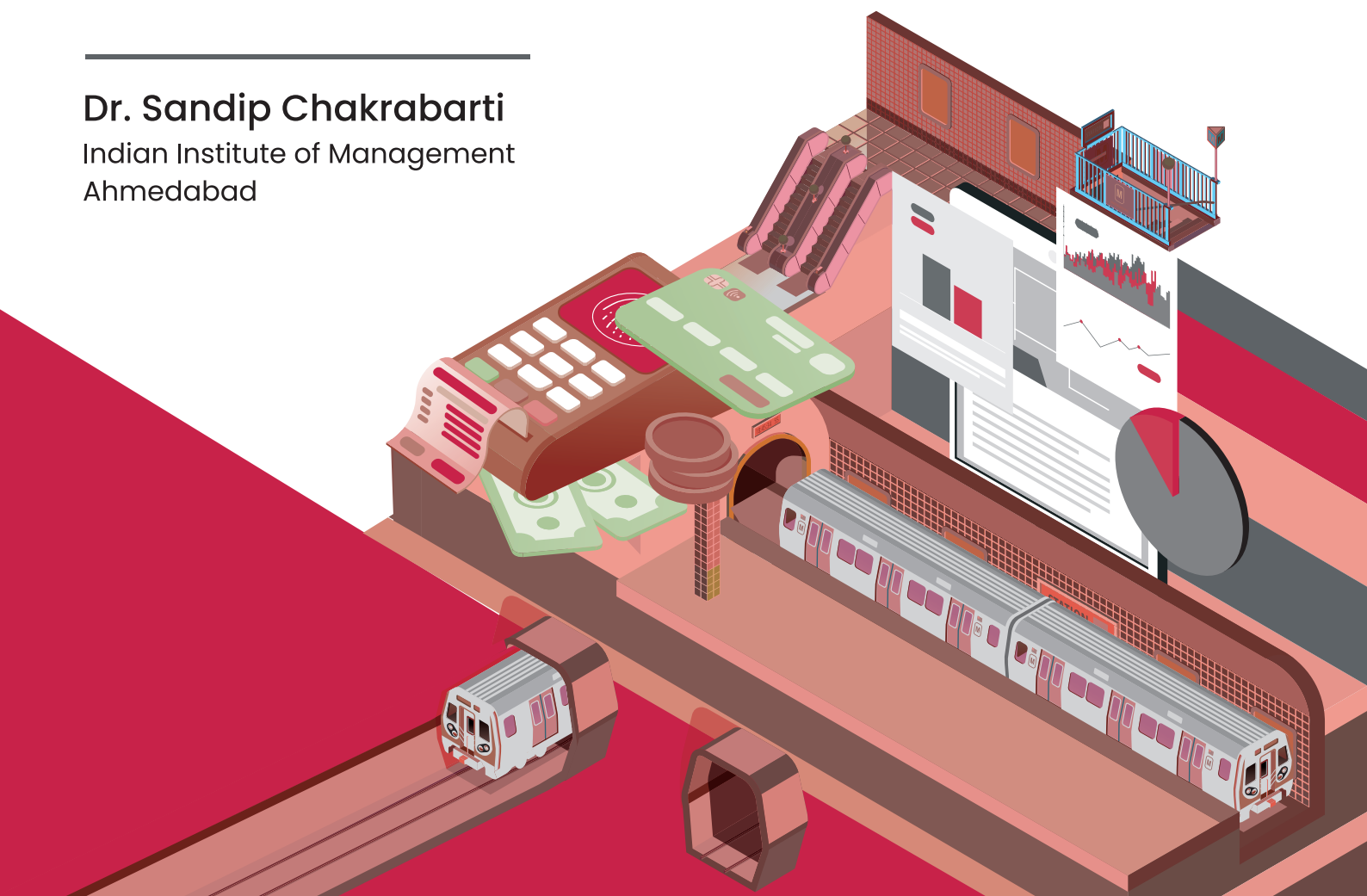


# STRATEGIES TO IMPROVE THE FINANCIAL PERFORMANCE OF METRO RAIL SYSTEMS IN INDIA

Creative approaches for financially sustainable  
development and operations

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# 1. FINANCIAL PERFORMANCE OF INDIAN URBAN RAIL (METRO) SYSTEMS

## 1.1 Global interest in metro rail development

Metro rail systems, or heavy railways with exclusive rights-of-way serving urban areas, are globally recognized as critical mass transportation infrastructure for promoting low-carbon cities. Metro rail, given its superior service quality and performance relative to alternative mass urban transportation – or public transit – options, is widely considered by urban planners to be an effective tool to encourage public transit use and adoption, retain existing transit patrons, promote transit-oriented developments and activity patterns in the long term, and, under certain conditions, increase transit dependents' accessibility to opportunities. Metro rail's promise to improve urban traffic congestion, air quality, mobility and access, and the local economy has resulted in a global movement towards new construction and expansion of these systems. By the end of 2020, more than 190 cities across the world had operational metro rail systems with a total track length of over 17,000 km and a total annual ridership of about 60 billion passengers. Interestingly, revenue service started in 3,300 km – or about 20% – of tracks in just the three-year period between 2018 and 2020 indicating accelerated development of such systems. The Asia-Pacific region experienced the highest growth in metro network length as well as annual ridership, about 70% and 45% respectively over the pre-pandemic five-year period (2014-2019), consistent with the region's high population and urbanization growth rates. As of 2021, more than 450 new and proposed metro rail projects spanning over 8,500 km were being developed globally. The global interest in metro rail is evident.

## 1.2 Metro rail development in India

India's first metro rail service started in 1984 in Kolkata over a 3.4 km corridor. The second city to get a metro rail system was Delhi where revenue operations started in 2002. As Delhi Metro expanded its network across several phases, a metro rail development revolution gained momentum across the country. India's metro network has increased from 229 km across five cities in 2014 to 860 km across 20 cities in April 2023, with about 5.6 km of metro lines being commissioned per month currently. At the time of writing this report, the latest statistics show that more than 980 km of metro lines are being constructed across 27 cities. Delhi's metro, with a current network length of about 390 km, is one of the ten largest metro networks in the world, although Delhi's network length per million people of about 13 km is significantly lower than its Asian counterparts such as Hong Kong (26 km) and Singapore (40 km). Hyderabad, Bengaluru,

1. UITP. (2022). Statistics from: World Metro Figures 2021. UITP Statistics Brief. Retrieved from <https://cms.uitp.org/wp/wp-content/uploads/2022/05/Statistics-Brief-Metro-Figures-2021-web.pdf>.
2. Fortune Business Insights. (n.d.). Metro Rail Infrastructure. Fortune Business Insights. Retrieved from <https://www.fortunebusinessinsights.com/metro-rail-infrastructure-market-106990>.
3. Research Unit, Press Information Bureau. (2023). Enhancing Urban Mobility: India's Metro Rail Transformation. Press Information Bureau, Government of India. Retrieved from <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2023/may/doc2023522201101.pdf>.
4. Swarajya. (2023). Expanding Footprint of Metro Rail in India - A Tracker On Ongoing Projects. Retrieved from <https://swarajyamag.com/infrastructure/expanding-footprint-of-metro-rail-in-india-a-tracker-on-ongoing-projects>.
5. DMRC. (n.d.). DMRC Introduction. Retrieved from [https://www.delhimetrorail.com/pages/en/introduction#:~:text=Presently%2C%20the%20Delhi%20Metro%20network,Bahadurgarh%20and%20Ballabhgarh%20in%20Haryana;The%20Business%20Standard.\(2022\).10%20Largest%20Metro%20Rails%20in%20the%20World.Retrieved%20from%20https://www.tbsnews.net/world/10-largest-metro-rails-world-559090;UITP.\(2021\).Performance%20of%20Indian%20Metro%20Systems%20Lessons%20for%20Upcoming%20Urban%20Rail%20Projects.UITP%20Knowledge%20Brief.Retrieved%20from%20https://cms.uitp.org/wp/wp-content/uploads/2022/01/Knowledge-Brief-November-2021.pdf](https://www.delhimetrorail.com/pages/en/introduction#:~:text=Presently%2C%20the%20Delhi%20Metro%20network,Bahadurgarh%20and%20Ballabhgarh%20in%20Haryana;The%20Business%20Standard.(2022).10%20Largest%20Metro%20Rails%20in%20the%20World.Retrieved%20from%20https://www.tbsnews.net/world/10-largest-metro-rails-world-559090;UITP.(2021).Performance%20of%20Indian%20Metro%20Systems%20Lessons%20for%20Upcoming%20Urban%20Rail%20Projects.UITP%20Knowledge%20Brief.Retrieved%20from%20https://cms.uitp.org/wp/wp-content/uploads/2022/01/Knowledge-Brief-November-2021.pdf).

Chennai and Mumbai are among the top five metro systems in the country. While large Indian cities are planning to aggressively expand their metro rail networks, relatively smaller cities with a current estimated population under 50 lakhs such as Jaipur, Nagpur and Kochi have 10–40 km of metro lines operational, and even smaller cities with a current estimated population under 30 lakhs like Bhopal, Indore and Agra are building metros.

The Ministry of Housing and Urban Affairs has acknowledged the potential of “Metrolite” services or Light Rail Transit (LRT) systems – smaller capacity intra-urban trains that are cheaper to construct and operate and are common across North American and European cities – as an appropriate rail-based mass transit option for smaller cities with lower ridership projections, but Indian transport planners and policymakers continue to be captivated by conventional metro rail and consider it as the magic bullet for sustainable transport transitions across urban India. LRT is still a pipe dream, the BRT model (Bus Rapid Transit, or urban bus systems with limited dedicated right-of-way and rail-like facilities) is dying a slow and painful death due to a lack of local resources and central assistance, and rather than considering the most effective, efficient and equitable multimodal urban mass/public transit mix, many Indian cities are lured into investing heavily on glamorous, capital intensive metro rail systems largely with taxpayer money.

A new system of semi-high-speed railways connecting metropolitan cities with regional growth nodes is being conceived in India. The first Regional Rapid Transit System (RRTS) is being developed within the National Capital Region, connecting Delhi with Meerut in UP, Panipat in Haryana and Alwar in Rajasthan. These regional rail systems are designed to travel at average speeds greater than 100 km/hour, have fewer stops, and provide on-board and station facilities that are superior to conventional urban metro rail systems. The objective of regional rail is to primarily promote balanced regional economic development and improve regional accessibility to jobs and other opportunities. Although these systems traverse multiple states and may require a different financial and organizational model compared to metro rail systems, there is no specific policy governing or guiding regional rail developments in India till date. The Metro Rail Policy, 2017 is therefore the de-facto policy framework applicable for regional rail developments.

Given the pace at which rail-based urban and regional mass transit systems are being planned and developed across India, a comprehensive institutional and policy framework for ensuring the financial sustainability of these systems is imperative to ensure continued political and social support for these systems and to ensure that these systems can effectively meet their urban and regional sustainability goals.

### 1.3 India’s metro rail policy and adopted financial models

India’s central government supports and guides metro rail development across cities. The Metro Rail Policy, 2017 recognizes metro rail as a key urban transportation infrastructure for arresting personal vehicle ownership and use and remedying congestion and pollution problems in cities. The policy provides high-level guidance for metro rail project appraisal, implementation and fare

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6. MoHUA. (2019). Standard Specifications of Light Urban Rail Transit System “Metrolite.” M/o Housing & Urban Affairs, Government of India. Retrieved from
  7. Observer Research Foundation. (2020). Have Indian cities bid farewell to the Bus Rapid Transit System?. Retrieved from <https://www.orfonline.org/expert-speak/have-indian-cities-bid-farewell-bus-rapid-transit-system/>.
  8. Source: National Capital Region Transport Corporation website, <https://ncrtc.in/>.
  9. Ministry of Housing and Urban Affairs. (2017). Metro Rail Policy, 2017. Retrieved from [https://mohua.gov.in/upload/whatsnew/59a3f7f130eecMetro\\_Rail\\_Policy\\_2017.pdf](https://mohua.gov.in/upload/whatsnew/59a3f7f130eecMetro_Rail_Policy_2017.pdf).

setting, and lays out the various broad options/models of central financial assistance for metro rail construction, including a) viability gap funding in case of public-private partnership, b) grant to state government up to 10% of qualifying project costs, and c) 50% equity sharing with state government with support of up to 20% of qualifying project costs. In the latter two options, some form of private sector involvement in project implementation, operations, maintenance, fare collection, etc. is necessary for obtaining the central government's grant support or investment.

