

SECTOR ASSESSMENT (SUMMARY): TRANSPORT (RAIL AND URBAN)

A. Sector Road Map

I. Sector Performance, Problems, and Opportunities

1. **Urban transport in India.** Efficient and sustainable urban transport systems and mobility are critical for the smooth functioning of India's cities. Although national population growth has slowed to 1.02% per year in 2019 from its peak at 2.33% in 1974,¹ the urban population continues to grow rapidly. It is estimated that more than 50% of Indians will be living in urban areas by 2050, compared with 34% in 2018.² Growing urbanization will result in the total number of Indian cities with populations of 1 million or more growing from 19 cities to 71 cities by 2050. About 70% of net new jobs generated by 2030 will be in urban areas.³

2. Rapid urbanization is intensifying demand for urban transport. India continues to rely heavily on private vehicles for urban transport. From 2003 to 2017, the number of total registered vehicles in India increased 318%, from 67 million to 253 million, an annual growth rate of 10%.⁴ The rapid increase in private vehicles on the roads has led to congestion and severe air pollution, causing serious health problems in many cities. Severe traffic congestion in just four major metropolises—Bengaluru, Delhi, Kolkata, and Mumbai—is estimated to cause \$22 billion in economic losses annually.⁵ Consequently, the government is strongly committed to promoting public mass transport. Public transportation infrastructure in India needs high levels of investment and massive upgrading to spur a shift away from private vehicles to more sustainable forms of transport. Metro rail, particularly mass rapid transit, is seen as a key solution for India's large cities, while smaller and medium-sized cities are exploring other urban transport options.

3. **Metro rail sector.** The country's first mass rapid transit system was the Kolkata Metro, which began operations in 1984; the second was launched in Delhi in 2002. The Delhi Metro is the country's largest network, and has established good practices in operations and management. Following the success of the Delhi Metro, additional metro systems are being built and/or expanded in an increasing number of cities. As of 2019, 640 kilometers (km) of metro railways were operational in 10 cities across India. Of these, 390 km were commissioned during 2015–2019.⁶ An additional 700 km of metro railways are under construction. The newest metro in Nagpur (Maharashtra state) opened on 8 March 2019.

II. Government's Sector Strategy

4. **National policy.** The National Urban Transportation Policy (NUTP), launched by the Ministry of Urban Development in 2006, aims to provide better mobility and sustainability by focusing on moving people, not vehicles. The objective of this policy is to ensure safe, affordable, quick, comfortable, reliable, and sustainable access for the growing number of city residents to jobs, education, recreation, and other needs. It encourages all state capitals and all cities with a population of more than 1 million to start planning high-capacity public transport systems. As per

¹ United Nations Population Fund. 2019. [State of World Population 2019](#). New York.

² United Nations, Department of Economic and Social Affairs, Population Division. 2019. [World Urbanization Prospects 2018](#). New York.

³ McKinsey & Company. 2010. [India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth](#).

⁴ Government of India, Ministry of Road Transport and Highways. 2019. [Annual Report, 2018–2019](#). New Delhi.

⁵ The Boston Consulting Group. 2018. [Unlocking Cities: The Impact of Ridesharing across India](#). Delhi.

⁶ Government of India, Ministry of Housing and Urban Affairs. 2019. [Transforming Urban Landscape 2014–2019](#). New Delhi.

the directives of the policy, high-capacity, rail-based mass transit systems are rapidly being implemented across the country not only to facilitate easy and quick movement of people but also to stimulate economic growth, improve quality of life, and reduce pollution, accidents, and per capita vehicle ownership and usage. States and cities must have a comprehensive mobility plan that is compliant with the NUTP to be eligible for assistance from the central government.⁷

5. **Action agenda.** The Government of India's Three-Year Action Agenda (2017) focuses on improved urban mobility and metro rail systems.⁸ The agenda was developed by the National Institution for Transforming India, which is India's apex planning body. It recognizes that metro rail projects are an efficient source of public transportation in many cities. The success of initial metro rail projects has led to demand from other cities for metro rail projects. This highlights the need for a national metro rail policy that will ensure that projects are not considered in isolation but as part of a comprehensive plan for overall public transportation.

