



**ASIAN INFRASTRUCTURE
INVESTMENT BANK**

P000353-IND
Oct 10, 2023

Sovereign-Backed Financing

Approval Project Document

P000353 India: Mumbai Urban Transport Project 3A – Station Improvement

Currency Equivalents

(July 31, 2023)

Currency Unit – Indian Rupee (INR)

INR1.00 = USD0.012

USD1.00 = INR82.28

Borrower's Fiscal year

April 1 – March 31

Abbreviations

AIIB (or the Bank)	Asian Infrastructure Investment Bank
BB	Building Block
CAAA	Controller of Aid Accounts and Audit
CBA	Cost-Benefit Analysis
CBTC	Communication-Based Train Control
CCTV	Closed-Circuit Television
CMD	Chairman and Managing Director
CR	Central Railway
DDC	Detailed Design Consultant
DEA	Department of Economic Affairs
DPR	Detailed Project Report
EHS	Environment, Health and Safety
EIRR	Economic Internal Rate of Return
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESP	Environmental and Social Policy
ESS	Environmental and Social Standards
FOB	Foot Over Bridge
GAD	General Arrangement Drawing
GC	General Consultant
GDP	Gross Domestic Product
GoM	Government of Maharashtra
GRM	Grievance Redress Mechanism
IGBC	Indian Green Building Committee
IOCT	International Open Competitive Tender
IR	Indian Railway
IUFR	Interim Unaudited Financial Statement
MDB	Multilateral Development Bank
MMR	Mumbai Metropolitan Region
MMRDA	Mumbai Metropolitan Region Development Authority
MoR	Ministry of Railways
MRVC	Mumbai Railway Vikas Corporation
MSAAPCC	Maharashtra State Adaptation Action Plan on Climate Change
MUTP	Mumbai Urban Transport Project

NPV	Net Present Value
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Management System
O&M	Operating and Maintenance
PAP	Project-affected Persons
PIM	Project Implementation Manual
PMO	Project Management Office
PPM	Project-affected People's Mechanism
PwD	People with Disabilities
RAP	Resettlement Action Plan
SRI	Solar Reflective Index
SSM	Site and Station Management
VOT	Value of Time
VSI	Value of Statistical Injury
VSL	Variable Spread Lending
WE	Water Efficiency
WR	Western Railway

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1. Summary Sheet

Project No.	P000353
Project Name	Mumbai Urban Transport Project 3A - Station Improvement
AIIB Member	India
Borrower	Ministry of Finance, India
Project Implementation Entity	Mumbai Railway Vikas Corporation
Sector Subsector	Transport Urban transport
Alignment with AIIB's thematic priorities	Green infrastructure Technology-enabled Infrastructure
Project Objective	The objective of the Project is to provide passengers with improved quality of service at selected stations of the Mumbai Suburban Rail network in an inclusive, safe and environmentally sustainable manner.
Project Description	There are two activities under the Project. The main activity (Component A) involves improving selected stations. Depending on the availability of space and other constraints, the improvements mainly include the renovation of suburban rail entry/exit areas; the construction of additional foot-over-bridges (FOBs) connecting the platforms, skywalks and deck level for better passenger circulation; the construction of additional ticket offices and toilets; the widening of platforms; and adding more staircases, escalators, lifts and parking lots for two-wheelers. In addition, the work will include developing gender-responsive facilities and facilities for People with Disabilities (PwD). The relocation of station office areas and general electrification works will also be included. The new features will follow Indian Green Building Committee (IGBC) station building standards. The second activity (Component B) will provide capacity building, preparation support and finance of technical studies.
Implementation Period	Start date: 09/01/2023 End date: 12/31/2027
Expected Loan Closing Date	12/31/2027
Proposed Amount of AIIB Financing (USD m)	USD100 million

Financing Plan	The total estimated cost of the Project: USD145 million. Financing plan: - AIIB: USD100 million (69%) - Ministry of Railways: USD22.5 million (15.5%) - Government of Maharashtra: USD22.5 million (15.5%)
ES Category (or AIIB equivalent, if using another MDB's ES Policy)	B
ES Category Comments	The Project has been assigned Category B, given the limited and localized construction stage environmental and social (E&S) impacts.
Risk (Low/Medium/High)	Medium
Conditions of Effectiveness	(a) the Subsidiary Agreement has been executed on behalf of the State of Maharashtra and the Project Implementing Entity, and all conditions precedent to its effectiveness have been fulfilled; and (b) the Project Implementation Manual has been prepared in form and substance satisfactory to the Bank.
Key Covenants	(a) An Operational Health and Safety consultancy firm must be engaged by the Project Implementing Entity, in accordance with terms of reference acceptable to the Bank, by December 31, 2023.
Conditions for Disbursement	None
Retroactive Financing (Loan % and dates)	All eligible expenditures under the Project, incurred in compliance with AIIB's procurement policies and guidelines and in respect of which payments were made not more than 12 months prior to the date of the loan agreement, up to an amount of USD20 million (20% of the amount of the Loan).
Policy Waivers Requested	No
Policy Assurance	Yes
Economic Capital (ECap) Consumption (USD m)	USD11.09 million

President	Jin Liqun
Vice President	Urjit Patel
Director General	Rajat Misra
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2. Project Description

A. Project Overview

1. **Country Priority.** Between 2001 and 2021, the population residing in urban areas in India increased from 28% to 35%,¹ which means that India's urban areas grew by around 100 million people. India's transport infrastructure has been unable to keep pace with this rapidly growing urbanization and rising demand for urban transport services, resulting in traffic congestion, pollution and safety concerns. Continuous improvements in India's urban transport sector are necessary to accompany economic growth and enable more sustainable urban development. Despite facing growing vehicle motorization, public transport services in Indian cities remain the backbone of the urban transport system, providing essential low-carbon transport options to urban residents. However, urban public transport faces severe challenges, particularly overcrowding and low service quality. Expanding the capacity, accessibility and level of service of public transport, including the suburban railway system, over the next 20 years is, therefore, a stated government priority.²

2. **Sector Context. The public transport system of the Mumbai Metropolitan Region (MMR) is challenged by the rapid growth of passenger demand and the lack of integration.** MMR spans over 4,355 square kilometers, with a population of 24.9 million in 2017.³ MMR is India's most populous metropolitan region and is expected to reach a population of 29.3 million by 2031 and 32.2 million by 2041. Based on the Comprehensive Transportation Study of MMR, the average daily trips within MMR were 18.8 million⁴ per day in 2017, with expectations of 24.9 million by 2041. With rapid urbanization, several satellite townships (municipal corporations) emerged within MMR in recent years. This has resulted in increased economic activities and a burgeoning population, leading to longer commutes for an increasing segment of the population.⁵ Before the COVID pandemic, the Mumbai Suburban Rail network carried over 8.5 million passengers daily, representing 43% of the modal share of trips in MMR.⁶ The modal share of the suburban rail system is followed by two-wheelers at 21%; buses at 20%; autos and taxis at 14%; and metro and monorail at 2%. The Mumbai Suburban Rail system is the absolute transport backbone of the city. Further attention should be paid to the lack of physical and operational integration among public transport networks in MMR, partly due to the lack of institutional integration.⁷ The poor transfer conditions among different urban transport modes, including walking, bi-wheelers, taxis and cars,

¹ <https://data.worldbank.org/indicator>: Urban Population (% of total population) - India

² Urbanization Beyond Municipal Borders, The World Bank, 2013.

³ Update of Comprehensive Transportation Study for Mumbai Metropolitan Region (MMR), MMRDA, 2020

⁴ The number of trips is exclusive of trips by walking.

⁵ Mumbai Metropolitan Regional Plan, Mumbai Metropolitan Region Development Authority (MMRDA), 2016.

⁶ MRVC [https://mrvic.indianrailways.gov.in/uploads/MRVC%20brochure%20July%202021\(1\).pdf](https://mrvic.indianrailways.gov.in/uploads/MRVC%20brochure%20July%202021(1).pdf)

⁷ The planning and provision of Suburban Rail service in Mumbai is under Indian Railway (IR). Mumbai Railway Vikas Corporation (MRVC), a special purpose entity owned by the Ministry of Railways (51%) and the Government of Maharashtra (GoM) (49%), is responsible for project preparation and implementation of the Suburban Rail development in Mumbai. The development of the Metro network is carried out by Mumbai Metropolitan Region Development Authority (MMRDA), an urban development authority led by GoM. The bus services are governed mainly in respective municipalities within MMR.

buses, metro and Suburban Rail, clearly limit the ability of Mumbai's urban transport system to serve passengers more efficiently.

3. **MMR has been expanding railway networks with support from MDBs.** With help from the World Bank supporting the Mumbai Urban Transport Project (MUTP1) in 2002 and Mumbai Urban Transport Project 2 (MUTP2) in 2010, the capacity expansion of Mumbai Suburban Rail has increasingly been expedited to meet travel demands. These two projects set the foundation of systematic planning through comprehensive transport studies of MMR to improve all urban transport modes, including Suburban Rail. An integrated urban transport institutional framework was proposed following several studies but will take time to implement. Under MUTP2, the Development and Expansion Plan for Mumbai Suburban Rail Network was developed in 2016, which set out a phased development program for future stages, including 1) Mumbai Urban Transport Project 3 (MUTP3) for the short term; 2) Mumbai Urban Transport Project 3A (MUTP3A) for the medium term; and 3) Mumbai Urban Transport Project 4 (MUTP4) for the long term. Mumbai Railway Vikas Corporation (MRVC), a special purpose entity owned by the Ministry of Railways (51%) and the Government of Maharashtra (GoM) (49%), has been involved in the preparation and implementation of all the previous MUTP projects. AIIB is currently supporting part of the activities of MUTP3, which is under smooth implementation with MRVC as the implementing entity.

4. **The latest program of MUTP3A emphasizes improving the efficiency and quality of service of the existing suburban rail infrastructure.** The previous MUTP1 to MUTP3 projects focused more on expanding the Mumbai Suburban Rail service's capacity, adding new lines, additional tracks and trains, which were much needed and adequate in the early stage of capacity expansion. The main corridors and rail sections were quadrupled and even sextupled to provide more services, yet the previous capacity expansion is still insufficient even to meet current demand. However, the potential for large-scale physical expansion has become limited due to land constraints. Furthermore, stations remain neglected and face increasing overcrowding due to the network's capacity expansion. The latest MUTP3A program plans to continue the physical expansion where possible but with emphasis on measures to improve the operational efficiency and the network's level of service. The key activities in the MUTP3A program include: 1) Physical expansion of the network, including new lines and tracks; 2) Train maintenance and parking facilities; 3) Communication-Based Train Control (CBTC); and 4) Station Improvement on selected existing stations. The Detailed Project Report of the MUTP3A program was developed by MRVC in 2019, and the total investment has reached USD6.7 billion. The Economic Internal Rate of Return (EIRR) of MUTP3A is 19.55%. The station improvement activities of this Project are part of the MUTP3A program.

5. **The Mumbai Suburban Rail network faces severe overcrowding and safety issues.** During peak hours, more than 6,000 passengers travel in 12-car trains, with a carrying capacity of only 3,600. As a result, the passenger density in suburban trains in Mumbai can reach 15 passengers per square meter at peak hours, significantly higher than the global benchmark of six to eight passengers per square meter.⁸ Even on station

⁸ Study of Development and Expansion Plan for Mumbai Suburban Rail Network, MRVC, 2016

platforms, the density can reach up to 1-2 people per square meter during train delays,⁹ and stations urgently need to be improved to decongest platforms to provide better passenger mobility. Between 2011 and 2016, there were about 20,638 fatalities (on average, 9.4 per day) on the Mumbai Suburban Rail network. Around 23% of fatal accidents were due to overcrowding and 57% to illegal trespassing of passengers and pedestrians.¹⁰ Between 2001 and 2017, private vehicle ownership in MMR increased from 71 vehicles per 1,000 people to 248.¹¹ The easy auto-financing thanks to economic growth and the overcrowding in Suburban Rail are the common reasons behind the rise.

6. Improving station quality is becoming an urgent need for Mumbai Suburban Rail due to their poor level of service, lack of basic facilities and lack of integration with other transport modes. Most of the suburban rail stations are more than 85 years old. Although small renovations have been carried out regularly, critical issues requiring immediate action remain. The circulation space for passengers is limited, which generates overcrowding at platforms and concourse areas, posing a severe safety problem. There are insufficient passenger foot-over-bridges (FOBs) connecting different platforms and insufficient but necessary facilities to meet passenger demands, especially for vulnerable groups. The poor connectivity at entry/exit points with other transport modes, including walking, bi-wheelers, buses and cars, limits passenger access and inclusion. The connections between bus stops and suburban rail entrances are often lengthy and cumbersome. In addition, stations often lack drop-off and vehicle parking areas, especially for two-wheelers. As there are still few transfer stations between the Mumbai Suburban Rail and Metro lines (currently under development), it is critical to create a seamless and efficient prototype of an interchange station to guide future developments and ensure an integrated rail-metro system. The stations to be improved under the Project were selected by the operators (Central Railway and Western Railway) based on the severity of the issues mentioned above during daily operation.

7. Project Objective. The objective of the Project is to provide passengers with improved quality of service at selected stations of the Mumbai Suburban Rail network in an inclusive, safe and environmentally sustainable manner.

8. Project Description. There are two activities under the Project. The main activity (Component A) involves improving selected stations. Depending on the availability of space and other constraints, improvements include the construction of additional FOBs connecting the platforms, skywalks and deck-level connecting FOBs for better passenger circulation to decongest the existing platforms; the renovation of station entry/exit areas; the construction of additional ticket offices and toilets; the widening of platforms; additional staircases, escalators and lifts; and parking lots for two-wheelers. In addition, the work will include developing gender-responsive facilities and facilities for People with Disabilities (PwD), such as ramps, tactile pathways, “Nirbhaya

⁹ Final report of the consultancy for detailed planning for improvement of identified suburban railway stations of central and western railway in Mumbai including surveys, architectural and passenger movement plans, preparation of GADs, specifications and cost estimations, Intercontinental Consultants and Technocrats Pvt. Ltd, & Gian P. Mathur & Associates Pvt. Ltd, 2023

¹⁰ Updating of Comprehensive Transportation Study for Mumbai Metropolitan Region, MMRDA, 2020

¹¹ Update of Comprehensive Transportation Study for Mumbai Metropolitan Region (MMR), MMRDA, 2020

rooms,”¹² toilet and drinking water facilities, etc. The relocation of the station office area and general electrification work will also be included. The newly constructed features will follow IGBC station building standards. At this stage, the improvements are planned in 17 stations. The second activity (Component B) will provide capacity building and preparation support and finance of technical studies. The design consultants of this Project are funded in this component. The other consulting services included will support future investment preparation and strategic planning, having a direct or indirect impact on the stations.

9. **Expected Results.** The Project Objective indicators include: 1) Increase in passenger satisfaction level (all passengers/female passengers); 2) Increase in the number of stations equipped with adequate facilities for gender and PwD; 3) Reduction in the annual number of fatalities and injuries at selected stations; and 4) Increase in the number of stations receiving “silver” or “gold” level certificates from IGBC.

10. **Expected Beneficiaries.** The primary beneficiaries are existing suburban rail passengers boarding and alighting at the selected stations (around 2 million passengers per day), who will benefit from much-improved station level of service and safer services, including better accessibility at entry/exit points, ease of movement within the stations, less crowded platforms and additional modern facilities. In particular, thanks to the gender-sensitive and inclusive features included in the design, women, children, the elderly and PwD passengers will significantly benefit from more accessible and more secure stations. Furthermore, it is estimated that 96 new employment opportunities¹³ could be created at the selected stations since there will be more room for small businesses on the constructed elevated decks. MRVC will benefit from capacity building and technical study activities with an increased ability to identify solutions to tackle station-related challenges. Finally, the general public, particularly residents and commercial establishments in the stations’ surroundings, will benefit from the reduced passenger crowding at the existing entry/exit locations. More efficient pedestrian movements at the entry/exit locations are expected to lead to more efficient traffic organization at these points, creating a more pleasant station environment. As a result, land and property may increase in value in the stations’ surrounding areas.