In practice, the four prevalent financial and organizational models adopted by metro rail systems across Indian cities are as follows:

1. 50:50 joint venture model: A joint venture usually means the collaboration of the central and the state governments resulting in a Special Purpose Vehicle (SPV). Central government provides financial support to metro rail projects in the form of equity and subordinate debt, subject to an overall ceiling of about 20%; state matching support is about 20%; multilateral/bilateral financing is 60%. Some form of private participation is required in this model (see below). Examples include Delhi, Mumbai, Chennai, Bangalore, Nagpur, Lucknow, Kochi, and Ahmedabad metro systems.
2. Central government funding: This model allows the central government to be responsible for the entire funding and making financing arrangements for capital and O&M expenses. An example is Kolkata Metro Line 1 (North-South Metro).
3. State government funding: In this model, the state government contributes to the full funding. An example is Jaipur Metro.
4. Public Private Partnerships (PPP): This model can be adopted in the form of,
  - i. Construction of new metro rail systems through DBFOTs (Design-Build-Finance-Operate-Transfer) with viability gap funding from governments.
  - ii. Award of concessions for operational services in the case of models 1/2/3 above, which could include the supply of rolling stock.
  - iii. Award of concessions for maintenance and upgrading of infrastructure in case of models 1/2/3 above.

Our analysis of various annual reports of metro rail systems suggests that the 50:50 joint venture model is the predominant model adopted for metro rail financing and organization in India. The Mumbai Metro Line-1 (Versova-Andheri-Ghatkopar Metro Project) and Hyderabad Metro Rail are the only metro systems that have been developed and are successfully operating in the PPP-DBFOT mode with viability gap funding and grants from the Government of India.

The 50:50 joint venture model requires substantial funding provision and other financing arrangements made by the central and state governments. Although the model aims to achieve cost efficiencies as well as to ensure superior service quality and performance by mandating private sector participation in certain functions such as O&M and thereby maximising system-wide ridership and revenue, the role of private entities is limited. The private sector partners do not bear any significant financial risk and normally do not need to take responsibility for ensuring the financial sustainability of the systems. In case the SPV is unable to meet its financial obligations such as covering O&M costs and repayment of loans through fare and non-fare revenues, the central and state governments need to step in and arrange for alternative funds as the project owners. Moreover, the SPV may need to tap into additional central and state government funds, or even require government intervention in the form of changes in land use, development, and transport laws/regulations and various direct or indirect taxes to expand its non-fare revenue streams.



In sum, the financial responsibility of the majority of Indian metro rail systems under the joint venture model lies with governments, and therefore governments must:

- i. Find ways to become more prudent and adopt scientific approaches in fare setting and periodic fare revisions to maximize user-fee-based revenues.
- ii. Get more creative in identifying and implementing significantly large non-fare revenue streams to effectively supplement the revenues derived from affordable transit fares.
- iii. Get creative in finding land use, design, and pricing-based approaches for increasing system patronage.

Only a few metro systems/lines are currently operating in the PPP-DBFOT mode, or the true PPP mode where private entities are the majority/significant shareholders. This is not surprising. A large body of global academic literature suggests that urban transportation, particularly public transit, projects are the most marginal of all infrastructure PPPs. Lack of private sector interest and the failure of numerous PPP contracts can be attributed to three key factors: 1) demand uncertainty, specifically, the complexity of accurate demand assessments, and the high likelihood of lower than projected system patronage under economic growth scenarios (transit is an inferior good), b) urban complexity (e.g., fragmented institutional environments, less manageable risk profiles, and inexperience of local governments in infrastructure development facilitation) leading to project implementation hurdles, and c) the politics of public transit fare regulation. This suggests that all levels of the government have a major role to play in encouraging private sector participation as investors/shareholders rather than lenders or contractors. How governments should intervene is not straightforward. For example, tax incentives and risk guarantees can help attract private players, but the approach may erode motivations to innovate. A government safety net can even result in private partners breaking contracts and quitting projects altogether without significant penalties when confronted with financial or operational challenges, such as the Delhi Airport Express Line. It is clear, however, that the private sector prefers and may be allowed to select (i.e., become shareholders of) the most profitable and low-risk projects – i.e., parts/lines of larger metro rail systems – and be given fare-setting autonomy because willingness-to-pay for metro trips may be significantly high for a large section of travellers along certain high-demand corridors with high levels of traffic congestion at certain times. While one can argue that the private sector may not even be needed in those projects, the marginal gain in productivity due to private sector innovation and efficiency may help subsidize, under certain contract terms, other “public” parts of a city’s larger metro rail network. In sum, governments should realize that the private sector is risk-averse and that it is the governments’ responsibility to find ways to engage them strategically.

Here are six key responsibilities of the government to attract private sector participation in metro projects:

- i. Conduct independent scientific project appraisals including demand/ridership projections to identify parts of networks that are most suitable for the PPP mode.
- ii. Implement allied plans and policies (e.g., transit use supportive development regulations, taxes on alternative modes, first/last mile connectivity improvements, park-and-ride facilities, etc.) that are essential to boost transit/metro rail ridership demand and thereby increase PPP feasibility.

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10. See, e.g., Siemiatycki, M. (2011). Urban transportation public-private partnerships: drivers of uneven development?. *Environment and Planning A*, 43(7), 1707-1722; De Jong, M., Mu, R., Stead, D., Ma, Y., & Xi, B. (2010). Introducing public-private partnerships for metropolitan subways in China: what is the evidence?. *Journal of Transport Geography*, 18(2), 301-313; Willoughby, C. (2013). How much can public private partnership really do for urban transport in developing countries?. *Research in Transportation Economics*, 40(1), 34-55.



- iii. Identify and institute dedicated funds drawn from creative non-fare revenue streams to cover viability gaps in the presence of demand uncertainty.
- iv. Improve local and state government capacity in managing/facilitating development activities; also make institutional adjustments to reduce development hurdles caused by the multiplicity of departments.
- v. Offer reasonable fare setting and revision autonomy to the private players.
- vi. Consider the possibility of innovative bundling of privatized projects (e.g., metro rail plus priced parallel roadway facility) along certain high-demand multimodal corridors to ensure the financial viability and profitability of bundled projects from the private sector's perspective.

## 1.4 Central government funding support for Metro rail

Urban transport is a state subject. Usually, state/UT governments initiate the development of metro rail projects in cities, and the central government considers the feasibility of their proposals before making a financial assistance or shareholding decision. In the 2014–2022 period, about Rs. 90,000 Crores of funds have been released by the Government of India for metro rail projects in the form of equity, subordinate debt, pass-through assistance, grant, viability gap funding, etc.

The Government of India's budget allocation for metro rail investments and expenditures has increased significantly over the years, demonstrating committed support for these systems. Over the last three union budgets, i.e., between 2021–22 and 2023–24, the total annual budget allocation has increased from Rs. 18,998 Crores to Rs. 19,518 Crores. The Sovereign Green Bond proceeds will be used to cover part of the metro rail budget allocation for 2023–24, indicating the central government's recognition of metro rail projects as environmentally sustainable or "green" investments.

The National Capital Region Transport Corporation has been allocated over Rs. 8,000 Crores over the last two union budgets (2022–23 and 2023–24), indicating the central government's commitment to developing rail-based regional mobility systems as well.

Given the large investments made in urban and regional rail projects over the past several years and given the large number of sanctioned projects in the pipeline, the continued financial sustainability of these systems is in the best interest of the Government of India.

## 1.5 Financial performance of Indian metro rail systems

A snapshot analysis of the financial performance of six metro rail systems across Indian cities between 2019–20 and 2021–22 using publicly available annual reports shows that the systems

11. Ministry of Housing & Urban Affairs. (2022). Since 2014, a total of about 548 kms of metro rail network has been built/operationalized in the country. Press Information Bureau. Retrieved from <https://pib.gov.in/PressReleaseframePage.aspx?PRID=1848346>.
12. Source: Union Budget website, retrieved from <https://www.indiabudget.gov.in/doc/eb/stat15a.pdf>.
13. The Economic Times. (2023). Rs 19,518 Cr allocated to metro projects across India in Budget 2023–24. Retrieved from <https://economictimes.indiatimes.com/industry/transportation/railways/rs-19518-cr-allocated-to-metro-projects-across-india-in-budget-2023-24/articleshow/97529904.cms?from=mdr>.
14. Ministry of Housing & Urban Affairs. (2022). Since 2014, a total of about 548 kms of metro rail network has been built/operationalized in the country. Press Information Bureau. Retrieved from <https://pib.gov.in/PressReleaseframePage.aspx?PRID=1848346>.

have been able to cover operating expenses with operations-related revenues comprising fare box income as well as non-fare revenues. The 2020-21 year was an exception because of the Covid-19 pandemic when ridership levels plummeted due to lockdowns and temporary public rejection of shared transportation systems. Most systems show signs of recovery to the pre-pandemic level by 2021-22.

Total income as a percent of total annual expenses was less than 100% for all the systems studied across all three years, indicating large financial losses, except for Delhi Metro in 2019-20. These numbers suggest that the metro rail SPVs/authorities in all cases, i.e., with and without private sector shareholding, are unable to meet a significant part of non-operations costs such as finance costs, employee benefits, depreciation and amortization expenses and other expenses with the total of fare, non-fare and other income streams. This may indicate a problem, particularly when the reported annual losses are large. Although we understand that government owners/partners may already have planned loan repayment obligations using their pledged equity share (depending on the financial/organizational arrangement) in the case of newly constructed systems or lines, very large reported losses could mean that governments must arrange for alternative funds that are not originally dedicated to metro, for meeting total expenses and maintaining the planned level of service/operations. In cases where O&M, as well as substantial loan repayment (e.g., repayment of soft loans provided by multilateral and bilateral agencies), is the responsibility of the SPV/authority using fare and non-fare revenues, the large losses could indicate significant unplanned financial burdens on the government owners/partners and consequently on taxpayers.

Table 1: A snapshot of the financial performance of select Indian metro rail systems

Metro rail system (City)	Total income as % of total expenses			Revenue from operations as % of operating expenses		
	2019-20	2020-21	2021-22	2019-20	2020-21	2021-22
Delhi	92%	48%	58%	202%	118%	142%
Lucknow	37%	17%	29%	100%	44%	68%
Kochi	30%	33%	29%	208%	98%	156%
Bangalore	44%	-	-	185%	-	-
Mumbai	22%	34%	26%	-	-	-
Hyderabad	78%	18%	21%	248%	89%	130%

Source: Publicly available annual reports of various metro rail systems; “-” indicates that data is not available.

Data from annual reports of the study cities suggest that the fare box recovery ratios (i.e., fare box revenue as a per cent of operating expenses) of Kochi, Delhi and Hyderabad were in the 125-150% range in 2019-20. The fare box recovery ratio of Lucknow was about 80% the same year. In 2021-22 (post-pandemic), the ratios of all four cities were under 100%, in the 54-77% range. Globally, fare box recovery ratios are found to be relatively high (i.e., > 100%) in select metro systems across Asian countries such as Hong Kong, Osaka, Tokyo, Taipei, Singapore, etc. In Europe, the London Underground system has a >100% ratio. The fare box recovery ratios of transit systems across North America are low. For example, the metropolitan transportation authorities of New York City and Los Angeles recorded ratios of about 40% and 25% respectively around 2015-2016. These values, however, cannot easily be compared because cost/expense components may differ across countries. Moreover, not all values are available from reliable sources and for the same years.

It is important to note that none of the metro rail systems had undergone any fare revision over the study period, indicating erosion in the real value of fares and consequent increasing losses in the presence of inflation and rising operations expenses. Ridership and revenue data from the annual reports suggest that in 2019-20 (pre-pandemic), the average per-rider fare collected across the metro rail systems was in the Rs. 20-25 range. Lack of periodic or annual fare revision of highly affordable fares due to administrative hurdles is undesirable and hurts metro rail's financial performance adversely. The fares of Delhi Metro, for example, were last revised in 2016-17.

It is also important to observe that non-fare revenue streams of most Indian metro rail systems are currently largely limited to income from advertising, rents from space leases to commercial/retail establishments, and some property developments around station areas. These are not substantial and do not have the potential to significantly increase total income. Creative non-fare revenues that rely on government fund transfers or require government interventions for institutional, legal, or policy changes (e.g., to impose new or additional taxes) are being tested in some cases only (discussed later in the report).

Why do fare box revenues and the financial performances of metro rail systems vary across cities and over time? As Taylor et al. (2009) suggest, the consumption of transit service and consequently a transit system's potential to generate operations-related fare and non-fare revenues depend on five key urban/regional factors, not all of which are under the control of transit agencies:

- i. Urban or regional geography: Total population, population density, geographic land area, urbanization level, urban form and structure, climate, topography, etc.
- ii. Metropolitan economy: Household income and income distribution, housing prices, sectoral composition of the economy, employment level, GDP, etc.
- iii. Population characteristics: Age, education, race, car-ownership levels and distributions, etc.
- iv. Auto/highway system characteristics: Congestion level, fuel price, parking availability and price, road supply and condition, etc.
- v. Transit (metro rail in this case) characteristics: Fare level, service frequency, network coverage and density, service reliability, transit mode, first/last mile connectivity, etc.