6. **Policy guidelines.** The Metro Rail Policy (2017) aims to ascertain and enhance the feasibility of metro rail projects and to guide state governments in preparing comprehensive project proposals.⁹ The policy sets out guidelines for the development of metro rail projects as well as conditions for receiving central government approval and aid. Two conditions are that projects (i) involve private participation, and (ii) ensure last-mile connectivity for commuters. The policy allows states to formulate rules and regulations and empowers them to establish permanent fare-fixation authorities. It also promotes innovative financing such as value capture finance (VCF). Furthermore, projects should be cleared based on an economic internal rate of return of 14% or more. The policy outlines four models: (i) public-private partnership (PPP) with central assistance, which will be part of the Ministry of Finance's viability gap funding scheme; (ii) fully funded by central government; (iii) fully funded by state government; and (iv) 50:50 equity sharing between the central and state governments.

7. **Value capture finance policy framework.** Urban transit projects, including metro railways, are highly investment intensive. City governments that cannot finance urban transport projects have to rely on financial support from central governments—a common challenge for city governments worldwide. VCF is an innovative approach (i) to monetize land value through induced and activated land-use change, and (ii) to finance projects. The financing tool, which several countries use, is based on the premise that a government makes large investments in developing public infrastructure that leads to rapid economic development in those areas and a sharp increase in land prices. A VCF policy would enable the government (i) to recover a portion of this value including additional taxes and by acting as a realtor, and (ii) to use the revenue to fund infrastructure projects in the same area. The Ministry of Urban Development issued the Value Capture Finance Policy Framework (2017) to apply VCF by specific zone (area) or by project infrastructure.¹⁰ The government has made VCF an integral part of proposals for all central government projects.

8. **National transit oriented development policy.** The Ministry of Housing and Urban Affairs issued the National Transit Oriented Development (TOD) Policy in May 2017.¹¹ The

⁷ Government of India, Ministry of Urban Development. 2015. [Urban and Regional Development Plans Formulation and Implementation Guidelines Vol.1](#). New Delhi.

⁸ Government of India, National Institute for Transforming India. 2017. [India Three-Year Agenda, 2017–18 to 2019–2020](#). New Delhi.

⁹ Government of India, Ministry of Housing and Urban Affairs. 2017. [Metro Rail Policy, 2017](#). Delhi.

¹⁰ Government of India, Ministry of Urban Development. 2017. [Value Capture Finance Policy Framework](#). Delhi.

¹¹ Government of India, Ministry of Housing and Urban Affairs. 2017. [National Transit Oriented Development Policy](#). Delhi.

objective of the TOD policy is to transform Indian cities from private-vehicle-dependent development to public transport-oriented development. To facilitate public transport use, the TOD policy promotes highly dense and mixed land-use development around mass transit stations with an influence zone of 500–800 meters. Institutional incentive mechanisms for the TOD policy include higher floor space index within the influence zone.¹² In addition, the TOD policy includes provisions to improve accessibility to transit stations for pedestrians and nonmotorized transport users through footpaths, bicycle lanes, and other conveniences. The TOD policy also benefits urban poor residents who rely more on nonmotorized transport, including walking.

9. **Public–private partnership.** A PPP component is mandatory for states availing of central assistance for new metro projects under the Metro Rail Policy (2017). The PPP model not only aims to lessen the financial burden on the national government in funding metro projects but also brings in efficiency. However, there have been hiccups for metro rail PPP projects in India over issues like fixation of fares, leading to delays and litigation and impacting viability. The first PPP model for a metro line was applied to the airport line of the Delhi Metro. After the public opening in February 2011, services were suspended in July 2012 due to low ridership, and the operation of this line was eventually taken over by the Delhi Metro Rail Corporation from the concessionaire. The PPP model has also been tried for the Mumbai Metro Line 1, the first line of the network connecting the 11 km section between Andheri and Ghatkopar, which became operational in 2014. However, there was an issue over fare fixation, leading to litigation. The Hyderabad Metro Rail Project has also been taken up in the PPP model, with more than 50 km operational as of February 2020.