B. Rationale

11. **Strategic fit for AIIB.** The Project entails improving selected stations of the Mumbai Suburban Rail network. The Project is well aligned with the thematic priorities of AIIB’s corporate strategy, particularly: 1) Green infrastructure. Mumbai Suburban Rail system is the backbone of the city’s public transport network, carrying 43% of daily trips of MMR. Improving the level of service of stations will encourage Mumbai residents to use more efficient public transport for their daily travels. The Project also aims to upgrade a station (Neral Station) to the IGBC’s “Silver” level,¹⁴ allowing additional

¹² “Nirbhaya rooms” are designated for nursing/breastfeeding and is also useful as a waiting area during late hours.

¹³ Number of employment opportunities is estimated based on available spaces for small business at deck level by assuming 1 employment opportunity/20 square meters.

¹⁴ IGBC, part of the Confederation of Indian Industry (CII) was formed in 2001. The council offers a wide array of services which include developing green building rating programs, certification services and green

benefits in energy efficiency and carbon reduction; and 2) Technology-enabled infrastructure. Installing Closed-Circuit Television (CCTV) systems and electric information boards will increase passenger safety and comfort in the stations. The Project is aligned with AIIB's Transport Sector Strategy, supporting two of its priorities: "transport integration" and "upgrading of existing infrastructure." The improvement at entry points of selected stations, including paved pathways, parking spaces for two-wheelers and enhanced drop-off areas, will enhance transport integration. In particular, the Project will ensure the integration between the Mumbai Metro and the Mumbai Suburban Rail System at Ghatpokar Station by providing additional skywalks directly linking them, maximizing ease and efficiency for passenger transfer. The improvements and new facilities provided at Ghatpokar Station will set a precedent for future metro-rail transport integration. Additionally, the Project is aligned with AIIB's Sustainable Cities Strategy by supporting the investment priority of enhancing urban mobility. The Project is also aligned with the principle of "Realize Energy Efficiency Potential" of the AIIB's Energy Sector Strategy, considering the newly constructed features will follow IGBC station building standards.

12. **Paris Alignment.** The Project is aligned with the goals of the Paris Agreement Alignment. Based on the "Joint MDB Assessment Framework for Paris Alignment for Direct Investment Operations" and the AIIB Paris Alignment methodology, the mitigation dimension of projects (labeled as Building Block 1 (BB1)) and the adaptation dimension of projects (labeled as BB2) need to be considered to determine whether the Project is "Paris-aligned." Being a rail infrastructure project, the Project is universally aligned with labeled BB1. In addition, following national and local climate resilience action plans, the Project includes climate adaptation and resilience measures to address MMR's climate risks; hence, the investment is aligned with BB2. Further details of the Paris Agreement Alignment analysis are presented in Annex 5.

13. **Value addition by AIIB.** Beyond the provision of financing, AIIB has been acting as a key advisor to help shape the existing stations of the Mumbai Suburban Rail to provide passengers with more accessible, inclusive and safer public transport services. AIIB's involvement in the Project has ensured that challenges faced by female and PwD commuters were fully considered in the design of station improvements, building on the experience gained during the preparation and implementation of MUTP3 in gender-responsive design. Under this Project, AIIB has strongly encouraged MRVC to take one step further in ensuring inclusion and, particularly, supporting PwD. Leveraging on the know-how of a consultancy firm expert in universal accessible design solutions, PwD accessibility features are included in the design, and a Mumbai Railways Accessible Infrastructure Manual is to be developed for future projects. Additionally, drawing upon AIIB's mandate of developing green infrastructure and experience with climate-resilient solutions, AIIB has played a vital role in promoting "Green Railway Station" standards in the design of station improvement. Through the Project, AIIB offers significant value in setting out the path towards developing a modern style of stations, mixing transport with urban-living functions in India.

building training programs. "Green Railway Station" is one type of green buildings in IGBC's rating system. Silver certificate corresponds to 60-69 points (out of 100). Gold (70-79) and Platinum (80-100) levels are more environmentally friendly.

14. **Value addition to AIIB.** AIIB's participation in the Project will (i) enhance the Bank's experience in financing brownfield transport projects with high levels of complexity that will bring more opportunities to finance high-demand urban transport and railway projects in India and the region; (ii) enable the Bank to develop a methodology of economic analysis for station improvement projects; and (iii) familiarize the Bank with IGBC's green building standards and gain 'Green Railway Station' experience.

15. **Lessons learned from previous projects.** The Project has been built on lessons learned and outputs produced during MUTP1, 2, and 3. The difficulties encountered in the implementation of MUTP3 include procurement challenges and delays due to land acquisition. Lessons incorporated into the Project design at the Appraisal stage include:

- (i) **The Mumbai Suburban Rail not only needs the construction of new lines but improving existing facilities is also a must to provide passengers with better quality services.** While AIIB and other Multilateral Development Banks (MDBs) have supported several projects in the Mumbai Suburban Rail in the past, these have mainly covered the development of new lines and tracks, with much less effort on upgrading existing facilities and particularly stations. Hence, this Project addresses the need to improve the existing stations to provide passengers (including females and PwD) with better services. Furthermore, through this Project, the capacity of the existing stations will be adequately increased.
- (ii) **Engaging gender and PwD considerations at the early design stage** of the project preparation. The ongoing MUTP3 successfully conducted a gender survey of female passengers to understand their challenges and concerns, and recommendations were drawn up and incorporated into the project design early in the design phases. This Project has also followed this effective approach to gender-informed design (a gender survey was conducted during the design stage) and has successfully replicated it in the PwD consideration. Under the preparation of this Project, AIIB supported MRVC in appointing a PwD Accessibility consultant to further scrutinize the design of station improvements.
- (iii) **Taking a forward-looking approach in the planning of Suburban Rail projects.** The successive MUTP projects demonstrate the importance of taking a forward-looking approach in planning and preparing new investments. Improvements in Mumbai's highly complex Suburban Rail network are a long-term and continuous endeavor. This Project benefited from design studies conducted in MUTP3. Similarly, project preparation and technical studies financed under Component B of this Project will assess the challenges of Mumbai Suburban Rail in a holistic approach and propose investment activities of the next stage aimed at long-term safe, inclusive and sustainable development.
- (iv) **Minimizing private land-acquisition requirements.** In a high-densely urbanized context, expanding the stations at the ground level is not a realistic solution, as a large land area is required. Based on the land

acquisition delays experienced in MUTP1 and MUTP3, the design of the station improvements prioritizes, as far as possible, the use of the existing government land and railway land with minimal resettlement requirements. While no private land acquisition is required, the Project's land clearance and transfer process will begin as soon as feasible to identify and mitigate any future delays.

C. Components

16. **Component A. Improvement of Selected Existing Stations.** This component will expand and upgrade the infrastructure and facilities at selected stations to increase the passenger capacity and reduce crowding so that passenger flow, safety, inclusion and quality of service will improve. IR has selected the initial stations in consultation with Central Railway (CR) and Western Rail (WR). The main criteria considered were: 1) at least one station from each corridor of the Mumbai Suburban Rail System (Central Line, Western Line, and Harbour Line); 2) different station sizes covering the entire Mumbai Suburban Railway network; and 3) stations with significant footfall that are technically feasible for improvement with limited land requirements. At the Appraisal stage, 17 stations have been proposed in the Project, seven stations on Western Line, six stations on Central Line, and four stations on Harbour Line.

17. The improvements include the construction of an elevated deck and additional FOBs and skywalks to enable the interconnectivity between FOBs, platforms, and entry/exit and drop-off points. Also, selected deteriorated structures will be demolished and/or revitalized. The improvements also include renovation of station entry/exit areas, additional ticket offices and toilets, additional staircases, escalators and lifts, and parking lots for two-wheelers. Accessibility solutions for PwDs and gender-responsive facilities for female passengers will be provided in the selected stations, such as ramps, tactile pathways, "Nirbhaya rooms," drinking water facilities, etc. The relocation of station office areas and general electrification works will also be included. Green building features will be incorporated in all stations, targeting one station (Neral Station) to receive the IGBC station rating of silver. These investments will enhance accessibility to the stations and circulating spaces within the stations, alleviating passenger congestion and existing difficulties in managing passenger movement. As a result, the quality of service of the selected stations will significantly increase in terms of comfort, safety and inclusion.

18. **Component B. Capacity Building, Preparation Support and Technical Studies.** The component will provide capacity building, project preparation support and technical assistance to the implementing entity. The activities included will directly or indirectly impact Suburban Rail stations by focusing on inclusiveness, safety and sustainability to improve the quality of the Suburban Rail services. (1) The capacity-building activities include training and workshops to enhance MRVC's capacity to develop future network improvements. (2) The project preparation support includes preparatory studies¹⁵ for this Project and for future investments in the Mumbai Suburban Rail network. The design consultants of this Project were hired under this component, including detailed design consultants, an Environmental and Social Impact Assessment (ESIA) consultant and a PwD accessibility design consultant. (3) The planning and

¹⁵ TORs will be cleared by the Bank, and the studies are to be compliant with AIIB's ESP.

technical studies will contribute to identifying solutions to tackle Suburban Rail operation challenges holistically and inclusively, considering that the interaction and integration of different transport systems will impact Suburban Rail stations.

D. Cost and Financing Plan

19. Table 1 shows the project's components, cost, and its financing. Its total cost is estimated at USD145 million, and the AIIB loan, at 69% of the total, will be USD100 million.

Table 1. Project Cost and Financing Plan				
Item	Project Cost (USD m)	Financing (USD m and %)		
		AIIB	GoM	MoR
Baseline Costs				
Component A	139.75	94.75 (68%)	22.5 (16%)	22.5 (16%)
Component B	5	5 (100%)	0 (0%)	0 (0%)
Front-end Fee	0.25	0.25 (100%)	0 (0%)	0 (0%)
Grand Total	145	100 (69%)	22.5 (15.5%)	22.5 (15.5%)

E. Implementation Arrangements

20. **Implementation period.** The Project is expected to be implemented from September 2023 to December 2027.

21. Implementation readiness.

- (i) **Policy and institutional arrangements.** MRVC, a special purpose entity owned by the Ministry of Railways (51%) and the Government of Maharashtra (49%), manages the capital investment of the suburban railway network in Mumbai. MRVC has been involved in preparing and implementing all the previous MUTP projects.¹⁶ MRVC is the Project Implementation Entity for the Project. MRVC has a well-defined organizational management structure with clear roles and responsibilities. The Chairman and Managing Director (CMD) heads MRVC. To support the CMD, there are Directors for Project; Finance; Technical; Resettlement and Rehabilitation; and Infrastructure and Commercial Development, each with their respective teams. A Chief Vigilance Officer assists the CMD in handling complaints from any source, including those related to allegations of corruption.

¹⁶ Once MRVC completes the implementation of infrastructure and/or procurement of relevant facilities, the ownership, operation and maintenance of physical assets revert to two divisions of Indian Railways: Western Railways (the Western Line) and Central Railways (the Central and Harbour Lines).

- (ii) **Project Management Office (PMO).** A PMO has been established in MRVC, headed by the Director of Project and assisted by the Executive Director/General Manager/Chief Project Manager. A consultancy firm was appointed in 2021 to prepare the detailed engineering designs of the improved stations. The day-to-day contract administration, procurement support, supervision of construction, environmental and social management, and quality assurance will be ensured by MRVC's in-house staff.
- (iii) **Project implementation manual and plans.** The Project Implementation Manual (PIM) has been updated based on the existing PIM of MUTP3. The project implementation plan is included in PIM. It is planned that the major civil work contracts will take around three years to complete, and the general electrification contracts will follow. The advance procurement of the planned civil work contracts has started.
- (iv) **Procurement and financial management arrangements.** The updated PIM indicates the Project's procurement and financial management arrangements, which are the same arrangements as the MUTP3 project. These arrangements are ready and proved to be well-functional.
- (v) **Required clearances/approvals for project implementation.** The authorities and the Bank have cleared the required environmental and social impact assessment report and the Resettlement Action Plan (RAP). They are disclosed publicly.

22. **Monitoring and Evaluation.** The overall responsibility for monitoring Project results will be with MRVC. MRVC will collect data on Project Objective Indicators. During Project implementation, MRVC will prepare a quarterly progress report to be shared with the Bank. It will highlight the status of agreed targets for various monitoring indicators and detail the implementation progress of all aspects of the Project, including procurement status, physical progress against plans, disbursements, compliance with environmental and social requirements, key implementation issues and solutions, and updated implementation and procurement plans. MRVC will submit a project completion report within six months after Project completion.

23. **AIIB's Implementation Support.** The Bank will conduct two field visits per year to monitor progress. In addition to the biannual visits, AIIB will engage local consultants for technical, environmental and social aspects to conduct more frequent supervision of the design, construction, and environmental and social management activities on the ground. Furthermore, additional meetings will be organized as needed to provide in-time support to MRVC. AIIB will carry out a midterm review between 24 and 30 months following the implementation start date.

3. Project Assessment

A. Technical

24. **Project Design.** The Project involves the improvement of selected priority suburban stations along Western, Central and Harbour Lines. The improvement measures aim to reduce passenger crowding and trespassing, ease passenger flow, incorporate gender-inclusive and PwD accessibility design aspects, and implement resource efficiency features. The planning and design of the improvements are based on topographical surveys, characteristics of passenger traffic (rail passenger movement and load at peak hours assessments, parking surveys, etc.) and findings from passenger surveys and focused group discussions with female commuters. The new amenities and facilities for the stations to be improved are dimensioned based on forecasted passenger demand for the horizon year 2036 and the transport infrastructure expected to be developed in MMR. Furthermore, the design adheres to Indian Standards codes and specifications¹⁷ and follows the IGBC Green Railway Station guidance and recommendations.

25. A station planning consultant was engaged in 2019, financed under MUDP3, to prepare General Arrangement Drawings (GADs) of the selected stations. A Detailed Design Consultant (DDC) has been engaged since 2021 to provide detailed structural and architectural designs based on GADs. Surveys were conducted inside and outside the stations to understand passenger flows, bottlenecks, constraints and opportunities. Passenger density analysis was conducted with considerations of current and future demands. A gender survey was conducted, interviewing 502 female passengers at the selected stations to understand their experiences and suggestions.

26. Given that stations cannot be expanded at the ground level due to land constraints, the construction of elevated decks and FOBs to increase circulation space within stations for the decongestion of platforms has proved to be the most adequate option. Some passenger service functions will be relocated and enhanced at the created space at the deck level; additional FOBs, escalators and lifts connecting the deck level with platforms will be constructed; and additional fencing will be installed along the tracks on the stations' surroundings. These measures will further decongest the platforms and improve the quality of service and the safety of passengers. The new facilities are also expected to discourage trespassing, reduce accidents and improve safety. In addition to these measures, the other improvements being adopted include renovation of suburban rail entry/exit areas; additional ticket offices and toilets; widening of platforms; skywalk areas connecting FOBs for better passenger circulation; additional gender-responsive facilities and facilities for PwD such as ramps, tactile pathways, a "Nirbhaya room," toilets and drinking water taps, etc.; parking lots for two-wheelers; improvement of drop-off areas; enhancing signage and electric guidance systems; and other station office area and general electrification work, etc.

27. **Gender Responsiveness and PwD Accessibility Design.** A gender survey was conducted interviewing 502 female passengers at these stations to understand their experiences while using station facilities and to obtain the corresponding suggestions. The detail design engineering consultant also uses expert panels to evaluate the

¹⁷ BS/IRC/IS and American standards in case IRC/BIS code and MORTH specifications are insufficient.

existing stations and the proposed improvement measures. In particular, the expert panels assess gender responsiveness measures and facilities for PwDs to be included in the detailed design. The comfort of female passengers will be enhanced through FOBs with elevators and escalators, enhanced entry-exits points with ramps, drinking water provisions, clean washrooms and “Nirbhaya rooms.” In addition, female passengers will feel more secure thanks to improved lighting, improved line of sight, closed-circuit television cameras at isolated spots and a women-safety helpline. Accessibility and comfort of PwD will be improved through barrier-free movement up to the platform, equipping at least one FOB with elevators, handrails at adequate heights, a low-height ticket counter, tactile pathways, improved drop-off/pick-up areas, designated benches at platforms, and directional and information signage in braille. Further details of the gender and social inclusion strategy are presented in Annex 4.