The first four factors are called "nature" factors that are usually outside the control of transit agencies. The fifth factor is a "nurture" factor that can be strategically influenced by transit agencies. In the case of Indian metro rail systems, some cities may be more primed for metro rail system consumption than other cities and they may have a natural advantage given the local geography, economic and demographic characteristics, multimodal transportation environment, etc., and consequently, the metro rail systems in those cities enjoy relatively higher patronage and productivity. However, the variation in financial performance of metro rail systems (or lines/corridors within systems) can also be explained by how large and dense the system is, how well the system is integrated/connected with other modes, the extent to which the system/line enhances regional accessibility, how affordable fares are, how good the system performance is, etc.

The improvement of metro rail's financial performance can not only be ensured by finding creative funding and financing mechanisms but also by creatively promoting its ridership using planning, policy, design, and system management tools. This report offers guidance.

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15. Taylor, B. D., Miller, D., Iseki, H., & Fink, C. (2009). Nature and/or nurture? Analyzing the determinants of transit ridership across US urbanized areas. *Transportation Research Part A: Policy and Practice*, 43(1), 60-77.

## 1.6 Takeaways

The financial health of Indian metro rail systems, particularly new systems (or small systems that do not have significant urban/regional network coverage or density) in relatively smaller cities, does not look particularly promising. This is because of three key reasons: 1) actual ridership numbers are usually much lower than forecasts made during project planning, which could be a result of inaccurate demand estimations, and hence there is a supply-demand mismatch; 2) the cities may not require metro rail systems given their geographic and sociodemographic profiles, but have received metro rail over more flexible, useful and cost-efficient bus systems due to the disproportionately high policy support (government assistance availability) for metro rail, and; 3) associated factors such as subsidies towards personal vehicle ownership and use, lack of transit-proximate activity locations, housing and opportunities, inadequate metro rail connections, lack of integration of metro rail lines with other urban/regional transit modes, etc. that make metro rail use unattractive or infeasible. As India continues to focus policy attention on metro rail development, finding ways to ensure the satisfactory financial performance of these systems is essential.

In the absence of significant private ownership of (or investment in) metro and regional rail projects (i.e., in the business-as-usual environment), it seems imperative that central and state governments must take on the responsibility of creating and arranging alternative “justified” funding sources to effectively supplement fare box and other operations related non-fare revenues and ensure continued financial sustainability, thereby avoiding loan repayment defaults and service deterioration, both of which are vicious cycles. Justified sources include, for example, appropriating part of the property value gain that can result from metro rail investments, removing unjust subsidies on carbon-intensive transportation modes such as personal motorized vehicles using pricing and taxes, and apportioning part of green or low-carbon infrastructure development funds to metro rail given its sustainability promises. Most of these sources should be local (i.e., where investments happen and where beneficiaries are concentrated), and any new fees or taxes should be aimed at promoting equity and removing existing market inefficiencies (e.g., free parking or underpriced car travel). This effectively means increasing the government’s share of total funding support (including substantial non-fare revenues) for metro/regional rail projects and reducing the SPV’s independent financial obligations/responsibility of arranging non-fare revenues. Moreover, while metro and regional rail fares should be affordable and socially acceptable, the periodic fare review and revision process must be eased and ideally made formula-driven. Otherwise, dependence on non-fare sources and consequently on government-arranged funds (derived from more taxes, etc.) will continue to increase. These are essential for sustaining operations, attracting private players as contractors as well as investors, and continuing to expand and improve metro rail systems across Indian cities.

The remainder of this report is structured as follows: Chapter 2 discusses a range of innovative funding and financing mechanisms that are relevant in the Indian metro rail development context. Chapter 3 highlights challenges related to metro rail fare fixation (specifically fare revision) and establishes the need for improving processes. Finally, Chapter 4 offers recommendations for improving the productivity of metro rail systems and urban transit in general.

## 2. INNOVATIVE FUNDING AND FINANCING MECHANISMS

This chapter analyzes and identifies effective, efficient, and equitable non-fare revenue sources that can be leveraged for funding and financing metro rail systems across Indian cities. The institutional and technical challenges associated with activating and collecting these innovative revenue streams are also discussed. The three key guiding principles behind the instruments are: a) beneficiaries of positive spillovers of metro rail (public transit in general) should contribute to infrastructure development and service operations, b) polluters in the urban transportation environment must pay for environmental and social damages they cause and attempt to partially mitigate their impacts by contributing to sustainable transportation investments, and c) urban public transit funds should, to the extent possible, be collected from where they are spent. While Indian cities have started experimenting with some of the funding and financing instruments discussed here, there is still a long way to go. Planners, policymakers, and politicians should act to make the recommended funding and financing instruments mainstream and thereby ensure the financial sustainability of Indian metro rail systems.

In the following sections, we present the following three revenue generation ideas:

- i. Land value capture mechanisms
- ii. Taxes and fees on carbon-intensive transportation modes
- iii. Various carbon taxes, and other local option taxes and fees

### 2.1 Land value capture mechanisms

#### 2.1.1 Concept and instruments

The impact of transportation investments on property values and economic development is well established. Land Value Capture (LVC) is an approach to generate/catalyze and recover part of the additional value that infrastructure development (e.g., new projects or upgrades) generates or can potentially generate in the private market, e.g., for private landowners. Using LVC instruments comprising of asset management, urban planning and public finance tools, local governments can charge fees and taxes to key beneficiaries (along with expanding the beneficiary base) of development projects such as developers and other property owners to fund local public services in general, and specifically pay for the infrastructures that are primarily responsible for growth in land or property values. Value capture mechanisms can help link increasing land and property values with the development and operations of public transport services including metro rail. Indeed, metro rail investments potentially contribute to increasing the values of land and real estate along the rail corridors or in proximity to stations and thereby generate additional benefits for private property owners. Additional fees and taxes charged to the corridor or station-area property owners, and, simultaneously stimulating more developments in the station areas, can generate justified funds for constructing and operating metro rail services.

16. See, for example, Zhong, H., & Li, W. (2016). Rail transit investment and property values: An old tale retold. *Transport Policy*, 51, 33-48; Dziauddin, M. F., Powe, N., & Alvanides, S. (2015). Estimating the effects of light rail transit (LRT) system on residential property values using geographically weighted regression (GWR). *Applied Spatial Analysis and Policy*, 8, 1-25.

LVC mechanisms have been implemented in various countries to recover and reinvest land value increases for financing the development of infrastructure. Instruments such as “betterment levies” have been in existence for many years in Latin America. In addition to augmenting investments in physical infrastructure, LVC has also proved to be an integral tool in achieving positive social and environmental outcomes.

The idea is that strategic land use regulations/readjustments and development incentives in metro rail station areas coupled with development-based LVC can help justifiably “capture” property value increases due to the metro rail investments and simultaneously promote transit-orientation in land uses and travel behaviours. The revenues from LVC can be leveraged to cover the cost of metro infrastructure development and operations/maintenance, and provide or improve public services, facilities and even affordable housing for low-income groups.

Although numerous LVC methods exist in the literature, a list of LVC instruments that are relevant in the Indian context and specifically in the context of metro rail development and financing in Indian cities is provided in the following table. The instruments are classified by theme, depending on whether they are linked to municipal finance, land use planning, or public asset management.

Instruments that involve fees and taxes are likely to have the broadest payment base and potential to generate greater and more reliable long-term revenue streams that, if allocated for metro rail projects, can help generate significant non-fare revenues. Land use and development regulations such as land readjustment and density bonuses, and the asset management or joint development approaches are instruments that are necessary for creating the tax or fee payer base in the first place, and for developing vibrant transit-oriented developments that can promote transit use and boost metro rail ridership.

It is recommended that Indian metro rail systems explore all these LVC instruments and consider adopting those that are most impactful, equitable, and politically or socially acceptable. Guidance is offered in this report.

Table 2: LVC instruments relevant in the Indian metro rail development context

<b>Fees and taxes on private entities</b>
<ul style="list-style-type: none"> <li>• Betterment charge: One-time charge for property value increase</li> <li>• Impact fees: One-time contribution for obtaining development rights</li> <li>• Tax increment financing: Assigning revenues from increased taxes to the development</li> <li>• Special assessment districts: Recurrent fee to recover infrastructure costs from an area</li> <li>• Local property tax: A mandatory higher recurrent property tax</li> <li>• Real estate transfer tax: Tax levied during a real-estate transaction</li> </ul>
<b>Regulation of land use and developments</b>
<ul style="list-style-type: none"> <li>• Land readjustment: Regularization of private land for new developments</li> <li>• Density bonuses: Payment for building in greater than usual density or intensity</li> <li>• Conversion fee: Payment for developing in otherwise restricted zones or plots</li> </ul>



## Private sector control of government owned land or property

- Air rights development: Lease or purchase of space above infrastructure such as stations
- Leases or concessions or sale: Contract for using a site or purchase of site for a payment
- Joint development agreements: Joint development on government site
- Naming rights: Purchase naming rights in exchange of a fee or responsibility

Source: GIZ, NITI Aayog, ASCI

In addition, six LVC tools from across the three categories that are most relevant and have the greatest potential are discussed below. The references to articles that have informed this section are given as a list at the end of this chapter. Relevant case studies related to each of the instruments are given in the Appendix.

## 2.1.2 Six key LVC instruments for funding Indian metro rail systems

### ***Betterment levy***

Betterment levies are the most direct form of value capture and impose a fee or tax on land or properties that have gained or are expected to gain in value due to public infrastructure investments. In other words, when there is a public improvement or service that benefits adjacent parcels of land, beneficiaries (property owners) are made to contribute by paying a charge or fee to defray the cost of the improvement. For operationalization, the specific public improvements to be made are to be identified first, followed by delineating the areas that will benefit (by varying amounts) from the improvements. The cost of the improvements (or a portion of it) is then assigned to each parcel based on the share of benefits received, either as a one-time fee or long-term payments. Betterment levies are challenging to implement equitably in practice because it is difficult to accurately quantify the land value increments resulting from infrastructure investments. This type of instrument has been used in Spain, Israel, and Latin American countries.

The stamp duty land tax (or SDLT) is a variant of this instrument. In this approach, the owners of properties typically above a certain value are required to pay an additional stamp duty to the local government. This additional tax is applicable in areas that benefit from public transport investments. The fundamental principle, again, is that a high-quality public transit service such as the metro rail system increases the value of land and properties within a certain influence zone, and the benefits accrued to land and property owners can, at least in part, be captured and sourced into a dedicated fund to pay for the public transit service. The tax surcharge can be a function of distance from the transit system with closer properties subjected to a higher rate.

### ***Land pooling, land readjustment, and expropriation***

Often, there are plots of land that cannot be leveraged to their most efficient use. Land parcels in that situation may be pooled and readjusted into different shapes and sizes in an orderly configuration, making space and opportunity for public improvements such as utilities, roads, transit lines, parks, commercial complexes, etc. After the land readjustment, involved land/property owners typically receive a smaller tract of land (or property), whose value is higher than the original plot (or property) because of up-zoning and the improvements made to

17.. GIZ, NITI Aayog, ASCI. (2021). Land Value Capture - Towards Planning and Financing Equitable Cities in India. Workshop Proceedings. Retrieved from [https://www.niti.gov.in/sites/default/files/2022-04/LVC&S\\_Workshop\\_Proceedings\\_25042022.pdf](https://www.niti.gov.in/sites/default/files/2022-04/LVC&S_Workshop_Proceedings_25042022.pdf).



the immediate area. This type of pooling and readjustment may be highly appropriate in the case of metro rail station areas in Indian cities to create a transit-oriented, mixed-use, economically productive neighbourhood. This type of readjustment can potentially help attract new developments in station areas, extract value from developers and property owners, and fund the metro rail projects in addition to increasing ridership. Under certain arrangements, it is possible that existing landowners also benefit from such readjustment because of the overall improvement of the station zone.

This type of intervention, i.e., pooling and readjustment, becomes necessary when the area (e.g., station area) comprises unplanned, irregular, or inefficient patterns of plots, land uses, floor area ratios, etc. that makes new development difficult, and there is insufficient land space for public services or new developments. Landowners typically contribute to the upgrade by trading a larger plot for a smaller but more valuable plot. Sometimes, the readjustment of the newly planned area could include the creation of collectively or publicly owned parcels that are leased or sold to generate additional revenue for the planned area.

This type of instrument has been used in Germany, Japan, India, Ethiopia, South Korea, Philippines. From an implementation perspective, this instrument has strong linkages with land use planning/zoning as well as municipal finance. Significant municipal and state interventions are required to operationalize this instrument.

### ***Impact fee***

Sometimes, developers are made to pay a fee or surcharge to obtain development approvals in certain designated neighbourhoods or zones. This payment is intended to compensate for the impact of new developments on existing public infrastructure, or for covering the cost of providing new public infrastructure and improvements that are demanded by new developments. In the metro rail development context, the idea is that new station area developments can potentially generate (or, be made to generate using creative parking regulations as well as other transit use incentives) new metro rail trips, thereby impacting the metro system, and therefore developers should pay a fee like a traffic mitigation fee. The assumption is that the metro rail system serves or is demanded by the new developments (i.e., the new developments would not have happened in the absence of the metro rail), and therefore the developers should pay. Impact fees are operationalized as a one-time payment during the approval of development or issuance of building permissions and paid by approval-seeking developers. In many cases, the fee or charge is set at a level that is linked to the impact on the public infrastructure and other social/environmental costs of the new developments. This type of instrument is widely used, globally.

