



**ASIAN INFRASTRUCTURE  
INVESTMENT BANK**

PD000352-IND  
October 29, 2020

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**Project Document  
of the Asian Infrastructure Investment Bank**

**Sovereign-backed Financing**

**Republic of India**  
**Delhi–Meerut Regional Rapid Transit System Project**

## Currency Equivalents

(As on October 8, 2020)

Currency Unit – Indian Rupee (INR)

INR1.00 = USD0.01364

USD1.00 = INR73.3150

## Borrower's Fiscal Year

April 1-March 31

## Abbreviations

ADB	Asian Development Bank
AFCS	Automatic Fare Collection System
AIIB	Asian Infrastructure Investment Bank
CCTV	closed-circuit television
COVID-19	coronavirus disease 2019
DPR	detailed project report
EIA	environmental impact assessment
EIRR	economic internal rate of return
EMP	environmental management plan
ES	environmental and social
ESP	environmental and social policy
ESS	environmental and social standard
FIRR	financial internal rate of return
GC	general consultant
GHG	greenhouse gas
Governments	Government of India, Government of Uttar Pradesh, and Government of Delhi
GRM	grievance redress mechanism
ha	hectare
MDB	multilateral development bank
MFF	multitranche financing facility
MoHUA	Ministry of Housing and Urban Affairs
NCR	National Capital Region
NCRTC	National Capital Region Transport Corporation
NCT	National Capital Territory
O&M	operation and maintenance
OCC	Operation Control Center
OD	origin-destination
PMO	project management office
PPM	project-affected people's mechanism
PPP	public-private partnership
RISA	Resettlement Implementation Support Agency
RP	resettlement plan
RRTS	Regional Rapid Transit System
RSS	receiving substations
S&T	signaling and telecommunications
SHE	safety, health and environment
SPS	Safeguard Policy Statement
TOD	transit-oriented development
VC	video conference
VCF	value capture financing
VoC	vehicle operating cost

WA withdrawal application

## Contents

<b>1. SUMMARY SHEET .....</b>	<b>1</b>
<b>2. THE PROJECT DESCRIPTION.....</b>	<b>3</b>
A. Rationale.....	3
B. Project Objective and Expected Results .....	7
C. Description and Components.....	7
D. Cost and Financing Plan.....	8
E. Implementation Arrangements.....	10
<b>3. PROJECT ASSESSMENT .....</b>	<b>13</b>
A. Technical .....	13
B. Economic and Financial Analysis.....	15
C. Fiduciary and Governance .....	16
D. Environmental and Social .....	19
E. Risks and Mitigation Measures .....	23
Annex 1: Results Monitoring Framework .....	26
Annex 2: Detailed Project Description.....	28
Annex 3: Economic and Financial Analysis.....	33
Annex 4: Sovereign Credit Fact Sheet.....	39

**1. Summary Sheet**  
**Republic of India**  
**Delhi-Meerut Regional Rapid Transit System**

Project No.	000352
Borrower	Republic of India
Project Implementation Entity	Ministry of Housing and Urban Affairs (MoHUA) acting through National Capital Region Transport Corporation (NCRTC)
Sector / Subsector	Transport / Railways
Project Objective	The objective of the Project is to improve the efficiency, safety, social inclusiveness, and environmental sustainability of the transport in the Delhi–Meerut corridor of the National Capital Region.
Project Description	<p>The proposed Project involves development and construction of an 82 kilometers (km) rail-based rapid transit system, with a design speed of 180 km per hour (km/h) and an average speed of 100 km/h. The Project will connect Sarai Kale Khan in Delhi to Modipuram in Meerut, Uttar Pradesh.</p> <p>The Project will be jointly cofinanced with ADB under its Multi-tranche Financing Facility (MFF) in a total of four tranches.</p> <p>The Project component to be jointly cofinanced by AIIB and ADB includes civil works for elevated and underground sections with stations, two depots, track work and traction. For the purposes of ADB's MFF and its internal approvals, AIIB loan is referred to as "Tranche-2" for the Project.</p> <p>Other Project components to be financed by the Government of India, Government of Uttar Pradesh, and Government of Delhi (Governments) are detailed design consultants, general consultant, two elevated civil works packages for the first 17 km of the corridor from Delhi and all land acquisitions required for the proposed Project. Further, rolling stock is also proposed to be financed by the Governments.</p>
Implementation Period	Start Date: July 2021 End Date: August 2027
Expected Loan Closing Date	December 2027
Cost and Financing Plan	<p>Project cost: USD3,449.70 million</p> <p><u>Financing Plan:</u>  AIIB: USD500.00 million (14.5%)  Asian Development Bank (ADB): USD1,049.00 million (30.4%)  Japan Fund for Poverty Reduction: USD3.00 million (0.1%)  Governments: USD1,897.70 million (55.0%)</p>

Size and Terms of AIIB Loan	USD500 million (Tranche-2) Final maturity of 25 years including a grace period of 8 years
Cofinancing (Size and Terms)	ADB (Tranche-1): USD500 million in 2020 ADB (Tranche-3): USD250 million in 2023 ADB (Tranche-4): USD299 million in 2025
Environmental and Social Category	ADB Category A for Environment, A for Involuntary Resettlement and C for Indigenous Peoples (equivalent to Category A if AIIB's ESP were applicable)
Risk (Low/Medium/High)	High
Conditions for Effectiveness	(i) Execution of Framework Financing Agreement between ADB and the Government of India; (ii) effectiveness of ADB Tranche-1 loan agreement; and (iii) execution of the Project colenders' agreement between AIIB and ADB.
Key Covenants	(i) Sufficient counterpart funds to be made available for the timely and effective implementation of the Project; (ii) adequate funds toward operation and maintenance to be made available; and (iii) the Project at all times to be fully funded including from the Governments' resources as required in the event that any cofinancing envisaged under the Project does not materialize.
Retroactive Financing (Loan percent and dates)	All eligible expenditures up to an amount of USD100.00 million (20% of the amount of the AIIB Loan).
Policy Assurance	The Vice President, Policy and Strategy, confirms an overall assurance that AIIB is in compliance with the policies applicable to the Project.

President	Jin Liqun
Vice President, Investment Operations (Region 1)	D.J. Pandian
Director General, Technical Department Region 1	Rajat Misra, Acting Director General
Manager	Rajat Misra, Manager
Team Leader	Amit Kumar, Senior Investment Operations Specialist
Team Members	Aditi Khosla, Counsel, Investment Operations Chang Tian, Project Assistant Irish Fe Aguilar, Social Development Specialist Kishlaya Misra, Investment Specialist Sunhye Park, Young Professional Véronique Allarousse, Senior Legal Consultant Yangzom Yangzom, Procurement Specialist (Operations) Yogesh Malla, Financial Management Specialist Zhaojing Mu, Environmental Specialist

## 2. The Project Description

### A. Rationale

1. **Country Priority.** India has experienced rapid growth in urbanization in the last decades, with the share of the urban population rising from 17.9 percent in 1960 to 34.0 percent in 2018.<sup>1</sup> By 2030, Indian cities are projected to be home to another 250 million people.<sup>2</sup> High-technology and export-oriented manufacturing jobs are growing fastest in the outskirts of large metropolitan areas. As a result, the metropolitan areas are facing extremely high population densities and traffic congestion. Hence, efficient and sustainable infrastructure development is a priority for the country and remains key to urban development to facilitate increased economic activities, mobility, and improve environmental and social (ES) outcomes.

2. **Urbanization in the National Capital Region.** The National Capital Region (NCR), covering an area of over 55,083 square kilometers (km), is a coordinated planning region centered around India's capital city, Delhi. The region encompasses the entire city of Delhi and several districts surrounding it from the states of Haryana, Rajasthan and Uttar Pradesh. The NCR and the associated NCR Planning Board were created in 1985 to plan the development of the region and develop harmonized policies for the control of land use and the infrastructure in the region. Prominent cities of the NCR include Delhi, Faridabad, Ghaziabad, Gurgaon, Meerut and Noida. The district of Meerut, situated about 77 km northeast of central Delhi, has a population of about 3.5 million and is one of the largest suburban centers in the NCR. The NCR is the fastest-growing urban agglomeration in India and its population is expected to reach 64 million by 2021 from 46 million in 2011. The urbanization rate of NCR is also projected to reach 71 percent by 2021 from about 62.5 percent in 2011.<sup>3</sup>

3. **The City of Delhi.** Contributing nearly 8 percent of India's gross domestic product, the NCR's importance has increased with the country's economic growth. In particular, the National Capital Territory (NCT) of Delhi has been experiencing an unprecedented rate of urbanization. While it covers only 4.4 percent of the NCR area, it accounts for 37 percent of the total NCR population. Job opportunities are highly concentrated in the NCT of Delhi, attracting a large influx of migrants from neighboring states. The influx has led to a lack of space for the development of essential basic infrastructures such as water supply and sewerage and lack of affordable housing.

4. **Congestion in Delhi and the National Capital Region.** Rapid urbanization in NCR coupled with imbalanced infrastructure investments within the region have put a severe strain on NCR's existing transport infrastructure. While Meerut is connected to central Delhi by the existing Northern Railway, most of the existing track capacity is dedicated to long-distance express trains and is unable to serve NCR commuters. The estimated travel time from Meerut to Delhi by the

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<sup>1</sup> World Bank. [Urban population \(% of total population\) – India](#).

<sup>2</sup> World Bank. 2013. [Urbanization beyond Municipal Boundaries: Nurturing Metropolitan Economies and Connecting Peri-Urban Areas in India. Directions in development countries and regions](#). Washington, DC: World Bank.