28. **Green Building.** The IGBC, part of the Confederation of Indian Industry, offers green building rating programs and certification services, particularly its Green Railway Station Rating. The new structures and facilities to be built in the Project will comply with the requirements listed in the climate resilience section above. Even though the existing buildings and station facilities have low IGBC ratings, the overall rating of the improved station (considering both existing and new facilities) will not reach the “Silver” standard, except for Neral Station. Neral station is located on the outskirts of Mumbai with the potential of a comprehensive makeover as a pilot, and once improved will reach the IGBC “Silver” rating. In addition, the Project has identified additional feasible measures of green building improvements on existing stations and facilities, which would lead to silver or gold ratings. These measures will be advised to IR for adaptation.

29. **Operational sustainability.** WR and CR currently operate the selected stations. Indian Railway (IR) is a statutory body under the ownership of the Ministry of Railways of India, and WR and CR are two zonal railways of IR. WR and CR operate not only Mumbai’s Suburban Rail but also the long-distance passenger trains and freight trains in several states of India. Upon the Project’s completion, WR and CR will also ensure the management, operations and maintenance of the improved stations. As the size and services provided at the stations will increase, activities on maintenance, cleaning, security, etc., will also increase, and additional station staff will be required. It is estimated that, on average, the additional O&M cost per station will be USD26,220 per year, which is very marginal compared to the financial capability of WR and CR. Most of the operational and maintenance activities are outsourced. WR and CR are expected to amend ongoing contracts or retender contracts for cleaning, maintenance of amenities, parking management, etc., to incorporate the extension of their perimeter.

B. Economic Analysis

30. **Economic Analysis.** A Cost-Benefit Analysis (CBA) was conducted to calculate the EIRR and Net Present Value (NPV) of the Project. The improvements in the selected stations are expected to result in better passenger conditions in terms of accessibility, safety and comfort. However, it is envisaged that station improvement in this Project will not increase passenger demand. The increase in travel passenger demand is often the main benefit of public transport projects since CBA tends to focus on quantitative impacts and ignores qualitative benefits as these are much harder to quantify and monetize.

31. The benefits of this Project comprise a reduction in the station accessibility time, a reduction in the number of accidents and an increase in comfort. Other inclusive benefits include enabling access to public transport services to PwD or improving the hygiene of female and children passengers. Still, these benefits cannot be monetized and are not included in this Economic Analysis. Although these benefits cannot be quantified, having inclusive stations for female passengers, vulnerable groups and PwD passengers is crucial to facilitating access to economic opportunities and improving their welfare and autonomy. Thus, these benefits are expected to be significant at the Project level. The costs included in the CBA are capital expenditures and O&M costs.

32. The EIRR of the Project is 17.0%, and the NPV is USD65.68 million (discount rate 10.0%). The EIRR is above the opportunity cost of 10.0%; therefore, the Project is considered economically viable. Further details of the economic analysis are presented in Annex 3.

C. Gender Equality and Social Inclusion

33. Gender equality and social inclusion in transport projects can be tackled through four phases: stakeholder engagement, engineering design, construction phase and operation phase. In this Project, the gender and social inclusion strategy focuses on the first three phases. The suburban rail operators will carry out the operation phase. Further details of the gender equality and social inclusion strategy are presented in Annex 4.

- (i) Stakeholder engagement phase. About 31% of suburban railway passengers are women. While preparing MUTP3, female passengers were surveyed to assess their satisfaction with existing station facilities. The survey revealed low satisfaction with accessibility, safety and cleanliness. A similar survey was conducted for stations covered under this Project, followed by a detailed gap analysis comparing the survey findings with the measures provided for station improvements. MRVC is also prominently publicizing the station improvement design videos through its website and inviting inputs from commuters and the public.
- (ii) Engineering design phase. Detailed station designs incorporate the recommendations from stakeholder engagement. MRVC also engaged a consultant expert to strengthen improvement measures regarding inclusion and accessibility based on international experiences.
- (iii) Construction phase. The potential impact on women during construction has been assessed in the ESIA. Mitigation measures are identified in an Environmental and Social Management Plan (ESMP) and RAP, including non-discriminating in wage payment for construction work, measures to ensure the safety and health of female workers, and the gender-based violence and prevention plan.

D. Fiduciary and Governance

34. **Procurement.** Procurement will be conducted under the provision of the Bank's Procurement Policy, January 2016, and Section II of Interim Operational Directives:

Procurement Instructions for Recipients, June 2016. The procurement of works and goods will follow International Open Competitive Tender (IOCT) and National Competitive Tender (NCT) as set out in paragraphs 10.1 and 10.4 of the Bank's Procurement Instructions for Recipients, respectively, using the Government of India central e-tendering platform www.eprocure.gov.in. MRVC is implementing MUTP3, and the relevant staff on board are already familiar with MDB's general procurement requirements. In addition, the procurement arrangements for this Project reflect lessons learned during the implementation of MUTP3.

35. MRVC has prepared a draft Project Delivery Strategy, and the Bank has provided in-principal clearance for it. The Project Delivery Strategy outlines procurement arrangements, including tendering and contracting strategies, capacity and risk assessments, proposed mitigation measures and procurement thresholds. Any contracts estimated to cost more than USD40 million for works and USD3 million for goods and Non-Consulting Services will follow IOCT methods. Any contract estimated to cost more than USD2 million for Consulting Services will follow the International Open Competitive Selection (IOCS) method. MRVC will use AIB Standard Procurement Documents (SPDs), and the Bank will review contracts estimated to be more than USD15 million for Works, USD4 million for Goods and USD2 million for Consulting Services.

36. To meet the Department of Economic Affairs' readiness criteria, MRVC has initiated advance procurement. As for the pre-appraisal mission in March 2023, MRVC had concluded procurement of two packages amounting to USD34.6 million. The tender process of the remaining packages is at various stages, and most of the civil works' contracts are expected to be finalized by the end of 2023.

37. **Financial Management.** MRVC's finance department will undertake the financial management aspects of the Project. It will be executed following its existing processes and procedures, deemed adequate by the Bank and currently applied to the MUTP3 project. The Finance Department, headed by the Director of Finance, is staffed with experienced professionals executing financial management responsibilities for several projects financed by MDBs. The finance department utilizes an accounting system called "Tally ERP," which is equipped with accounting, monitoring and reporting functions on Project funds by sources of finance, Project components and activities. The department's internal control system is well-established and effective, reinforced through its internal audit function, statutory audits and audits executed by the Comptroller and Auditor General of India. Project financial management will follow MRVC's prevailing financial management practice. Areas for enhancement have been discussed and agreed on under MUTPs and will be applied to MUTP3A. The Project's annual budget will be part of MRVC's annual budget, with a yearly budget project statement prepared and sent to the Bank for review within one month after budget approval. Quarterly budget variance will be executed and shared with the Bank as part of the Interim Unaudited Financial statement (IUFR). The approval and signing of contracts and the payments to contractors will follow MRVC's Schedule of Powers. "Certificate of payment" will be prepared by the Project Manager and submitted to the office of the Project Director. The Project Director will sign the certificate of payment and arrange payment to the contractor. The Project funds received and expenditures incurred will be accounted for following the accrual basis. The Interim Unaudited

Financial Report, however, will be prepared on a cash basis and be submitted to the Bank within 45 days after the end of each quarter. The audited annual Project financial statements will be submitted to the Bank within nine months after the end of each fiscal year. The audit report contents shall be agreed on with the Bank and included in the PIM. The Comptroller and Auditor General of India will carry out the audit of Project account.

38. Disbursements and fund flow.

- (i) **Disbursement method:** The reimbursement, advance payment and direct payment methods will be permitted. Concerning reimbursement, the proceeds from the AIIB loan will be disbursed to the account of the Controller of Aid Accounts & Audit (CAAA) of the Ministry of Finance, maintained with the central bank of India.
- (ii) **Fund flow:** The funds will be further transferred by CAAA to the accounts of MoR and GoM and then to MRVC, following the government's standard procedures for external aid. All withdrawal applications will be prepared by MRVC and submitted to CAAA. CAAA will approve all withdrawal applications and submit applications to the Bank. The disbursement arrangements have been finalized and will be documented in the disbursement letter. All disbursements will be made per the terms and conditions contained in the disbursement letter.
- (iii) **Counterpart funding** from MoR and GoM will be provided to MRVC following the standard procedures for budget allocation. Railway Board conveyed the sanction of the MUTP3A program, including station improvements, in April 2019. GoM agreed to share the funding with MoR on a 50:50 basis for the MUPT3A program. The annual commitment of funds, as the share from MoR, for the MUTP3A program is approved in the Government of India's Annual Budget and published in the Pink Book. The subsidiary agreement, a financing agreement between MRVC and GoM, and associated government agencies under GoM to support the 50% share of the MUPT3A program, was signed in July 2023. This subsidiary agreement defines the terms to regulate the transfer of funds, about USD1.6 billion in eight years, from GoM to MRVC for the execution of the whole MUTP3A program. The counterpart requirement for the Project is only about 1.5% of the entire financing agreement. Therefore, the risk of providing counterpart funds from government agencies is low.
- (iv) **Category of expenditure:** Considering the focused activities in this Project, the following Categories are proposed with allocated loans.

Table 2: Category of expenditure

Category	Amount of the Loan	Percentage of Eligible Expenditures to be

	allocated (USD)	financed (Inclusive of Taxes)
(1) Goods, works, non-consulting services, and consulting services under Component A of the Project	94,750,000	80%
(2) Goods, non-consulting services, consulting services, Training under Component B of the Project	5,000,000	100%
(3) Front-end Fee	250,000	100%
Total	100,000,000	

- (v) Projected profile: The following disbursement projections are estimated.

Table 3: Disbursement projection

Year	1 st year	2 nd year	3 rd year	4 th year
Disbursement Amount (as a % to the total loan)	15%	25%	35%	25%

39. **Governance and Anti-corruption.** AIIB is committed to preventing fraud and corruption in the projects it finances and places the highest priority on ensuring that financed projects are implemented in compliance with its Policy on Prohibited Practices (2016). Implementation will be monitored regularly by AIIB staff. AIIB reserves the right to investigate, directly or indirectly through its agents, any alleged Prohibited Practice relating to the Project will require the borrower to take necessary measures to mitigate the risk of such practices and promptly address any issues, as appropriate. AIIB will monitor the work related to tender document preparation and tender/proposal evaluation under AIIB financing.

E. Environmental and Social

40. **Environmental and Social Policy and Categorization.** The Bank's Environmental and Social Policy 2022, including the Environmental and Social Standards (ESSs) and the Environmental and Social Exclusion List, applies to this Project. ESS 1 (Environmental and Social Assessment and Management) and ESS 2 (Land Acquisition and Involuntary Resettlement) will be triggered due to the identified rehabilitation impacts and potential additional land requirements for the Project. ESS 3 (Indigenous Peoples) will not apply to the Project as the Project-affected area is highly urbanized and does not contain distinct social and cultural group(s) possessing distinct characteristics as per ESS 3. Given the limited and localized environmental and social

(E&S) impacts during the construction stage, the Project has been assigned Category B.¹⁸

41. **Instruments.** ESIA, including an ESMP and the RAP, were prepared as per Bank's ESP and disclosed in March 2022.¹⁹

42. **Environment.** The Project's potential environmental impacts will be site-specific. Reversible construction stage impacts, including air and water pollution, noise pollution, and disposal of construction and demolition wastes, are assessed in the ESIA. The assessment confirmed no impact on Historical and Cultural Monuments. Relevant national policies will be followed if any discoveries are made during excavation. The ESMP provides mitigation measures, including institutional arrangements, scheduling and budgeting for the implementation and monitoring. The ESMP also includes mitigation plans, measures and provisions related to occupational health and safety, construction site management, and traffic and public utility management, among others. WR and CR will manage additional wastewater and solid wastes on account of improved facilities during the operational phase. During the operation stage, ES impacts are considered insignificant. There is no impact of noise and vibration during operation.

43. **Social Aspects.** The station improvement works require 15.8 ha of land. Government land comprises 1.01%, whereas the remaining land belongs to the railway authority. The government land will be made available to MRVC through an administrative process. No private land is assessed to be acquired. Efforts were made to utilize existing railway land for the Project and thus avoid private land acquisition. A RAP is prepared per the MRVC Resettlement Plan Framework for addressing the limited impacts, and RAP has been disclosed. Nine encroached structures are fully affected, which include five commercial shops in Chembur station and four encroached residential structures in Mumbai Central. Eighteen non-title holder Project-affected persons (PAPs) are identified occupying the government land at these two stations, and the impacts will be addressed according to RAP. Compensations are budgeted for commercial Project-affected families (PAFs) for livelihood assistance, subsistence allowance, transportation allowance, resettlement allowance whereas the compensation for residential PAFs is budgeted for loss of structure, subsistence allowance and transportation allowance. In addition, the RAP included budgets for providing handholding support throughout the process. The MRVC, WR and CR will collaborate with the local government and facilitate transport circulation around the stations during the construction and operational phases of the Project.

44. **Occupational Health and Safety (OHS), Labor and Employment Conditions.** MRVC has outlined mitigation measures for OHS in the ESMP, as informed by the current Project work in MUTP3. Project construction work will be consistent with all applicable laws and policies of India and international guidelines such as OHSAS

¹⁸ This Project was assigned as Category A during the concept review due to limited information at that stage. Subsequently, with clear identification of the Project scope and outcome of E&S due diligence, including site surveys on the land requirement, the Project is now categorized to Category B during project preparation. The due diligence further confirms adequate E&S capacities with the implementing entity and limited and localized environmental and social impacts.

¹⁹ https://mrv.c.in/dianrailways.gov.in/view_section.jsp?lang=0&id=0,295,406,468

18001-2007, Occupational Health and Safety Management System and ISO 14001-2015, and Environmental Management Systems. The contractor will follow an Environment, Health and Safety (EHS) Manual during the pre-construction phase, covering identification of the unit responsible for coordinating and monitoring the contractor's EHS performance, EHS training courses and emergency drills, safety audit, EHS communication, medical facilities on site, preparation of Emergency Response Plan and other safety aspects.

45. Appropriate safety measures for both workers and commuters during the construction phase are included in ESMP. Contractors will implement the EHS Communication Plan to communicate the safety, occupational health and environment management measures through posters campaigns, billboards, banners and glow signs displayed around the work site. A commuter management plan will be implemented to inform the passengers about upcoming activities, including details on construction areas, period of construction and alternate routes. The contractors will display signages in the local language to demarcate trenches, storage areas, etc. During the operation phase, improvements such as widening the platforms and installing railings along the tracks will prevent crowding situations and discourage trespassing, leading to overall improvements in passenger safety during the operational phase.

46. **Stakeholder Engagement, Consultations and Information Disclosure.** MRVC has conducted several public consultations with PAPs, focus group discussions (FGDs) and key informant interviews/discussions in Mumbai stations. It involved different stakeholders, including shop owners, informal settlers, kiosk operators, daily passengers, students and others. Major findings include issues related to trespassing, noise and vibration, employment of female security guards and resettlement logistics. The Project design benefited from these inputs. The ES instruments are disclosed on the AIIB website²⁰ and the MRVC website.²¹

47. **Project Grievance Redress Mechanism (GRM).** The existing GRM for addressing Project-related grievances for MUTP3 established per the requirements of the Bank's ESP will also be applicable for this Project. The GRM includes a procedure to receive and facilitate the resolution of Project-affected peoples' and workers' concerns, complaints and grievances. Communities and individuals who believe they are adversely affected by the Project can submit complaints to the Project-level GRM. The due diligence and field missions confirm the functioning and performance of satisfactory GRM.