### ***Air rights development***

The fundamental concept of air rights development is the development and use of the air space above (or below) a parcel of land's primary use. In the metro rail development context, this usually involves providing rights to private entities to develop and own/rent spaces above corridors and stations. Since, as the Latin legal maxim goes, whoever owns the soil/land typically owns the sky and the depths (with certain restrictions due, for example, to requirements of aviation, building by-laws, etc.), the metro rail authority can leverage the development and revenue generation potential offered by their air rights. In the US, air rights developments using transportation facilities include commercial and residential buildings, offices, parking, clubs, etc.

Exploitation of air rights has inherent advantages. The sale or lease of air rights over publicly owned facilities can generate significant revenues for government agencies such as metro

rail authorities. The private sector may be equally attracted to developing and leveraging the air rights of public assets in urban areas. This arrangement, for example, eliminates the hassles of land assembly, demolitions, and relocation of tenants in dense, developed parts of cities. Metro rail corridors and certain station areas are also prime locations where affordable developable land may not be available. Moreover, the air space purchase may help avoid some construction costs, and also generate greater demand for certain commercial activities. The station neighbourhood community can also benefit from such developments as they can reduce disruptions and create desirable high-density and architecturally appealing built environments rather than, for example, open parking lots. This type of instrument has been used in Canada, France, India, the Philippines, the US, etc.

### ***Additional development rights***

Typically, cities or zones within cities have stipulated density (e.g., total developable space relative to plot size), height and use restrictions. In this approach, developers or landowners who intend to build beyond those limits (subject to other applicable land use or development regulations) are required to pay in cash or kind (e.g., building some affordable housing or providing public services) in exchange for additional special development rights. Additional development rights can be provided in the form of chargeable premium FSI, change of land use charges, charge for transfer of development rights, etc. The potential of property value increase and activity pattern changes in certain station areas because of metro rail development can promote demand for the purchase of additional development rights. This type of LVC instrument is widely used in many OECD countries, Singapore, Brazil, etc.

### ***Tax increment financing***

Tax increment financing is a public finance mechanism that, in principle, helps develop infrastructure using locally generated additional revenues. The system works as follows. The public sector agency building an infrastructure such as metro rail borrows money to finance the project. The loan repayments are planned using ring-fenced expected future additional tax (e.g., property tax) revenues from within a designated impact zone that is expected to benefit from the project. The total property tax received by the local authority (e.g., the urban local body) from the impact zone is frozen (with or without a certain rate of annual increase) at the pre-project level for a fixed term, e.g., the project loan repayment period or a certain period such as 25 years. The difference between the actual increased property taxes and the frozen level of taxes within the impact zone is transferred to a dedicated fund that is used to pay off the project loans. Increased property taxes could result from more intense development in the impact zone as a result of project development either naturally or by implementing land use and development policy incentives. The increase could also result from additional taxes and fees on property within the impact zone, or from an average increase in the assessed values of properties. After the freeze period, the total taxes belong to the local authority or taxing district. This financing mechanism is widely used in the US.

## **2.1.3 Administrative, institutional and technical requirements**

The following table lists the administrative and institutional requirements for LVC instruments. The importance of enabling legislation, integration of LVC into urban and regional statutory plans, prudent communication, trained human resources and establishment of supportive institutions, and instrument selection and implementation issues are highlighted. Although the topic of value capture has been discussed in India, the adoption of relevant instruments and effectively using them for infrastructure development remains a challenge. This report provides practical insights.

Table 3: Administrative, institutional and technical requirements of LVC

<b>Enabling legislation</b>
LVC requires enabling legislation. It is important to first establish enabling laws related to land use and municipal finance. Most of these legal changes are the responsibility of the state governments and their departments.
<b>Integration</b>
Integration of value capture into the urban and regional land use planning process can help create an established legal and institutional framework for implementing area specific special development regulations, taxes and fees for funding critical transportation infrastructures.
<b>Communication</b>
If a metro rail SPV/authority wants to implement LVC, there must be clear messaging and outreach about the benefits including equity issues of LVC, transparency on where and how funds will be spent, and from where value is derived in order to garner support from the public and politicians.
<b>Human resources and institutions</b>
LVC requires revenue collection, property value assessments, auditing etc. Trained staff and a well-established mechanisms/institutions are necessary.
<b>Identifying beneficiaries and benefit areas</b>
Since LVC is based on the beneficiary-pays principle, it is important to conduct rigorous studies and market analyses to identify affected impact areas and entities. Impact areas may depend on instrument choice. Benefits as well as costs of infrastructure and burdens of fees/taxes should be analyzed.
<b>Selecting appropriate technique</b>
LVC technique selection should be based on funding need (magnitude, duration and timing), who the beneficiaries are and how they receive benefits, market conditions and sociodemographic factors, and larger public policy goals.

Source: USDOT, FHWA Center for Innovative Finance Support

### 2.1.4 Indian experience

In India, some cities are currently experimenting with value-capture instruments for funding urban transport projects. For example, in the case of Bangalore Metro, Metro Cess and Additional FAR are the instruments in use under the “Metro Infrastructure Fund.” The fund is managed by the Bangalore Development Authority. In Nagpur, additional stamp duty has been implemented by amending the Maharashtra Municipal Corporation Act, 1949 in 2015. Increased FSI has been enacted by amendment to the development control regulations by the Urban Development Department, Government of Maharashtra in 2017. Pune and Jaipur have also implemented additional stamp duty. Increased FSI has also been enacted in Noida, Lucknow and Jaipur.

18. USDOT. (n.d.). Value Capture Resources, General Resources. USDOT FHWA, Center for Innovative Finance Support. Retrieved from [https://www.fhwa.dot.gov/ipd/value\\_capture/resources/value\\_capture\\_resources/general.aspx](https://www.fhwa.dot.gov/ipd/value_capture/resources/value_capture_resources/general.aspx).

19. See NCRTC. (n.d.). Report of Committee on innovative methods of revenue generation for implementation of Regional Rapid Transit System (RRTS). Retrieved from [https://ncrtc.in/wp-content/uploads/2022/09/a.-Report-of-Committee-on-innovative-methods-of-Financing-\\_Sept-2017.-2.pdf](https://ncrtc.in/wp-content/uploads/2022/09/a.-Report-of-Committee-on-innovative-methods-of-Financing-_Sept-2017.-2.pdf).

## 2.2 Tax on alternative, carbon-intensive modes

Scholars and policymakers recognize that the existing taxes and fees levied on private motorized vehicle use – such as fuel taxes, vehicle taxes, road taxes, registration fees, etc. – do not reflect the social and environmental costs of owning or using such vehicles. In other words, personal motorized vehicle travel is highly subsidized, globally. This is true for electric vehicles as well because they have no impact on congestion, and, can potentially encourage vehicle adoption and promote horizontal urban growth. The social costs of free or underpriced parking are also not paid by vehicle users. The application of the polluter-pays principle (or internalization of external costs) – i.e., making vehicle users pay for a substantial share of the externalities they cause – is essential for sustainable urban mobility planning/policymaking, and to promote socially optimal mode choice/use behaviours. Revenues from a given city can be ring-fenced (i.e., transferred into trust funds) for enhancing public transport and active modes including metro and regional rail system funding in that city. The potential for revenue generation can be large.

In this section, we discuss two key instruments – congestion charging and parking pricing – that impose charges/taxes on the negative externalities caused by alternative carbon-intensive modes, primarily personal motorized vehicles, and generate significant social and environmental benefits in addition to revenues for cities. In the context of this report, both of these instruments are relevant for Indian cities and can be justifiably used for funding metro rail developments.

### **Congestion charging**

Urban traffic congestion is a cost and an inconvenience, and travellers would rather avoid it. Interestingly, although motorists feel that they are the victims, they are the contributors to congestion. In other words, motorists not only experience congestion, they create it. Socially suboptimal levels of congestion are caused because our travel decisions are based on how much congestion we are going to experience and how much personal cost (e.g., our time, out-of-pocket and inconvenience costs) we are going to incur, not how much cost our travel imposes on society and the environment (e.g., by marginally increasing delay for everyone else, and by marginally increasing pollution levels). Simply speaking, we create congestion (slow everybody down), but are not required to pay for the cost everybody else has to incur because we decide to travel (drive). Urban traffic congestion is therefore a market failure. Supply-side increases (e.g., adding lanes or developing new facilities) can, in theory, reduce social costs by creating more free space for all to travel, but it is well established (in theory and based on evidence) that road supply increase elicits more traffic. A congestion charge (toll or tax), if calculated appropriately, can effectively capture costs travellers impose on each other and optimize the use of a facility. A congestion charge is therefore efficient and usually considered fair from the perspective of transport economics.

Congestion charges are preferred by economists because using peak pricing or surcharges to manage demand and address congestion is common and preferred in a market economy. For urban planners and policy makers, congestion charges implemented along specific roadway corridors for entering specific zones at certain high-demand times of the day or days of the week can both reduce traffic congestion and associated externalities and also help generate revenues

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20. See, for example, Brueckner, J. K. (2000). Urban sprawl: Diagnosis and remedies. *International Regional Science Review*, 23(2), 160–171; De Palma, A., & Lindsey, R. (2011). Traffic congestion pricing methodologies and technologies. *Transportation Research Part C: Emerging Technologies*, 19(6), 1377–1399.
21. See, for example, Duranton, G., & Turner, M. A. (2011). The fundamental law of road congestion: Evidence from US cities. *American Economic Review*, 101(6), 2616–2652.

for funding public transit systems including metro rail. While motorists with a high value of travel time savings (VTTS) and value of reliability (VOR) are expected to pay the congestion charge and drive, others who find the charge unaffordable can use alternative public transit systems that are expected to be developed or improved by leveraging congestion charging revenues.

The implementation of congestion pricing has yielded notable benefits in cities such as London, Stockholm, and Seattle. In London, congestion pricing reduced vehicle trips (compared to no-pricing scenario) by 18%, and a 30% reduction in congestion within the pricing zone was observed during weekday charging hours. Additionally, the number of bus trips increased by 33%, waiting time decreased by 30%, and emissions were reduced by 12-19%. Similarly, during the trial period, the comparison between 2005 and 2006 data suggests that Stockholm experienced a 20% reduction in vehicle trips, a 33% reduction in congestion during mornings, a 50% reduction in evening congestion, a 7% increase in transit trips, a 22% increase in bicycling trips, and a 7-14% decrease in emissions. In 2006, upon implementation of Seattle's SR-520 project, the pricing scheme resulted in a 25% reduction in congestion during morning peak hours, an 8-minute reduction in travel times, increased speeds during peak hours, and minimal diversion to alternative routes.

Both London and Stockholm are known to reinvest generated revenues into public transit, resulting in significant service quality improvements and ridership gains.

In sum, congestion charging – applied as dynamically priced lanes/roads, zones, and distance-based schemes – helps to reduce vehicular traffic and promote mode shifts towards mass/shared transportation. Transit service consumption and quality improve as a result. Revenues from congestion charging programs get into a dedicated urban/regional sustainable transportation development fund to improve transit systems further (cross-subsidy). It is time that Indian cities consider congestion pricing as a public transport funding instrument, particularly for generating revenues for metro rail systems. Many cities around the world including London, Durham, Stockholm, Gothenburg, Milano, Valletta, and several US cities have either implemented or are planning to implement congestion charging. Singapore had implemented a congestion charging program since 1975 that transitioned to electronic road pricing in 1998. Singapore's congestion pricing program has generated significant positive mobility and economic benefits including opportunities to expand and improve public transit services in the city.

Pricing measures may not be readily acceptable and hence strategic planning is essential for a proposal's success. For example, it is important that the traveller's willingness to pay to avoid congestion (along with sociodemographic, and trip purpose/travel time-related variations) is assessed and corridors/zones where congestion charging may be appropriate (along with the feasibility of mode switches) are identified scientifically. The public must be informed about

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22. Tools of Change (2013). Tools of Change. Retrieved from Stockholm Congestion Pricing: <https://toolsofchange.com/en/case-studies/detail/670#:~:text=Traffic%20Changes,between%2010%25%20and%2014%25;> US DOT. (2018). Traffic volumes declined by 34 percent on SR 520 after deployment of pricing and electronic tolling. Retrieved from ITS deployment evaluation: <https://www.itskrs.its.dot.gov/its/benecost.nsf/ID/78a1e4026c2ed620852581a7003b7b87>; Transport for London (2023, February 17). Congestion Charge marks 20 years of keeping London moving sustainably. Retrieved from Transport for London: <https://tfl.gov.uk/info-for/media/press-releases/2023/february/congestion-charge-marks-20-years-of-keeping-london-moving-sustainably#:~:text=It%20has%20resulted%20in%20a,the%20roads%20run%20more%20efficiently.>

23. U.S. Department of Transportation. (n.d.). Lessons Learned From International Experience in Congestion Pricing. Retrieved from <https://ops.fhwa.dot.gov/publications/fhwahop08047/02summ.htm#:~:text=Congestion%20pricing%20has%20been%20a,9%3A30%20in%20the%20morning.>

the objective of the charging program, intended impacts and use of revenues well in advance. Communication of social and environmental benefits as well as the overall urban sustainable mobility strategy along with conveying the availability of good enough mobility alternatives are key. Adequate mobility alternatives must be developed before introducing any charging program. A trial period where travellers get the opportunity to get accustomed to the charging program, test out alternatives, and experience the benefits and inconveniences of the new program, is critical. Finally, equity issues must be addressed which may include exemptions for certain types of vehicles and user groups.