<sup>3</sup> Government of India, Ministry of Housing and Urban Affairs, National Capital Region Planning Board. 2013. *Regional Plan 2021: National Capital Region*. New Delhi.

railway is over two hours, but the actual time may be more since the railway is extremely congested and operating at over 170 percent of design capacity. The national and state highways connecting Delhi and Meerut are congested with one-way travel time between three to four hours. The insufficient existing infrastructure has resulted in greater dependence on private vehicles and intermediate public transport, leading to congestion and low mobility. Despite launching the Delhi metro<sup>4</sup> and increasing the road network, traffic congestion has continued to grow unabated at a rate of 7 percent per year, which is estimated to cost USD9.6 billion annually in wasted fuel, reduced productivity, air pollution and accidents.<sup>5</sup> The unicentric development focus on Delhi without adequate transportation options connecting to the neighboring satellite cities has limited the NCR from realizing its full economic potential.<sup>6</sup> The Delhi–Meerut expressway has been proposed under the Functional Plan on Transport for NCR-2032 to help tackle the challenge (scheduled to be completed in 2020). However, it does not pass through city centers and densely populated intermediate urban nodes and will have limited attractiveness for public transit commuters. The travel time on this expressway will be longer than RRTS, and the expressway is still insufficient to ease the congestion significantly. Therefore, the traffic studies conducted during the preparation of the Project has also taken into account the development of the Delhi–Meerut expressway.

**5. Limited Urban Mobility for Women and Differently-Abled Persons.** Women and differently-abled persons face additional layers of challenges when using public transport in the region, which significantly limits their mobility. Focus group discussions with women reveal that they are often discouraged from using public transport due to fears of harassment, lack of last mile connectivity, as well as inadequate hygiene facilities. Further, consultations with organizations working with differently-abled persons also reveal that inaccessible streets and transport vehicles as well as the behavior of transport service providers present great obstacles in using public transport. Women and differently-abled persons are often less well-placed to take advantage of increased economic opportunities. The unemployment among female graduates in the state of Uttar Pradesh (where NCR is located) is at 14.7 percent, double the national average of 7.3 percent. Further, around 65 percent of the state’s differently-abled population is unemployed. Ensuring safe and easily accessible modes of transport for women and differently-abled persons would substantially increase their mobility and their employment prospects.

**6. Impact of Coronavirus Disease 2019.** The recent coronavirus disease (COVID-19) pandemic has further revealed the severity of limited connectivity in the region and its impact on the Delhi workers’ livelihood. As the country went into lockdown, millions of migrant workers in Delhi and its satellite towns were left stranded without immediate incomes, away from their families. When provided with good regional connectivity, the workers will be able to live with their families in better living conditions in other NCR towns where cost of living is lower. Fast and comfortable commute in NCR would allow Delhi’s development to be more controlled, relieving pressure on Delhi transport infrastructure and promoting urban development in the NCR.

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<sup>4</sup> The current length of operational network of Delhi Metro is 389 km with 285 metro stations.

<sup>5</sup> N. Davis et al. 2017. *Congestion costs incurred on Indian Roads: a case study for New Delhi*. Chennai: Department of Electrical Engineering, Indian Institute of Technology.

<sup>6</sup> NCRTC-NIUA. India: Detailed report on Value Capture Financing: Implementation of Transit Oriented Development along Delhi-Ghaziabad-Meerut RRTS Corridor. Unpublished

7. **Institutional Context.** To improve the mobility of both people and goods in NCR, the NCR Planning Board's "Functional Plan on Transport for NCR-2032" recommended an integrated multimodal transportation system, which included a proposal for the construction of eight rail corridors to connect Delhi to other cities in NCR with high-speed commuter trains under the regional rapid transit system (RRTS). National Capital Region Transport Corporation (NCRTC) was incorporated and mandated to implement the RRTS projects across the NCR. NCRTC was established as a joint venture company of Government of India and NCT of Delhi, and States of Haryana, Rajasthan and Uttar Pradesh, under the administrative control of Ministry of Housing and Urban Affairs (MoHUA).<sup>7</sup>

8. Out of the eight rail corridors, NCRTC plans to implement three prioritized RRTS corridors first. The proposed Project as the first RRTS corridor in India will support the development of Delhi–Ghaziabad–Meerut corridor (82 km) connecting Delhi to Sahibabad, Ghaziabad, Duhai, Muradnagar, Modinagar and Meerut in Uttar Pradesh. The second corridor (180 km) will be the Delhi–Gurugram–SNB–Alwar corridor passing through the urbanized and industrialized areas of Haryana, Rajasthan and also connect to Delhi airport. The third corridor (103 km) will connect Delhi to Panipat in Haryana. All the three corridors will converge at the multi-modal RRTS station to be constructed at Sarai Kale Khan in Delhi. The three prioritized corridors will be integrated with the airport, eight Delhi Metro stations, three interstate bus terminals and two Indian Railways stations in the capital apart from several other towns in the NCR.

9. **Strategic Fit for the Asian Infrastructure Investment Bank.** The proposed Project aligns with the following thematic strategies of the Asian Infrastructure Investment Bank (AIIB):

- (i) *Transport Sector Strategy.* The Project will ensure seamless multimodal regional connectivity across the NCR region by providing integrated access to rail, road, bus, metro and airport. In addition, the Project will provide increased transport capacity to remove bottlenecks between major urban centers in NCR region.
- (ii) *Sustainable Cities Strategy.* The Project entails improving the public transport system and enhancing urban mobility through high speed, reliable, safe and comfortable mode of travel.
- (iii) *Energy Sector Strategy.* The Project is expected to result in a net reduction in greenhouse gas (GHG) emissions due to modal shift of passengers from carbon-intensive modes of transport to a low-carbon railway system.
- (iv) *Private Capital Mobilization (PCM).* The Asian Development Bank (ADB) and AIIB are in discussions with NCRTC to encourage private sector participation in operation and maintenance (O&M).

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<sup>7</sup> Agreeing to this partnership, the Memorandum of Understanding between participating stakeholders was signed on June 29, 2011 and an equity share in NCRTC was agreed upon for setting up an initial seed capital of USD14.08 million. The contributions for this equity share from the stakeholders were received by August 1, 2013 along with the signing of the Memorandum of Association and Association of Agreement of NCRTC. NCRTC was formally incorporated on August 21, 2013 as a Company under the Company Act, 1956. As a partnership project between the Center and the States, NCRTC have one nominated director each from the participating states, and four nominee directors from the Government of India. The Secretary, Urban Development, Government of India is the ex-officio chairperson of the Board of Directors and the managing director is a nominee of Government of India.

10. **Value Addition by AIIB.** First, AIIB's support will help close the financing gap for the proposed Project, which requires substantial upfront capital investments to address infrastructure constraints. Second, AIIB has been working closely with the ADB team throughout Project preparation to streamline the prerequisite requirements and the implementation procedures in line with the multilateral development banks' (MDBs') standards and the good international industry practice. AIIB, in collaboration with ADB, is providing continued support to NCRTC to enhance its capacity to meet MDBs' procurement and ES measures required for projects of such scale and complexity. To ensure that Project objectives are achieved during project implementation, the AIIB team will provide periodic advisory to the client, building on its experience in developing a number of metro and railway projects, enhancing last mile connectivity and developing transit-oriented development (TOD) plans.

11. **Value Addition to AIIB.** AIIB's participation will provide a continued track record for AIIB in financing large-scale transport projects with regional connectivity, which will later bring more opportunities to finance high-demand regional connectivity transport projects. Most importantly, the Project provides a unique opportunity for AIIB to participate in developing a new type of rail-based urban transport that combines relatively high speeds, widely spaced stations and metro-like operations, which is a first of its kind in India. Furthermore, as AIIB and ADB support NCRTC to contract a private operator, the Project provides an opportunity for AIIB to accrue experience in developing a public-private partnership (PPP) for O&M in an Indian RRTS context that can be replicated in other projects. As the Project is jointly cofinanced by ADB, AIIB can also fortify its partnership with the lead cofinancier ADB and establish AIIB's status as a reliable partner.

12. **Lessons Learned from Previous Projects.** AIIB team notes that lessons learnt from railways and urban transport projects in India as well as similar RRTS projects in other countries, have been carefully reflected in the Project design as follows:

- (i) Using elevated tracks on the carriageway of existing roads to minimize involuntary resettlement impacts and land acquisition requirements.
- (ii) Adopting a smart technology-based platform (Building Information Modelling) that enables an intelligent three-dimensional model-based process to plan, design, construct and manage stations more efficiently.
- (iii) Ensuring interconnectivity with other transport modes with multimodal hubs that enable easy interchange to rail, metro and bus stations for greater convenience of the passengers. Of the total 24 stations in the corridor, at least 5 will be developed as major multimodal hubs. The deliberate planning on interconnectivity allows the Project to provide regional as well as local transport connectivity.
- (iv) Including design features that are friendly to the elderly, women, children and differently-abled persons to improve safety for the riders and maximize ridership.
- (v) Planning O&M requirements at an early stage and utilizing the PPP model for O&M of the lines to improve asset quality and service levels. PPP consultants will be hired to recommend various options for rail operations and assist NCRTC

with the structuring of the rail operations contract for the Project, and later help develop performance standards.

## B. Project Objective and Expected Results

13. **Project Objective.** The objective of the Project is to improve the efficiency, safety, social inclusiveness, and environmental sustainability of the transport in the Delhi–Meerut Corridor of the NCR.

14. **Expected Results.** The Results Framework presented in Annex 1 will be used to monitor and evaluate the achievement of the proposed project objective indicators. These include:

- (i) Travel time between Delhi–Meerut by train reduced to 1 hour (hour);
- (ii) Carbon dioxide (CO<sub>2</sub>) reduced per annum (tons); and
- (iii) Share of riders including women and differently-abled persons perceiving the RRTS to be accessible, safe, and reliable in user survey (percentage)

15. The proposed Project intermediate output indicators will be measured periodically during Project implementation to ensure that the Project is progressing in accordance with the implementation plan. Given that AIIB is jointly cofinancing the Project with ADB although AIIB will finance Tranche 2 of the Project, the indicators are designed to track the results accrued from the Project until completion of all tranches.<sup>8</sup> Detailed information on the indicators is available in Annex 1.

