the first large-scale financing of buses in India’s top 100 cities. Launched in 2005, the mission had a programmatic outlay of approximately \$20 billion, covering 61 cities with populations over one million. The policy’s core objectives included creating integrated land use and transportation planning, ensuring equitable road space allocation, and developing innovative financing mechanisms for public transport. It advocated for investments in public and non-motorized transport modes, highlighting the need for integrated transit systems and cleaner fuel technologies.

Technologically, JNNURM introduced sophisticated Intelligent Transport System upgrades. These included LED signboards, GPS tracking mechanisms, smart card ticketing systems, and onboard diagnostics (Ministry of Urban Development, 2009). The mission’s bus procurement strategy was meticulously calculated, with megacities receiving 50 buses per 400,000 citizens, and smaller cities receiving 40 buses per 100,000 residents.

The mission mandated significant structural reforms from states, requiring the establishment of unified metropolitan transport authorities, creation of dedicated urban transport funds, generation of funds through innovative mechanisms like vehicle registration fees, and promotion of Indian bus manufacturing facilities.

JNNURM fundamentally represented a state-driven approach to public innovation in transport service delivery, focusing on national manufacturing and technological infrastructure development (Sivramakrishnan et al., 2005). Its legacy lies in reimagining urban mobility as a comprehensive, technology-enabled ecosystem that prioritizes citizen movement over vehicular infrastructure. The JNNURM was the last national policy that provided dedicated funding to state governments to purchase and operate buses. Urban missions like AMRUT have focused on non-motorized transport, and have not had provisions to fund bus purchases, though many cities have made use of funds from the SCM to build physical infrastructure like roads, highways, and some to lease buses (Press Information Bureau, 2025; Taraporevala, 2018; Times of India, 2021). Multimodal integration has particularly stood out for needing a PPP model. Tanwar and Agarwal (2025) describe that in the last ten years, the presence of PPP projects has led to increased technology adoption in smartening cities, but also the adoption of electric vehicles. The number of PPP projects, which leverage the expertise and resources of the private sector to develop integrated transport infrastructure and services, has also risen from 10 in 2015 to 60 in 2021 (Tanwar & Agarwal, 2025).

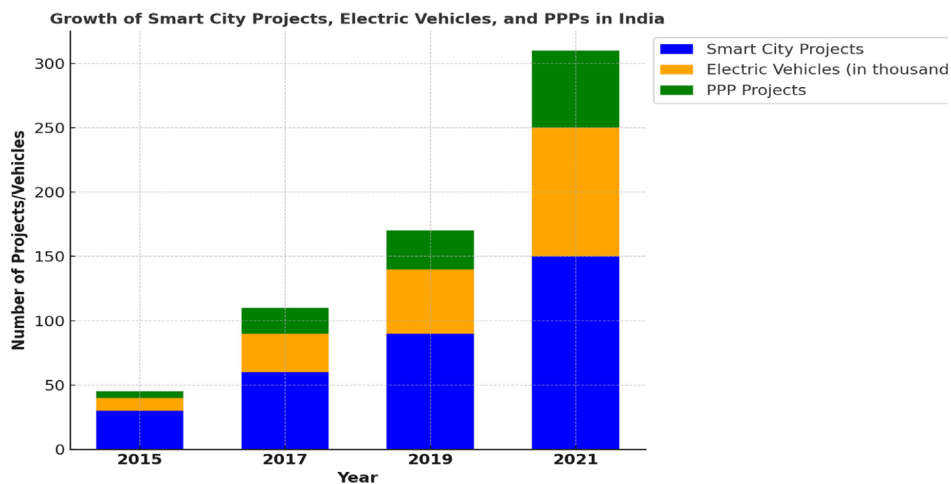


Figure 1

The move to electric bus fleets has been led by PPP models, which has taken the operation of buses out of the hands of state transport undertakings to bus manufacturers and distributors. Trade unions, like in Karnataka, insist on in-house operation of electric bus fleets, yet the financing and technical maintenance costs of EVs are high and make this unmanageable. While end-labor has been impacted by shifts in policy intent, financing, and models, so have regular citizens for whom public transportation is key to working and accessing city space (Gadepalli et al., 2022). The shift to PPP-operated electric fleets, therefore, raises questions not only about service continuity for riders but also about labor conditions and worker rights for those whose livelihoods depend on public transport operation.

6.3. The “hybrid infrastructures” turn

Smart Cities projects frequently involve the creation of hybrid infrastructures that blend physical assets with digital technologies. Examples include Integrated Command and Control Centres (ICCC), networks of fiber optic cables, smart poles equipped with sensors and cameras, and extensive traffic and surveillance systems (Prakash, 2025). The focus on sensor-based and GPS-based projects under SCM, especially after 2018, was partly aimed at generating specific types of urban data, particularly spatial data related to environment or transport, along with GIS-enabled master planning, which was less common in earlier e-governance initiatives (Ahmed et al., 2020; Parkar et al., 2023).