10. The major issues related to PPPs in metro rail projects in India are long-term commercial viability and procurement of rights-of-way and land. Metro rail projects are highly capital intensive. Private participants look for a return of about 12%–15%. Projects take a long time to break even. Returns can only be generated by steep fare hikes, but such an approach is problematic for various reasons including affordability and political decision. The magnitude of revenue generation is uncertain in most public transportation projects.

11. **Mobility card.** The government has launched a program to promote the introduction of a contactless integrated circuit card (smart card), called the National Common Mobility Card, for all public transport modes nationwide, and to enhance benefits for passengers. The card works on RuPay, the government-backed payment platform, and can be used for common ticketing and payment for metro rail, bus, train, and parking. Implementation is tasked to metro rail operators nationwide, with the Delhi Metro Rail Corporation implementing a pilot in three metro stations.

12. **Mobility of persons with disabilities.** The Government of India passed the Rights of Persons with Disabilities Act (2016), which in section 41 states that the government should ensure facilities like toilets and ticketing counters for persons with disabilities at bus stops, railway stations, and airports. Facilities should conform to design standards, including retrofitting old modes of transport, wherever technically feasible, to enable people with disabilities to access all modes of transport. Concerned local governments should also promote the personal mobility of people with disabilities at affordable prices by providing incentives and concessions.

13. **Comprehensive mobility plan.** A comprehensive mobility plan aims to guide sustainable growth of transport sector in a city, enabling a relevant proposal for infrastructure/transport development in line with the entire urban development direction. Preparing a comprehensive mobility plan covering all forms of transport is mandatory for cities planning metro rail projects, in accordance with the Metro Rail Policy (2017).

¹² Floor space index is defined as a ratio of the total floor area of a building to the total area of the site.

III. Transport in Bengaluru

14. **Transport demand growth.** The state of Karnataka has been experiencing rapid economic growth for decades, with the focus of its economy shifting from the primary sector to manufacturing and services. Bengaluru, the state capital, is a leading center of high technology industries and information technology. Rapid economic growth has accelerated urbanization and urban sprawl in Bengaluru as more people migrate from the suburban areas of Karnataka and other states. The population of the Bangalore Metropolitan Region (BMR) is expected to reach 20.3 million in 2031, from 9 million in 2011.¹³ Population density is highest in the city center, especially inside the Outer Ring Road. The rapid rate of population growth puts great pressure on all city and regional functions, including the transportation system comprising roads, railways, metro rail, and the airport. Urban sprawl increases the demand for longer-range transport.

15. **Road network.** Roads are the dominant mode of transport. Karnataka state has more than 3.2 million km of road network, comprising national highways, state highways, major district roads, municipal roads, and other roads. National highways are fully surfaced and state highways are more than 99.8% surfaced. In the BMR, five national highways and 12 state highways form the major road network connecting major towns and cities. The radial road network in the BMR converges at the city core and serves urban–suburban traffic, as well as inner-city traffic. The roads in the city center have been developed over centuries. Within the core road network, capacity is substantially inadequate because of insufficient length and lanes. Most of the major roads are four lanes or less, with little space left for widening because of urbanization. Most city roads are also used for on-street parking, which further reduces the effective carriageway width available for traffic. Travel speeds in the city are declining and are the lowest among major Indian cities while travel distances increase. In the long term, facilitating public transport will be more important than increasing road capacity.