16. **Expected Beneficiaries.** The primary beneficiaries are new RRTS passengers who will directly benefit from faster, more reliable, safer and better-quality integrated transport services of regional-based rail compared to existing road-based public and private transport. Fast and seamless travel would facilitate movement of job opportunities from urban centers in Delhi to broader NCR region as mobility increases, which will contribute to the economic competitiveness of the region. With the socially inclusive design of the corridor, women and differently-abled persons in particular will benefit from improved mobility, encouraging them to engage in employment and other economic activities. The secondary beneficiaries are residential and commercial establishments in towns and cities situated along the RRTS corridor which will benefit from improved accessibility and connectivity as well as increased economic opportunities. In the long term, the public will also benefit from reduced pollution as commuters shift from road-based public transport to the RRTS with lower GHG emissions.

## C. Description and Components

17. **Overview.** The Project will support the development of the 82 km of Delhi–Ghaziabad–Meerut corridor. The Project will pass through the densely populated sections of the NCR, connecting Delhi to Meerut via Ghaziabad. With a design speed of 180 km per hour and high

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<sup>8</sup> ADB financing comes in through a multitranches facility; however, ADB and AIIB will be financing the same components i.e., civil works, under a joint cofinancing structure.

frequency operations (5 to 10 minutes), this corridor is expected to substantially reduce vehicle travel time by 2 to 3 hours. The Project component to be jointly cofinanced by AIIB and ADB includes civil works for elevated and underground sections with stations, two depots, track work and traction. Recently, the New Development Bank (NDB) approved a parallel loan of USD500 million, to finance part of rolling stock, signalling and telecommunications (S&T) system, construction of multi-storied staff quarters, stabling yard and connectivity from Mathura road to the Jangpura stabling yard complex. The NDB financed packages are not considered as part of the Project and therefore excluded from the financing plan of the Project. AIIB and ADB will not finance any packages financed by NDB.

18. **Civil Works.** The component consists of construction of 14 km of underground section and 68 km of elevated viaducts. It will connect Sarai Kale Khan in Delhi to Modipuram in Meerut. The viaduct will be built along the central median of the existing Delhi–Meerut Highway wherever feasible. For underground section, two parallel tunnels with a single track in each tunnel are planned. A total of 24 stations will be constructed along the corridor, in consideration of universal accessibility, facilities for female passengers and staff, and green building features. Two depots will be constructed, one at Duhai (at the center of alignment) and the other at Modipuram (at the end of alignment) for the maintenance of rolling stock and fixed assets.

19. A grant from Japan Fund for Poverty Reduction (JFPR)<sup>9</sup> (to be administered by ADB) will finance a range of pilot activities including toilet blocks outside station areas, assistive aids for the differently-abled, training for women and differently-abled on safe mobility and employment opportunities, sensitization and behavioral change trainings of public transport providers.

20. The Governments will finance the following components using counterpart funds: (i) detailed design consultants and general consultant; (ii) two elevated civil works packages for the first 17 km of the corridor from Delhi; (iii) all land acquisitions required for the proposed Project, including private land and Government land; and (iv) utility shifting and other miscellaneous works.

#### **D. Cost and Financing Plan**

21. **Financing Plan.** The Project is estimated to cost USD3,449.7 million and will be jointly cofinanced by AIIB and ADB. The cofinancing is proposed in four tranches under ADB's multitranche financing facility (MFF).<sup>10</sup> In terms of counterpart contribution for the Project, as per the sanction order of MoHUA, Government of India, dated March 2019, the Governments will

<sup>9</sup> The JFPR is a possible funding source subject to the approval of the Government of Japan.

<sup>10</sup> ADB's MFF is a financing modality that supports a client's medium- to long-term investment program or plan. ADB's Board of Directors approves a maximum amount for an MFF, and the conditions under which financing will be provided. On the basis of the ADB Board's approval, and at the client's request, ADB Management converts portions of the facility amount into a series of tranches to finance eligible investments. A tranche can be a loan (other than program or a sector development program loans), grant, guarantee, or ADB-administered cofinancing. Financing terms and conditions can differ between tranches. The overall amount of the MFF is not recorded as a legally binding financial commitment on the part of either ADB or its clients; only the amounts converted (into loans, grants, guarantees or ADB-administered cofinancing) are recorded as committed, if and when approved.

contribute about 55 percent of the Project cost. The Government of India will contribute 27.5 percent, State Government of Uttar Pradesh will contribute 23.07 percent and the Government of NCT of Delhi will contribute 4.43 percent of the Project cost. The indicative total Project cost and financing plan is presented in Table 1.

**Table 1.** Indicative Project Cost and Financing Plan (USD million, rounded)<sup>11</sup>

Item	Cost	AiIB	ADB	JFPR	Governments
<b>A. Investment Costs</b>					
Civil Works	1,848.3	374.5	806.2	0.8	667.3
<b>Subtotal (A)</b>	<b>1,848.3</b>	<b>374.5</b>	<b>806.2</b>	<b>0.8</b>	<b>667.3</b>
<b>B. Other Components financed by others</b>					
Rolling Stock	170.8	0	0	0	170.8
Land Acquisition	188.0	0	0	0	188.0
General Charges	73.1	0	0	0	73.1
Consulting Services	66.1	0	2.8	2.4	60.9
Taxes (except state taxes)	197.6	0	0	0	197.6
<b>Subtotal (B)</b>	<b>695.6</b>	<b>0</b>	<b>2.8</b>	<b>2.4</b>	<b>690.4</b>
<b>C. Contingencies*</b>					
Contingencies	447.9	73.9	141.3	0.3	232.4
Escalation	312.7	51.6	98.7	0	162.4
<b>Subtotal (C)</b>	<b>760.6</b>	<b>125.5</b>	<b>240.0</b>	<b>0.3</b>	<b>394.8</b>
<b>D. Financial Charges during Implementation</b>					
Interest during construction	143.7	0	0	0	143.7
Commitment charges	1.5	0	0	0	1.5
<b>Subtotal (D)</b>	<b>145.2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>145.2</b>
<b>Total Costs (A+B+C+D)</b>	<b>3,449.7</b>	<b>500.0</b>	<b>1,049.0</b>	<b>3.0</b>	<b>1,897.7</b>

ADB = Asian Development Bank, AiIB = Asian Infrastructure Investment Bank, JFPR = Japan Fund for Poverty Reduction.

\*Physical contingencies computed at 17 percent for civil works and goods. Prices contingencies computed at average of 4 percent on local currency and 1.6 percent for foreign currency costs.

**22. Multitranches Financing Facility.** ADB's MFF is a modality to enable a phased release of financing to support the client's long-term investment objective. The MFF with four tranches simply reflects the time-slicing approach adopted by ADB for large-scale investment projects, and therefore each tranche is not linked to a specific stage, contracts, completion milestones or component of the Project. The MFF tranches will be subject to the Governments' submission of related periodic financing requests, execution of the related loan and project agreements for each tranche, and fulfilment of terms and conditions and undertakings set forth in the framework financing agreement between the Government of India and ADB.

<sup>11</sup> The Project cost does not include the land acquisition cost, state taxes, duties and the automated fare collection system proposed through PPP model. Taxes will be financed by the central government and the respective state governments, and the government land will be financed by the respective government that owns the land.

23. For the purpose of ADB's MFF and its internal approvals, AIIB's cofinancing for the Project is referred to as "Tranche-2" scheduled from 2021 onwards. ADB will finance the first tranche scheduled for 2020, the third tranche proposed in 2023 and the fourth tranche in 2025. The disbursement of tranches will be based on accrued expenditures and is not based on pari passu. ADB's first and third tranches are expected to overlap with AIIB's cofinancing (Tranche-2) to ensure there are no delays in disbursements between tranches, as presented in Figure 1 below.

**Figure 1.** Expected Completion Year for Each Tranche under the Asian Development Bank's Multitranche Financing Facility

MFF/Year	2020	2021	2022	2023	2024	2025	2026	2027
Tranche-1								
Tranche-2								
Tranche-3								
Tranche-4								

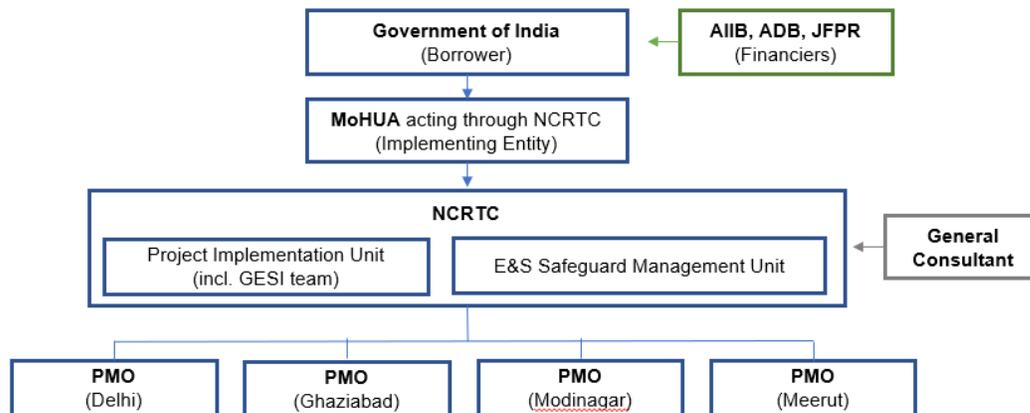
24. **Cofinancing arrangement.** The Project will be jointly cofinanced by AIIB and ADB, providing an opportunity for mutual knowledge sharing between the two banks. AIIB will cofinance about 32 percent of the total loan amount or 14.5 percent of the total Project cost. ADB will provide procurement, ES, financial management, disbursements, Project monitoring and reporting services for the Project on behalf of AIIB. As permitted by AIIB's policies, ADB's policies and procedures on ES issues, procurement, disbursement, financial management, project monitoring, and reporting will be used for the Project (including activities to be financed by AIIB), as they are materially consistent with AIIB's corresponding policies. AIIB will provide adequate support to project implementation according to a colender's agreement between AIIB and ADB.

25. **Financing Terms.** AIIB loan tenor will be 25 years, including a grace period of 8 years, at AIIB's standard interest rate for sovereign-backed variable spread loans.