Classic urban infrastructure problems like failure of maintenance, issues with contracting and subcontracting, and lack of proper supervision often carry forward into the digital realm. Anecdotes reveal instances of crumbling or non-functional digital infrastructure, such as touch-screen kiosks for citizen services that fail.

There are also observations of vendor-driven logic, where technology deployment (like clusters of multiple cameras on a single pole) may prioritize sales over actual functional needs. Transport planners working on the electrification and digitization strategies identify that the lack of clarity in hardware standards, data latency, quality, and format in procurement specifications is adding to the complexity and hindering effective system integration. The National Urban Digital Mission is meant to fill this gap, and it remains to be seen how the standards created from this mission will be implemented in new-age DPLs.

A significant portion of SCM investments went into traditional infrastructure projects like road construction, parking areas, and multimodal transport hubs (Jadhav, 2025; Taraporevala, n.d.). In many cases, the percentage of projects strictly relying on Information and Communication Technologies (ICT) is relatively low compared to conventional solutions. Even where ICTs are deployed, their effectiveness is questionable; some technical proposals in smart city plans are noted as not genuinely innovative or inclusive, with solutions like smart cards for parking potentially only benefiting more affluent users. There’s also a lack of investment in municipal capacity-building and technical skills needed to manage and leverage these new technologies and data, reinforcing reliance on external actors.

Case of Integrated Command and Control Centers

The Smart Cities Mission (SCM) introduced specific approaches to urban development and digitalization. Candidate cities had to propose two types of interventions. Area-based development focusing on retrofitting or redeveloping an existing area to serve as an example, and pan-city projects using smart technical solutions to be rolled out city-wide, such as video surveillance and integrated road traffic management systems. The mission aimed to provide adequate infrastructure services like water, electricity, sanitation, and public transport, alongside e-governance and IT connectivity.

Initially, the SCM did not have a primary focus on ICT, like JNNURM, but instead, laid greater focus on projects with potential for revenue generation, like paid parking or smart metering for monetizing usage. However, around 2017, there was a significant push for Integrated Command-and-Control Centers (ICCC) in all smart cities (Prakash, 2025).

Extra funding was provided, and the idea was to create a centralized overview of the city, visualizing parameters like water levels, traffic flow, weather, temperature, and utility usage, and ideally tracking public transport. After 2018, cities were specifically encouraged to adopt digital approaches, particularly focusing on sensors and GPS devices to create new datasets. The ICCC tied directly into projects like traffic and surveillance, which became the most common and intensive digital projects. These projects utilized sensors and networks, enabling centralized monitoring (Ahmad et al., 2020). The ICCC was even made compulsory through an official notification in 2020. Yet, the role of the municipality in accessing the decision-making process, or data gathered from the ICCC, varies across the country, with Kochi Municipal Corporation, for example, having near-zero access (Prakash, 2025). Experts also note that in the case of the ICCC, transport data coming from road transport agencies was not shared, though it is reported that much of this data went to the India Urban Data Exchange (IUDX). Initially framed as a data exchange platform for academia, public consultation, and industry, it has primarily been made available to industry, as reported through anecdotes by transport practitioners and activists.

The SCM process relied heavily on external expertise from consultants for interpreting national directives and drafting plans, with the central government even vetting a list of consultants for cities to engage (Khan et al., 2018). This outsourcing effectively shifted capacity-building processes outside municipal institutions. The official SCM guidelines emphasize the importance of citizen participation in defining project content and even allocate points for participation and citizen engagement in the city proposal evaluation process (Ministry of Housing and Urban Affairs, 2015). Yet, this often translated to tokenistic efforts using various digital platforms and traditional media, and city descriptions of participation were not always corroborated (Birkinshaw & Taraporevala, 2023).

The ICCC became the “visible infrastructure backbone” over the past five years, especially in the management of the COVID-19 pandemic (Chatterjee, 2024). The end of the SCM, end of financing from central and state governments, leaves fiscally poor municipalities to manage the future of these centres beyond 2027. It’s likely that a move to “self-financing” will involve monetization of public data, or concentrated power over the utility of the data amassed over the last ten years (Lal, 2025). States have different approaches for how to manage these: Maharashtra agreed to keep the ICCC for Pune functioning for their urban floor management program, Nagpur and Solapur have asked to use fines collected via the data-driven decision-making from ICCC to fund their maintenance (Chatterjee, 2024). These have played a role in discursively showing high technology achievements (Prakash, 2023). Digital twinning initiatives have drawn public funding, which builds on smart cities mission thinking and integrates with the Gati Shakti Program (Mohanta 2024; PWC, n.d).