Since traditionally car-centric cities such as Los Angeles and complex urban systems such as New York are considering congestion charging, Indian cities such as Mumbai, Delhi and Bangalore should consider such programs. The impact of congestion charging on metro rail's success – in terms of system usage and financial performance – in these and other large Indian cities can be positive.

A related charging program involves specially managed “express” roads or lanes. The idea is to create new priced roadway facilities or allocate some of the existing lanes in a roadway corridor segment as priced lanes. This ensures that those who are willing to pay to avoid congestion – typically travellers with high VTTs and VOR – get the choice to use the new facility or the express lanes that are maintained at high levels of speed and reliability by dynamically adjusting prices and consequently demand. Although the express lanes may or may not help reduce overall corridor-level traffic congestion, they can generate significant revenues for public transit improvements, and thereby promote transit use and improve transit's financial health.

Both congestion charging programs and priced express lanes require significant infrastructure investments including geometric and pavement alterations/improvements of roads, intelligent transportation systems, and digital technologies. Either of these programs, if strategically bundled with metro rail projects, can potentially attract private sector investors. For example, the potential of revenue generation from road pricing may help manage the ridership demand risk of metro rail in a bundled scenario. Indian transport policymakers should consider this option, especially along high-demand multimodal urban corridors where a roadway and metro rail line either exist or can be developed parallel to each other. Such contexts are certainly available in the extended metropolitan areas of Delhi and Mumbai.

### ***Parking pricing***

Appropriate market-based pricing of on-street parking and publicly owned off-street parking is another powerful tool to charge motorists for the negative externalities of vehicle use (and thereby reduce subsidies associated with motorized vehicle ownership and use) and consequently reduce car dependence, promote public transit use (thereby increasing ridership and revenue), and potentially generate significantly large funds for public transportation infrastructure development as well as fund public services that are essential for sustainable transport orientation in cities.

Public parking across Indian cities is usually free or arbitrarily underpriced and poorly managed. Parking is considered effectively free when prices do not affect travel behaviour. Since free parking causes distortions in travel behaviour and consequently causes environmental and social damage, Indian cities should seriously consider appropriate pricing and taxing of parking



to both promote sustainable travel and generate revenues to support sustainable transportation infrastructures including metro rail systems.

San Francisco's SF Park program – a dynamic (in time and space) parking pricing program that adjusts the prices of 7,000 on-street parking meters and 11,500 off-street parking spaces across 14 city-owned parking to achieve a target occupancy rate for on-street spaces – showed how pricing can efficiently allocate high-demand parking spaces, reduce cruising for parking, address traffic congestion, enhance transportation equity, and promote public transit use. More importantly, the program has demonstrated how parking revenues can be returned to the metropolitan transportation authority for funding public transit. Similarly, the city of Houston, Texas demonstrated how parking revenue from within a designated parking benefits district can be returned to the city for public improvement projects. New York and Washington D.C. are also testing peak-hour parking charges.

Privately supplied and operated off-street parking can be taxed as well. The justification for taxation remains the same. For example, the County of San Francisco imposes a 25% tax on parking charges in the private market (including employers and organizations, public or private), and parking operators have to collect (from motorists) and pay taxes to the office of the Treasurer & Tax Collector of the City and County of San Francisco on a monthly, quarterly or annual basis depending on total tax obligation. Parking charges are typically advertised and quoted by operators as an all-inclusive price. The parking tax revenues are used to fund various city services that may include urban transportation infrastructure.

In general, it is well established that there is a huge potential for cities to generate revenues through appropriate parking management and pricing, and use the revenues for delivering sustainable urban mobility projects. For example, 14 national governments, 16 leading cities and 300 follower cities across the European Union have partnered in the Park4SUMP program to explore innovative ways of integrating parking management and pricing into the future sustainable urban mobility plans of various levels of the government. Technical partners including consultancies, planners, research institutions, universities, city networks, parking associations, etc. are providing strategic advice. Stakeholders have agreed, among other things, to earmark earnings from parking for improving and promoting alternative modes of transportation such as public transit, bicycling, etc., and also for other public services such as parks and playgrounds to get broader citizen support.

It is high time that Indian cities learn from European and North American experiences and implement parking pricing across cities to fund critical urban infrastructures including metro rail systems.

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24. See Pierce, G., Willson, H., & Shoup, D. (2023). Optimal pricing of public parking garages. *Transfers Magazine*. <https://transfersmagazine.org/magazine-article/issue-1/optimal-pricing-of-public-parking-garages/>.
  25. Parking benefit districts. City of Houston. Retrieved from <https://www.houstontx.gov/parking/pbd.html#:~:text=What%20is%20a%20Parking%20Benefit,recommend%20by%20the%20Advisory%20Committee>.
  26. U.S. Department of Transportation. (n.d.). Contemporary Approaches to Parking Pricing: A Primer. Retrieved from [https://ops.fhwa.dot.gov/publications/fhwahopl2026/sec\\_1.htm](https://ops.fhwa.dot.gov/publications/fhwahopl2026/sec_1.htm).
  27. Treasurer and Tax Collector, City and County of San Francisco. (n.d.). Parking Tax. Retrieved from <https://sftreasurer.org/business/taxes-fees/parking-tax>.
  28. Refer to the Park4SUMP website at <https://park4sump.eu/>.
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## 2.3 Carbon taxes, and local option taxes and fees

In this section, we highlight two types of revenue sources that can be leveraged for metro rail funding in Indian cities – 1) various forms of carbon and emissions-related taxes, and 2) local taxes, fees and financing mechanisms. The following exhibit lists the various instruments under the two categories. Most of the instruments mentioned here either do not exist in India or have been tested in limited contexts only. It is expected that governments across levels consider these options for funding sustainable transportation projects and other public programs.

Table 4: Carbon taxes, and local option taxes and fees for Indian metro rail funding Sources: Government of British Columbia, Tax Foundation, Ministry of Power, Metropolitan Transportation Commission, Transport for London, ACEEE, Werland and Rudolph (2019).

Carbon and emission related taxes
<p><b>Fuel carbon tax:</b> This is an add-on fuel tax collected from motorists at gas stations to address transport related carbon pollution. An example is British Columbia’s carbon tax of 14.31 ¢/litre for gasoline (petrol) and 16.85 ¢/litre for diesel. India does not have a fuel carbon tax currently.</p>
<p><b>Carbon tax:</b> Carbon taxes are levied on industrial polluters to internalize the environmental and health costs of carbon emissions. Sweden levies the highest carbon tax rate in the EU, of USD 130 per ton of carbon emissions. India does not have an explicit carbon tax currently.</p>
<p><b>Cap and trade revenue:</b> Revenues from emission permits in a cap-and-trade program can be used in sustainability projects. The Indian Government is planning to develop the Indian Carbon Market (ICM) that can help activate this funding stream. For example, California’s cap-and-trade program reduces pollution by imposing limits on emissions, and these limits become stricter each year. Emitters are required to buy an allowance for every ton of carbon dioxide they release. State law requires this money to be spent on projects that reduce greenhouse gas emissions and transit projects qualify.</p>
<p><b>Tax on high emission vehicles:</b> This is a tax on high emission passenger and goods vehicles to enter the city or a specific zone within the city. Tax on high-emission heavy goods vehicles is standard in most European countries. Central London’s Ultra Low Emission Zone (ULEZ) program requires polluting vehicles of all categories to pay a ULEZ charge to enter the ULEZ. The daily charge is GBP 12.50 for cars. Commercial vehicles entering Delhi pay an “Environmental Compensation Charge” that is used to fund sustainable transportation infrastructure.</p>

## Local taxes, fees and financing mechanisms

**Vehicle registration fee surcharge:** This is an additional fee for registering vehicles in a city/ jurisdiction. In San Francisco, Proposition AA is a voter-approved USD 10 annual vehicle registration fee that generates USD 5 million per year and helps fund various transportation projects including transit.

**Employer levy:** Dedicated contributions from large public and private employers in a city/ region that generate traffic and benefit from transportation improvements can be earmarked for expanding, maintaining and operating the public transport systems. Global experience suggests that the levy could be a percentage of wages paid, or linked to number of parking spaces, etc.

**Green city bonds:** These are municipal or city bonds with proceeds ring-fenced for sustainable infrastructure development projects including transportation. Such bonds are common in Europe. Indore Municipal Corporation issued a green bond in 2023 for development of a solar power plant.

Sources: Government of British Columbia<sup>29</sup>, Tax Foundation<sup>30</sup>, Ministry of Power<sup>31</sup>, Metropolitan Transportation Commission<sup>32</sup>, Transport for London<sup>33</sup>, ACEEE<sup>34</sup>, Werland and Rudolph (2019).

29. Government of British Columbia. (n.d.). British Columbia's Carbon Tax. Retrieved from <https://www2.gov.bc.ca/gov/content/environment/climate-change/clean-economy/carbon-tax>.

30. Bray, S. (2022). Carbon Taxes in Europe. Tax Foundation. Retrieved from <https://taxfoundation.org/data/all/eu/carbon-taxes-in-europe-2022/>.

31. Ministry of Power. (2023). Ministry of Power & Ministry of Environment, Forests & Climate Change to develop Carbon Credit Trading Scheme for Decarbonisation. Press Information Bureau. Retrieved from <https://pib.gov.in/PressReleasePage.aspx?PRID=1923458>.

32. Metropolitan Transportation Commission. (n.d.). Cap and Trade Funding. Retrieved from <https://mtc.ca.gov/funding/state-funding/cap-and-trade-funding>.

33. Transport for London. (n.d.). Ultra Low Emission Zone. Retrieved from <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone>.

34. ACEEE. (2021). Funding Options for Low-Carbon Transportation: Alternatives to the Federal Gasoline Tax. American Council for an Energy-Efficient Economy. Retrieved from [https://www.aceee.org/sites/default/files/pdfs/funding\\_low-carbon\\_transportation\\_final\\_4-28-21.pdf](https://www.aceee.org/sites/default/files/pdfs/funding_low-carbon_transportation_final_4-28-21.pdf).

## 2.4 Other strategies to increase revenues

In this section, we present three strategies to increase non-fare revenues of Indian metro rail systems indirectly by using resources more efficiently and boosting ridership keeping fares and services unchanged. The strategies can be classified into three categories: 1) operations, 2) planning, and 3) asset management. These are practical strategies that can generate significant revenues in a cost-efficient manner. The following table provides a summary.

Table 5: Using operations, planning and asset management for boosting revenues of Indian metro rail systems

<b>Operations: Goods transportation using metro rail</b>
<p>Metro rail authorities should conduct demand assessments and explore the feasibility of running goods trains using special coaches at certain off-peak hours of the day or during late nights. It is also possible to allow cargo bikes and porters affiliated with certain city logistics companies in regular trains for a fee. The demand for goods transportation may be high in congested cities and where metro rail network coverage and density are high. The demand may further grow as transit-oriented developments happen. The Delhi-Meerut RRTS, for example, is planning to transport agricultural products and white goods according to media reports.</p>
<b>Planning: Improving first- and last-mile connectivity</b>
<p>There is a large body of academic literature that underscores the importance of first- and last-mile connectivity to public transit stops and stations as a key determinant of transit mode choice. Indian metro rail authorities should find creative ways including partnerships or contracts with private sector mobility service providers or platforms to offer such connectivity using a blend of conventional vehicles (e.g., buses and vans), app-based ride-hailing services, shared non-motorized transportation modes, etc. There are numerous global examples where public transit operators offer or arrange/facilitate first- and last-mile connections with positive impacts on transit use.</p>
<b>Asset management: Park and ride facilities</b>
<p>Literature suggests that park-and-ride (i.e., parking lots) near public transit stops and stations broadens the customer base for transit and thereby increases transit ridership. Indian metro rail systems should strategically leverage their air rights to provide multilevel or underground personal vehicle parking at select stations that suffer from inadequate local neighborhood connectivity. Parking can be subsidized in a way that promotes transit use but does not discourage the use of other sustainable first- or last-mile modal alternatives if they exist.</p>

Source: Karesdotter et al. (2022), Duncan and Cook (2014).