## E. Implementation Arrangements

26. **Implementation period.** The Project is expected to be implemented from July 2021 to August 2027.

27. **Implementation Management.** MoHUA acting through NCRTC will be the Project implementing entity for the proposed Project. Detailed project implementation structure is provided in Figure 2.

**Figure 2. Project Implementation and Monitoring Structure**

ADB = Asian Development Bank, AIIB = Asian Infrastructure Investment Bank, GESI = Gender Equality and Social Inclusion, JFPR = Japan Fund for Poverty Reduction, MoHUA = Ministry of Housing and Urban Affairs, NCRTC = National Capital Region Transport Corporation, PMO = project management Office.

28. **Project Implementation Entity.** NCRTC has a well-defined organizational management structure with clear roles and responsibilities, headed by a managing director nominated by the Government of India. To support the managing director, there are four full time directors for projects, finance, systems, and electrical, respectively each with their respective teams. A chief vigilance officer assists the managing director in all vigilance matters. The Project organization chart is presented in Annex 2. NCRTC currently has full time regular staff of around 200 people to support the organizational objective of project development.

29. **Project Management Offices.** NCRTC established four project management offices (PMOs) at the site-level, each headed by a chief project manager directly responsible for the day-to-day implementation. These PMOs have been established at Delhi, Ghaziabad, Modinagar, and Meerut to manage development across different sections of alignment. The PMOs will conduct preconstruction activities and be responsible for monitoring and evaluation of Project activities and outputs, including periodic review and preparation of review reports.

30. **General Consultant.** A general consultant (GC) has been mobilized to provide high quality technical, ES advice and project management services to NCRTC for the Project. The GC will ensure quality of workmanship and compliance with the contracts. As of July 2020, around 72 experts in different fields have been mobilized by the GC. Detailed design consultants for the entire elevated viaduct, stations and depot have also been engaged. The GC scope of work has been reviewed and is considered as satisfactory to AIIB and ADB.

31. **Monitoring and Evaluation.** The overall responsibility for monitoring Project results will be with NCRTC, supported by the GC who will produce monthly progress reports. NCRTC will prepare a quarterly progress report and share it with AIIB and ADB. This report will form one of the

main means of monitoring implementation of the proposed Project. It will highlight status of achieving agreed targets for various monitoring indicators and detail the implementation progress on every aspect of the Project. Technology is being leveraged to monitor the ongoing construction activities such as CCTV cameras, drone's imagery, and an internal online project monitoring dashboard. NCRTC has also formed an internal steering committee comprising key officials of NCRTC and the GC, in which the GC makes a monthly presentation of project implementation activities to actively monitor project implementation.

32. **AIIB's Implementation Support.** ADB plans to visit the Project sites twice a year to monitor the progress. As it is jointly cofinanced, AIIB team will join the ADB team in all supervision missions to monitor the implementation progress until completion of Tranche 4 (beyond Tranche 2 financed by AIIB) to track the Project outcome in its entirety until completion. Appropriate resources will be made available to match the frequency of ADB supervision missions. In addition to the semi-annual supervision missions, AIIB and ADB may carry out more frequent supervision of construction, procurement, financial management, and ES management activities in the earlier stages of project implementation. AIIB will engage local consultants for technical, ES management activities on the ground, while travel restrictions are in place during COVID-19 pandemic.

33. AIIB and ADB will carry out a midterm review mission to assess whether attainment of the Project intermediate outputs is still likely to be achieved and if any changes to the Project are required.

34. **Procurement.** ADB being the lead financier and procurement to be jointly cofinanced, AIIB will follow ADB's Procurement Policy (2017, as amended from time to time) and Procurement regulations for ADB Borrowers (2017, as amended from time to time). In line with AIIB's Procurement Policy and Interim Operation Directive on Procurement Instructions for Recipients (June 2, 2016), Open Participation will be applied to permit firms and individuals from all countries to offer goods, works and services for all procurement packages to be financed by AIIB and ADB. All tenders will be processed through the national e-procurement system [eprocare.gov.in](http://eprocare.gov.in). All procurement packages to be jointly cofinanced by AIIB and ADB have been identified in the procurement plan and are to be procured through international open competitive method, which is the preferred method of AIIB. NCRTC will be responsible for all aspects of the procurement process and contract management. ADB will be primarily responsible for reviewing and providing oversight to procurement packages jointly cofinanced by AIIB and ADB in accordance with AIIB and ADB colender's agreement.

35. **Financial Management.** NCRTC will be responsible for overall financial management of the Project to ensure proper usage of funds. The planning, budgeting, funds flow, accounting, reporting, internal controls, and audit arrangements will be aligned with NCRTC's existing system and procedures. NCRTC will prepare annual work plan and budget as per procurement plan and financing agreements. NCRTC's in-house finance/accounts staff will manage the Project financial management. NCRTC will maintain separate books and records by funding source for all expenditures incurred on the Project following accrual basis double entry accounting system and

guidelines issued by the Institute of Chartered Accountants of India. The Project internal audit will be carried out by chartered accountant firm on quarterly basis and submit reports to audit committee of NCRTC.

36. NCRTC will prepare the detailed Project financial statements separately for each tranche, for all sources of financing. The Interim Unaudited Financial Reports (IUFs) will be submitted to AIIB and ADB within 45 days after the end of each fiscal quarter. The external audit reports for each year of Project implementation will be submitted as follows: (i) the Project audit report within 6 months from the fiscal year-end; and (ii) NCRTC Entity audit report within 1 month from approval by NCRTC Board, but no later than 1 year from end of the fiscal year. The external audits will be carried out in accordance with the Government's audit regulations by an independent auditor appointed on behalf of the Comptroller and Auditor General of India and up to standards acceptable to AIIB and ADB.

### 3. Project Assessment

37. **Project Assessment during COVID-19.** Given the travel restrictions in place due to COVID-19 pandemic, the AIIB team has undertaken the Project assessment via video conference (VC) missions with NCRTC. The AIIB team also engaged local consultants on the ground to monitor the progress in preparation and facilitated periodic discussions with ADB team and NCRTC for close coordination. The AIIB team along with local consultants have visited the entire alignment as well as the PMO in March 2020.

#### A. Technical

38. **RRTS Corridor.** The 82 km of Delhi–Meerut RRTS consists of 68 km of elevated section and 14 km of underground section. It will be implemented with track on the standard gauge (1,435 mm). The geometric design criteria are based on international practices adopted for similar RRTS systems with a design speed of 180 km/hour. The alignment and station locations have been designed to connect densely populated areas in consideration of future development along the corridor.

39. **Civil Works.** The elevated section of the RRTS will run along the median of the existing Delhi–Meerut Highway, wherever feasible. Topographical surveys and geotechnical investigations have been carried out to avoid delays due to unexpected site conditions during Project implementation. For the underground section, two parallel tunnels with single track in each tunnel are planned. Long tunnels are recommended to be constructed by bored tunneling method using tunnel boring machines. The choice of earth pressure balancing machines and/or slurry shield machines will be decided during detailing of the tunnel construction.

40. **Station Design for Safety, Convenience and Accessibility.** The stations will include gender and socially inclusive features to provide universal accessibility, which will benefit women and differently-abled passengers. To illustrate, CCTV cameras will be installed in all stations to monitor coaches, pickup, and drop-off. All public areas will be well-lit and patrolled by security

guards. Differently-abled-friendly access ramps, elevators and escalators will be provided for universal accessibility. In addition, platform screen doors will be installed to separate the station platform from the train to prevent accidents. A dedicated coach and four seats in each coach will be reserved for women only, with additional seats reserved for pregnant women, caregivers, elderly, differently-abled, indicated with signage of international quality. Furthermore, there will be at least one access route and one emergency route step-free for a person on a wheelchair to travel from the road to each station, concourse, platform and train.

41. **Multimodal Integration.** The three prioritized RRTS corridors will be integrated with as many as eight Delhi metro stations, three interstate bus terminals as well as two Indian Railways stations in the national capital, along with the airport. Multimodal integration will be provided through elevators, walkways, escalators and underpasses, depending on the location, to ensure that commuters get seamless transit options to metro lines, bus terminals, or other transport modes. The ticketing system adopted for RRTS will support National Common Mobility Standards, making the ticketing completely integrated across metro and other city transit systems, and therefore incentivizing the use of public transport.

42. **Last-Mile Connectivity.** Last mile connectivity is proposed to be achieved by integration of RRTS stations with nonmotorized transport, app-based shuttle bus, smart bikes and electric scooters, e-rickshaws and other feeder modes. NCRTC will also actively engage with private sector last mile service providers and city-level transit operators. NCRTC is envisaging collaborations with private cab aggregators. Station design elements to support E-Mobility solutions are also being explored, including parking and charging facilities for E-Vehicles.

43. **Technical Soundness and Compliance.** The technical viability is sound with use of proven technology. NCRTC has prepared the original Project reports, detailed designs, and specifications. The technical designs and specifications for most of the civil engineering works are based on Indian standards which are well proven and widely applied on Indian railways and other metro projects. For underground works, design-build contracts will be awarded to suitably qualified contractors with proven experience in the construction of similar works and who will be required to engage experienced and competent designers for the design of works. The design of various works will meet the relevant standards for the seismic zone of the Project area. As per the specifications, the track will conform to international railway standards, with the rolling stock being of modern design, lightweight, made of stainless steel or aluminum, and with a regenerative braking system.

44. **Project Readiness and Impact of COVID-19.** Readiness for Project implementation is high, with limited impacts of COVID-19. NCRTC is leveraging VC and other information technology tools for timely completion of Project task. For instance, it has already conducted four global pre-bid meetings through VC and finalized bid of rolling stock. The civil works have already commenced for the first 17 km of the corridor without delays. The GC has been mobilized. ES due diligence has been completed for the entire corridor. Geo-technical investigations have been done and detailed design work is in progress. To minimize delays, pre-construction activities such as utility shifting for various sections of the corridor are ongoing. The pandemic has not much affected Project implementation arrangements or cost. In addition, Project implementation period

of 7 years provides sufficient buffer to catch up with delays, if any. Based on government orders and guidelines to avoid spread of the virus, standard operating procedures have been developed and are being strictly implemented for resumption of regular works at various NCRTC site offices and construction sites. Strict compliance monitoring is to be ensured by chief project managers at PMOs.