48. **Project-Affected People's Mechanism (PPM).** AIIB's Policy on the Project-affected Peoples Mechanism (PPM) applies to this project. The PPM has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement the ESP in situations when their concerns cannot be addressed satisfactorily through the project-level GRM or the processes of AIIB's Management. Information on AIIB's PPM is available at:

²⁰<https://www.aiib.org/en/projects/details/2020/proposed/India-Mumbai-Urban-Transport-Project-3A-1.html>

²¹https://mrv.c.inianrailways.gov.in/view_section.jsp?lang=0&id=0,295,406,468

<https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html>.

49. **Monitoring and Supervision Arrangements.** Considering this is a Category B Project, as agreed with the PMO, Project E&S matters, including ESMP implementation, will be monitored by the MRVC. The MRVC will prepare a biannual E&S monitoring report. AIIB will conduct onsite implementation support missions regularly.

F. Risks and Mitigation Measures

Table 4: Summary of Risks and Mitigating Measures

Risk Description	Assessment (H/M/L)	Mitigation Measures
<p>Implementation Delay in implementation due to constraints of keeping the suburban rail service running during execution of work, due to limited availability of space for the contractors to work, restriction in movement of workers and material and requirement to work in certain areas near the tracks only under traffic and power shutdowns.</p>	Medium	<p>Better planning of work execution by utilizing lessons learned from implementing earlier brownfield projects under previous MUTP.</p> <p>Provision of dedicated supervision staff at each work site/station who are conversant with the station's features and passenger movement in and around.</p> <p>Regular coordination meetings between MRVC's project team and O&M teams of WR and CR at all working levels to exchange ideas and solve issues.</p>
<p>Implementation Passenger safety risk due to ongoing civil work at stations open to routine operations.</p>	Medium	<p>Adequate clauses for safety measures are included in the contracts, coupled with strict oversight by contractors and MRVC during execution.</p> <p>Boards and fences separate the construction areas from other station areas.</p> <p>Signage is provided at stations to caution passengers.</p>
<p>Implementation. Work delays due to monsoons and system vulnerability to flooding during monsoon seasons.</p>	Medium	<p>The improvements are designed in such a manner as to minimize earthwork that gets badly affected by floods.</p> <p>Monsoon seasons will be factored into the Project schedule so that as far as possible, the period is utilized for activities not affected by flooding.</p>
<p>Procurement and Financial Management</p>	Low	<p>MRVC is familiar with the procurement procedures and requirements of AIIB, thanks to the experience gained with</p>

<p>Delays in procuring major civil works contracts.</p> <p>Financial Management not complying with the Bank's requirements.</p>		<p>implementing MUTP3. Regarding the works contracts, four of the selected stations are already contracted. The procurement of the remaining works packages is expected to be completed by the end of 2023.</p> <p>The financial management structure remains the same as MUTP3. The financial management implementation of MUTP3 is satisfactory.</p>
<p>Environmental and Social</p> <p>Adverse environmental impacts on the surrounding society.</p> <p>Delays of land acquisition.</p>	<p>Medium</p>	<p>The main environmental risks are typical construction-stage risks, including air pollution, noise, disposal of construction and demolition wastes, and inconvenience to the passengers due to access restrictions during improvement works. Mitigation measures as per ESIA, including an easy-to-understand communication plan for apprising the commuters on access restrictions, will be implemented by MRVC.</p> <p>The design of the station improvements prioritizes, as far as possible, the use of the existing government land and railway land with minimal resettlement requirements. 15.8 ha of land belonging to Indian Railway or local government is required for the Project with 18 Project-Affected People identified. It is envisaged the land will be transferred by the end of 2023.</p>

Annex 1: Results Monitoring Framework

Project Objective:	The objective of the Project is to provide passengers with improved quality of service at selected stations of the Mumbai Suburban Rail network in an inclusive, safe, and environmentally sustainable manner.								
Indicator Name	Unit of measure	Base-line Data Year	Cumulative Target Values				End Target	Frequency	Responsibility
			YR1	YR2	YR3	YR4			
Project Objective Indicators:									
1. Increase of Passenger Satisfaction level (Total/female)	Scale (1-10)	6.5/6.1					7.8/7.3	After Operation of the improved stations	MRVC
2. Number of stations equipped with adequate facilities for gender and PwD	Number	0			4		17	After Operation of the improved stations	MRVC
3. Reduction in the annual number of fatalities and injuries at stations to be improved	Number of annual fatalities and injuries	432					less than 346	After Operation of the improved stations	MRVC
4. Number of stations having a “silver” or “gold” level certificate from India Green Building Committee	Number	0			1		1	After Operation of the improved stations	MRVC

Project Objective:	The objective of the Project is to provide passengers with improved quality of service at selected stations of the Mumbai Suburban Rail network in an inclusive, safe, and environmentally sustainable manner.								
Indicator Name	Unit of measure	Base-line Data Year	Cumulative Target Values				End Target	Frequency	Responsibility
			YR1	YR2	YR3	YR4			
Intermediate Results Indicators:									
1. Overall construction progress of station improvements	Percentage	0%	15%	35%	65%	100%	100%	Annual	MRVC
2. Number of Technical Assistance studies completed	Number	0					10	Annual	MRVC

Annex 2: Detailed Project Description

A. Context

1. **Mumbai Suburban Railway Network.** The Mumbai Suburban Rail network consists of 385 route km and 118 stations, with more than 3,031 trains in operation per day¹ and with a fleet of over 275 Electric Multiple Units (EMU). The Mumbai Suburban Rail is served by two of India's zonal railways, Western Railway (WR) and Central Railway (CR), operating four main lines in total. WR operates the Western Line from Churchgate to Dahanu Road, whereas CR operates the Central Line (CSTM²–Kasara and CSTM to Khopoli), the Harbour Line (CSTM to Panvel and CSTM to Andheri), and the Trans-Harbour Line (Thane to Vashi and Thane to Nerul).

2. The Mumbai Suburban Rail network is the backbone of public transport in the MMR. Currently, people in the MMR rely heavily on the Mumbai Suburban Railway for commuting to work daily. The rail network carries over 8.5 million passengers per day³ and has a modal share of 43%⁴, followed by two-wheelers at 21% and the Brihanmumbai Electricity Supply and Transport (BEST) buses at 20%. During peak hours, more than 6,000 passengers travel in 12 car train, whereas the carrying capacity of the train is only 3,600. As a result, the passenger load density can reach up to 16 standing passengers per square meter of floor space, making the Mumbai Suburban Rail one of most crowded public transport systems in the world.

3. **Mumbai Urban Transport Projects (MUTP).** To meet the travel demands and to ease overcrowding, and with the help from the World Bank supporting the Mumbai Urban Transport Project (MUTP1) in 2002, and Mumbai Urban Transport Project 2 (MUTP2) in 2010, the capacity expansion of Mumbai Suburban Rail has increasingly been expedited. These two projects set the foundation of systematic planning through comprehensive transport studies of MMR, to improve all urban transport modes including Suburban Rail. Through studies, the Development and Expansion Plan for Mumbai Suburban Rail Network was updated in MUTP2 in 2016, which set out a phased development program for future stages, including 1) Mumbai Urban Transport Project 3 (MUTP3) for the short term; 2) Mumbai Urban Transport Project 3A (MUTP3A) for the mid-term; and 3) Mumbai Urban Transport Project 4 (MUTP4) for the long term. AIIB is supporting part of the activities of MUTP3, which is currently under smooth implementation. MRVC has been involved in the preparation and implementation of all the previous MUTP projects. The Project is part of MUTP3A program.

4. The past and present expansion of the network, undertaken under MUTP is presented in Figure A2.1.

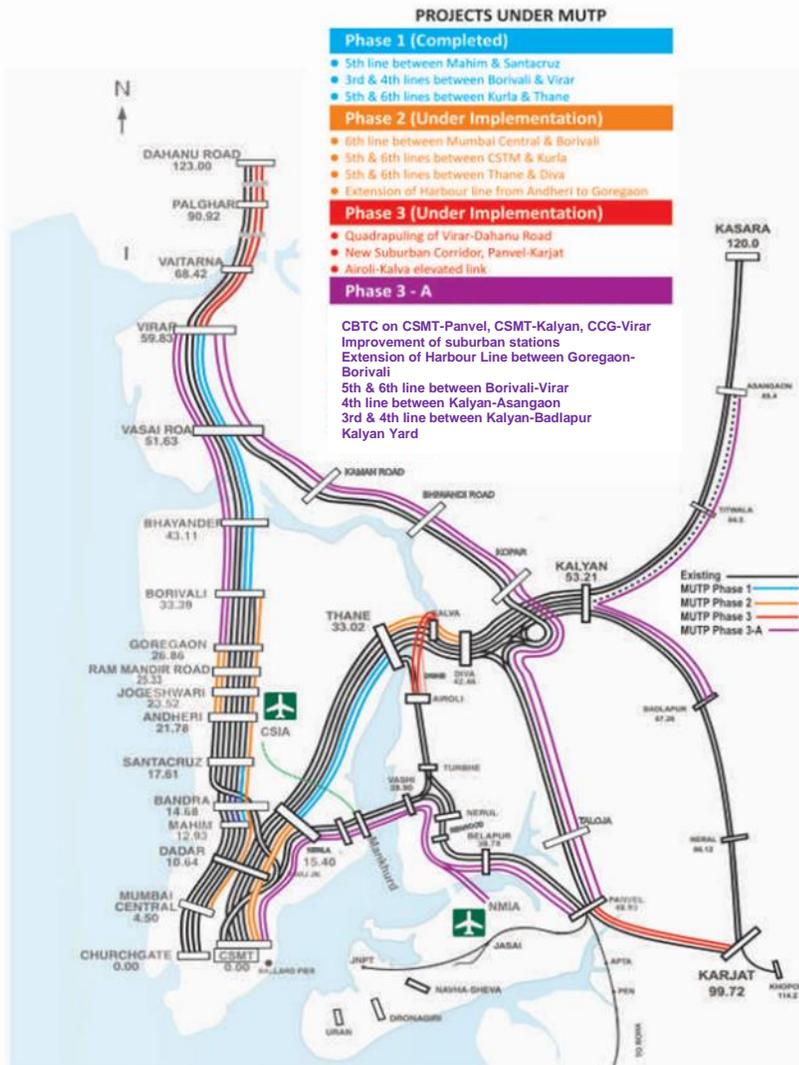
¹ Source: MRVC website. [https://mrvc.indianrailways.gov.in/uploads/MRVC%20brochure%20July%202021\(1\).pdf](https://mrvc.indianrailways.gov.in/uploads/MRVC%20brochure%20July%202021(1).pdf)

² Chhatrapati Shivaji Maharaj Terminus (CSTM)

³ Source: MRVC website. [https://mrvc.indianrailways.gov.in/uploads/MRVC%20brochure%20July%202021\(1\).pdf](https://mrvc.indianrailways.gov.in/uploads/MRVC%20brochure%20July%202021(1).pdf)

⁴ Source: Municipal Corporation of Greater Mumbai. 2016. Comprehensive Mobility Plan for Greater Mumbai. Mumbai

Figure A2.1: Mumbai Suburban Railway Network and MUTP Projects



5. **The previous major investments have not benefited the existing stations.** MUTP projects have increased and will increase, once completed, the capacity of the suburban railway network, in terms of number of services per hour and number of coaches (train carrying capacity), resulting in de-crowding of the Suburban Rail services. However, these major investments have not benefited the existing stations, either to enhance their capacity and accommodate the increase in passengers, nor with any major rehabilitation work. There is, therefore, an urgent need for creating additional capacity and other improvements to avoid overcrowding at station areas and to increase the level of service by reducing crowding in platforms, reducing waiting time at ticket counters, facilitating passenger movements etc. Furthermore, in heavily congested surroundings of stations, accessibility and multi-modal integration are also critical and cause major safety problems. Between 2011 and 2016, there were about 20,638 fatalities (on average, 9.4 fatalities per day) on the Mumbai Suburban Rail network. Around 23% of fatal accidents were

due to overcrowding situations, and 57% due to illegal trespassing⁵. PwD accessibility and gender safety are also crucial to ensure inclusive transport services.

6. Under MUTP 2 and 3, MRVC has been constructing additional FOBs close to stations, extending existing platforms, constructing new platforms and staff quarters, etc., whenever it is feasible. However, due to the urgent need to increase capacity, accessibility and safety in stations, MRVC has decided to fast track the process to start the implementation of major station improvement in selected stations of the Suburban Rail network under the MUPT3A. The expansion and modernization of the existing stations is an innovative pilot project that MRVC expects to replicate in other stations of the network.

B. Project Components

7. **Component A. Improvement of Selected Existing Stations (total cost: USD139.74 million; AIIB loan: USD94.75 million).** Through MUTP projects, MRVC had undertaken certain studies by experienced consultants to analyze the passenger movements, crowding and development of Mumbai Suburban Rail network⁶. These reports combined with the experience of Indian Railways and MRVC led to the proposal of the development and improvement of Mumbai suburban stations. The initial stations have been selected by IR in consultation with Central Railway (CR) and Western Rail (WR). The main criteria considered were: 1) at least one station from each corridor of Mumbai Suburban Rail System (Central Line, Western Line and Harbour Line), 2) different station sizes covering the entire Mumbai Suburban Railway network, and 3) stations with significant footfall and are technically feasible for improvement with limited land requirements.

8. Under this Project at Appraisal stage, 17 stations were chosen to be developed. Figure A2.2 underlines the 17 stations that are identified for improvement under this Project. Out of the 17 stations, 7 stations are on the Western Line, 6 are on the Central Line and 4 in the Harbor line.

⁵ Updating of Comprehensive Transportation Study for Mumbai Metropolitan Region, MMRDA, 2020

⁶ Study of Development and Expansion Plan for Mumbai Suburban Rail Network, by Egis India & Aarvee Associates, 2016
Mumbai Sub-urban Rail Passenger Surveys and Analysis, by Wilbur Smith Associates, 2012

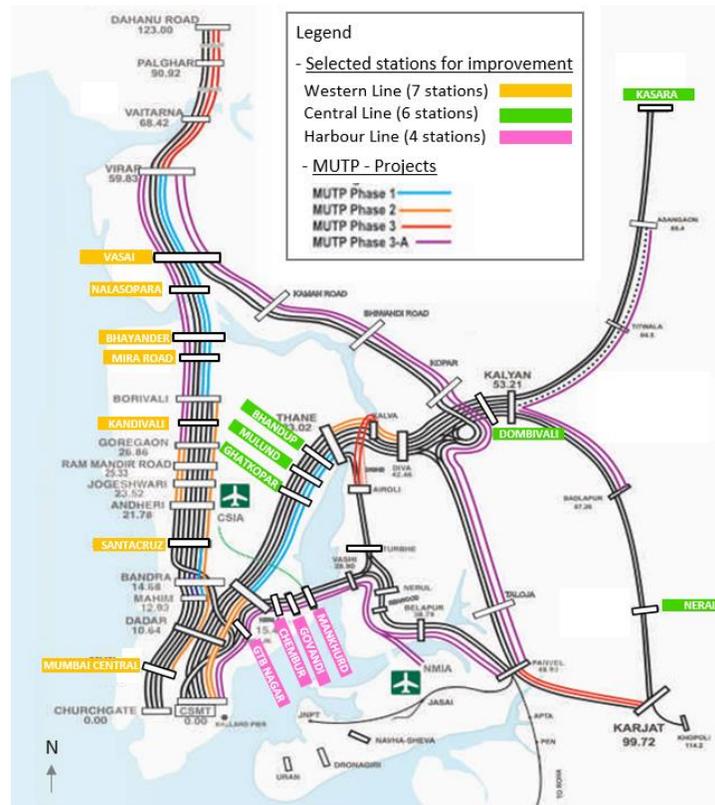


Figure A2.2: Selected Stations to be Improved in the Project

9. In order to reduce crowding at the stations, particularly the platforms and to improve passenger movement between entry/exit and platforms, a number of improvement measures are proposed at selected stations depending on availability of space and requirement. These include construction of additional FOBs, widening of existing FOBs, construction of elevated decks and skywalks. The decks are being designed in such a way that a passenger will have access to all platforms. This will also provide the passengers with a waiting space by the time a desired train arrives. This improvement, in addition to widening of platforms that is being implemented at some stations, will reduce crowding and cross-movements in platforms, thereby enhancing passenger safety. Further, more ticket windows are being planned that will reduce crowding at ticket windows and overall transit time. All these measures are envisaged to enhance the level of service at the stations.