35. Kåresdotter, E., Page, J., Mörtberg, U., Näsström, H., & Kalantari, Z. (2022). First mile/last mile problems in smart and sustainable cities: A case study in Stockholm County. *Journal of Urban Technology*, 29(2), 115-137.
36. Duncan, M., & Cook, D. (2014). Is the provision of park-and-ride facilities at light rail stations an effective approach to reducing vehicle kilometers traveled in a US context?. *Transportation Research Part A: Policy and Practice*, 66, 65-74.

Other strategies to promote metro rail ridership and hence boost revenues include elevated pedestrian walkways (up to 2 km) connecting metro stations and other modes that can ease transfers (there can be commercial activities along the walkways too), and light or monorail systems in business districts to offer first/last mile connections to metro rail systems.

## **2.5. A summary of innovative feasible revenue options**

In this section, we present a subjective assessment of the various feasible non-fare revenue generation instruments/mechanisms based on the following criteria:

- i. The magnitude of revenue that will potentially be available for metro rail systems
- ii. Predictability or certainty of the revenue as a one-time fund or recurrent stream for metro rail systems
- iii. Equity concerns associated with revenue generation
- iv. Impacts of the revenue generation instrument on transit use, including metro rail use
- v. Impacts of the revenue generation instrument on transit-oriented development
- vi. Public acceptance of the instrument and underlying policy
- vii. Ease of implementation of the revenue generation instrument
- viii. The level of government responsible for policy formulation to implement the instrument

The following table summarizes the assessment for reference. The assessment provides a general framework for comparing the various charges and taxes discussed in this report and should not be used as an objective basis for instrument selection. In general, all the instruments/mechanisms discussed have the potential to generate significant funds for metro rail systems in Indian cities.

Table 6: Subjective assessment of alternative revenue generation mechanisms

Instrument	Potential revenue for metro	Predictability of revenue for metro	Equity concerns	Impacts on transit use	TOD impacts	Public acceptance	Ease of implementation	Responsibility for policy enactment and implementation
Betterment levy	High	High	High	None	Moderate	High	High	State
Land readjustment	High	High	High	None	High	Low	Low	State
Impact fee	High	High	Moderate	None	Moderate	High	High	State
Air rights dev.	Moderate	Moderate	Low	Positive	High	High	High	State
Addl. dev. rights	High	Moderate	Low	Positive	High	Moderate	High	State
Tax incr. fin.	High	High	High	None	Moderate	Low	Low	State
Congestion charging	High	High	High	Positive	High	Low	High	Local
Parking pricing	High	High	High	Positive	High	Low	High	Local
Fuel carbon tax	High	High	High	Positive	Moderate	Low	High	State
Carbon tax	Unclear	Unclear	Low	None	None	High	Low	Central
Cap and trade	Unclear	Unclear	Low	None	None	High	Low	Central
Tax on HEV	Moderate	High	Low	None	None	High	High	State
Veh. registration	Moderate	High	Moderate	Moderate	Moderate	Moderate	High	State
Employer levy	Moderate	High	Low	None	None	High	High	State

Author's subjective analysis

Note: A list of sources that have been referred to for developing this chapter, in addition to the references included as footnotes throughout the chapter, are given at the end of the report.

## 3. METRO RAIL FARE FIXATION

### 3.1 Context

As discussed in previous chapters, identifying and adopting sustainable funding and financing mechanisms for making appropriate capital expenditures (for new developments as well as system augmentations and upgrades) as well as to cover part of operations and maintenance expenditures (specifically when fares are kept low) of metro rail systems are critical. In addition, it is also important to develop robust institutional structures and well-established technical mechanisms for ensuring that fare box revenues of metro rail systems are maximized. The significance of robust fare box revenues for debt/loan repayments (that are usually the responsibility of the metro rail SPV/authority), sustaining operations and maintenance costs/ payments, and, if possible, generating funds for contributing to future system upgrades cannot be overstated.

We know that Indian metro rail systems suffer from a lack of periodic fare updates leading to gradual erosion of the real value of fares, plummeting real revenues, increasing subsidy requirements, and sudden large fare increases after long periods that potentially cause significant customer dissatisfaction and ridership loss. This chapter therefore focuses on policy and procedural changes necessary for improving the periodic fare revision processes of the metro as well as the new breed of regional rail systems in India.

Prudent fare setting (along with planning, design, management, and pricing initiatives to promote ridership) is important for ensuring the healthy financial performance of metro systems. The Government of India's General Financial Rules (2017) clearly states that every government ministry/department must ensure that user charges (in this case fares) recover the current cost of providing services with a reasonable return on capital investment. This suggests that metro rail fares not being able to ensure cost recovery may be a concern for government-owned systems.

Fare revisions are extremely important. We know that fare box revenues of metro and regional rail systems may not be able to cover the total operations and maintenance costs, let alone total annual costs including loan repayments, etc. This is, in part, due to relatively low fare levels, considering the social obligation of metro systems – i.e., provision of accessibility for various sociodemographic groups, and the need for maximizing ridership and system utilization for deriving larger environmental, social and transportation network performance benefits. Consequently, even small declines in fare box revenue relative to the cost of delivering service can lead to significant deteriorations in service levels, thereby eroding transit patronage. Such declines can happen due to increases in operations and maintenance costs, ridership fluctuations across space and over time, fare evasion, etc. Declines become inevitable particularly when fares are not reviewed and revised along with supply-side cost increases and changes in macroeconomic conditions such as inflation. Institutional arrangements and established methodologies for fare revision are therefore useful.

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37. Government of India (2017). General Financial Rules. Department of Expenditure, Ministry of Finance, Government of India. Retrieved from [https://doe.gov.in/sites/default/files/GFR2017\\_0.pdf](https://doe.gov.in/sites/default/files/GFR2017_0.pdf).

The Government of India's General Financial Rules (2017) state that user charges of government services should be linked to appropriate price indices and reviewed at least once in three years and that ease of revision should be enabled. Interestingly, however, for Indian metro systems that are partly or wholly owned by the Government of India, neither are fares linked to economic and price indices, nor are fares systematically reviewed and revised periodically. The fare revision mechanism is complex. As per The Metro Railways (Operation and Maintenance) Act (2002), although the initial (first) fare can be set by the metro rail administration, any subsequent fare revision requires the constitution of a Fare Fixation Committee that comprises a Chairman (a person who is or has been a Judge of a High Court) and two other members (persons who are or have been Additional Secretary to the Government of India or hold/held comparable positions in the central or state governments) nominated by the central and state governments. The committee, with data and information inputs as well as proposals from the metro rail authority and other experts, makes binding recommendations that must be implemented by the metro rail administration. In practice, metro rail fare revisions in India have historically been challenging due to a lack of consistency in activating the revision process, delays in analysis and decision-making, and the lack of uniform and objective revision methodologies. At the time of writing this report in 2023, the last fare revision of India's largest metro rail system, Delhi Metro, happened more than six years ago. The consequence has been undesirable for both metro rail agencies as well as patrons. While agencies have to keep increasing operating subsidies over long and uncertain periods, patrons have to endure sudden steep fare increases. Both effects are economically unproductive, politically undesirable, and detrimental to public transit.

Many cities around the world including Asian cities have benefited from the formalization and streamlining of fare revision processes. Metro rail infrastructures are critical for sustainable urban development in Indian cities, and therefore it should be ensured that the financial sustainability of these systems is not threatened by the lack of efficient institutional and technical arrangements for systematic periodic fare review and revision.

## 3.2 Metro rail fare revision process: Experiences from India and abroad

This section presents key insights from the fare revision approaches adopted by Indian (Delhi Metro) and international (Hong Kong MTR and BART, United States) metro rail systems by evaluating various publicly available fare revision reports/documents, media analysis, and literature reviews. We summarize the need, aims, periodicity (intervals within which fares are revised) and the revision methodology/formula of Delhi Metro, Hong Kong MTR, and BART, United States.

### 3.2.1 Delhi Metro

The National Council of Applied Economic Research (NCAER) proposed Delhi Metro's initial fare in 2002. After that, the fares were revised in 2004, 2005, 2009, and 2016. The fundamental principles of balancing financial sustainability and maintaining fare affordability guided all four fare revisions. All four fare fixation committees (FFCs) aimed to propose a fare structure to cover the aggregate costs and attain a no-profit and no-loss position. The need for the 1st fare revision

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38. Refer to [https://www.mohua.gov.in/upload/uploadfiles/files/MetroRail\\_Act\\_2002.pdf](https://www.mohua.gov.in/upload/uploadfiles/files/MetroRail_Act_2002.pdf).



(2004) was required due to the commissioning of the new sections of the Delhi Metro at the end of 2004, which led to about 30% of the system being operational (DMRC, 2004). The rationale of the 2nd fare revision (2005) was due to the anticipated commissioning of a major portion of the 3rd line of Delhi Metro from Barakhamba to Dwarka by December 2005, leading to distances outside of the fare slabs considered by the 1st FFC (DMRC, 2005). Further, the need for the 3rd fare revision (2009) was driven by the commissioning of the full 2nd phase including the Airport Express Line (AEL) and other network expansions. The construction of AEL was under the Public Private Partnership (PPP) model, where the costs of civil infrastructure were borne by the DMRC, and the remaining costs were incurred by the concessionaire, making it inevitable to revise fares (DMRC, 2009). The 4th fare revision (2016) was implemented in two phases, i.e., in 2016 and 2017. The need for it was felt due to the prolonged break in fare revision since the 3rd FFC reviewed fares around seven years ago (DMRC, 2016).

The 4th FFC (2016) suggested an automatic fare revision formula to revise the then-prevailing fare structure moving forward. The formula specified the per cent change in fare (over a certain period) in each fare slab as a function of change in the unit cost of energy, consumer price index, and maintenance and other costs. Additionally, the committee recommended considering a productivity factor to moderate fare increases in line with the fare revision philosophy adopted by Hong Kong Metro. The 4th FFC recommended that fares be adjusted annually and implemented on 1st January every year. However, the fares have not been adjusted annually in practice.

### **3.2.2 Hong Kong MTR**

The rail merger in 2007 between Kowloon Canton Railway Corporation and the Hong Kong MTR Corporation Limited (MTRCL) has implemented the Fare Adjustment Mechanism (FAM), eliminating the autonomy MTRCL previously had. The FAM is a transparent, objective method that determines the Fare Adjustment Rate (FAR) using data from the Hong Kong Census and Statistics Department that represents Hong Kong's general economic performance (Transport and Logistics Bureau Transport Department, 2022). The primary guiding principles assure financial viability, including a steady revenue stream for the upgrade, renewal, maintenance, and improvement of the railway network and facilities. The general fare adjustment equation includes factors such as the Composite Consumer Price Index, Transport Nominal Wage Index and a Productivity Factor.

The fare adjustment rate for a given year is calculated as the overall fare adjustment rate minus a special annual adjustment. The special adjustment intends to minimize fare adjustment as per FAM and maintain a moderated fare level for riders (Transport and Logistics Bureau Transport Department, 2022). Since the 2013 FAM review, an affordability cap has been imposed to limit the effective fare increase to the year-over-year change in the Median Monthly Household Income (MMHI) for the fourth quarter of the preceding year. The FAM is legally enforceable and is reviewed every five years (Transport and Logistics Bureau Transport Department, 2022).

### **3.2.3 San Francisco BART**

The Bay Area Rapid Transit (BART) adopted a fare increase system based on inflation that was endorsed by the Board of Directors in 2003. The primary purpose of the fare increase is to ensure that the costs associated with providing safe and dependable service are covered.

Any additional revenue generated by the fare increase is allocated to the system's operational and capital expenditures. In addition, fare revision increases funding for train service, improved sanitation, increased police and unarmed safety personnel presence, and capital expenditures such as the purchase of new train coaches.

BART revises its fare every two years at 0.5 percentage points below inflation. It has increased fares by 5.4% in 2020, 2.7% in 2018, 3.4% in 2016, and 5.4% in 2014. The BART system experienced the latest fare hike on July 1st, 2022, by 3.4%. This fare increase is significantly lower than the current inflation rate and complies with the Board-approved Inflation-Based Fare Increase Program. This program provides passengers with a predictable pattern of minor fare increases below inflation over some time.

### 3.2.4 Literature review

Insights from studies conducted by Vickrey (1955), Looi & Tan (2007), Soon & Hong (2009), Wang et al. (2015), and Zhao & Zhang (2019) suggest that systematic and frequent review and revision of fares are required if a desired level of income, and consequently desired levels of service and ridership are to be maintained.

We reviewed various news articles to understand the perceived impacts of fare adjustments in Delhi, Hong Kong, and San Francisco. In general, we find that in Delhi, large fare increases after prolonged intervals are not appreciated by existing riders and potential passengers. Even when fare increases are warranted due to inflation and cost increases, long time intervals between fare revisions and consequent abrupt fare changes hurt ridership demand. The key learning is that the fares should be revised frequently so the riders get accustomed to small and regular (expected) fare hikes. Based on the opinions of lawmakers and NGO spokespersons regarding the Hong Kong MTR fare hikes, we find that large fare increases are not readily accepted by the travelling public in the context of profit-making transit companies experiencing service quality disruptions. To ensure passengers' acceptance of fare increases, hikes must occur simultaneously with service quality enhancements. Analysis of Singapore LRT's fare revisions indicates that travellers will accept fare hikes if the service is dependable and the operators raise fares due to upgrades to the system. Maintaining and increasing the level of service and efficiency is crucial.