16. **Vehicle growth and composition.** Among cities in India, Bengaluru is second after Delhi in number of vehicle registrations.¹⁴ Registered vehicles increased from 3.2 million in fiscal year (FY) 2009 to 8.0 million in FY2019.¹⁵ With the rapid growth of information technology in Bengaluru, more employees are able to afford vehicles, especially two-wheelers. This, coupled with the inadequacy of comfortable and convenient public transport, results in more commuters shifting to cars and two-wheelers. Growth rate of cars is faster than two-wheelers, and the trend is likely to continue. A convenient public transport system is needed to slow this trend.

17. **Public buses.** Public buses are the dominant form of public transport in the city. Bangalore Metropolitan Transport Corporation (BMTC), reputed to be one of the best and more successful public bus operators in the nation, is the operator of the city bus in Bengaluru.¹⁶ However, because BMTC does not raise fares, and because staff and operation costs have risen with the introduction of air-conditioned buses, BMTC is not generating a profit. It operates more than 6,000 buses and 2,263 routes, carrying about 3.5 million passengers per day.¹⁷ BMTC has adopted new technology, equipping its bus fleets with global positioning systems, intelligent transport systems, and passenger information systems.

¹³ Bangalore Development Authority. 2017. [Draft Revised Master Plan for Bengaluru – 2031. Volume 3](#). Bengaluru.

¹⁴ Government of India, Ministry of Road Transport and Highways. 2018. Road Transport Year Book (2015–16). Delhi.

¹⁵ Data obtained from the Government of Karnataka, Transport Department.

¹⁶ Institute of Urban Transport, India. 2013. *Best Practices in Urban Transport*. Delhi.

¹⁷ Government of Karnataka, Department of Planning, Programme Monitoring and Statistics. 2019. *Economic Survey of Karnataka 2017–18*. Bengaluru.

18. **Rail network.** Bengaluru is an important rail hub and a major junction on the regional railway network. Bangalore has five broad-gauge rail corridors radiating out of the city. Most trains out of Bangalore are long-distance trains serving other cities, while a few morning and evening conventional short-distance trains serve commuters living outside of Bengaluru. Most rail traffic is along the Chennai (east) to Mysore (southwest) line. The Government of India and the Government of Karnataka established a special purpose vehicle for the construction and operation of a suburban railway in 2002 although none has been constructed as of October 2020.

19. **Air transport.** Kempegowda International Airport (KIA, also called Bangalore International Airport) lies about 35 km north of the center. It is the third busiest airport in the nation and serves as the major regional airport for southern India, with both domestic and international passenger flights. Under a concession agreement signed in 2004, Bangalore International Airport Limited is the concessionaire to carry out the development, design, financing, construction, operation, and management of KIA for an initial period of 30 years from 23 May 2008, with an option to extend for another 30 years. KIA handled 33.7 million passengers per year in 2019. Air traffic movements reached 235,000 in 2019.¹⁸ It is recognized as the fastest growing airport in the world. An expansion of KIA with a new runway and second terminal is underway, which will boost capacity to 55 million passengers per annum. The major traffic artery linking the airport with the core city is the NH-44 highway, which has some of the highest traffic volumes in the BMR. The only mass public transport connecting the airport with the city is a bus service operated by BMTC. Intermediate public transport, mainly comprising private taxis, is the other main mode of public transport serving KIA.

20. **Bengaluru Metro.** Bengaluru Metro is owned and operated by Bangalore Metro Railway Corporation Limited (BMRCL), which is a special purpose vehicle established by the Government of India and the Government of Karnataka with 50:50 equity share ratio. Construction of phase 1 of Bangalore Metro, which is 42.3 km long, commenced in 2007 and was completed and became fully operational in 2017.¹⁹ Phase 1 comprises two lines: the East–West line and the North–South line, intersecting in the middle. Phase 2, comprising six reaches (sections) with a total length of 72.1 km, will be commissioned section by section from 2020 and become fully operational by 2024. Phase 2 will extend the phase 1 lines outward toward the suburbs, and will install third and fourth lines. One is the new North–South line (called red line) passing through the city center, and the other is toward the Southeast (called yellow line). BMRCL operates six-car trains with a capacity of 2,004 passengers per train. Annual ridership in FY2019 reached 134 million, which equates to an average daily ridership of 367,000. Average daily ridership in FY2020 was 382,000.