10. The planning and design of the Suburban Rail station improvements are based on the characteristics of present passenger traffic and planned infrastructure expected to be developed by 2036. A traffic study, in addition to secondary data collection, has been carried out to analyze passenger and traffic movement and assesses future demand for each station. In this way, it will ensure the adequacy of the proposed measures to improve the stations amenities and facilities, station circulation, and connectivity with the surroundings and with other future transport systems for the horizon year 2036. The design of station improvement is gender and PwD responsive (Please refer to Annex 4). The climate risks were analyzed, and climate resilience features are incorporated into the design (Please refer to Annex 5).

6. **Component B. Capacity Building, Preparation Support, and Technical Studies (total cost: USD5 million; AIB loan: USD5 million).** The component will provide capacity building, project preparation support, and technical assistance to the implementing entity. The activities in this component will have direct or indirect impacts on Suburban Rail stations, by focusing on the inclusiveness, safety and sustainability to improve the quality of the Suburban Rail services.

7. The activities of this component consist of three main areas:

- (i) Capacity building activities include trainings and workshops. It is planned trainings and workshops are to be organized and supported as needed to enhance the capacity of MRVC staff as well as the staff of Western Railway and Central Railway, aiming to enhance the level of service of the Suburban Rail. Small project management expenses (Incremental Operating Costs) could be included.
- (ii) Project preparation support. Preparation support activities include consulting services to prepare this Project, as well as to prepare future potential investments at the next stage.
 - a. Consulting services to prepare this Project. The design consultants of this Project have been hired under this component, including detailed design consultant, ESIA consultant and PwD accessibility design consultant.
 - b. Consulting services to prepare future investments, including feasibility studies for the specific improvement projects, which will have direct or indirect impacts on existing stations.
- (iii) Additional technical studies, which will provide knowledge on the following aspects:
 - a. Studies supporting strategic planning for MRVC and IR, will assess the operation challenges of Mumbai Suburban Rail in a holistic approach, and to propose investment activities of the next stage aiming at long-term safe, inclusive, and sustainable development.
 - b. Studies to assess climate vulnerabilities of the suburban rail system and to propose strategies and mitigation measures.

8. Cost and Financing Plan

Item	Project Cost (USD m)	Financing (USD m and %)		
		AIB	GoM	MoR
Component A	139.75	94.75 (68%)	22.5 (16%)	22.5 (16%)
Component B	5	5 (100%)	0 (0%)	0 (0%)
Front-end Fee	0.25	0.25 (100%)	0 (0%)	0 (0%)
Grand Total	145	100 (69%)	22.5 (15.5%)	22.5 (15.5%)

9. **Implementation period.** The Project is expected to be implemented from September 2023 to December 2027.

C. Implementation Capacity, Schedule, and Operation & Maintenance

10. **Implementation Capacity.** MRVC will assume the lead role as the implementation entity. Other agencies involved are, Indian Railways (IR) for approvals, operations and general ownership, Government of Maharashtra (GoM) for land acquisition and local government coordination, DDC for detailed engineering design, other subject-specific consultants and Contractors for procurement and execution of works. The organizations involved and their relationship is shown in Figure A2.3. Project execution team related to the Project is shown in Figure A2.4.

Figure A2.3: Organogram of the Project

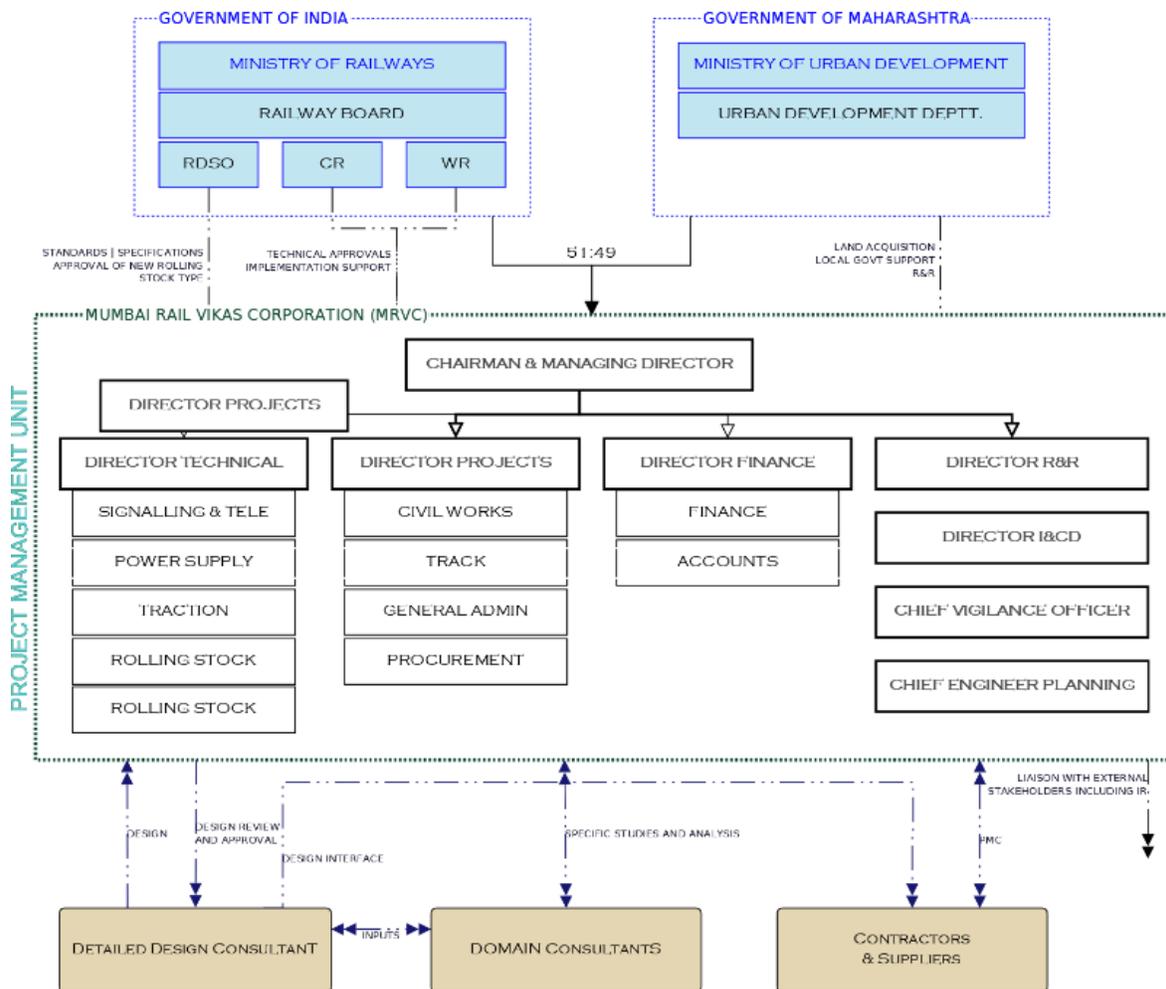
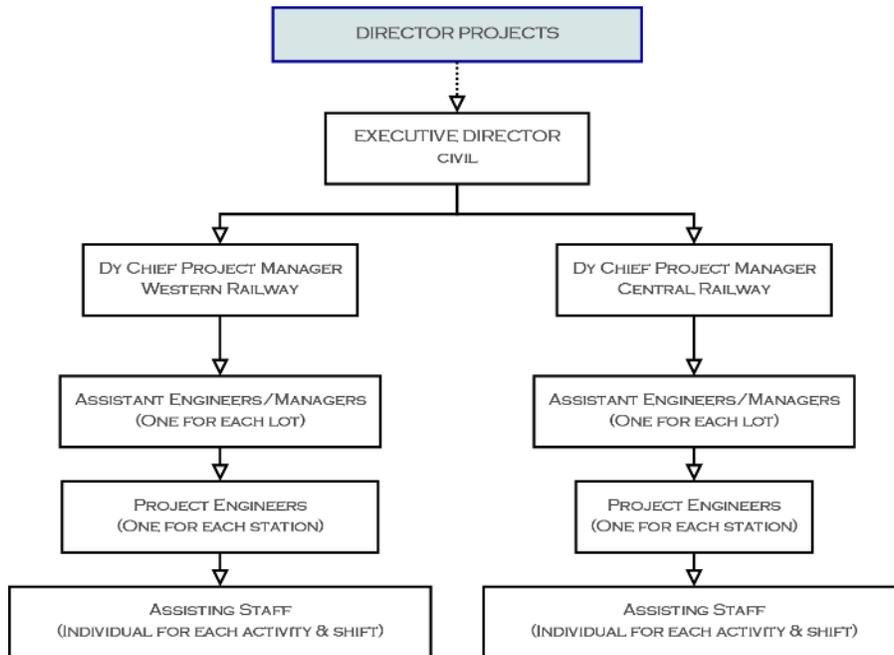


Figure A2.4: Organogram of Project Execution Team

11. The PMO is setup by MRVC. Director (Projects) is responsible for civil engineering matters, track works and planning. Director (Technical) is responsible for rail systems (signaling, telecommunications, power supply, rolling stock). Director (Finance) is responsible for financial and secretarial matters. Two additional directors are responsible for Resettlement and Rehabilitation (R&R) and Infrastructure and Commercial Development (I&CD). The unit also has a Chief Vigilance Officer to look after matters of transparency and integrity.

12. MRVC will handle the responsibility of project management by itself. It includes design review and bid process management. Bid process management will include tender packaging, preparation and finalization of tender documents for works contracts and evaluation of bids. MRVC officials will be responsible for implementation of design, construction, testing & commissioning of the Project, in addition to supervision of the contractors' performance, progress monitoring, supervision and monitoring of implementation of mitigation measures elaborated in the and Environmental and Social Management Plan (ESMP), certification for completion of various works by the different works contractors, supervision of system integration and ensuring commissioning of the Project as per the target dates laid. It also includes interface management and stakeholder management and coordination with different regulators and government agencies.

13. The DDC appointed by MRVC are responsible for detailed survey (including land survey, geotechnical investigation, utility survey) and producing detailed construction drawings for use by the contractors. The DDC would be associated with the Project during the project execution and provide support in respect of designs.

14. Other consultants under various stages of appointment are responsible for specialized studies that are important for the success of the Project. The Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) studies have been completed by the consultant.

15. **Operation & Maintenance.** The stations under the Project are already functional and are being operated and maintained by Central and Western railway zones of Indian Railways. Once completed, the facilities under the Project will be handed over to IR for operation and maintenance on the same pattern.

Annex 3: Economic Analysis

A. Introduction

1. The economic analysis was undertaken to assess the economic viability of the MUTP3A-Station improvements. As part of the DPR, an initial economic analysis was carried out for the overall MUTP 3A program, the estimate of the economic internal rate of return (EIRR) was estimated at 19.55 percent. This economic evaluation did not consider the specific benefit and costs of the station improvements; hence a separate economic analysis has been conducted.

2. For the economic evaluation, the applied methodology is Cost Benefit Analysis. The CBA entails the comparison of the incremental economic benefits and costs from the Project to the transportation infrastructure in the Mumbai Metropolitan Region. The objective of most public transportation projects is to increase the passenger demand of the system by increasing the train frequency or the train capacity, where travel time savings are often the primary justification for transportation infrastructure investments. However, the Project focuses on the travel conditions and in particular accessibility, safety, and comfort of selected existing stations. Therefore, the Project is not expected to lead to an increase in the number of passengers, but to an increase in the quality of services provided to the existing ones.

B. Economic Analysis

3. **Cost-benefit analysis and key assumptions.** All costs and benefits are estimated in constant 2023 prices with an average exchange rate of INR 83.3 to USD 1. The economic analysis is conducted over a 24-year period starting from year 2023 until 2046, with a works phase of 4 years and an operating life span of 20 years. The discount rate selected for the Project is 10.0 percent⁷.

4. **Passenger travel demand.** As explained above, the stations' improvements are not expected to impact on the volume of passenger demand of the Mumbai Suburban Railway System. Furthermore, the analysis takes the conservative assumption that the passenger travel demand will remain constant in the future. Following the population growth in Mumbai Metropolitan Region, the daily passenger travel demand is expected to increase from 19.64 million in 2021 to 24.91 million in 2041⁸. However, as the metro network in Mumbai is expanding very fast, it is forecasted that there will be a modal shift from rail to metro and it will partially absorb the new public transport demand. The travel demand model developed in a recent study⁹ shows that the daily passenger volumes in the Mumbai Suburban Rail system in 2041 will be almost the same as in 2023.

5. **Project cost.** The economic costs of the Project comprise the following:

⁷ The 10% discount rate is selected for the project by referring to the recent economic analyses of World Bank projects and AIIB projects. It is about twice the historical 20-year per capita gross domestic product growth rate in India.

⁸ Updation of Comprehensive Transportation Study for the Mumbai Metropolitan Area

⁹ Updation of Comprehensive Transportation Study for MMR

1) **Capital cost.** As per MRVC' latest estimates, the capital costs for the Project, excluding central and state taxes and government land acquisition costs, is approximately USD 145 m. An economic conversion factor of 83% is applied to the capital cost, as per the Appraisal Guidelines for Metro Rail Project Proposals of MoHUA.

2) **O&M costs.** The new station's facilities constructed under the Project such as elevators, escalators, toilets, etc. will require cleaning, and routine maintenance, but will also increase the utilities expenses such as electricity, water, heating, etc. These costs have been estimated by MRVC based on the actual operating costs of stations of the Mumbai Suburban Rail. It is estimated that on average the additional O&M cost per station will be USD 26,220 per year, so USD 445,740 per year for all 17 selected stations. An economic conversion factor of 87% is applied to the O&M cost, as per the Appraisal Guidelines for Metro Rail Project Proposals of MoHUA.

6. **Project benefits.** The passengers of the Mumbai Suburban Rail will benefit from safer and more accessible stations, as well as improved comfort while waiting for the train on the platforms. The economic benefits of the Project comprise the following:

- 1) **Reduced injuries and fatalities in the selected stations.** The construction of a deck and larger FOBs improving the connection between the station entry points and the platforms will help prevent trespassing at the selected stations. Furthermore, the widening of FOBs and of the platforms in some of the selected stations will also prevent overcrowded conditions in the platforms.

Figure A3.1: Passengers trespassing at a station of the Mumbai Suburban Rail



Between April 2022 and March 2023, there were a total of 429 accidents in the 17 selected stations, resulting in 270 injuries and 159 deaths¹⁰.

The occurrence of an accident not due to train operations is mainly related to the number of people crossing the tracks (trespassing). Higher is the trespassing, higher the

¹⁰ Source: Central Railway and Western Railway

probability of an accident leading to person injured or a fatality. After the stations improvements, it is expected that trespassing will significantly decrease and therefore the accidents on the stations surroundings too. An *expost* evaluation of the trespassing measures implemented under MUPT2A showed that the number of trespassing could be significantly decreased by 60-80% with proper measures including FOBs and skywalks¹¹. It is conservatively assumed that the Project implementation of accessibility and safety measures will help reduce 20.0 percent of the accidents along with associated injuries and deaths.

Monetized benefit of reduced road accidents requires placing a dollar value on avoided injuries and death. Using the hedonic wage approach, a recent study in India¹² estimated the VSL at INR 44.69 million (\$0.60 million) and Value of Statistical Injury (VSI) at INR 1.67 million (\$0.02 million) (2019 Price).