## 3.3 Recommendations

We offer the following guidance related to institutional arrangements and streamlined technical processes that should be adopted for periodic fare revision of new and existing metro/regional rail systems in India.

Table 7: Recommendations related to fare revision of Indian metro rail systems

<b>Institutional issues</b>
<ul style="list-style-type: none"> <li>• Formula-based frequent, preferably annual, fare revisions should be made so that customers experience small and regular (expected) fare increases.</li> <li>• The Metro Rail Policy should recommend the overarching structure of a fare revision formula in line with Delhi Metro’s 4th FFC recommendations and other international examples. The Policy should also stipulate a maximum annual increase rate (e.g., 5–6%, based on justifications) in the average fare level that may be updated through amendments periodically.</li> <li>• The metro rail authority should follow the Metro Rail Policy guidance, formulate a fare revision formula based on the specific context, and notify the formula along with a detailed revision implementation process at the time of initial (first) fare notification. The approval of the initial fare and the fare revision formula should be done together by the respective approval authority.</li> <li>• The metro rail authority should implement fare revision at a certain date each year, subject to the ceiling given in the Metro Rail Policy, without the requirement of any additional approvals.</li> <li>• If fare revision beyond the annual fare increase rate ceiling stipulated in the Policy is necessary, or if any change in the fare revision formula is proposed, only then fresh review and approval should be necessary. An independent fare regulation standing committee or metro/transit tariff regulatory commission (similar to the Central Electricity Regulatory Commission) that can deliver timely decisions should be in place for such approvals (refer to the next chapter).</li> </ul>
<b>Technical issues</b>
<ul style="list-style-type: none"> <li>• The fare revision formula should address inflation effects on components such as O&amp;M cost, energy, staff salaries, etc.</li> <li>• Productivity benefits, whenever applicable, should be passed on to customers.</li> <li>• Annual fare increase (%) cap and floor may be necessary in the average system wide fare or each fare slab, as relevant.</li> <li>• Revision must be periodic (annual) and predictable.</li> </ul>
<b>General considerations</b>
<ul style="list-style-type: none"> <li>• Systematic periodic fare revision is essential to maintain a certain revenue level in real terms; any significant deficit can impact service quality and system efficiency.</li> <li>• Fare revision formula should be reviewed by the metro rail administration as the system matures and productivity increases.</li> <li>• Fare increase should be made alongside service quality maintenance or improvement to ensure riders’ acceptability of such increases.</li> </ul>

Note: A list of sources that have been referred to for developing this chapter, in addition to the references included as footnotes throughout the chapter, are given at the end of the report.

## 4. POLICY RECOMMENDATIONS

### 4.1 Core objectives

The development, facilitation and adoption of sustainable transportation systems, or low-carbon, resilient and inclusive modes of transportation, are critical for achieving India's sustainable urban development goals. The transition towards sustainable multimodal urban and regional transportation that includes electric rail-based systems requires significantly large capital investments as well as ongoing operations-maintenance expenditures that can potentially exceed the costs of traditional public transportation solutions. Given the fundamental economics of transportation and the larger social and environmental goals of urban planning, the role of the government in sustainable urban transportation system development and service provision is inevitably high. It will be impractical and idealistic to imagine a wholly or predominantly privatized urban transportation environment that is environmentally sustainable and socially equitable soon unless natural or policy-induced dramatic structural transformations in urban forms and consumer preferences happen. In the real world, governments or government agencies will have to continue owning and supporting significant parts of multimodal urban transportation networks and often maintain fares at affordable levels regardless of service provision costs. Governments will have to additionally play a major role in creating or expanding conditions – using planning, design and policy tools – such that private sector interest in the ownership and operations of certain profitable parts of multimodal networks can be increased.

It is therefore imperative for governments at all levels to establish institutions, policies and processes that can help: 1) generate appropriate large public funds without hurting the economy, 2) attract private sector participation to the extent feasible, and 3) become more prudent at selecting the most effective and efficient transport infrastructure mix, to effectively promote sustainable transportation across Indian cities. These policies and processes can help improve the financial performance of metro rail systems as well. We do understand that a simplistic financial cost-benefit analysis should not be solely used to assess the performance of and make decisions on sustainability projects such as public transit, but financial productivity is still important for public transit's continued social and political support. We offer guidance in this chapter.

Before recommending a specific institutional and policy framework, let's discuss the core objectives and principal considerations that should guide India's metro rail policy.

#### Five core objectives:

1. To activate innovative local revenue sources for metro rail
2. To increase the financial accountability of metro rail authorities
3. To streamline the metro rail fare review and revision processes
4. To enhance private sector interest in metro rail financing and investing
5. To ensure that public money is spent on metro rail projects responsibly

**Five key considerations:**

1. Urban local (municipal) governments should find space as key stakeholders in metro rail system planning and finances. Local bodies have a major role to play in the identification, implementation, collection and management of innovative local funding and financing mechanisms with state government support and facilitation, as discussed in previous chapters. Effective leveraging of local governments' capabilities is critical for prudent operational and financial planning of urban transportation systems. Local government involvement can also help implement local, contextual strategies for boosting transit ridership using a variety of tools. It is important to design institutions and processes that can incentivize local and state governments to collaboratively identify and activate creative local resources using efficient and fair charges and taxes.
2. As a principle, the market inefficiencies, particularly unjust subsidies for carbon-intensive personal transportation modes, must be addressed using pricing tools. Metro rail can never succeed in generating sufficient ridership and becoming financially healthy if alternative modes are not managed well, either in the form of investments (e.g., walking and bicycling) or taxes (e.g., motorized vehicles with negative externalities). In other words, metro rail's financial performance is governed by some factors that are currently not under the direct control of metro rail authorities.
3. Metro rail should fundamentally be viewed as a component within the larger multimodal transportation network in cities. Metro rail can only be an effective solution that enhances urban mobility and accessibility in a low-carbon manner when planned strategically. When, where and how much metro rail is required are scientific rather than political questions. Institutions and processes that can ensure prudent decision-making can help enhance metro rail's positive impact as well as its productivity. In general, central and state funding support should be extended to solutions that can solve a critical urban transportation problem rather than a preferred mode. For example, BRT or bus-based transit solutions may be more effective and cheaper than rail in certain urban contexts, but such projects may become unattractive because of governments' funding priorities.
4. The central government should continue to search for ways to tax carbon across sectors. A central trust fund using a portion of the taxes should be created to specifically support sustainable urban transportation projects including metro rail systems across cities based on a streamlined mechanism of fund disbursement that ensures judicious spending by transportation authorities.
5. In general, all government funding such be based on rigorous assessments of operational and financial performance (actual or planned) so that metro rail systems can effectively contribute to larger environmental and social goals and also remain financially viable. This means that user fee-based revenues should be maximized to the extent possible, and creative sources of substantial non-fare revenues should be identified and implemented. Metro rail systems that are based on overly optimistic ridership and cost estimations are usually never financially viable or socially impactful. An arrangement of independent project review, appraisal and approval is essential for metro rail projects to be successful.

## 4.2 A paradigm shift: UMTA 2.0

### 4.2.1 Overview

The principal institutional and policy change that is essential to create a structure or framework within which prudent decisions lead to the financial success of existing and planned metro rail systems in Indian cities is the establishment of Unified Metropolitan Transport Authorities (or UMTAs). While the UMTA idea has been discussed for a long time and some cities have already

established UMTAs, we propose a significant expansion in the scope of UMTAs' functions and responsibilities and a modification in UMTAs' organizational setup. For simplicity and policy continuity, we retain the nomenclature of the unified body. We suggest that to make metro rail systems financially healthy, we need to think beyond metro rail and consider a paradigm shift in urban transportation policy.

Before elaborating on the UMTA 2.0 proposal, let's discuss the existing UMTA model in India and what the UMTAs have achieved so far.

## 4.2.2 The current status of UMTAs in India

India's National Urban Transport Policy (2006) highlighted the need for and introduced the concept of UMTA. The policy recommended the setting up of UMTAs in "all million plus cities, to facilitate more coordinated planning and implementation of urban transport programs and projects and an integrated management of urban transport systems." Following are the salient features of the existing UMTA model along with a discussion on the status of the model.

### ***Rationale for establishment***

The complexity arising from multiple laws at the central and state government levels, along with the involvement of various authorities and departments, is known to hinder the development of integrated and sustainable urban transport solutions. The NUTP-2006 acknowledged that the current governance structure in the transport sector lacks the appropriate mechanisms to address urban transport issues effectively. As a solution, it proposed the establishment of UMTA in all cities with a population of one million or more.

UMTA's primary purpose is to enable better coordination in planning and executing urban transport programs and projects. To achieve this, the NUTP suggested reassigning existing functions from various agencies to facilitate the integration of land use and urban transport planning and ensure the successful realization of UMTA's objectives. According to the recommendations from the Working Group on Urban Transport in the 12th Five-Year Plan, UMTA is envisioned as an executive body governed by a board composed of city department heads, local elected officials, and prominent citizens. The board's responsibilities encompass policy formulation, regulation, comprehensive planning for transport services and associated infrastructure, organization and coordination among different organizations and agencies, and management of shared facilities, among others.

### ***Benefits***

The current coordination between transport and land use plans, infrastructure investments, and urban services involves multiple departments and agencies at different levels, leading to difficulties in seamless integration due to their diverse missions, objectives, budgets,

39. Refer to the National urban Transport Policy document at <https://mohua.gov.in/upload/uploadfiles/files/TransportPolicy.pdf>.

40. The existing UMTA model description is based on the following sources: Government of India. (2016). Operations Document for Unified Metropolitan Transport Authority (UMTA). MoUD; Desai, D. (2022). Lost in transit: Unified Metropolitan Transport Authority (UMTA). Retrieved from <https://www.orfonline.org/expert-speak/lost-in-transit-unified-metropolitan-transport-authority-umta/>; Reeves, S. (2018). Successes and Failures of UMTAs in India", How Kochi can Perfect Integration of Public Transport. Retrieved from [http://www.kochipublictransportday.org/blog-details/2/Successes\\_and\\_Failures\\_of\\_UMTAs\\_in\\_India\\_%E2%80%93\\_How\\_Kochi\\_can\\_Perfect\\_Integration\\_of\\_Public\\_Transport](http://www.kochipublictransportday.org/blog-details/2/Successes_and_Failures_of_UMTAs_in_India_%E2%80%93_How_Kochi_can_Perfect_Integration_of_Public_Transport).



management styles, and governance structures. This lack of coordination negatively impacts the transport system's effectiveness. To address this issue, the UMTA model has been proposed, encompassing all planning and implementation functions related to urban transport programs and projects. UMTA aims to align the responsibilities of all urban transport agencies, streamlining their functioning and creating a unified agency to oversee the planning, operations, and monitoring of various transport modes in a city. The integration of urban development planning with transport decisions shall be a key objective of UMTA, facilitating holistic and coordinated urban mobility planning. UMTA is also envisioned to establish regulatory mechanisms for periodic review and updates of fares for all public and intermediate public transport systems.

Research and development are essential functions that play a crucial role in optimizing investment and utilization in the urban transport system. To make well-informed decisions, agencies and the public should have access to data and information related to the transport system, including travel patterns for different resident categories and transport modes, as well as information on sustainable modes of transport. Such data helps in tailoring fare structures based on peak and off-peak periods and enables service providers to implement price discrimination strategies while maximizing revenue and meeting welfare objectives. UMTAs are expected to address the lack of trained staff and technology adoption in state and city authorities to cope with increasing traffic volume and urban transport challenges. It is expected to provide guidance, consultancy services, and integrated solutions to urban transport problems through research, studies, awareness campaigns, and promotion of best practices in the field.

### **Functions**

The transportation system in a city comprises various components, including land-use plans, road networks, public and private transport modes, parking facilities, regulatory systems, and traffic management. Typically, strategic policymaking is carried out by central and state governments. UMTA is anticipated to take on planning and regulatory functions, focusing on ensuring a well-coordinated urban transport system within the city. Since UMTA is envisioned as a planning and regulatory body, it will not be involved in public transport operations, infrastructure construction, and maintenance, as these responsibilities may remain with the local or state government. The UMTA aims to facilitate the seamless integration of multiple transport modes to create a unified and efficient urban mobility system.