The ICCC highlights the complex nature of building consensus amongst public agencies to share data amongst themselves, between market and academic players, and the kinds of costs associated with maintaining real-time data across cities with millions of residents. A DPI-led approach may come sectorally, like in transport, but will contend with similar issues.

6.4. Datafication: Challenges to justice and effectiveness

Datafication enabled by SCM aimed to create granular data sets from the city, enabled by sensors and GPS devices, often visualized through command-and-control centres (Parkar, personal communication, 2025; Parkar & Pudandre, 2023; Singh & Upadhyay, 2022). The data generated by smart city systems, such as GPS and ridership, raises questions about who has access to it and how it is used, particularly concerning equitable service delivery for low-income users. While the DPI approach could potentially alleviate concerns for low-income residents by improving services like transport and generating data for better planning, whether this translates to increased transportation justice or equitable outcomes is debatable. For example, efforts to use data for “better routes” in public transport may end up replicating existing inequalities, connecting affluent parts of the city, rather than improving access for those in informal settlements.

Capability-building approaches for municipal actors, transport agencies, and state authorities have focused on building capacity within the bureaucracy regarding knowledge and data (eGov, n.d.; IIHS, 2025). The SCM guidelines highlighted the potential for external support (consultants) but simultaneously underscored the importance of citizen participation, calling upon different forms of knowledge (Pudandre, 2023). However, investment in municipal capacity-building and training for technical agents is minimal (e.g., 0.2% of planned SCM budgets), hindering cities’ ability to manage new technologies and data (Taraporevala, n.d.). This situation risks consolidating state urban regimes or enhancing the rise of private actors perceived to possess the required skills (Vogelpohl et al, 2022).

Transport practitioners explain that challenges also arise from the nature of vendor contracts, as noted by transport experts. Software contracts may link significant payments to a system’s “go-live” event, potentially reducing the vendor’s incentive for sustained maintenance and long-term delivery. This can lead to situations where systems require complete replacement when vendors change, rather than being built for continuity. The failure of maintenance and contracting supervision, seen in older infrastructure projects, also carries forward into the digital realm. These dynamics pose significant challenges for DPIs aiming to create equitable, integrated, and sustainable transport systems.

There is also a critical issue where technology vendors or technologists may focus only on the top layer (e.g., multi-modal ticketing via platforms like ONDC) without fully understanding the complex, underlying systemic issues related to timetables, operations, information layers, and other foundational aspects required for efficient transport. This disconnect means solutions may fail to address the core operational problems of the transport system. The broader issue of civic participation in the context of DPI and digital platforms is complex. If the design and implementation of digital interfaces and apps are primarily driven by developers, consultants, or market logic, the ability for precarious urban citizens to genuinely influence transport planning and governance becomes questionable. The focus on “user-centricity” or “handling exceptions” in the design process does not inherently guarantee the actualization of citizens’ right to service.

7. Conclusion

A DPI approach in urban transport in Indian cities presents a complex landscape when viewed through the lens of transportation justice. While DPI is envisioned as a progression of e-governance and a means to create interoperable, open digital solutions building on previous efforts like the Smart Cities Mission, its impact on the precarious urban lives dependent on patchwork infrastructure requires careful consideration.

Metropolitan Indian cities are characterized by significant inequities, leaving many residents, particularly those in informal settlements, disconnected from formal mass transit. This necessitates reliance on intermediate and personal transport, often at greater cost to those with precarious livelihoods who need reliable, affordable, and manoeuvrable options to navigate fragmented urban spaces for work and daily needs. Existing planning and policies have frequently fallen short in creating equitable access, hindering mobility for low-income residents.

Rescale the question of the role of the state in urban governance and digital public infrastructure

The nature of questions being asked about DPIs' interest in 'public' first needs to be rescaled to the unit of governance since the 'state' is a heterogeneous category that is federated (Mazucatto, Eaves, Vasconcellos, 2024). DPI in transport – the city stacks – will be met with familiar issues seen in the SCM, but reshaped with the NUDM, infrastructural financing, and has the potential to be integrated into nationwide or state-wide multimodal transport planning.

DPIs in transport based on the open mobility networks – open, decentralized stacks and consumer-facing platforms – will be shaped by city markets and contained by pricing, taxation, and labor protection needs, but will not have to contend with the challenges of city stacks unless they seek that integration. City Stacks are evolving day to day, as are open mobility stacks, so the integrations around public use and the role of the urban government in shaping public use are yet to play out. The policy implication is clear: urban governments need explicit mandates and fiscal capacity to shape DPI development for transport, rather than inheriting systems designed by technology vendors and financiers who are removed from local governance realities.