21. **Financing modality for previous phases.** Based on a detailed project report prepared by the Delhi Metro, the government initially attempted to fund the Bengaluru Metro project phase 1 through commercial bank financing. However, the cost of commercial funds and short loan tenures made the proposal unviable. The government then approached the Asian Development Bank (ADB) to request nonsovereign lending for phase 1, and ADB approved this loan in 2011. Since fares are to be affordable, and ridership buildup was slow, it was essential that this nonsovereign ADB loan be predicated on complete revenue guarantees from the state government. However, the government determined that this financing model was not workable because of the high costs of nonsovereign borrowing and the scale of future requirements including complete state government guarantees. As a result, BMRCL funded phase 1 of the metro through borrowings with sovereign guarantees from bilateral agencies such as the Japan International Cooperation Agency (JICA) and Agence Française de Développement (AFD), along

¹⁸ Bangalore International Airport Limited. 2020. [BLR Airport Welcomes 33 million pax.](#)

¹⁹ Bangalore Metro Rail Corporation Limited. 2019. *12th Annual Report 2017–18*. Bengaluru.

with borrowings from commercial banks. Similar arrangements were followed for phase 2, with the inclusion of the European Investment Bank (EIB) and the Asian Infrastructure Investment Bank (AIIB).

22. **Two new phases.** Phases 2A and 2B comprise two new metro rail lines with a total length of 56 km and 30 stations, following phases 1 and 2. Phase 2B will connect the city with KIA, while phase 2A will run along the Outer Ring Road (ORR). These lines will be part of a circular metro route along the ORR once the west half is completed. Last-mile connectivity will be secured at all stations by installing bus bays and bicycle parking spaces as needed. BMTC is operating feeder bus services at major stations of phase 1, and is expected to operate such services at new stations as well. The metro network will be interconnected with the Indian Railway network at major junction stations. Installation of footpaths (i.e., pedestrian bridges and walkways) at stations will improve accessibility to stations and safe road crossing even for non-users of the metro.

23. **Integrated circuit card.** Bangalore Metro installed an automatic fare collection system with automatic gates and smart cards for phase 1 in 2007. The number of smart cards already issued are about 2 million as of June 2019, while 56,000 smart cards are issued every month. The average number of rides using smart cards is 221,000 per day. The system is not interoperable with the fare collection system of other public transport operators in the city. In February 2019, a contract for system expansion to phase 2 was awarded, which will also enable the system to support the National Common Mobility Card. In addition, BMRCL will introduce QR-code-based mobile ticketing for single journey as well as mobile ticketing based on near field communication technology.

24. **Measures for mobility.** The city of Bangalore has proposed multiple initiatives to make public transport safe for women under the Nirbhaya Scheme. This includes training women drivers at BMTC to operate heavy passenger vehicles.²⁰ The proposed Safe City Project includes installing (i) closed-circuit television cameras on all buses and stations, (ii) a centralized control room for operation tracking and emergency control, (iii) women-only lounges, (iv) gender-sensitization training of staff, (v) a mobile application for real-time tracking of buses, (vi) increased patrolling for security, and (vii) a public awareness campaign. BMTC has also introduced a request-a-stop service for women and panic buttons in buses,²¹ and has proposed deploying 25 pink Sarathi vehicles to patrol and ensure the safety of lone female passengers waiting at bus stops. BMTC is also in the process of introducing a new 4-digit helpline number for women passengers under the Nirbhaya Scheme.²²

25. **Transit-oriented development in Bengaluru.** Transit-oriented development represents a new direction for urban development in Bengaluru, centering on promotion of public transport and multimodal integration, in line with the national TOD policy (para. 8).²³ A draft Bengaluru Transit Oriented Development Policy was prepared by BMRCL detailing approaches and measures to apply in line with the national TOD policy, which was subject to a public comment process in February 2019. The draft Bengaluru TOD policy advocates the need for higher floor space index to promote the TOD policy, among others.²⁴

²⁰ Press Information Bureau. [Schemes under Nirbhaya Fund](#) (accessed 19 August 2019).