45. **Post-COVID-19.** The Project would remain even more important post-COVID-19. Efforts are being made to restart the economy and mitigate the adverse impact of the lockdown particularly on employment of vulnerable population. The Project will create employment opportunities during construction and operation, and further generate demand to kickstart the economy. It will facilitate growth of businesses in the region with improved mobility, increased quality of living, and equitable access of infrastructure, which will make growth recovery more inclusive.

46. **Operational Sustainability.** Following the international best practice in most metro and railway projects, NCRTC is exploring private sector participation to increase the asset quality and efficiency of the operational system, and further achieve cost efficiencies. A shadow operator has been engaged, that will help ensure that the designs integrate long-term O&M requirements. NCRTC, with guidance from AIIB and ADB, is exploring the following areas to attract private sector participation:

- (i) Development of an O&M contract through which a private operator will manage the lines.
- (ii) Operation of automated fare collection system
- (iii) Provision of logistics services to accommodate freight traffic to enhance supply chain operations in the catchment area and unlock additional revenue potential for RRTS.
- (iv) Procurement of rolling stock contract to include 15-year performance-based maintenance obligations. The payment to the rolling stock provider will be based on availability payments, and at least 30 trainsets of six coaches each will be provided for the RRTS.

## **B. Economic and Financial Analysis**

47. **Economic Benefits.** It is expected that the Project will accrue multiple social and economic benefits to the society through savings in vehicle operating costs (VoC), fuel, travel time, and reduction in pollution for both public transport and existing road users. All the benefits are calculated in market price terms and then converted to economic prices using conversion factors as per the Appraisal Guidelines for Metro Rail Project Proposals by the MoHUA, Government of India. The ridership estimates used for the calculation of various benefits are obtained from the detailed project report (DPR) and capped at a maximum ridership of 750,000 passengers per day on a conservative basis.

48. **Economic Costs.** The economic costs of the Project have been derived from the financial costs (capital and O&M expenditures) by adjusting them with conversion factors. The market prices of the capital expenditure and the O&M expenditure have been considered from the inputs obtained from NCRTC.

49. **Economic Analysis Results.** The estimated economic internal rate of return (EIRR) of the Project is 11.33 percent and the net present value of USD922 million at a 9 percent discount rate, indicating that the Project is economically feasible. Six sensitivity tests were conducted for the following scenarios: (i) 10 percent/20 percent reduction in ridership; (ii) 5 percent/10 percent increase in capital expenditures; (iii) 1-year/2-year delay in benefits. All scenarios yielded EIRR of above 9 percent. More details on economic analysis are provided in Annex 3.

50. **Financial Analysis and Results.** The financial internal rate of return (FIRR) has been estimated based on the discounted cash flow of projected costs and earnings that would accrue from the Project over 36 years. All financial calculations were made in 2019 Indian rupees terms with no adjustment for inflation.

51. The estimated FIRR of the Project is 2.5 percent. Sensitivity tests were conducted for the following scenarios: (i)  $\pm 10$  percent change in fare; (ii)  $\pm 10$  percent change in ridership; (iii)  $\pm 10$  percent change in Project cost. The sensitivity tests result in FIRR in the range of 1.8 to 3.1 percent. In addition to ADB's financial analysis, AIIB team has assessed the operating ratio (operating expenses divided by total revenue) to determine whether revenues are sufficient to cover operating expenses incurred along the Project lifetime. The base case scenario would produce an operating ratio of 46 percent on average over 30 years period. If the operating expenses are increased by 20 percent or revenues are reduced by 20 percent, the average operating ratio over 30 years would still be in the range of 53–55 percent. More details on financial analysis are provided in Annex 3.

### C. Fiduciary and Governance

52. **Procurement.** ADB Procurement Policy and Procurement Regulations are materially consistent with the AIIB's Core Procurement Principles set out in the Procurement Policy. AIIB has reviewed the procurement arrangements proposed by NCRTC and agreed by ADB and included in the procurement plan. The proposed procurement arrangements presented in the procurement plan, including contract packaging, procurement methods and bidding procedures, implementation timelines, procurement review methods and bidding documents meet AIIB's Core Procurement Principles and Procurement Standards. The national e-procurement system [eprocare.gov.in](http://eprocare.gov.in) to be used for Project procurement has provisions for international tenders and has been used in projects financed by MDBs. Value for money will be ensured through the proposed procurement and contract strategy, use of fit-for-purpose contract forms including ADB's goods contracts, FIDIC (Fédération Internationale Des Ingénieurs-Conseils) MDB 2010, FIDIC Yellow 2017, and prior review of major contract packages. The procurement plan will be updated regularly or on an as-needed basis and submitted to AIIB and ADB for review and no

objection during Project implementation. The civil works contracts for the first 17 km section will not be covered by the Procurement Policy as it is not financed by AIIB and ADB.

53. NCRTC will be responsible for all aspects of the procurement process and contract management. As per the procurement capacity assessment carried out by ADB, NCRTC has a well-structured bid process management system and mechanisms to ensure integrity and transparency in procurement. However, as a new agency, NCRTC has a very limited procurement capacity and the procurement staff has no experience in ADB financed projects. Based on the limited capacity of procurement staff and lack of exposure to MDB financed projects, Project procurement risk is rated “high.” Training and awareness workshops have been organized to familiarize NCRTC staff with ADB policies and procedures. In addition to the support provided by the GC, NCRTC will be guided by ADB in ADB’s procurement process management.

54. **Financial Management.** NCRTC is a new agency and is handling AIIB- or ADB-funded investment project for the first time. The financial management assessment considered capacity of NCRTC, including budgeting, funds-flow arrangements, staffing, accounting and financial reporting systems, financial information systems, and internal and external auditing arrangements. Based on the assessment, NCRTC has sound financial and accounting systems; adheres to procedures, manuals, policies, guidelines, and reporting framework prescribed by the Comptroller and Auditor General of India; and has a robust internal control system with internal audit outsourced to a firm of chartered accountants whose reports are presented to the audit committee of NCRTC. NCRTC is already preparing their entity-level financial statements in compliance with Indian Accounting Standards. The statutory auditors have given unmodified audit opinions on financial statements of NCRTC, internal controls over financial reporting and corporate governance compliance for FY2019. The overall financial management risk is medium, with appropriate risk mitigation measures in place.

55. **Funds Flow and Disbursement Arrangements.** MoHUA will provide AIIB and ADB loan funds to NRCTC for Project implementation. The Governments will provide counterpart funds in their respective proportions in accordance with Presidential Sanction Order for the Delhi-Ghaziabad-Meerut RRTS. The Governments will be responsible for meeting the financial responsibilities and obligations of NCRTC for the Project. The Project will be budgeted through a single line item in the MoHUA budget for AIIB and ADB loan component and capital grants from the Governments. After the budget is approved, funds allocation will be made by MoHUA to NCRTC. AIIB and ADB portion will be pre-financed and released by the MoHUA based on estimation of expenditure.

56. Eligible Project expenditures will be submitted to Controller of Aid Accounts and Audit, Ministry of Finance through Statement of Expenditures procedure for reimbursement by AIIB and ADB. For ADB-administered cofinanced funds, the borrower will submit one original of the Withdrawal Application (WA) and copies of supporting documents to AIIB, and one original of the WA and copies of supporting documents to ADB. ADB will review each WA and advise AIIB to make the necessary payment directly to the borrower, if any. Disbursement and Financial

Information Letter will detail out the authorized signatories, process of submitting claims and other terms and conditions of disbursements related to the Project.

57. **Governance and Anti-corruption.** AIIB is committed to preventing fraud and corruption in the projects that it finances. It places the highest priority on ensuring that the projects are implemented in compliance with AIIB's 2016 Policy on Prohibited Practices. AIIB will monitor the work related to tender document preparation and tender/proposal evaluation and award financed under its loan. Implementation will also be monitored rigorously and regularly by AIIB staff. AIIB reserves the right to investigate, directly or indirectly through its agents, any alleged Prohibited Practices relating to the Project and to take necessary measures to prevent and redress any issues in a timely manner, as appropriate. To the extent that the ADB's Anticorruption Policy (1998, as amended to date) is similar to AIIB's Policy on Prohibited Practices, ADB's Policy will apply, and to the extent it diverges from AIIB's Policy, AIIB's Policy will apply to the Project activities financed in whole or in part by the proceeds of the proposed AIIB and ADB loans. Detailed requirements will be specified in the Loan Agreement and will also be included in the colenders' agreement and the Project tender documents.

58. **Institutional Capacity.** NCRTC is a newly established organization to serve as a special purpose vehicle for the Project with no previous exposure to MDB-funded projects. However, many of the NCRTC staff come from the Indian Railways as well as metro corporations across India, and therefore individually have sufficient experience implementing railway and metro projects and working on externally aided projects. Nonetheless, the large scale of the Project may present some capacity challenges for NCRTC to simultaneously manage multiple projects, contracts, and document flow, including financing reporting and auditing. Acknowledging the client capacity needs, ADB is providing NCRTC with training workshops on project and contract management, financial management, procurement and ES. The GC will provide extensive support to NCRTC for the Project implementation, as well as ADB consultants that are financed through technical assistance grants funded by ADB and the Urban Climate Change Resilience Trust Fund. ADB's technical assistance will also help NCRTC develop and implement a TOD action plan and value capture financing (VCF) instruments to provide additional revenue streams and enhance financial sustainability of the Project.

59. **Reporting and Monitoring.** NCRTC, with the support of GC, has adequate capacity to perform the agreed monitoring, evaluation and reporting practices. NCRTC will monitor the Project implementation according to the schedule and timebound milestones and keep AIIB and ADB informed of any significant deviations. NCRTC will provide AIIB and ADB with:

- (i) quarterly progress reports including financial and disbursement report, variance analysis of physical and financial progress, details of utilization of funds and reconciliation with ADB loan financial information system;
- (ii) consolidated annual reports including (a) progress achieved by output as measured through the indicator's performance targets, (b) key implementation issues and solutions, (c) updated procurement plan, and (d) updated implementation plan for the next 12 months; and

- (iii) a Facility completion report within 6 months of physical completion of the MFF and Project.