Based on conservative estimate, the safety interventions of the Project are expected to result in an estimated value of US\$ 17.1 million in life saved per year, and US\$ 1.3 million in injuries avoided per year at the 2023 base level.

- 2) **Reduction of crowding on platforms and concourses areas.** Overall, the platform area is expanded by 158,130 m² (an increase of 14.8 percent) and the concourse area is widening by 98,766 m² (an increase of 77.6 percent). The reduction of crowding in the concourse areas and on platforms will clearly improve the circulation and waiting conditions of passengers, in particular at peak hours, making the station environment more pleasant and thus increasing passengers' waiting and accessing/dispersal comfort.

Passengers place a high value on qualitative factors such as waiting for comfort and convenience, but the conventional transport planning evaluation tends to focus on quantitative impacts and undervalue qualitative impacts. Few qualitative factors are incorporated in transport economic evaluations. Nevertheless, research indicates that passengers are willing to pay for improved travel convenience and better comfort. A recent paper on people's preferences for improvements in Public Transportation Systems based on an experience from India shows that users consider the service quality of the public transportation system to be poor and are willing to pay for improved service¹³. Another study shows that the passenger comfort benefits of railway travel can be estimated using a special generalized costs function (named Railway Passenger Comfort Benefits {RPCBs}) with a series of objective and subjective indexes¹⁴. In this study, the objective variables considered in the RPCB are the following: area per capita in passenger coaches, vibration, pressure changes, noise, temperature, and passenger travel time. The

¹¹Source: <https://mumbaimirror.indiatimes.com/mumbai/other/stopping-death-in-its-tracks/articleshow/66371113.cms>

¹² Source: Majumder and Madheswaran. 2019. Value of Statistical Life in India: A Hedonic Wage Approach. Bangalore, The Institute for Social and Economic Change.

¹³ Lunani, K., Vasudevan, V. & Kumar, V. People's Preferences for Improvements in Public Transportation Systems: An Experience from India. *Transp. in Dev. Econ.* 8, 24 (2022). <https://doi.org/10.1007/s40890-022-00155-6>

¹⁴ Wencheng Huang, Bin Shuai, A methodology for calculating the passenger comfort benefits of railway travel, J. Mod. Transport. (2018). <https://doi.org/10.1007/s40534-018-0157-y>

subjective variables considered are related to health conditions, seat comfort, interior decoration, information services, and catering services. This study, based on surveys and collected data from two high-speed railway lines in China, calculates the weight of each index and shows that there is a linear relationship between the RPCB and ticket fare with a correlation coefficient of 0.9616.

Drawing a parallel between the comfort benefits of passengers on trains and in stations, it is assumed that rail passengers are willing to pay more for more comfort in the stations. The level of crowding in stations being one of the factors included in the comfort, based on this correlation, the reduction of crowding at stations can be monetized.

To monetize the benefit of a reduction of crowding in the stations, the willingness to pay of Mumbai Suburban Rail passengers was calculated using the travel demand of AC and non-AC trains and the fare tickets of AC and non-AC trains¹⁵. The data shows that passengers in Mumbai Suburban Rail are willing to pay around 8.5 percent more for 1 percent more of comfort. Passengers are not only taking AC trains for the air-conditioning, but they are also taking AC-trains because the overall experience is more pleasant and comfortable (reduced train passenger density, seat availability, less noise, less vibration, etc.). Comfort comprises several factors with different weights, being the temperature the main one. It is assumed that the crowding factor has a weight of 7.5 percent on passenger perception of comfort in trains and is comparable to the one in stations.

As the crowding situations in the selected stations are mostly experienced during peak hours, it is assumed that only passengers at peak hours are willing to pay for a reduction of station crowding. The Project improvements are expected to result in an estimated value of USD 6.0 million per year in comfort related to a reduction in crowding at stations at the 2023 base level.

3) Improved accessibility to the stations and ease to circulate in the concourse area.

The construction of additional entry/exit points and a deck level connecting all the platforms with new FOBs will improve the station accessibility and ease the passenger flow, resulting in time savings on passenger's overall traveling time.

Based on a survey conducted in 2023 at 2 of the 17 selected stations (Santacruz and Ghatkopar stations), the average accessibility time to stations, both boarding and alighting time, is 2:48 minutes. The boarding time does not include the train waiting time.

¹⁵ In Western Rail Lines, the average daily passenger in AC trains per service is 1,140, and in non-AC trains is 2,160.

Figure A3.2: Crowding at FOBs and platform at peak hours at a station of the Mumbai Suburban Rail



It is assumed that the station accessibility time at peak hours will be reduced by 10%, while at non-peak hours will be reduced by 5%.

The value of time (VOT) considered in the analysis is based on the VOT used in the Update of Comprehensive Transportation Study for the Mumbai Metropolitan Region. The VOT calculated in this study is derived using the wage rate approach and is estimated for each mode. For the Suburban Rail, it is estimated that the VOT is INR 118 per passenger per hour (2018 Price). This value is update to 2023 prices, with the average annual inflation rate in India of the 2018 – 2022 period¹⁶.

The Project improvements are expected to result in an estimated value of USD 3.7 million in accessibility time savings per year at the 2023 base level.

7. In addition to the quantifiable benefits considered in the economic analysis, the Project will also create business opportunities and jobs and socially empower women and PwDs through safe and accessible stations.

8. **Results of the Economic Cost-Benefit Analysis.** In the base case scenario, with a discount rate of 10.0 percent, the investment yields an EIRR of 17.0%, and ENPV of USD 65.68 million for the Project. Avoided injuries and saved lives account for 65 percent of the economic benefits. Table A3.1 summarizes the economic costs and benefits.

¹⁶ Source: IMF

Table A3.1. Economic cost and benefits

Year	Economic costs		Economic benefits			Net benefit
	Capital cost	O&M costs	Avoided injuries and saved lives	Improved comfort (reduction in crowding)	Time savings	
2023	6.74	-	-	-	-	(6.74)
2024	33.71	-	-	-	-	(33.71)
2025	53.94	-	-	-	-	(53.94)
2026	40.46	-	-	-	-	(40.46)
2027	-	0.39	18.39	6.00	3.68	27.68
2028	-	0.39	18.39	6.00	3.83	27.83
2029	-	0.39	18.39	6.00	3.98	27.98
2030	-	0.39	18.39	6.00	4.14	28.14
2031	-	0.39	18.39	6.00	4.31	28.31
2032	-	0.39	18.39	6.00	4.48	28.48
2033	-	0.39	18.39	6.00	4.66	28.66
2034	-	0.39	18.39	6.00	4.85	28.85
2035	-	0.39	18.39	6.00	5.04	29.04
2036	-	0.39	18.39	6.00	5.24	29.24
2037	-	0.39	18.39	6.00	5.45	29.45
2038	-	0.39	18.39	6.00	5.67	29.67
2039	-	0.39	18.39	6.00	5.90	29.90
2040	-	0.39	18.39	6.00	6.13	30.13
2041	-	0.39	18.39	6.00	6.38	30.38
2042	-	0.39	18.39	6.00	6.63	30.63
2043	-	0.39	18.39	6.00	6.90	30.90
2044	-	0.39	18.39	6.00	7.17	31.17
2045	-	0.39	18.39	6.00	7.46	31.46
2046	-	0.39	18.39	6.00	7.76	31.76
Total	134.85	7.76	367.70	120.07	109.65	454.81
				EIRR	17.02%	
				ENPV	\$65.68	

9. **Sensitivity analysis.** Sensitivity analysis was conducted to test the robustness of the Project's economic viability based on project-specific and market risks, including cost overruns and reductions in estimated travel savings.

10. The results of the sensitivity analysis are shown in Table A3.2. In all tests, the EIRR is above the hurdle rate of 10.0 percent. This shows that the Project investment is robust to withstand variations in both cost and benefit shocks.

Table A3.2. Results of the sensitivity analysis

Sensitivity test	EIRR (percentage)	NPV (USD million)
(1) Capital expenditures increase by 20%	14.2%	45.25
(2) O&M costs increase by 20%	17.00%	65.23

(3) Avoided injuries and saved lives decrease by 20% (reduction considered 16% instead of 20%)	14.9%	44.30
(4) Crowding in stations decrease by 20%	16.3%	58.7
(5) Time savings decreases by 20%	16.5%	60.0
(6) Combination of (3), (4) and (5)	13.6%	31.7
(7) Avoided injuries and saved lives decrease by 50% (reduction considered 10% instead of 20%)	11.4%	12.2

Annex 4: Gender Equality and Social Inclusion Strategy

A. Assessment of gender equality in MMR

1. Gender equality is enshrined in the Indian Constitution - in its Preamble, Fundamental Rights, Fundamental Duties and Directive Principles. Upholding and safeguarding rights of all citizens irrespective of caste, creed, religion, gender or any other identity is the core responsibility of the government. Both Union and state governments are empowered to develop and implement laws, policies and programs promoting gender equality. The Government of India and State Governments have prioritized Gender, Disability and Social Inclusion in all infrastructure related projects implemented in India. In particular, the State Policy on Women 2014 outlines the processes for gender responsive policies and programs: *“Gender budgeting is essential so that the principles of man-woman equality, eradication of gender-based discrimination and gender equality are reflected boldly in the planning of all departments of the state”*.

2. However, gender inequality in India is significant. The World Economic Forum has ranked India 140 (score of 0.625 with parity being 1.0) among 156 countries in the 2021 Global Gender Gap Report. One of the major factors for India’s poor performance is the large gender gap in economic opportunities and participation (score of 0.326). Low level women participation in the labor market and wage disparity for similar work are the two major attributes for the large economic opportunity and participation gap. With respect to Gender Based Violence, 42.2 percent of ever married women aged 18-49 experienced spousal violence.¹⁷

3. The State of Maharashtra, which has the highest Gross State Domestic Product (GSDP) in India, has taken major steps towards empowering women since 1994, when the Maharashtra’s first policy for empowering women was released. The second policy was brought in 2001 and thereafter another one in 2014. These social reforms aimed to enhance women’s role and participation in social, economic and political development. Maharashtra State Policy for Women 2014 covers different thematic areas, and specifically presents a concrete action plan for Gender Inclusive in Infrastructure, including transport, housing and wash¹⁸.

4. The Gender Inclusive Infrastructure area of this policy states that *“access to safe, clean, affordable and reliable transportation for women, girls and transgender persons will be provided both in peak and off peak hours across urban and rural areas. Ease of travel for persons with disabilities, pregnant women, women with infants and other vulnerable groups will be prioritized across various modes”*. To achieve this objective, this policy sets out ten main actions in the transport sector. The station services are specifically covered in two of these ten actions, which aim to (i) provide gender and disabled friendly transport hubs with provision of ramps, railing, escalators, changing rooms, feeding rooms, etc. following maintaining standard hygiene, and (ii) ensure safety and security of women and transgender persons in public and private transport systems including provision of CCTV cameras, GPS trackers of public transport vehicles,

¹⁷ National Family Health Survey-5 (2019-21), http://rchiips.org/nfhs/NFHS-5Reports/NFHS-5_INDIA_REPORT.pdf.

¹⁸ Maharashtra State Policy and Action Plan for Gender Equality and Women’s Empowerment, 2022, <http://www.bamu.ac.in/Portals/O/GEWE-Policy.pdf>

emergency helpline numbers prominently displayed, etc.

5. In addition, Maharashtra is one of the few states in India that have enacted laws to ensure equal representation of women in the elected wing of city governments, and as presidents of councils. At the community level also, there is representation of women through the women's self-help groups (SHGs), which are mostly composed of women from low-income and marginalized groups. Maharashtra is one of the few states in India which has a strong SHG network.

6. However, Maharashtra ranks quite low in terms of indicators on gender compared to other states. The female working population ratio for the age group 15 years and above in Maharashtra is significantly higher than the national average (37.2 percent in Maharashtra vs. 28.7 percent at the national level, 2019-2020)¹⁹, but this is largely due to the rural female participation. If considering only the urban female working population (16.7 percent in 2017-18), it is almost similar to the national trends (14.9 percent in 2017-18)²⁰, which shows that women in urban areas remain outside employment opportunities. In addition, the demographic indicators for women and girls are far lower than in other states. The state has a sex ratio of 958 females per 1000 males, ranking 16th among all states²¹, and the child sex ratio is even lower at 894 girls per 1000 boys²². Almost one in three ever-married women have experienced spousal physical or sexual violence in Maharashtra, a proportion higher than in 15 other Indian states²³.

7. The continuous decline in the sex ratio and the declining female employment participation in Maharashtra (female participation in urban areas has decreased from 27 percent to 16.7 percent between 2004 and 2017), together with the rise in gender-based crimes and sexual harassment, reveal the remaining gender inequalities in the state.

8. Public transport system plays an important role in the social and economic growth of the city especially in a city like Mumbai which is facing rapid urbanization and traffic congestion on roads due to increased numbers of private vehicles. The Mumbai Suburban Rail network, with about 31 percent of female passengers, can contribute to addressing the inequalities challenges and empowering greater gender equality, as public transportation enables access to social and economic activities. A survey conducted by World Bank in Mumbai in 2019 pointed out that 4 percent of the surveyed women indicated that transport was a commuting barrier for work. However, the quality of the facilities and safety in the Mumbai Suburban Rail still remains a concern for women and vulnerable groups.

9. In addition, PwDs also face many challenges to having access to public transport systems. In India, there are approximately 26.8 million PwDs, which is roughly 2.2 percent of the country's population²⁴. More than 11 percent of the total population of PwDs hails from the state of

¹⁹ Ministry of Labour and Employment, India, <https://pib.gov.in/PressReleasePage.aspx?PRID=1805783>

²⁰ Annual Report, PLFS 2017-18.

²¹ Annual Report, PLFS 2017-18

²² Census 2011

²³ National Family Health Survey Round -2 and 3

²⁴ Government of India. (2021). Persons with Disabilities (Divyangjan) in India - A Statistical Profile : 2021. National Statistical Office. http://www.nhfdc.nic.in/upload/nhfdc/Persons_Disabilities_31mar21.pdf

Maharashtra, amongst this large population there are several persons with diverse disabilities, elderly, persons with diseases and other vulnerable conditions. Following the enactment of the “Rights of Persons with Disabilities Act” by the Government of India in 2016²⁵, suitable measures should be taken to provide PwDs equitable access to public transport. In this regard, several policy guidelines have been issued to incorporate accessibility for PwDs in India’s transport sector. These include the Manual for Standards and Specifications for Railway Stations issued by the Railway Board in 2009, Guidelines on Passenger Amenities for Passenger/Persons with Disabilities issued by the Railway Board in 2016, and Harmonized Guidelines for standards of accessibility and provision of facilities for PwDs in IR issued by Railway Board in February 2020.

10. MRVC and IR have always taken proactive initiatives in this direction to ensure that commuters will get more affordable and comfortable rides for their daily commute. While doing so, they have emphasized improving women's safety and guaranteeing that PwDs have equal access to and participation in public transportation. In order to do this, IR, particularly WR and CR, have introduced a variety of complaint mechanisms and facilities, including but not limited to women safety helpline number, special coaches reserved for female passengers, ladies special trains during morning and evening peak hours, special coaches for PwD’s in every train, etc.

B. Strategy to address gender and social inequalities

11. Gender and social inequalities in transport projects can be tackled through four dimensions: stakeholder engagement, engineering design, construction phase and operation phase. In this Project, the strategy to contribute to addressing gender inequalities concentrates on the first three dimensions. The operation phase will be carried out by the suburban rail operators.

12. **Stakeholder engagement.** To ensure that gender issues are taken into consideration in the preparation and implementation of this Project, a study to propose recommendations on gender responsiveness and facilities for PwDs was carried out by the DDC Consultant. These recommendations were made based on a questionnaire survey and focused group discussions with female commuters. The objective of these consultations was to ascertain the needs of women and vulnerable groups of commuters traveling on the Mumbai Suburban Rail network and record their experience while using the stations. The survey was conducted during peak hour and non-peak hours in selected stations with a total sample size of around 500 passengers. A satisfaction survey was conducted as well for around 1000 passengers (male + female passengers) to understand their satisfaction levels towards the existing status of the selected stations.