Investing in the social and institutional fabric around DPIs

While DPI offers technological pathways to potentially enhance urban transport, achieving transportation justice is contingent upon navigating these profound challenges. This demands a shift from a mere technology-first approach to one that fundamentally addresses operational efficiency, ensures equitable data governance for the public good, fosters genuine civic participation, overcomes governance fragmentation, guarantees the sustainability of digital infrastructure, and safeguards the rights and well-being of transport workers. Crucially, the success of DPI hinges not only on its technical deployment but also on the often-underestimated investment in the social and institutional fabric surrounding it (Global Development Network, 2024). This includes nurturing accountability mechanisms, enabling iterative design processes that incorporate user feedback, and cultivating public trust, especially among marginalized communities. These non-technical components, which are not part of the API, can ultimately make or break user adoption and sustained impact. Without resolving these systemic issues and investing in this vital governance layer, the promise of DPI for a more just and accessible urban transport system for all residents risks remaining unfulfilled.

Prioritize core service provision: Expand physical infrastructure while focusing on improving service delivery

Buses, expanding networks, and creating real-time information on bus availability are key to reducing traffic, expanding livelihood options for city residents, and reducing the costs of transport. This is echoed by transport practitioners and law and order officials alike. A DPI-led approach, which, leveraging data and technology, aims to improve efficiency and integration, does not currently point to its intent to deliver on the expansion of hard infrastructure like buses, bus stops, sidewalks, or links to policies that hold the power to fulfill this. While the SCM is criticized by some for allowing states to focus on the hard vs technology infrastructure, this was a necessary prerequisite to make technology useful. The need for expanded bus networks (and related infrastructure) and roads has not been fulfilled through the SCM, and this need remains. A primary concern is the potential for technology vendors and developers to focus on superficial “top layer” solutions like multi-modal ticketing, without adequately addressing the complex underlying systemic and operational issues crucial for service reliability. This focus often stems from a tech-centric view that may not fully grasp or prioritize the on-the-ground realities faced by everyday commuters.

Build systems that address governance gaps to make multimodal transport integration meaningful. DPIs should be designed to address, not bypass, existing governance challenges like integrating public and private, informal, intermediate public transport, and power differentials in government departments. Transport authorities should have clear data-sharing protocols and accountability measures that transcend individual tenures or administrative changes.

Adopt an incremental approach to data integration

The history of technology deployment, notably under SCM, reveals challenges in data governance. Despite extensive data collection, issues persist with data quality, standardization, and sharing between government institutions. Critically, infrastructure built with public money is at risk of being utilized by alternative, market-based platforms. There are concerns that public data could be monetized or used by private vendors to sell platforms back to cities, potentially concentrating power rather than ensuring equitable public access. This comes back to the question of what public DPIs intend to serve – a question that surrounds every DPI being created. In the transport space, precarious urban residents may not contribute to the top line or monetized parking or ticketing services that are currently being envisioned.

Just transitions in the service ecosystem

The tendency for past technology deployments like SCM to prioritize revenue-generating projects could divert attention and resources from the crucial task of expanding and improving core public transport services that are fundamental for justice. Moreover, data-driven approaches to route optimization, if not carefully designed with equity in mind, risk replicating or even exacerbating existing spatial inequalities, favoring connections between affluent areas over serving underserved communities. The digital transformation, coupled with shifts towards electrification and subcontracting models, directly impacts transport labor. While facilitating service expansion, these changes raise significant concerns about worker treatment and working conditions, highlighting the essential need for a just transition that prioritizes labor rights.

Foster transparency and public engagement

While intentions may include civic participation, the practical implementation under SCM was often tokenistic and skewed away from low-income urban residents. As DPI relies on developers and market logic to shape digital interfaces, the potential for precarious urban citizens to genuinely influence transport planning and governance through these systems remains questionable.

The DPI turn in urban transport is an opportunity to ask, from the outset, whether digital systems can be designed to serve those who depend on urban mobility most. The transport justice lens developed through this report – grounded in the spatial, affordability, integration, and governance dimensions of how precarious urban residents move through cities – offers a way to hold that question open as city stacks and open mobility networks continue to evolve. The answer will depend less on the technology than on the institutional choices, investment priorities, and governance arrangements that surround it.