#### **D. Environmental and Social**

60. **Environmental and Social Policy.** The Project will be cofinanced with ADB as lead cofinancier, and its ES risks and impacts have been assessed in accordance with the ADB's Safeguard Policy Statement (SPS) 2009. To ensure a harmonized approach to addressing the ES risks and impacts of the Project, and as permitted under AIIB's Environmental and Social Policy (ESP) and agreed in the cofinancing Framework Agreement between AIIB and ADB, AIIB agrees that the ADB's SPS 2009 and related procedures of ADB will apply to the Project in lieu of AIIB's ESP. AIIB has reviewed the ADB's SPS and is satisfied that: (i) it is consistent with AIIB's Articles of Agreement and materially consistent with the provisions of AIIB's ESP and the relevant ES Standards (ESS), and (ii) the monitoring procedures that are in place are appropriate for the Project.

61. **Categorization.** Under ADB's SPS, the Project has been categorized as Category A for environment, Category A for involuntary resettlement, and Category C for Indigenous Peoples. This is equivalent to Category A if AIIB's ESP were applicable. An Environmental Impact Assessment (EIA) accompanied by an Environmental Management Plan (EMP), a Resettlement Plan (RP) and a Gender Equality and Social Inclusion Action Plan have been prepared to meet the requirements of ADB's SPS and ADB's Policy on Gender and Development, 1998. The EIA and RP prepared to comprehensively assess the entire Delhi–Meerut corridor, were reviewed by AIIB and found to be satisfactory.

62. **Environmental Aspects.** The Project is located neither within an existing nor any proposed ecologically sensitive zone known for providing habitat or serving as a corridor for movement of wildlife. However, potential negative impacts include acquisition of 5.04 ha forest area in Ghaziabad and Meerut respectively, felling of 10,292 trees, construction-related air, water and waste pollution, noise and vibration during construction and operation phases, as well as occupational and community health and safety risks.

63. Most impacts are expected to be short-term and limited to the construction site. NCRTC will obtain permission from the local municipal authority/forest department to cut trees at the Project site. For trees to be felled, tree replantation with a ratio of 1:10 will be undertaken. The EMP accompanied by an Environmental Monitoring Plan with a detailed EMP budget of INR306.72 million (USD4.06 million), describes the mitigation measures for the identified impacts, the roles and responsibilities for EMP implementation, and institutional arrangements for monitoring, reporting and capacity building. Construction has commenced for a 17 km stretch from Sahibabad to Duhai and a 26 km stretch from Duhai to Meerut South. The contractors have obtained all the permissions and submit monthly monitoring report to NCRTC. Due diligence has been conducted by AIIB and ADB with a timebound corrective action plan prepared. No construction will be commenced within the forest area until the forest clearance has been obtained. In addition to the EMP, the contractors are also required to follow Safety, Health and

Environment (SHE) guidelines for metro projects in India, as well as the SHE Manual of NCRTC. The GC will assist NCRTC to supervise the contractors' day-to-day work and prepare the semi-annual environmental monitoring report to AIIB and ADB. The external monitor will conduct the independent monitoring and prepare the semi-annual external environmental monitoring report to AIIB and ADB.

64. **Climate Change Risks and Opportunities.** The RRTS Project area (Delhi, Ghaziabad, Meerut) all have high extreme heat risks. The State Action Plan on Climate Change projects the temperature in Delhi to increase by 1.5–2 degrees Celsius, and the rainfall levels to increase by 20 percent within the next three decades. According to the climate risk tool ThinkHazard,<sup>12</sup> urban flooding risk is high in Delhi, medium in Ghaziabad and low in Meerut. Water scarcity is classified as high in all three subregions of NCR. The Project will support climate change mitigation by encouraging commuters to shift from road-based urban transport to sustainable low-carbon railway transport with a net reduction in GHG emissions. The traffic studies carried out found that over the 29-year design life of the Project from 2025 to 2054, there will be a net reduction of about 7.4 million tons of CO<sub>2</sub> with an average reduction of over 258,035 tons per annum. The Project will take into consideration the climate change effects of an anticipated continuous increase in ambient temperature, intensity of cyclones and storm surge, and heavy precipitation events in the future. Appropriate resilience or adaption measures have been addressed in the Project design through use of head hardened continuous welded rail, provision of surface coating treatments on concrete lining of underground tunnels, raising of underground station entrances above surrounding ground levels, raising of the viaduct level across major rivers to prevent flooding of the tracks during heavy rainfall, and installation of flood gates at all underground stations. Overall, of total Project cost of USD500 million, USD498.53 million is considered as mitigation finance, and the remaining USD1.46 million as the adaptation finance as per the joint MDB climate finance tracking methodology.

65. **Social Aspects.** The proposed RRTS alignment will broadly utilize an existing right of way, the median strip of the existing Delhi–Meerut Highway, which will pass along major arterial roads of cities en route to Meerut. It will use (i) elevated tracks either in the middle or at the side of the road, and (ii) underground tunnel to minimize land acquisition and consequently involuntary resettlement impacts arising from land acquisition. The Project will require about 170 hectares (ha) of land comprising 138 ha of private land and 32 ha of government land for acquiring new right of way,<sup>13</sup> substation, depots, power substation and entry and exit points to stations. It is estimated that 813 households (5,453 persons) will be affected comprising 72 physically displaced, 732 economically displaced, and 9 physically and economically displaced due to land acquisition or restrictions on land use. Out of the total number of project-affected households, 571 households (3,997 persons) will experience significant impacts.<sup>14</sup>

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<sup>12</sup> ThinkHazard is developed for informational purposes by the Global Facility for Disaster Reduction and Recovery. <http://thinkhazard.org/en/>.

<sup>13</sup> For when alignment deviates from NH 58 right of way.

<sup>14</sup> As per the ADB Operations Manual on Safeguard Policy Statement, significant impacts mean (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating).

66. The RP has been prepared based on resettlement surveys, social assessments and consultations to address involuntary resettlement impacts on titled and non-titled households. It provides as a framework for land procurement, either the Direct Purchase Policy of Project states (Uttar Pradesh)<sup>15</sup> or the RFCTLARR Act 2013<sup>16</sup> in cases where negotiated settlement fails. The RP also includes an entitlement matrix, the provisions of which are in compliance with the ADB SPS. A resettlement implementation support agency (RISA) and an independent external monitor will be engaged respectively to undertake day-to-day supervision and overall monitoring of entitlements and other provisions outlined in the RP.

67. Although there are Scheduled Tribes present in Ghaziabad and Meerut districts,<sup>17</sup> the Project alignment is generally in urban and peri-urban areas where Scheduled Tribes do not have cultural attachment to land, customary territories, and distinct livelihood systems. Hence, Project activities are not likely to affect Scheduled Tribes as per ADB's SPS.<sup>18</sup>

68. **Gender Equality and Social Inclusion.** The Project will improve women and differently-abled persons' safe mobility and access to entrepreneurial and employment opportunities along the RRTS corridor and specifically, major urban centers. ADB has classified the Project as effective gender mainstreaming<sup>19</sup> with a Gender Equality and Social Inclusion Action Plan prepared, which includes the following key measures: (i) collect gender-disaggregated data and ensure effective consultation with women and differently-abled groups during Project design and implementation, (ii) integrate gender-responsive and universal accessibility features in the design of coaches and RRTS stations, (iii) address gender-related aspects of last-mile connectivity, (iv) strengthen capacity for gender mainstreaming within NCRTC, and (v) pilot-test modalities for improved urban mobility of vulnerable and differently-abled women and gender-related behavior change among public transport providers. To maximize the positive spillover effects of RRTS to the vulnerable population, the Project will provide mobility aids for differently-abled persons, and job trainings for women, financed by JFPR fund. NCRTC will conduct RRTS user survey with at least 45 percent women respondents and conduct at least four consultations with women's groups, young adults, the elderly and the differently-abled.

69. **Occupational Health and Safety, Labor and Employment Conditions.** The contractors are required to follow SHE guidelines for metro projects in India. There will be one environmental staff and one health and safety staff at each site. An Occupational Health and Safety Management Plan will be prepared by the contractor within the first 3 months of being mobilized, considering COVID-19 health and safety exercises. The SHE Manual of NCRTC, formulated in accordance with all applicable legislation and Indian statutory requirements as well as international standards and guidelines, has been part of tender documents for contractors to implement. NCRTC will be

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<sup>15</sup> Private land is required only in the State of Uttar Pradesh and not in Delhi. Private land will be purchased from the landowners as per the provisions of the Uttar Pradesh Direct Land Purchase Policy, 2015. NCRTC has obtained the consent of nearly all landowners for the Duhai depot and the negotiation process for the remaining land area is under progress. Similarly, discussions for direct purchase of land from concerned landowners for Meerut depot is also under progress.

<sup>16</sup> Right to Fair Compensation and Transparent Land Acquisition, Resettlement, and Rehabilitation Act of 2013.

<sup>17</sup> 0.6 percent and 0.1 percent of the total population of the respective districts as per Census of India, 2011

<sup>18</sup> There were no Scheduled Castes and Scheduled Tribes found affected during the socioeconomic survey.

<sup>19</sup> ADB. 2012. [Guidelines for Gender Mainstreaming Categories of ADB Projects.](#)

required to ensure that contractors and O&M agencies adequately provide health and safety measures for their workers, and bidding documents include clauses on how contractors will address the health and safety requirements.