### **Current status**

The establishment of the UMTAs was recommended by the NUTP in 2006. Its implementation, however, has been limited, with only a few cities taking decisive steps towards its formation. Mumbai and Delhi have attempted to comply with the central mandate. In 2008, the government of Maharashtra formed UMTA under the MMRDA through a government resolution, comprising a "Main Committee" chaired by the Chief Secretary and other sub-committees. Subsequently, a "Core Committee" was introduced two years later to assist the main committee. The Delhi Integrated Multi-Modal Transit System Ltd. (DIMTS), formed in 2006 and not a UMTA per se, is limited to overseeing the city's cluster bus operations introduced in 2010 and lacks influence over the much larger Delhi Transport Corporation operations. Both Mumbai's UMTA and DIMTS have merely complied with the national mandate without obtaining any statutory or empowered status. Hyderabad's experience with UMTA also illustrates the establishment of an ineffective body comprised of multiple government departments and parastatals, leading to conflicting



objectives and turf wars. Chennai's CUMTA, created through Tamil Nadu state government legislation in 2010, is also largely a coordinating agency and has also had limited authority and impact. Moreover, the Bengaluru Metropolitan Land Transport Authority (BMLTA) Bill, 2022 makes the BMLTA the transportation planning and coordinating body. Most states, even those with metro rail systems, are yet to establish a functional UMTA that effectively serves the stated purpose. The integration of various public transport modes successfully necessitates concerted efforts from all stakeholders to reform the functioning of a city's public transport system. UMTAs are organizations with limited powers, heavily reliant on other agencies for support and project implementation. The key to UMTA's success lies in its leadership, acting as a crucial link between national, state, and local governments, bringing together powerful actors in the city's public transport sector. Successful integration of public transport modes requires substantial efforts from all involved parties to transform the functioning and operations of the city's transport system.

### 4.2.3. International UMTA models

India has much to learn from international models of integrated metropolitan transportation agencies. Cities around the world including London, Singapore, Los Angeles, Vancouver etc. can be referred to for studying the structures and functions of integrated agencies, and the policy frameworks that enable and empower the agencies.

TfL, created by the Greater London Authority (GLA) Act, 1999, is an integrated statutory body that is responsible for planning, delivery, and day-to-day operations of London's multimodal public transportation systems as well as London's main roads. The Mayor of London is the Chair of the TfL Board. TfL is a single organization that owns and operates most of London's transportation systems. TfL is responsible for all aspects (from strategic visioning through operations and maintenance) of London's buses (currently more than 9,000 vehicles operating across more than 650 routes), underground rail (currently covering over 400 km and serving close to 300 stations), Docklands Light Railway, London Overground, trams, major roads and traffic management, river services, dial-a-ride, cycling and walking networks, cable cars, etc. TfL also regulates and licenses taxis and privately hired vehicles, and engages in property development and other commercial activities to raise revenues. Some operations are performed by private operators through contracts awarded by TfL.

TfL manages transportation funding for London's multimodal transportation systems that it owns and operates. It draws from a variety of funding sources including fare income, congestion charges, Ultra Low Emission Zone charges, grants from central and state governments, borrowings, etc. TfL conducts studies, submits proposals, and periodically enters into long-term funding agreements with governments. Government funding is mainly based on an assessment of past performance, new project proposals, and the need to sustain critical transportation operations. Depending on government funding availability limits and TfL's requirements based on the region's transportation needs, TfL periodically identifies alternative funding and financing measures. Due to its financial powers, autonomy and accountability, TfL claims that it will be able to achieve a financially sustainable position and fund operations through normal revenue sources soon.

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41. Information source for TfL: <https://tfl.gov.uk/>.

The powers and functional responsibilities of the TfL allow it to strategically channel resources to achieve larger urban livability goals such as safety, sustainability and inclusivity. For example, TfL has set a target that 80% of all journeys should be made on foot, by cycle or using public transport by 2041. Achieving such goals is impossible in the presence of multiple organizations planning for, owning, and operating diverse transportation systems in a city, and when transportation decision-making is performed outside of cities at the central or state levels, like in India.

Los Angeles follows a similar model where the Los Angeles County Metropolitan Transportation Authority (LACMTA) serves as the transportation planner and coordinator, designer, builder, and operator at the county level. Like TfL, LACMTA is responsible for multimodal systems including bus, metro rail including subway and light rail systems, busways, bicycle facilities, ridesharing, carpool lanes including priced express lanes, etc. Certain services are delivered through partnerships with independent contractors. LACMTA is funded through fares, road tolls, transportation services revenues, state and federal grants, dedicated local sales taxes, and bonds.

Models such as TfL and LACMTA should guide India's UMTA 2.0 framework. We offer guidance in this report.

#### **4.2.4 Proposal for UMTA 2.0 in India**

We propose a significant change in the institutional structure and major expansions in the functions and responsibilities, including financial responsibilities, of Unified Metropolitan Transport Authorities (UMTAs) in the UMTA 2.0 model. We also propose that a dedicated Unified Metropolitan Transport Fund (UMTF), managed by the UMTA, be the only city-level fund that will be used for funding multimodal transportation systems in cities.

We offer general guidance and an overarching framework in this report so that appropriate policies and processes can be developed. The following is not an operationalization plan and does not include a comprehensive list of all functions that the proposed UMTAs should serve. This proposal underscores the need for rigorous studies leading to a detailed proposal for UMTA 2.0. The final UMTA 2.0 policy should be crafted and implemented by a relevant ministry such as the Ministry of Housing and Urban Affairs.

This proposal helps address concerns and meet the strategic objectives of urban transportation planning and development identified throughout this report. In addition to helping improve the financial performance of metro rail systems in India (i.e., the principal scope of this study), the proposal provides the institutional and policy framework for improving urban transportation planning and operations in India.

The UMTA 2.0 proposal is as follows:

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42. Information source for LACMTA: <https://www.metro.net/>.

## UMTA 2.0

1. The existing UMTA model's fundamental purpose is to enable better coordination in planning and executing urban transportation programs and projects. In the proposed UMTA 2.0 model, the UMTAs will serve as the planner, owner, builder, and operator of all transportation systems/networks within their jurisdictions. This is the overarching change proposed. While the current UMTA model may be considered as a subset of UMTA 2.0, we suggest a major shift (leapfrogging) in the institutional and policy framework since incremental increases/amendments in UMTA's functions will be difficult to achieve. The existing UMTA model has not been implemented widely or adequately anyway, which, ironically, will prove to be an advantage. Indian cities also do not have the time for incremental shifts given the urgency of addressing urban issues.
2. UMTAs should develop a strategic vision of multimodal transportation system planning and development in cities to meet the larger goals of carbon neutrality, inclusivity, and resilience. UMTAs should strive to plan for appropriate, contextual solutions to solve urban problems within their jurisdictions. Mechanisms to ensure high levels of service quality and performance as well as superior financial performance across modes – rail, buses, road systems, etc. – should be prioritized. UMTAs should have the capability to identify and implement creative revenue streams involving a variety of charges and taxes within their jurisdictions. A detailed operationalization plan outlining the necessary legal powers and organizational structures should be devised. In the context of the present study, contextual solutions, multimodal orientation, and financial autonomy of UMTAs may help improve the financial performance of existing and planned metro rail systems as well.
3. All million-plus cities should mandatorily form UMTAs within a certain timeframe. Cities that have operational metro rail and cities where metro rail systems are either under construction or sanctioned should form UMTAs urgently within a stricter timeline. Two or more relatively smaller million-plus cities without metro rail plans within the same state may form a single UMTA to start with. This is common in the case of development authorities as well. These joint UMTAs can be split later on as required. UMTA jurisdiction and boundary delineation should be performed by state governments.
4. A senior professional (respected administrator or transportation expert) should serve as the independent CEO/MD of a given UMTA. The UMTA board should comprise representatives from the local/municipal bodies, state and central governments, and eminent experts in the field of transportation, among others. The selection, nomination and appointment processes of the UMTA administration should be developed.

5. The UMTA in a city/jurisdiction should take over ownership, operations and maintenance of all non-privatized transportation infrastructures in the city including roads and all modes of public transit. Consequently, all city or metropolitan area-specific transportation-related functions such as policy formulation, strategic planning, project appraisals and approvals, project implementation, operations and maintenance, funding, and research should be the responsibility of the UMTA. The UMTA can appoint contractors for any of the functions. The UMTA can also enter into equity partnerships with private sector entities when required or feasible. The UMTA will also be responsible for managing, regulating and licensing the private transportation service network layer (e.g., app-based ride-hailing), micro-mobility layer (e.g., shared bicycles and electric scooters, etc.) and the city logistics layer (e.g., e-commerce deliveries, goods movement, warehousing, etc.). Moreover, traffic control, integrated mobility payment systems (e.g., transit smart cards, etc.), multimodal system data collection and real-time travel information provision should also be the UMTA's responsibility. There may be other allied functions; this is an indicative list of principal functions rather than an exhaustive list. In sum, all intra-city surface transportation networks should be under the UMTA. This would require major institutional changes and systematic transfers of ownership of transportation assets and functions across cities. A comprehensive study to prepare a roadmap for ownership transfers, mergers and dissolutions, and functional and technical handovers in a legal manner should be conducted.
6. Ownership and planning-operations responsibility across road and transit modes have inherent advantages. This will allow, for example, a single authority to implement plans and policies and make strategic investments to promote mode shifts (e.g., from personal vehicles to transit), perform coordinated operations to facilitate transfers (e.g., coordinated scheduling of bus and rail) and ensure seamless travel, boost electric vehicle adoption (e.g., through charging infrastructure location decisions), encourage non-motorized travel (e.g., by building bike paths), and create truly multimodal inclusive cities (e.g., by implementing complete streets).
7. As discussed earlier, UMTAs should have the capability (via established legal powers and organizational structures) to generate funds from innovative local and regional taxes and charges (e.g., for land value capture, congestion taxation, vehicle registration surcharges, employer levies, etc.). UMTAs should have the power to finance sustainable transport projects using instruments such as UMTA green bonds. UMTAs should be able to enter into PPPs with private investors/developers. This autonomy will help UMTAs make financial planning in an integrated manner, cross-subsidize modes as required, supplement fare box revenues with non-fare revenue streams effectively, minimize government grant requirements, and ensure that the urban transportation system remains productive overall. In addition to funding transportation systems directly, this will enable UMTAs to strategically attract new development for housing and commercial activities, stimulate urban regeneration, and promote sustainable transportation adoption.
8. UMTAs should have the autonomy to set and revise public transit fares as well as implement and revise road use charges and parking fees. Public transit and metro rail fare setting and revision processes should be overseen by an independent standing committee formed by the UMTA board in a way that is aligned with the fare fixation-related recommendations given in Chapter 3. A detailed system should be designed so that transit fare setting and revision are done scientifically.

9. The UMTA would be solely responsible for funding multimodal transportation systems in cities. A dedicated Unified Metropolitan Transport Fund (UMTF) will be used for this purpose. Just like TfL, the UMTF will draw from a variety of revenue sources including fare incomes, non-fare revenues from local/regional sources as discussed in Chapter 2, external borrowings, loans or grants from central and state governments, etc. Disbursement of funds from the unified fund should be based on strategic needs leading to donor and donee modes/infrastructures within cities. This will be positive for ensuring sustainable and balanced urban development, e.g., prioritizing certain infrastructures and promoting certain modes over others based on contextual needs and behaviours. Cross-subsidization to meet larger financial and livability objectives is justified.
10. UMTAs should enter into three- or five-year agreements with central and state governments for grant and other funding/financing support. Fund allocations or financial assistance to the UMTF by central and state governments should be based on a rigorous evaluation of project and program proposals. Support should be a function of past performance, demonstrated future needs, expected impacts, and plans for ensuring financial viability. In other words, UMTAs should be made responsible and accountable. For sanctioning central financial support, an independent standing committee (that includes, among others, eminent experts and professionals in transportation) for evaluating and approving UMTAs' proposals should be formed within a ministry such as the Ministry of Housing and Urban Affairs that governs urban transport funding/financing issues. Moreover, a dedicated National Urban Transport Fund (NUTF) should be created. The NUTF may comprise allocations from various existing or anticipated revenue streams such as the Sovereign Green Fund, fuel cess, carbon taxes, transfers from the general fund, etc., that can justifiably be allocated to urban transportation, particularly sustainable transportation projects. Examples of such funds are the US Highway Trust Fund (HTF) which funds mass transit as well, and the UK Local Sustainable Transport Fund (LSTF). Transfers to UMTAs' UMTF accounts from the NUTF should be a combination of formula-based assistance and competitive funding, similar to the US Federal Transit Administration's approach, adjudicated by the independent standing committee mentioned previously. This will further ensure judicious use of funds for urban transportation, and incentivize UMTAs to plan for appropriate, impactful and viable transportation systems in a cost-efficient manner.

43. Refer to the US Department of Transportation's Highway Trust fund website at <https://www.fhwa.dot.gov/highwaytrustfund/>.

44. Refer to the UK Government's LSTF website at <https://www.gov.uk/government/collections/local-sustainable-transport-fund>.

45. Refer to the US Federal Transit Administration's Grant Programs website at <https://www.transit.dot.gov/funding/grants/grant-programs#:~:text=FTA%20provides%20grants%20to%20local,commuter%20rail%2C%20trolleys%20and%20ferries>.

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