References

- Ahmed, S., Abbas, S., & Zia, H. (2020). *Smart cities—Opportunities and challenges* (S. Ahmed, S. M. Abbas, & H. Zia, Eds.; Vol. 58). Springer Singapore. <https://doi.org/10.1007/978-981-15-2545-2>
- Anand, A., Sreevatsan, A., & Taraporevala, P. (2018). *Overview of the Smart Cities Mission in India*. Centre for Policy Research. <https://cprindia.org/wp-content/uploads/2022/01/SCM-POLICY-BRIEF-28th-Aug.pdf>
- Anand, S., & Sami, N. (2015). *Urban Corridors: Strategies for economic and urban development* | International Growth Centre (1). <https://www.theigc.org/publications/urban-corridors-strategies-economic-and-urban-development>
- Anand, S., & Sami, N. (2016). Scaling up, scaling down: State rescaling along the Delhi–Mumbai Industrial Corridor. *Economic and Political Weekly*, 51(43), 56–64. <https://www.jstor.org/stable/44003407>
- Birkinshaw, M., & Taraporevala, P. (2023). Social media as e-governance. *SAMAJ: South Asia Multidisciplinary Academic Journal*, 30. <https://doi.org/10.4000/samaj.8855>
- Blanke, T., & Pybus, J. (2020). The material conditions of platforms: Monopolization through decentralization. *Social Media + Society*, 6(4). <https://doi.org/10.1177/2056305120971632>
- Chatterjee, S. (2024, May 11). *Smart Cities' command rooms face uncertainty as mission ends*. Hindustan Times. <https://www.hindustantimes.com/cities/delhi-news/smart-cities-command-rooms-face-uncertainty-as-mission-ends-101746900682577.html>
- Chakravarty, S., bin Mansoor, M. S., Kumar, B., & Seetharaman, P. (2023). Challenges of consultant-led planning in India's smart cities mission. *Environment and Planning B: Urban Analytics and City Science*, 50(5), 1375–1393. https://www.researchgate.net/publication/365253065_Challenges_of_consultant-led_planning_in_India's_smart_cities_mission
- Dawda, N. (2024). Prioritising non-motorised transport in India. *Observer Research Foundation*. <https://www.orfonline.org/english/expert-speak/prioritising-non-motorised-transport-in-india>
- Dayandana, B., Anucheta, M., & Kamath, N. (2025). *Nikhil Kamath ft. Police Comm'r & Traffic Police Comm'r of Bengaluru* [Video]. YouTube. <https://www.youtube.com/watch?v=LcWoP6KtZKw>
- Delhi Transport Stack. (2025). Retrieved May 12, 2025, from <https://delhi.transportstack.in/>
- Estache, A., & Fay, M. (2016, April 20). *Current debates on infrastructure policy* (World Bank Policy Research Working Paper). SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1032030

eGov. (2023). Strengthening States' Capacity : NUDM's technical training program on UPYOG - eGov Foundation. <https://egov.org.in/articles/nudms-technical-training-program-on-upyog/>

Gadepalli, R. (2016). Role of Intermediate Public Transport in Indian Cities. *Economic and Political Weekly*, LI(9), 46–49. https://shaktifoundation.in/wp-content/uploads/2016/03/Ravi_article.pdf

Gadepalli, R., & Bansal, P. (2022). Cost drivers of electric bus contracts: Analysis of 33 Indian cities. *Transportation Research Record*, 2676(10), 38–50. <https://doi.org/10.1177/03611981221088593>

Ghosh, B., & Arora, S. (2022). Smart as (un)democratic? The making of a smart city imaginary in Kolkata, India. *Environment and Planning C: Politics and Space*, 40(1), 318–339. <https://doi.org/10.1177/23996544211027583>

Groth, S. (2019). Multimodal divide: Reproduction of transport poverty in smart mobility trends. *Transportation Research Part A: Policy and Practice*, 125, 56–71. <https://doi.org/10.1016/j.tra.2019.04.018>

Helmond, A. (2015). The platformization of the web: Making web data platform ready. *Social Media + Society*, 1(2). <https://doi.org/10.1177/2056305115603080>

The Hindu. (2023). *Nearly 60% of commuters would choose public transit if bus and metro modes are available*. <https://www.thehindu.com/news/cities/bangalore/nearly-60-of-commuters-would-choose-public-transit-if-bus-and-metro-modes-are-available-iisc/article67417197.ece>

Indian Institute for Human Settlements. (n.d.). *Capacity Development Forum 2025*. Retrieved September 9, 2025, from <https://iihs.co.in/capacity-development/capacity-development-forum-2025/>

Indian Institute for Human Settlements. (2015). *Urban Transport in India: Challenges and Recommendations*. https://iihs.co.in/knowledge-gateway/wp-content/uploads/2015/07/RF-Working-Paper-Transport_edited_09062015_Final_reduced-size.pdf

Jacobs, G. D., & Greaves, N. (2003). Transport in developing and emerging nations. *Transport Reviews*, 23(2), 133–138. <https://doi.org/10.1080/01441640309895>

Jadhav, R. (2025, February 18). *Smart city mission: Most funds spent on fixing crumbling infra*. The Hindu BusinessLine. <https://www.thehindubusinessline.com/data-stories/data-focus/smart-city-mission-most-funds-spent-on-fixing-crumbling-infra/article69233705.ece>