**70. Stakeholder Engagement, Consultation, and Information Disclosure.** Public consultations have been carried out with key Project stakeholders and will continue during Project implementation, in accordance with national guidelines on restrictions imposed due to the COVID-19 pandemic. Appropriate methods will be adopted to ensure that consultations are meaningful and comprehensive. The provisions of consultations and stakeholder engagement are explicitly stated in the RP. It states that in addition to consultations during RP preparation, additional rounds of consultations with affected persons will form part of further stages of Project implementation led by the RISA. This will include disclosure on compensation, assistance options, Project-related employment, entitlement package and income restoration measures suggested for the Project. The consultation will continue throughout the Project implementation period. AIIB will monitor these consultations in coordination with the RISA, the external monitor, and ADB, particularly in areas where land for the two depots will be procured (Duhai and Modipuram).

71. In compliance with ADB's SPS, the draft EIA including the EMP was disclosed on October 9, 2019,<sup>20</sup> which was further updated to address AIIB and ADB comments and disclosed in May 2020 on ADB's website.<sup>21</sup> The RP has likewise been disclosed in March 2020 on ADB's website.<sup>22</sup> Same links have been provided on AIIB's website.<sup>23</sup> The Hindi versions of the executive summaries of the EIA and RP have been prepared and disclosed.

72. During implementation, a resettlement information leaflet containing information on compensation, entitlement and resettlement management adopted for the Project will be made available in Hindi language and distributed to affected persons by the RISA. For affected persons who are illiterate, appropriate and implementable methods will be followed in order to notify and inform such affected persons. RISA will disseminate relevant information through public consultations and other channels and will pay specific attention to ensure those who are illiterate receive information on a timely basis.

**73. Project-level Grievance Redress Mechanism.** A Project-level grievance redress mechanism (GRM) will be implemented under the Project to address complaints and grievances. A multi-tier GRM will be established by NCRTC. Communities and individuals who believe that they are adversely affected by the Project will be able to submit complaints to the project-level GRM for their resolution. In addition to the above GRM for addressing complaints from the local community, commensurate mechanism will be made available at the contractor level for worker's grievance.

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<sup>20</sup> ADB. 2019. [Delhi–Meerut Regional Rapid Transit System Project: Environmental Impact Assessment](#).

<sup>21</sup> ADB. 2020. [Delhi–Meerut Regional Rapid Transit System Project: Environmental Impact Assessment](#).

<sup>22</sup> ADB. 2020. [India: Delhi–Meerut Regional Rapid Transit System Investment Project](#).

<sup>23</sup> AIIB. 2020. [India: Delhi–Meerut Regional Rapid Transit System](#).

74. **Use of ADB’s Accountability Mechanism.** As noted above, ADB’s SPS will apply to the Project instead of AIIB’s ESP. Therefore, pursuant to AIIB’s agreement with ADB, AIIB will rely on ADB’s independent accountability mechanism, the Accountability Mechanism, to handle complaints relating to ES issues that may arise under the Project. Consequently, in accordance with AIIB’s Policy on Project-affected People’s Mechanism (PPM), submissions to the PPM under this Project will not be eligible for consideration by the PPM. Information on ADB’s Accountability Mechanism is available at: <https://www.adb.org/site/accountability-mechanism/main>.

75. **Monitoring and Supervision Arrangements.** NCRTC will be responsible for overall coordination, supervision and monitoring of the Project’s environmental and social aspects. NCRTC plans to establish a Social and Environmental Management unit within its organization structure to look after ES aspects associated with design, implementation and monitoring of the Project. Given ADB’s requirement for Category A project, external monitoring consultants will verify the internal ES monitoring reports prepared by NCRTC with the assistance from GC. Both semi-annually internal and external ES monitoring reports will be submitted to ADB and AIIB and disclosed on ADB’s website.<sup>24</sup> AIIB staff will conduct site visits at least semi-annually, together with ADB missions where feasible. With the travel restrictions during COVID-19 pandemic, AIIB team may conduct virtual supervision missions in lieu of field visits, and actively utilize the local consultants on the ground to monitor the implementation progress of the Project. Furthermore, NCRTC may utilize technologies including onsite CCTV and drones to monitor the Project implementation during the COVID-19 pandemic.

## E. Risks and Mitigation Measures

76. AIIB assigns a *High* overall risk rating to the proposed Project mainly due to COVID-19 pandemic, potential delay in procurement and/or land acquisition and resettlements, as well as NCRTC’s implementation capacity. ADB has undertaken due diligence on the Project and assigned a *Substantial* overall risk rating to the Project. ADB assigned the rating due to the risk of (i) inexperience of the implementing agency, (ii) potential procurement delays, (iii) financial sustainability, and (iv) COVID-19 pandemic.

77. The potential risks identified, and the mitigation measures proposed by AIIB team are summarized in Table 2. AIIB will monitor implementation of the mitigation measures during Project implementation through the progress reports from NCRTC and the joint supervision missions with ADB.

**Table 2:** Summary of Risks and Mitigating Measures

Risk Description	Assessment Ratings (High, Medium, Low)	Mitigation Measures
COVID-19	High	NCRTC has developed a standard operating procedure based on guidelines from the Government of India for resuming work safely after the COVID-19

<sup>24</sup> ADB will share semi-annual reports submitted by NCRTC for AIIB’s review and disclosure on AIIB website.

		lockdown. Preparatory works have been resumed and overall delay has been limited to less than a month.
<b>Environmental and social.</b> Delays in land acquisition and approval processes.	High	The total private land requirement for the Project is 138 ha. This is primarily required for the entry and exit of the stations along with two depots. The land acquisition process for this has been started through willing buyer-willing seller purchase rather than government acquisition process to expedite the overall process. Majority of the land for one of the depots is in advanced stage of negotiation hence mitigating the Project operational risk.
<b>Environmental and Social.</b> RP not adequately implemented  Clearance or permissions not obtained prior to construction	High	A resettlement implementation support agency will be engaged for the day-to-day supervision of RP implementation; and an independent external monitoring consultant will be engaged to monitor whether RP objectives are achieved.  Stage one of Forest Clearance has been obtained. The second stage is under processing. Close consultations with relevant authorities will be conducted for application documents preparation.
<b>Project Procurement Risk.</b>	High	The Project Procurement risk is rated as High by ADB. As a mitigation measure, ADB has already conducted trainings and workshops on ADB Procurement Policy. Further, all major packages under the Project will be subject to prior review.
<b>Implementation.</b> Delay in work due to lack of coordination between contractors and utilities' companies.	High	NCRTC is supported by the GC, which will monitor coordination between the contractors and the utilities companies to ensure timely execution of utilities identification and diversion. NCRTC has also established four project management offices along the alignment to coordinate and control the project implementation activities. These four offices are headed by chief project managers and are supported by team of experts.
<b>Implementation.</b> Time and cost overruns due to unforeseen conditions.	Medium	NCRTC has engaged detailed design consultants and has undertaken the geotechnical investigations to avoid unforeseen technical issues during implementation. As per the approved sanction order from the Government of India, any cost overrun for the Project will be borne by the Government of Delhi and the

		Government of Uttar Pradesh in proportion of route kilometers of alignment in their respective state.
<b>Implementation.</b> Delay in commissioning due to delay of the underground section of RRTS.	Medium	NCRTC has undertaken initial technical planning and preparation for the underground sections. GC is already on board to support the underground preparation activities.
<b>Implementation.</b> Risk of O&M by the private operator	Medium	ADB has engaged a shadow operator to review plans and designs to support the decision making and ensure efficiency and cost effectiveness of the O&M arrangements. NCRTC has engaged consultants in the development of appropriate structuring of the rail operations contract for the RRTS.
<b>Financial Management.</b> Appropriate and timely budgetary release and counterpart fund may not take place.	Medium	Timely budgetary release and provision of AIIB portion and counterpart funds is to be ensured. As per the sanction order for Delhi Meerut RRTS, grant and subordinated debts are to be contributed by the central and participating state governments. Appropriate budget allocations to ensure sufficient and timely funds available to NCRTC will be made in budgets of participating state.
<b>Financial.</b> Financial gaps during operation stage.	Low	As per sanction order from the Government of India, debt servicing will be the responsibility of the NCRTC. In case NCRTC fails to bear the liabilities, they will be borne by the respective Governments (Government of Delhi and Government of Uttar Pradesh) in the ratio of route kilometer of the Project falling in their respective State.  NCRTC is already exploring possible alternative sources of income, such as TOD, land value capture and commercial activities.

## Annex 1: Results Monitoring Framework

<b>Project Objective:</b>	The objective of the Project is to improve the efficiency, safety, social inclusiveness, and environmental sustainability of transport in the Delhi–Meerut corridor of the National Capital Region.											
Indicator Name	Unit	Base-line (2020)	Cumulative Target Values							End Target (2028)	Frequency	Responsibility
			2021	2022	2023	2024	2025	2026	2027			
<b>Project Objective Indicators:</b>												
1. Travel time between Delhi–Meerut by train reduced to 1 hour	Hour	3-4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	First year of operation	NCRTC
2. Carbon dioxide (CO <sub>2</sub> ) reduced per annum	Tons	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	258,035	First year of operation	NCRTC
3. Share of riders including women and differently-abled persons that perceive RRTS to be accessible, safe, and reliable in user survey <sup>1</sup>	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70%	First year of operation	NCRTC
<b>Intermediate Results Indicators:</b>												
1. Construction of elevated section (civil works), including stations with climate and disaster-resilient features and CCTV cameras installed	%	5	20	45	65	80	90	100	100	100	Semi-annually	NCRTC
2. Construction of underground section (civil works), including stations with climate and disaster-resilient features and CCTV cameras installed	%	0	10	30	50	70	85	100	100	100	Semi-annually	NCRTC

<sup>1</sup> The data source for the indicator will be the RRTS user survey conducted by NCRTC.

4. Number of women who received training for employment and/or entrepreneurial opportunities arising from improved railway <sup>2</sup>	Number	0	N/A	N/A	N/A	N/A	1,400	1,400	1,400	1,400	Annually	NCRTC/ contracted organiza- tion
5. Number of differently-abled persons received hearing, visual and/or physical mobility assistive aids <sup>3</sup>	Number	0	N/A	N/A	N/A	N/A	1,000	1,000	1,000	1,000	Annually	NCRTC/ contracted organiza- tion
6. Climate adaption/resilience measures incorporated into Project design	Y/N	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Annually	NCRTC

CCTV = close circuit television; N/A = not applicable; NCRTC = National Capital Region Transport Corporation

<sup>2 3</sup> The data source would be the progress and completion reports submitted to AIIB, ADB and NCRTC by the contracted organization, including certificates issued upon completion of trainings and/or receipt of assistive aids.