²¹ M. Malli. 2018. [Panic buttons installed in 150 Bengaluru government buses as women's safety aid](#). *The News Minute*. 20 November.

²² The Hindu. 2019. [Pink Sarathi to be launched to help women](#). 3 February.

²³ Bangalore Metropolitan Region Development Authority. 2016. [Final Report: Revised Structure Plan – 2031, Bangalore Metropolitan Region](#). Bengaluru.

²⁴ Bangalore Metro Railway Corporation Limited. 2019. [Bengaluru Transit Oriented Development Policy](#). Bengaluru (draft).

B. Major Development Partners: Strategic Foci and Key Activities

26. Major metro rail projects financed by development partners in India are listed in the following table.

Metro Projects in India Financed by External Development Partners

Project Name	Development Partner	Project Duration	Loan Amount
Ahmedabad Metro	JICA	October 2015–November 2020	¥82,434 million
Bangalore Metro (Phase 1)	JICA	January 2007–June 2017	¥19,832 million
			¥44,704 million
	AFD		€110 million
Bangalore Metro (Phase 2)	AFD	Feb 2014–June 2024	€200 million
	EIB		€500 million
	AIIB		\$335 million
Delhi Metro (Phase 1) (Phase 2) (Phase 3)	JICA	July 2013–December 2021	¥162,751 million ¥211,976 million ¥330,479 million
Kolkata Metro	JICA	July 2008–June 2021	¥55,742 million
Mumbai Metro	JICA	July 2013–December 2021	¥171,000 million
	ADB	February 2019–June 2023	\$926 million
	NDB		\$260 million
Chennai Metro (Phase 1) (Phase 2)	JICA	November 2008–March 2020	¥183,595 million
			¥357,476 million
Lucknow Metro	EIB		€450 million
Kochi Metro	AFD	July 2012–March 2020	€180 million
Pune Metro	EIB	January 2017–November 2021	€600 million
	AFD		€245 million
Nagpur Metro	KfW	August 2014–November 2020	€500 million
	AFD		€130 million
	ADB	November 2013–Mar 2020	\$157 million

ADB = Asian Development Bank, AFD = Agence Française de Développement, AIIB = Asian Infrastructure Investment Bank, EIB = European Investment Bank, JICA = Japan International Cooperation Agency, KfW = Kreditanstalt für Wiederaufbau, NDB = New Development Bank.