13. Overall, the survey and focused group discussions revealed low satisfaction with accessibility, safety, and cleanliness. The main findings of the survey and focused group discussions are summarized below:

²⁵ Section 41 (a) of the Act mentions that the Government shall provide “facilities for persons with disabilities at Bus stops, Railway stations and Airports conforming to the accessibility standards relating to parking spaces, toilets, ticketing counters, and ticketing machines”.

- Sanitation and Hygiene. The cleanliness of toilets is a major concern -- many station toilets are shut for maintenance and repair work without any alternative arrangement which causes inconvenience to passengers. 79 percent of respondents recorded their experience as negative for using toilets at the station. In addition, passengers reported that there are few drinking water facilities on the stations, 21 percent of the respondent expressed that drinking water facilities will make their journey more comfortable.
- PwD Facilities. Overall, passengers reported that the facilities such as the staircase and escalators etc. are comfortable, however sometimes are not in good condition and demanded for additional facilities (elevators, escalators, etc.). 28 percent of respondents are comfortable with the existing stairs, but respondents expressed that stairs are slippery (21 percent) and crowded (19 percent), and 23 percent answered that the steps are too big. Regarding the experience while using the ramp, 20 percent respondents complained that the ramps are slippery, while 10 percent recorded that the ramps are comfortable.
- Safety and Security. Though the women's safety helpline number has been displayed at stations and inside coaches, poor awareness about the helpline number was observed along the passengers. Only 44 percent of respondents knew about the railway's women safety helpline number. Security also remains a main concern -- 11 percent of respondents have faced harassment or threat.

14. **Engineering Design.** The second action of the gender strategy focuses on the engineering design of the improvements of the stations. The improvements to be made are designed with a gender-responsive approach to ensure the safety, accessibility, and comfort of each gender group in their use of the stations. Based on these findings of the consultations, the DDC proposed a list of facilities and amenities to be incorporated into the station design based on its technical feasibility and MRVC's scope of responsibility, which will enhance the satisfaction of women passengers.

15. The gender-responsive and PwD accessibility solutions incorporated in the design are summarized below:

- Sanitation and hygiene facilities.
 - Provision of vending machines for sanitary pads inside toilets as a desirable level of amenity.
 - Provision of baby feeding rooms.
 - Provision of clean washrooms with proper doors and fastenings.
 - Provision of more signages of facilities for women.
 - Provision of more drinking water tabs on platforms.
- PwD facilities.
 - Provision of queue segregating handrails at the ticket counters.
 - Ramp facility at the entry and exit with a minimum slope of 1:12.
 - Install a lift (elevator) to enable passengers with disabilities to move between floors.
 - Ensure that the tactile pathway at the staircase and platform edge is in continuation.
 - Provide toilets for PwD with an alarm system.
 - Installation of a foldable ramp facility along with a wheelchair.

- Safety and Security facilities.
 - In existing locations, lighting is being checked and improved wherever required. CCTVs are already available at the stations and more of them are being installed in new structures.
 - Provision of mobile phone charging arrangements; signage for facilities provided to women passengers; and drinking water facilities in front of ladies coach locations.
 - In the newly constructed decks and platforms, provision of May I help you booth if space allows (already provided in the existing areas).
 - In the newly constructed decks and platforms, installation of CCTV cameras at isolated spots (already provided in the existing areas).

16. **Construction Phase.** The potential impact on women during construction has been assessed in the ESIA, and mitigation measures are identified in ESMP and RAP, including non-discriminating in wage payment for construction work; measures to ensure the safety and health of female workers; the gender-based violence and prevention plan. To ensure the successful implementation of the design solutions, MRVC will ensure the design features to be integrated in the tender documents of the works packages and correctly implemented by the contractors.

17. The gender strategy followed in this Project ensures that the design of the improvements of the stations fully takes female passenger's needs into consideration and, to the extent possible, gender-responsive and PwD accessibility facilities are included in the design and implementation to improve women commuters experience and safety in the Mumbai Suburban Rail network.

C. **Design strategies for People with Disabilities.**

18. All the improvements are being implemented with proper accessibility for persons with disabilities in mind. The station area is divided into different zones with infrastructure elements and for each, requirements from accessibility considerations have been identified. Under the Project, MRVC will implement all such measures that fall within the scope of the Project. Further, this exercise will provide a readymade template for future developments at these and other stations. Such a detailed exercise has been undertaken for the first time in any of the MUTP projects. These identified zones and measures are given in Table A4.1.

Table A4.1: Design Parameters for Better Accessibility for PwD

Zone	Elements	Parameters and Implementation
Ticketing Zone	Information System & Infrastructure	1. Accessible Signage System
		2. Easily identifiable Ticket Counters
		3. Sufficient space for wheelchairs in front of the ticket / information counters

		<ol style="list-style-type: none"> 4. Part of the counter is lowered to an accessible height (750 mm to 800 mm) with specified knee and toe clearances 5. Access Route to Ticket Counter and nearest elevator 6. Ticket Vending Assistance Services 7. Accessible ATVMs 8. Queue management services
Platform Zone	Seating Elements	1. Easily identifiable
		2. Sufficient number of seating elements
		3. Height between 450-500 mm
		4. Child-friendly
		5. Appropriate adjoining space for wheelchair parking and manoeuvring
	Tactile Ground Surface Indicator	1. Appropriate distance from edge of Platform
		2. Appropriate orientation and layout
		3. Colour Contrast
	Help-Booth	1. Accessible Counter Height
		2. Handrails
		3. Tactile Path
		4. Audio Visual Communication
	Vending Kiosks	1. Easily identifiable
		2. Accessible counter
	Waste Disposable Bins	1. Appropriate signage system
2. Appropriately placed at regular intervals		
3. Maintenance and management		
Circulating Area	Staircase	1. Accessible wayfinding signage system
		2. Appropriate width – minimum 1500 mm
		3. Risers – maximum 150 mm, Treads – maximum 300 mm.
		4. Continuous handrails on both sides at two heights – 760 mm and 900 mm. Handrails in the centre for staircases wider than 3000 mm.
		5. Braille plates
		6. Landing (at least 1500 mm wide) at regular intervals

		7. Tactile warning tiles at beginning and end of steps
		8. Step edges (different colour or texture) easily identifiable by people with low-vision and vision impairment
		9. Non-slippery surface
		10. Adequate illumination levels
	Elevators	1. Access route leading to the elevator
		2. Easily identifiable elevator door
		3. Automatic doors for elevators with adequately longer time interval for door opening / closing
		4. Emergency intercom inside the elevator
		5. Tactile / braille instructions for the control panel
		6. Minimum internal dimensions of the elevator 1900 mm x 1900 mm minimum or having 13 persons capacity
		7. Handrails mounted on three sides at a height between 800 mm - 900 mm
		8. Audio/video system indicating floor arrival
		9. Mirror on opposite side of lift door
	Ramps	1. Ramp at the station entrance (at level difference) with minimum width of 1500 mm and slope of 1:12.
		2. Continuous handrails on both sides (at 760 and 900 mm as per specifications given in Harmonised Guidelines, 2021)
		3. Tactile warning tiles at beginning and end of ramps
		4. Non-slippery surface
		5. Edge protection
		6. Adequate illumination
	Elevators	1. Accessible signage system
		2. Colour contrast for steps
	FOBs	1. Accessible signage system
		2. TGSIs
		3. Non-slippery surface
		4. Continuous handrails on both sides (at 760 and 900 mm as per specifications given in Harmonised Guidelines, 2021)
		5. Braille plates
		6. Adequate illumination
Public Amenities	Public Toilets	1. Easy identification of accessible toilets
		2. Accessible section in both male and female toilets as well as a separate unisex accessible toilet
		3. Sufficient space inside the toilets to manoeuvre a wheelchair
		5. Non-slippery grab bars / swing bars

		6. Easy to grip faucets that are operational with one hand
		7. Call bells for raising alarm in case of emergency
		8. Skid proof, well drained and waterproof floor material
		9. Doors that open inward / outwards / both ways
	Drinking Water Points	1. Clearly identifiable signage
		2. Accessible water tap/spout (easily maneuverer drinking facility by a person with poor hand function/wheelchair user)
		3. Dry and hygienic drinking water area
		4. Child-friendly alternative for drinking water

Annex 5: Paris Agreement Alignment

A. BB1: Alignment with mitigation goals

1. The Project is a rail infrastructure project, which is included in the 'universally aligned list' of BB1 in the AIIB PA methodology in development.

B. BB2: Alignment with adaptation and resilience

2. The Joint MDB methodology for assessing the investment's climate adaptation alignment with the PA consists of three steps:

- (i) **Step 1: Climate risk and vulnerability assessment:** identify and assess physical climate risk to determine whether the road infrastructure, its ancillary facilities and its users are vulnerable to climate hazards.
- (ii) **Step 2: Climate adaptation and resilience measure definitions:** Propose measures to address the identified physical climate risks and contribute to build climate resilience; and
- (iii) **Step 3: Consistency with broader and national context for climate resilience:** Ensure that the project is consistent with the policies/strategies/plans for climate adaptation and resilience at the national, regional, local, city, level as considered relevant and/or with private sector or community-driven priorities.

3. **Step 1: Climate risk and vulnerability assessment.** Maharashtra has a tropical climate with three distinct seasons: summer, monsoon, and winter. MMR, flanked by the Arabian Sea and Creek on two sides, faces high risks of precipitation increase, flood, sea level rise, earthquake, and Tsunami. In addition, based on the climate and geological risk-screening exercise conducted by AIIB for this Project, the temperature and wind speed are identified as medium risks. The Mumbai Suburban Rail network is located along the periphery connecting with the center, thus causing rainwater to pass through outlets below railway tracks before entering the sea or creek. However, the drainage network of Mumbai is about a century old, and the poor state of the drainage network in the city leads to flood events affecting the railway tracks. It is also recognized that flooding issues in Mumbai are complex and need comprehensive solutions to be led by the government.

4. **Step 2: Climate adaptation and resilience measure definitions.** To limit the impact of a potential precipitation and temperature increase, MRVC has integrated climate change considerations into the Project design to address the need for adaptation, including: (i) improving adaptability to seasonal thermal variations in the stations through the use of large open spaces for unrestricted air movement, cross-ventilation, and ensuring that enclosed areas are well ventilated; (ii) shading is provided to all platforms, decks, FOBs, and skywalks to prevent passengers from high temperature and rainfalls. The slope of the roof is selected to have easy surface runoff; (iii) roof shading of light color is proposed with high Solar Reflective Index (SRI) value to reflect most of the solar energy to keep the underneath cool; (iv) expansion and contraction forces due to changes in temperature of the materials of the structure is considered

in design; (v) steel structure with reinforced concrete foundation is selected as the structural type for the FOBs, decks and skywalks, which has the advantage of flexibility and endurance to bear required loads. The coating of steel structure is selected to have the ability to get wet and then dry out with minimal damage. As such, the Project will contribute to building resilience to climate-induced shocks such as floods and increased temperatures.

5. Measures taken to increase the climate resilience of the Project are placed as Table A5.1.

Table A5.1: Measures for Climate Resilience

Climate Risk	Measures Adopted
Increase in temperature	<ul style="list-style-type: none"> - Expansion and contraction due to changes in temperature of the materials of the structure is considered in design. - Provision to relieve the temperature stress by means of expansion/contraction is made in the structure. - The temperature case analysis is done as per code IRC 6:2017. - Shading structures- All Decks, FOBs, Skywalks are covered with roof.
Increase in precipitation Flooding	<ul style="list-style-type: none"> - Slope of roof for decks, skywalks, FOBs are selected to have easy surface runoff. - Provision of Rain louvers are provided on elevated structures.
Flooding	<ul style="list-style-type: none"> - No risk to the work being done under the Project, as it is mainly elevated.
Heavy Winds	<ul style="list-style-type: none"> - The structure is designed for Heavy winds up to wind speed of 44m/s.
Rise in Sea Level Tsunami	<ul style="list-style-type: none"> - These structures are not vulnerable to rise in sea levels and tsunamis
Earthquake	<ul style="list-style-type: none"> - IRS seismic code 2020 is considered for Seismic design of Platform Decks. - Zone factor is considered as 0.16. - Response reduction factor is considered as 2. - Proper connection is provided between substructure and superstructures.

6. To ascertain the impact of the Project on making the stations more environmentally sustainable, and therefore, contribute to climate adaptation of Mumbai's infrastructure, MRVC has used the scheme of Green Railway Station rating by IGBC²⁶. This Project will add points to the potential IGBC rating. Moreover, MRVC has chosen Neral station as a model station to increase the overall station rating to at least Silver standard. This station will serve as a benchmark for Mumbai Suburban Rail for similar improvements at other stations.

7. **Step 3: Consistency with broader and national context for climate resilience.** As stated in the National Determined Contribution (NDC) of India, adaptation is inevitable and imperative for the country's development process. Indian's NDC indicates that the development of the adaptation actions are under state action plans on climate change, and should focus in sectors like agriculture, water, Himalayan ecosystems, forestry, Capacity building and Knowledge management.

8. The State of Maharashtra developed the Maharashtra State Adaptation Action Plan on Climate Change (MSAAPCC) outlines broad and ambitious strategies for building a climate resilient future. In the energy and infrastructure sectors, the MSAAPCC set out three main recommendations: promotion of cleaner forms of energy, shift to energy efficient systems to conserve energy, and climate-proofing of new public infrastructure²⁷. This last recommendation shall be translated into incorporating additional ranges of temperature, rainfall, and sea level rise into design specifications. MSAAPCC also outlines that waste-to-energy technologies should be actively promoted.

9. In addition to the MSAAPCC, to respond to the growing climate vulnerability of Mumbai, the Municipal Corporation of Greater Mumbai (MCGM) has developed a Mumbai Climate Action Plan (MCAP)²⁸ that covers six sectors delivering on both climate mitigation and adaptation. In the energy and building sector, MCAP emphasizes the need to promote low-carbon buildings and set out four sectoral action priorities: (i) increasing the proportion of clean energy in Mumbai's energy mix, (ii) switching to clean fuels and ensuring energy and water efficiency in all buildings, (iii) promoting low-carbon buildings through ECBC compliance and green building certification, (iv) integrating passive design strategies to make buildings climate-resilient. In the sustainable mobility sector, under the priority of enhancing public transport, MCAP presents an action plan which includes as a key action establishing a commuter helpline to address grievances around public transport safety, access, reliability, etc.

²⁶ Green building rating by Indian Green Building Council (IGBC) brings together a host of sustainable practices and solutions to reduce the environmental impacts. IGBC with the support of Indian Railways has developed the Green Railway Stations rating system. It is a voluntary and consensus-based program which facilitates the adoption of green concepts, thereby reducing the adverse environmental impacts due to station operation and maintenance and enhance the overall commuter experience at the station. The rating system evaluates certain mandatory requirements and credit points using a prescriptive approach and others on a performance-based approach.

²⁷ Assessing Climate Change Vulnerability and Adaptation Strategies for Maharashtra: Maharashtra State Adaptation Action Plan on Climate Change (MSAAPC), <https://www.teriin.org/projects/nutrition-security/files/Maharashtra-CC-Report.pdf>

²⁸ MCAP aligns with the goals of the PA and follows the C40 Climate Action Planning framework.

10. Following MSAAPCC's requirements and IGBC Green Railway Stations Guidelines, to support the plan, it is proposed a network-wide flood vulnerability and mitigation assessment study for the Mumbai Suburban Rail system be conducted in this Project.

11. As the Project incorporates adequate climate adaptation measures into the design and ensured that the implementation is aligned and consistent with national strategies on climate adaptation, the Project shall meet all three steps under the joint methodology. As such, together with the mitigation measures previously discussed, it is assessed that the Project is fully aligned under PA.