Jain, S., Aggarwal, P., Kumar, P., Singhal, S., & Sharma, P. (2014). Identifying public preferences using multi-criteria decision making for assessing the shift of urban commuters from private to public transport: A case study of Delhi. *Transportation Research Part F: Traffic Psychology and Behaviour*, 24, 60–70. <https://doi.org/10.1016/J.TRF.2014.03.007>

- Jaiswal, A., Manoj, M., & Tiwari, G. (2024). Exploring India's intermediate public transport: A comprehensive overview. *Transportation in Developing Economies*, 10, Article 14. <https://doi.org/10.1007/s40890-024-00202-4>
- Khan, S., Taraporevala, P., & Zerah, M.-H (2018). Indian smart cities: Shared challenges, variegated trajectories. *Flux*, 4, 86–99. <https://shs.cairn.info/journal-flux-2018-4-page-86?lang=en&tab=auteurs>
- Khan, S., Zerah, M.-H., & Taraporevala, P. (2018). *Mission impossible: defining Indian smart cities*. <https://www.epw.in/journal/2018/49/review-urban-affairs/mission-impossible.html>
- Kharwal, S., & Khandelwal, U. (2021). *Public-Private Partnerships (PPP) in City Bus Services in India: NCC and GCC*. <http://wri-india.org/blogs/public-private-partnerships-ppp-city-bus-services-india-ncc-and-gcc>
- Kovvali, V. G. (2023). *Intelligent transportation systems (ITS)* [Presentation slides]. Indian Institute of Technology Delhi. https://tripc.iitd.ac.in/assets/training_material/V_kovvali-IntroToITS_Vkovvali.pdf
- Lalwani, V. (2019, July 24). *Unreliable vehicles, long hours, low pay: What it is like being a bus driver in India*. Scroll.in. <https://scroll.in/article/930305/unreliable-vehicles-long-hours-low-pay-what-it-is-like-being-a-bus-driver-in-india>
- Lal, M. [@mlkhattar]. (2025, April 7). *Chaired a comprehensive Smart Cities Mission review meeting along with MoS @tokhansahu_bjp Ji. Extensive deliberations were held on the timely completion of ongoing projects, ensuring sustainable O&M of urban assets, leveraging ICCCs for better governance, and the evolving role of urban missions* [Post]. X. <https://x.com/mlkhattar/status/1909190791660023856>
- Mathews, R., Kundu, A., Chawla, P., Sebastian, T., Palanichamy, R. B., & Pai, M. (2023). *Morphology of Delhi National Capital Region's economic geography and its implications for planning*. WRI India. <https://doi.org/10.46830/wrirpt.22.00042>
- Mazzucato, M., Eaves, D., & Vasconcellos, B. (2021). *Digital Public Infrastructure and Public Value: What is 'public' about DPI?* <https://www.ucl.ac.uk/bartlett/publications/2024/mar/digital-public-infrastructure-and-public-value-what-public-about-dpi>
- Mohanta, N. (2024). Genesys International to Create Digital Twin of Varanasi. *Geospatial World*. <https://geospatialworld.net/prime/business-and-industry-trends/genesys-international-digital-twin-varanasi/>
- Ministry of Urban Development, Government of India. (2006). *National urban transport policy*. <https://mohua.gov.in/upload/uploadfiles/files/TransportPolicy.pdf>
- Ministry of Housing and Urban Affairs. (2022). *National Urban Digital Mission facilitates electronic delivery of municipal services to citizens across towns and cities of the country*. Press Information Bureau. <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1809159>

Ministry of Urban Development, Government of India. (2011). *Recommendations of Working Group on Urban Transport for 12th Five Year Plan*. https://mohua.gov.in/upload/uploadfiles/files/UT_FYP_12.pdf

Ministry of Housing and Urban Affairs, Government of India. (2015). *Smart city mission guidelines*. <https://smartcities.gov.in/guidelines>

Ministry of Housing and Urban Affairs, Government of India. (2022). *Multimodal integration: A perspective on ticketing and payments*. <https://www.urbanmobilityindia.in/Upload/Conference/62658ded-5764-4ca7-8160-434feeb54e4a.pdf>

Ministry of Urban Employment and Poverty Alleviation, & Ministry of Urban Development, Government of India. (2005). *Jawaharlal Nehru National Urban Renewal Mission: Overview*. <https://mohua.gov.in/upload/uploadfiles/files/1Mission%20Overview%20English%281%29.pdf>

MSME Desk. (2022, November 17). *Kochi Open Mobility Network expands statewide into Kerala Open Mobility Network with a tie-up with ONDC to allow users discover transport operators*. The Financial Express. <https://www.financialexpress.com/business/sme-msme-eodb-kochi-open-mobility-network-expands-statewide-into-kerala-open-mobility-network-with-a-tie-up-with-ondc-to-allow-users-discover-transport-operators-2786943/>