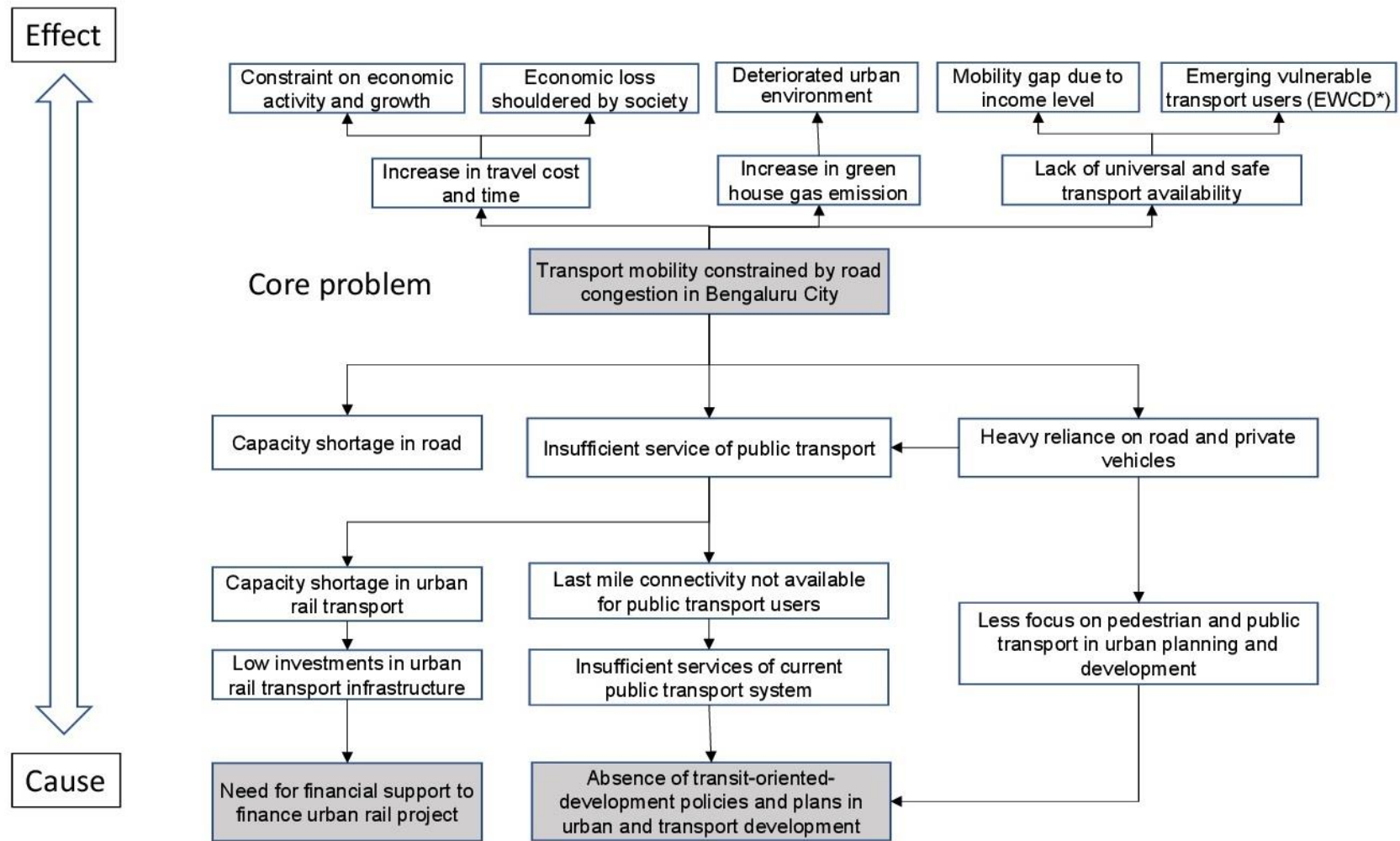
Source: Asian Development Bank.

C. ADB Experience and Assistance Program

27. **Urban transport.** The project will develop a safe, environment friendly, and reliable public transport system in Bengaluru City and improve the capacity of relevant city officials in urban transport planning and urban development. ADB's involvement in urban transport in India has focused primarily on policy and strategy aspects in line with India's NUTP, 2006. ADB has also supported the development of the Guidelines and Toolkits for Urban Transport Development in Medium-Sized Cities in India.

28. **ADB support.** ADB has been involved in the Jaipur Metro Rail Project approved in 2013, where it is helping to extend the first metro train line in Jaipur and to draw up plans to build a second line for the north–south corridor. The Mumbai Metro Railway Systems Project was approved in 2019 to finance procurement of rolling stock and signaling, as well as capacity development for Mumbai Metro operations. In South Asia, ADB is in the process of appraisal for metro rail and suburban rail projects in Bangladesh and Sri Lanka. Outside the subregion, ADB supported and financed the development of metro rail lines in Ha Noi and Ho Chi Minh City, the two largest cities in Vietnam. ADB also provided a nonsovereign loan to the Thai metro in 2017.

Problem Tree for Bengaluru Metro Rail Project



*Elderly, Women, Children, and Disabled people