Annex 6: Member Context

1. **Indian Economy.** India is a lower-middle-income country, with a GDP per capita at USD 2379.2 and a population of ~1.4 billion in 2022.²⁹ Prior to the pandemic,, India enjoyed a decade of robust economic performance growing at an average annual rate of 7.0 percent between FY2010 and FY2019. India's GDP contracted by 5.8 percent in FY2020 (year ending March 2021) on account of COVID-19 induced stringent lockdown restrictions imposed during the first half of the year. With increased mobility and favorable base effect, the Indian economy grew by 9.1 percent in FY2021 even with the Omicron wave happening in January 2021. Growth moderated to 6.8 percent in FY2022 due to the geopolitical tensions, rise in commodity prices and monetary tightening in advanced economies.

2. Inflation, after moderating from around 10 percent in FY2010 to below 5.0 percent in FY2019 have picked up in recent years, first due to supply disruptions and subsequently due to elevated global commodity prices. Retail inflation averaged 6.7 percent in FY2022, well above the 4±2 percent inflation targeting band which triggered the central bank to raise the policy rate by a cumulative 250 basis points between May 2022 and February 2023.

3. Public debt rose rapidly in FY2020 to 88.5 percent of GDP after remaining between 65 and 75 percent of GDP in the previous decade. The rise was driven by a sharp fall in revenue due to a decline in economic activity, a rise in various social welfare expenditure, and a contraction of the economy in FY2020. Public debt has moderated to around 83 percent of GDP by FY2022.

4. Going forward growth is expected to average around 6.0 percent in the medium term amid higher oil prices, weaker external demand, and tighter financial conditions. Inflation is expected to moderate gradually reflecting some moderation in global commodity prices and impact of monetary tightening. Public debt will only gradually decline from current elevated levels reflecting slow pace of fiscal consolidation, moderation in near term growth and high interest rates.

5. The economic contraction in FY2020 had a significant impact on the vulnerable sections of the economy and reversed many of the impressive socioeconomic gains made by India over the last two decades. Between 2004 and 2011, poverty rates fell from 39.9 in 2004 to 22.5 percent in 2011-12, and further to 10 percent in 2019. The World Bank estimates that the Covid-19 pandemic has resulted in an increase in the overall poverty rate by around 2.5 percentage points in 2020. As of 2021, the poverty rate declined to 13.8 percent which is still higher than the pre-pandemic level. Given the elevated inflation levels and normalization of fiscal support, poverty reduction is expected to follow a slower than expected trajectory.³⁰

6. The Covid-19 induced restrictions had a severe impact on employment. The unemployment rate (UR) shot up to 23.5% in April-2020, from a pre-pandemic average of 7%. As the restrictions started being lifted in June-2020, the UR improved and averaged 7.2% between July-2020 and March-2021. The localized restrictions on account of the second wave pushed up

²⁹ The income group classification for fiscal year 2020 is based on World Bank criteria. Data from WEO, April 2023.

³⁰ [Macro Poverty Outlook, 2023, World Bank.](#)

the UR to 11.8% in May-2021. With decreasing daily cases and increase in mobility from June-2021 onwards, the UR has improved to around 7.4% during the Sep-Dec-2021 period, comparable to the pre-pandemic level. Despite the third wave, the UR came down to 6.6% in January 2022. The UR started increasing from February 2022 onwards and has remained sticky around the 7.5 percent mark during the recent months, mainly due to an increase in urban unemployment.³¹

7. India roughly spends 4.5 percent of GDP on infrastructure, of which investment in roads and railways comprise of 54 percent and 41 percent respectively.³² Earlier in FY2021, the government allocated USD 52 billion under the National Infrastructure Pipeline (NIP), apart from the traditional sources like the budgetary and extra-budgetary resources as well as private sector investment. The government unveiled a National Monetization Pipeline (NMP) to unlock the value of investments in public sector assets by tapping private sector capital and efficiencies. The FY2023 Union Budget continued the stimulus to the infrastructure sector by increasing capital expenditure in infrastructure investment by 33 percent. Projects in the real estate sector, connectivity, smart cities are expected to benefit from the proposed budgetary allocations.

8. **State of Maharashtra.** Maharashtra is the largest state in India contributing to ~14 percent to the GDP, while it is the second largest state in terms of population. The state has the Arabian sea on the West and shares borders with six other states: Gujarat, Madhya Pradesh, Chhattisgarh, Karnataka, Telangana, and Goa. The state is subdivided into 36 administrative zones called districts. Estimates suggest a 6.8 percent growth in FY2022, similar to the all-India growth rate. The agricultural sector has been leading the growth momentum followed by industry and services. Services comprise of 60 percent of Gross State Domestic Product (GSDP) followed by industry (26.1) and agriculture and allied activities (13 percent). As of 2021-22, the per-capita state income is USD 2690 which is higher than the all-India average.³³ The state has also been one of the top FDI receiving states in India. Between 2000 and 2022, the state received 28.5 percent of total inflows in India. During the period June 2020 to December 2022, the state has attracted investment proposals of USD 34.2 billion.

9. Infrastructure in Maharashtra is relatively more developed compared to the rest of India. As per the 2011 census, Maharashtra was the third most urbanized state of India, behind Tamil Nadu and Kerala, with 45.22 percent of the population living in urban areas. Given the primacy of the state in India's economic performance it is imperative for the state to have a well-developed transport system to sustain efficient movement of freight and people. Currently, Maharashtra has 6242 km of railway route 323,873 km of roads and 34 million motor vehicles. The state has the highest share of installed capacity of electricity generation in India with an installed renewable capacity of 11400 MW. Some of recent impactful ongoing projects in the state are Navi Mumbai International Airport, Mumbai Coastal Road project and Delhi-Mumbai Industrial Corridor. Multiple metro lines in the city of Mumbai are being constructed with metro network also commissioned in the city of Pune and, Navi Mumbai and Nagpur. However, a more efficient

³¹ Unemployment data from Centre for Monitoring the Indian Economy.

³² [Global Infrastructure Hub](#). Accessed on May 04, 2023.

³³ At current exchange rate of INR 80=1 USD

multimodal transport system is required to release the stress on the infrastructure. As the state is responsible for about a fourth of India's total exports, efficient logistics and transport system will help drive the cost of operations down and will boost export competitiveness.

10. **Mumbai.** Mumbai is the capital of State of Maharashtra and is known as the financial capital of India. It is the second most populous city in India with a population of 20 million in 2018 and expected to rise to 24.7 million by 2025.³⁴ The city of Mumbai is a part of the Mumbai Metropolitan Region (MMR), which includes Mumbai suburban district, parts of Thane district (Thane, Bhiwandi, Kalyan and Ulhasnagar tehsils, Vasai tehsil), and parts of Raigad district (Uran tehsil, Panvel, Karjat, Khalapur, Pen and Alibaug tehsil). The MMR covers an area of 4,355 sq. km and is considered as one of the most densely populated areas in the world. The entire area is overseen by the Mumbai Metropolitan Region Development Authority (MMRDA), a Maharashtra State Government organization in charge of town planning, development, transportation and housing in the region. The region accounts for nearly 40% of Maharashtra's output. Two important ports viz. the Mumbai Port Trust and Jawaharlal Nehru Port Trust in the region handle more than 30% of the maritime trade.³⁵ The city of Mumbai (Mumbai city and Mumbai Suburban) contributes to 20 percent of total district GDP in Maharashtra. The COVID-19 pandemic has a huge impact on Mumbai's economy as growth declined to -10 percent in FY2020, much higher than the decline of -5.8 percent of India's GDP. The local economy bounced back in FY2021 and grew by 8.7 percent with the relaxation of COVID-related restrictions.³⁶ The economy is expected to grow at a steady rate in FY2023 and FY2024 subject to no major disruptions.

11. Public transport infrastructure in Mumbai comprises of rail and road network. But in Mumbai, the suburban railway network remains as the major mode of transport. Currently, there are multiple railway projects under development. During FY2021 when in COVID, the suburban railway network (comprising of Western and Central Railway) operated 229 local trains daily ferrying 34.5 lakh passengers, which is substantial lower than the ridership of 85 lakh before the Pandemic. Evidently, the Mumbai suburban railway system is extremely overloaded and is prone to accidents. As of 2022, 1689 railway injuries and 2078 fatalities were reported on the Mumbai suburban railway route.³⁷ Mumbai roads are also extremely congested as the city is ranked fourth globally in terms of congestion. Currently, the multiple projects are underway to develop the metro network in Mumbai which may prove to be a complement to the existing public transport infrastructure network.

³⁴ The World's Cities in 2018, United Nations. Available at https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf

³⁵ Comprehensive Mobility Plan (CMP) for Greater Mumbai, LEA Associates South Asia Pvt. Ltd., India

³⁶ [Economic Survey of Maharashtra, 2022-23](#)

³⁷ Same as above.

Annex 7: Sovereign Credit Fact Sheet

A. Recent Economic Development

1. India is a lower-middle-income country, with a GDP per capita at USD 2277.4 and a population of 1.39 billion in 2021.³⁸ India's economy grew at an average annual rate of 7.4 percent between FY2014 and FY2018 but slowed down in the years before the pandemic following disruptions due to demonetization, rollout of goods and services tax, rural distress and stress in the financial sector.^{39,40} According to IMF, India's GDP contracted by 5.8 percent in FY2020 (year ending March 2021) on account of stringent lockdown restrictions imposed during the first half of the year. Even though the second wave (April-June 2021) of the pandemic was more severe than the first wave (April-June 2020), the government opted for localized restrictions. With increased mobility and favorable base effect, the Indian economy grew by 9.1 percent in FY2021 even with the Omicron wave happening in January 2021. However, with waning of the pent-up demand from the lockdown, weakening of exports and tighter fiscal and monetary policy impacting aggregate demand, the economy is expected slowdown and grow at 6.8 percent and 5.9 percent in FY2022 and FY2023 respectively.

2. Inflation averaged 6.2 percent in FY2020, primarily driven by food inflation due to supply side disruptions. As a response to the pandemic, the Reserve Bank of India (RBI) reduced key policy rates and introduced measures to reduce the borrowing cost, bolster liquidity, and improve credit flow to the productive sectors. Policy rates remained unchanged with the RBI maintaining an accommodative stance between August 2020 and April 2022. Retail inflation averaged 6.7 percent in FY2022, well above the 4±2 percent inflation targeting band. Elevated food and fuel prices have contributed significantly to the rise in inflation. Responding to higher inflation, the RBI raised the repo rate by a cumulative 250 basis points between May 2022 and February 2023 which now stands at 6.5 percent. RBI expects inflation to moderate at ~5 percent in FY2023 due to easing of commodity prices. In April 2023, it decided to pause the tightening cycle while indicating a gradual withdrawal of the accommodative stance so that inflation comes down to the target band of 4±2 percent.

3. A downturn in revenue due to economic slowdown and higher spending on the stimulus package resulted in the fiscal deficit widening significantly to 12.8 percent of GDP in FY2020. Overall deficit moderated to 10 percent in FY2021 on the back of strong revenue collection, that allowed capital expenditure to overshoot its target. The deficit in FY2022 is expected to be similar to FY2021 with both revenue and expenditure growing at over 13 percent. A decline in federal government deficit in FY2022 was offset by an increase in the deficit of the states. A moderation in the deficit and pickup in economic activity helped public debt to decline to 83.5 percent of GDP in FY2022.

³⁸ The income group classification for fiscal year 2020 is based on World Bank criteria.

³⁹ Data are based on fiscal years. Fiscal year 2021 (FY2021) begins on 1 April 2021 and ends on 31 March 2022.

⁴⁰ On Nov. 8, 2016, India's government announced withdrawal of the legal tender of INR500 and INR1,000 notes, which accounted for 86 percent of the value of currency in circulation, and introduction of new INR500 and INR2,000 notes.

4. After posting a surplus in FY2020, the current account reverted to a deficit of 1.2 percent of GDP in FY2021 as merchandise imports surged while services exports remained stagnant. Private transfer, including remittances, remained strong with net inflow of USD 81.2 billion in FY2021. Net FDI inflows remained robust at USD 38.5 billion. During the first half of FY2022, the current account deficit widened to 3.3 percent of GDP mainly due to the widening of trade deficit. Although remittances and net FDI inflows remained robust, foreign portfolio investment recorded net outflows. External debt stood at USD 613.15 billion (19.1 percent of GDP) in December 2022. India's reserve holdings declined by 9 percent between January and December 2022 as the central bank aimed to reduce currency volatility. Since November 2022, reserves have increased and stands at USD 586.47 billion as of April 14, 2023. Reserves remain adequate according to conventional measures.

5. In December 2022, Fitch affirmed India's outlook to be stable in line with Moody's and S&P, while retaining the BBB- rating. In June 2020, Moody's downgraded India's rating to Baa3 with a negative outlook but revised the outlook to stable in October 2021 and retained the same rating and outlook in September 2022. In July 2022, S&P retained India's rating at BBB- with a stable outlook.

B. Economic Indicators

Table A7.1 Selected Macroeconomic Indicators (2019-2022)

Economic Indicators	FY2019	FY2020	FY2021	FY2022*	FY2023*
Real GDP growth	3.9	-5.8	9.1	6.8	5.9
CPI Inflation (average, % change)	4.8	6.2	5.5	6.7	4.9
Current account balance (% of GDP)	-0.9	0.9	-1.2	-2.6	-2.2
General government overall balance (% of GDP)	-7.6	-12.8	-9.6	-9.6	-8.9
General government gross debt (% of GDP)	75.0	88.5	84.7	83.1	83.3
Public gross financing needs (% of GDP)	11.6	18.7	15.6	16.2	15.3
External debt (% of GDP)	19.7	21.5	19.5	19.6	19.8
Gross international reserves (USD billions) 1/	475.6	579.3	617.6	586.4	
Exchange rate (INR/USD, EOP) 1/	75.4	73.5	75.8	81.9	

Note: FY 2020 ran from April 1, 2020 to March 31, 2021

* denotes projected figures

1/Reserves and exchange rate are sourced from RBI and pertain to mid-April 2023.

Source: IMF World Economic Outlook April 2023, Reserve Bank of India, and IMF Country Report 22/386.

C. Economic Outlook and Risks

6. The economy is expected to grow at 6.8 percent and 5.9 percent in FY2022 and FY2023 respectively, according to IMF. A weakening of the global economy and further monetary tightening

as a response to fighting domestic inflation would curb demand in FY2023. Private consumption will be affected as higher inflation erodes away purchasing power. The government's subsidized food, fertilizer and gas distribution will help offset some of the effects of high inflation. High policy rates may constrain investment spending. Agriculture growth may be subdued due to uneven monsoon and lower sown area while higher borrowing cost and commodity prices may impact manufacturing sector.

7. Overall inflation is expected to moderate to 4.9 percent in FY2023 due to easing of commodity prices and softening of growth. In May 2022, the RBI indicated withdrawal of its accommodative stance in response to sustained inflation and has maintained the same stance as of April 2023. Persistent domestic inflation and the fear of imported inflation through strengthening of the dollar may push the RBI to further raise interest rates in FY2023.

8. General government fiscal deficit in FY2023 is expected to moderate slightly to 8.9 percent of GDP as tax revenues increase on the back of improved economic activity. Central government deficit is projected to moderate to 5.9 percent of GDP. Fiscal pressures could strengthen due to rising subsidy burden and as hikes in policy rate increase the cost of borrowing.

9. Public debt is expected to remain around 83 percent of GDP in FY2023, similar to FY2022. In an environment of moderating nominal growth and higher interest rates, fiscal consolidation will be key to reduce public debt. Despite being high, India's public debt remains sustainable given favorable aided by having a long and medium maturity, being denominated in domestic currency, and primarily held by residents. India's external debt is expected to remain stable.

10. The current account deficit is projected at 2.6 percent of GDP for FY2022 owing to a slower than expected export growth due to the global slowdown and a higher import bill. Remittances may remain strong as a depreciating rupee makes remittances more lucrative. Waning of global commodity price pressures and impetus to exports from some of the ongoing schemes would help current account deficit to moderate to 2.2 percent in FY2023.