Mugulur, A. (2025). *Transportation justice in the face of just transition: Mobility and livelihood access in Bengaluru slums*. IHS Urban ARC 2025. <https://iihs.co.in/research/conferences/urban-arc-2025/>

Mulukutla, P., Pai, M., Bhat, R. K., Bachu, P., Dubedi, A., Varma, P., Nair, S., & Sinha, A. (2024). *Open E-Bus blueprint*. WRI India. <http://india.wri.org/research/open-e-bus-blueprint>

Mumbai Transport Stack. (2025). Japanese International Cooperation Agency. https://www.jica.go.jp/english/about/dx/jicadx/dxlab/project/detail_14/index.html#anc02

National Transport Development Policy Committee. (2014). *Institutions for transport system governance. In India transport report: Moving India to 2032* (Vol. 2). Routledge India. https://rakeshmohan.com/docs/NTDPC_Vol_01.pdf

National Urban Digital Mission. (n.d.). *NUIS*. Retrieved September 9, 2025, from <https://www.nudm.mohua.gov.in/nuis/>

Parkar, K. (2021). *The digital geography of India's Smart Cities Mission* [Video]. YouTube. <https://www.youtube.com/watch?v=EKjFwp6kSEY>

Parkar, K., & Purandare, U. (2023). *Decoding digitalization of urban governance in India: Policy, people and processes of the Smart Cities Mission and National Urban Digital Mission*. Centre for Policy Research. <https://cprindia.org/briefsreports/decoding-digitalization-of-urban-governance-in-india-policy-and-processes-of-the-smart-cities-mission-and-national-urban-digital-mission/>

- Parkar, K., Zérah, M.H., & Mittal, G. (2023). Platformisation, infrastructuring, and datafication: Regional variations in the digitalisation of Indian cities. *Economic & Political Weekly*, 58(14). <https://www.epw.in/journal/2023/14/special-articles/platformisation-infrastructuring-and-datafication.html>
- Plantin, J. C., & de Seta, G. (2019). WeChat as infrastructure: The techno-nationalist shaping of Chinese digital platforms. *Chinese Journal of Communication*, 12(3), 257–273. <https://doi.org/10.1080/17544750.2019.1572633>
- Philip, C. M., & Dilipkumar, B. (2023, December 14). *Auto Rickshaw Drivers Union in Bengaluru breaks up with Namma Yatri*. Moneycontrol. <https://www.moneycontrol.com/news/technology/auto/auto-rickshaw-drivers-union-in-bengaluru-breaks-up-with-namma-yatri-11887361.html>
- Prakash, D. (2025). Why do smart city projects fail to create impact? Understanding decision-making in smart city policy implementation. *Urban Governance*, 5(1), 45–53. <https://doi.org/10.1016/j.ugj.2025.02.004>
- Prakash, D. (2023). A clean slate: Metaphors and the smart city in India. In *Metaphorical Practices in Architecture* (pp. 209–224). Routledge. <https://doi.org/10.4324/9781003299219-16>
- Press Information Bureau. (2024). *PM E-DRIVE scheme: Driving towards a greener future*. <https://www.pib.gov.in/PressNoteDetails.aspx?>
- Press Information Bureau. (2024). *Enhancing Urban Life Vision and Progress of the Smart Cities Mission*. <https://www.pib.gov.in/PressNoteDetails.aspx?NotelId=151908&ModuleId=3>
- Press Information Bureau. (2009). *100 Days Agenda for Action of Ministry of Urban Development Unveiled*. <https://www.pib.gov.in/newsite/erelcontent.aspx?relid=49476>
- Press Information Bureau. (2025). *10 years of AMRUT: Transforming cities, improving lives*. <https://www.pib.gov.in/PressNoteDetails.aspx?ModuleId=3&NotelId=154737>
- Pucher, J., Korattyswaropam, N., Mittal, N., & Ittyerah, N. (2005). Urban transport crisis in India. *Transport Policy*, 12(3), 185–198. <https://doi.org/10.1016/j.tranpol.2005.02.008>
- Purandare, U. (2021). Who drives India's smart cities? Understanding the role of consulting firms in the Smart Cities Mission. In *Professional service firms and politics in a global era: Public policy, private expertise* (pp. 79–96). Springer. https://doi.org/10.1007/978-3-030-72128-2_4
- PWC. (n.d.). *How digital twins can make smart cities better Real-time simulations can create a bridge between physical and virtual worlds*. Retrieved September 9, 2025, from <https://www.pwc.com/m1/en/publications/documents/how-digital-twins-can-make-smart-cities-better.pdf>
- Rajan, V., & Krishnan, L. (2024, February 16). Commentary: Significance and implications of India's National Logistics Policy. *Georgetown Journal of International Affairs*. <https://gji.georgetown.edu/2024/02/16/significance-and-implications-of-national-logistics-policy-of-india/>

Rajeshwari, A., Mulukutla, P., Bhat, R., & Pai, M. (2024, December 9). *The game of DPI and how to play it*. WRI India Blog. <https://wri-india.org/blog/game-dpi-and-how-play-it>

Saldanha, L. (2017, January 24). *Citizens deliberate on a people's vision for Bengaluru*. Citizen Matters. <https://citizenmatters.in/citizens-deliberate-on-a-peoples-vision-for-bengaluru/>

Sami, N. (2012). *Building alliances: Power and politics in urban India* (Doctoral dissertation, University of Michigan). University of Michigan Deep Blue Repository. <https://deepblue.lib.umich.edu/items/10f33a3b-1a1c-431d-846e-181521c3154c>

Singh, J. (2010). *Bus system reform in India through JnNURM* [Slide presentation]. SlideShare. <https://www.slideshare.net/slideshow/bus-system-reform-in-india-through-jnnurm/5769592>

Singh, U., & Upadhyay, S. P. (2023). Fractured smart cities: Missing links in India's smart city mission. *Environment and Planning B: Urban Analytics and City Science*, 50(7), 1790–1805. <https://doi.org/10.1177/23998083221144321>

Sharma, P., & Rajput, S. (Eds.). (2017). *Sustainable smart cities in India*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-47145-7>

Sivaramakrishnan, K. C., Kundu, A., & Singh, B. N. (2005). *Handbook of urbanization in India: An analysis of trends and processes*. Oxford University Press

Surin, S., & Dave, S. (2024, February 23). *How most Indian cities moved from public to private transport modes*. Question of Cities. <https://questionofcities.org/how-most-indian-cities-moved-from-public-to-private-transport-modes/>

Srinivasan, R., Sharma, P., & Sarma, A. (Eds.). (2025). *Decoding digital public infrastructure: Scripting inclusive digital futures*. Observer Research Foundation. <https://www.orfonline.org/research/decoding-digital-public-infrastructure-scripting-inclusive-digital-futures>

Tanwar, R., & Agarwal, P. K. (2025). Multimodal integration in India: Opportunities, challenges, and strategies for sustainable urban mobility. *Multimodal Transportation*, 4(2), 100210. <https://doi.org/10.1016/j.multra.2025.100210>

Taraporevala, P. (2018). *Demystifying the Indian smart city: An empirical reading of the Smart Cities Mission* [Video]. YouTube. <https://www.youtube.com/watch?v=GxJRiua0m2o>

Taraporevala, P. (2018). *Demystifying the Indian Smart City: An empirical reading of The Smart Cities Mission*. <https://www.youtube.com/watch?v=GxJRiua0m2o>

Taraporevala, P. (2024). Smart ignorance: Instrumentalising useful unknowns to bureaucratise and rescale power in the city. *Environment and Planning F*. <https://doi.org/10.1177/26349825241283831>

The Times of India. (2021). *Six years on, scrapping of JNNURM hits Karnataka STUs*. <https://timesofindia.indiatimes.com/city/bengaluru/six-years-on-scrapping-of-jnnurm-hits-ktaka-stus/articleshow/85112821.cms>

Town and Country Planning Organisation, Ministry of Housing and Urban Affairs, Government of India. (2018). *Sub-scheme on formulation of GIS based master plans for 500 AMRUT cities*. https://mohua.gov.in/upload/uploadfiles/files/5%20Sub%20Scheme_Formulation%20of%20Plans_S%20Surendra.pdf

Vasudevan, V., Agarwala, R., & Dash, S. (2021). Is vehicle ownership in urban India influenced by the availability of high quality dedicated public transit systems? *IATSS Research*, 45(3), 286–292. <https://doi.org/10.1016/j.iatssr.2020.12.005>

Vogelpohl, A., Hurl, C., Howard, M., Marciano, R., Purandare, U., & Sturdy, A. (2022). Pandemic consulting: How private consultants leverage public crisis management. *Critical Policy Studies*, 16(3), 371–381. <https://doi.org/10.1080/19460171.2022.2089706>

Vyas, A., & Patel, P. J. (2024). A review of public road transport in India: Challenges, innovations and policy recommendations. *Grenze International Journal of Engineering and Technology*, 10. <https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=23955287&AN=175658286&h=IKeBlvxx7gff6uPx-oZ1EQwKovg61WjOzNtYNm8N9GwhHKCgJDILBaYgGHNZoGWaKDAmSAvQ3sIAh3Up9%-2BEc8mw%3D%3D&crl=c>

WRI India. (2025). *WRI and FIDE workshop on DPI in transport* [LinkedIn post]. LinkedIn. https://www.linkedin.com/posts/wri-india_wriindia-dpi-digitalpublicinfrastructure-activity-7282749809113919491-cV_m



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