## Annex 2: Detailed Project Description

### A. Delhi–Meerut Regional Rapid Transit System

1. The National Capital Region (NCR) is a multi-state region with Delhi as its center, covering an area of 55,083 square kilometer spread over the States of Haryana, Rajasthan, Uttar Pradesh and the National Capital Territory (NCT) of Delhi. The NCR is a highly urbanized region with high population and economic growth, involving large scale transportation of people and goods within the region. To promote the development of the NCR in a balanced manner, the NCR Planning Board conducted a study that recommended a rail-based regional commuter transit system, namely Regional Rapid Transit System (RRTS) for NCR. A total of eight RRTS corridors linking Delhi to surrounding cities have been proposed, out of which the Delhi–Meerut, Delhi–Alwar and Delhi–Panipat have been taken up for implementation in the first phase. The proposed Project is to construct the Delhi–Meerut corridor.

2. The Project specific details are as following: Corridor length of 82 kilometers (km), elevated stretch of 68 km (Delhi – 9.29 km, Uttar Pradesh – 58.74 km), underground stretch of 14 km (Delhi – 3.71 km, Uttar Pradesh – 10.41 km), 24 stations (16 RRTS and 8 Meerut Metro). The alignment of the Project is presented in Figure A2.1.

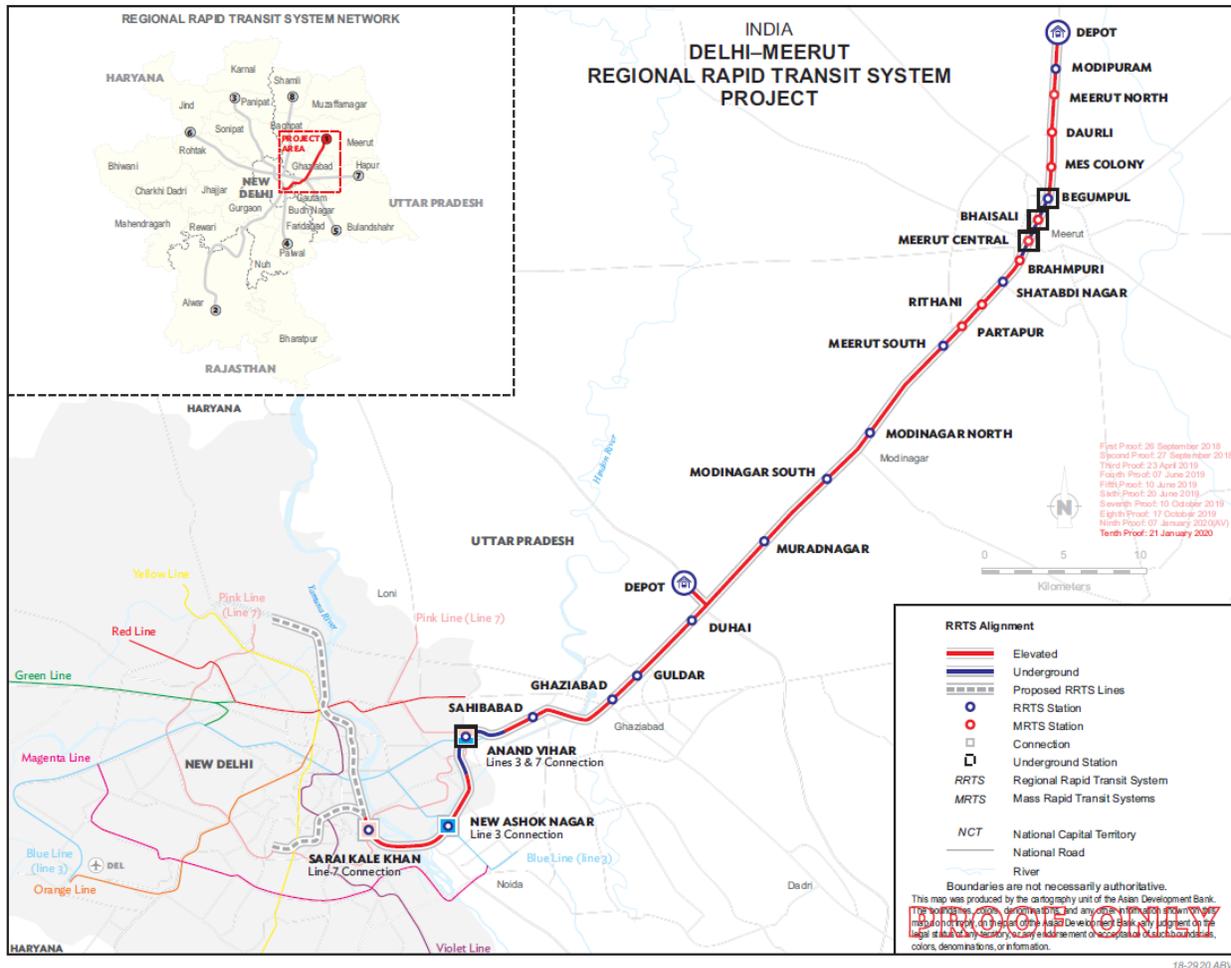
3. The RRTS infrastructure is also proposed to be used for operation of metro rail services in Meerut to meet the local mobility needs. Metro Services between Meerut South and Modipuram will be on RRTS Infrastructure (12 stations). The RRTS would be alternatively stopping on the stops between Meerut South and Modipuram, whereas Meerut Metro on the same infrastructure would halt at all stops between Meerut South and Modipuram. This arrangement will enable both the regional and local connectivity using the same infrastructure. This overlapping of alignment has saved considerable capital investment required for exclusive Meerut Metro works.

### B. Detailed Description of Project Component

4. The Project component to be jointly cofinanced by the Asian Infrastructure Investment Bank (AIIB) and the Asian Development Bank (ADB) includes civil works for elevated and underground sections with stations, two depots, track work and traction.

5. **Elevated and underground sections.** The elevated section of the RRTS will run along the median of the existing roads in most areas. As per the detailed project report, double U-shaped girder with full segment launching has been proposed as the option for the RRTS viaduct. The next option proposed is precast post-tensioned segmental box girder. Topographical surveys and geotechnical investigations have been carried out to avoid delays due to unexpected site conditions during project implementation. For underground section, two parallel tunnels are with a single track in each tunnel are planned. Long tunnels are recommended to be constructed by bored tunnel method using tunnel boring machine. The choice of earth pressure balancing machines and/or slurry shield machines would be decided during detailing of the tunnel construction.

Figure A2.1. Delhi–Meerut Regional Rail Transit System Alignment Map



Source: National Capital Region Transport Corporation.

6. All underground stations will be constructed with cut-&-cover method of construction. Underground section execution will be done through contractors on design-build basis where the detailed designs will be prepared by the contractors. Tunnel finished diameter will be 6.5 meters and it will be generally 15 meters below the ground level (it may vary as per the site conditions). No tunnel section is passing below the riverbed.

7. **Stations.** A total of 24 stations have been planned considering the maximum peak hour traffic load. Station locations have been determined to serve major passenger catchment and destination areas, and to enable convenient integration with other transport modes, while considering inter-station distance, spacing, land availability and utilities, among others. Building Information Modelling will be used to design the stations, which follows an intelligent three-dimensional model-based process that will help more efficiently plan, design, construct and manage stations. Potential non-fare box revenue resources, such as advertisements and

retailers, are under consideration. The stations will include gender and socially inclusive features to provide universal accessibility, which will benefit women and differently-abled passengers.

8. **Depots.** For the Project, it is proposed to have two depots, one at Duhai and the other at Modipuram. The depot type will be “out in the open” and “long and thin”. All rolling stock will return to either Duhai Depot or Modipuram Depot for overnight cleaning and servicing. In the year 2041, it is proposed to have rolling stock stabling as following: 10 in Modipuram depot and 21 (including 3 spare) in Duhai depot. The Duhai depot will be capable of undertaking all overhauls. In the inter-peak period, Modipuram depot will be used to stable the units.

9. **Trackwork.** For underground and elevated alignment, ballast less track and for depots ballasted track as well as embedded track has been proposed. The track for RRTS has been selected based on the requirements of track gauge, track structure, track center, speed potential and axle load, ruling gradient, vertical and horizontal curves, rails, turnouts, track fittings and buffer stops. Track maintenance technologies are continuously being developed to meet the demands of high-performance railway businesses and investment in high-tech machines is a good strategy.

10. **Traction (Power Supply System).** Dedicated Power supply at 220 kilovolts (kV) and 66 kV will be taken from Grid Sub-stations of Delhi and Uttar Pradesh utilities based on the geographical location of the NCRTC receiving substations (RSS) through 100 percent standby cable system. This will feed to the traction and auxiliary power supply requirements of the Delhi–Meerut RRTS corridor. It is proposed to have five RSS in this corridor. The locations of the RSS have been selected based on the even distribution of the power load between substations, the land available for construction of the substation and the feasibility of getting the supply from nearby grid of the utilities. The power supply of 25 kV for traction and 33 kV for auxiliary substations are to be integrated in such a way that in case of failure of one RSS, the adjacent RSS will be able to take on the load of the failed RSS. The entire system of power supply (receiving, traction and auxiliary supply) will be monitored and controlled from the operation control center (OCC) through supervisory control and data acquisition (SCADA) system.

11. Traction system will consist of 1x25 KV AC flexible overhead equipment (OHE) system for the elevated and rigid overhead catenary system for the underground section respectively. For the auxiliary power supply, a 33 kV duplicate cable ring network will be provided in the corridor. At every station and depot, there shall be auxiliary substations, which will step down 33 kV to 415 volts to meet the auxiliary power supply requirements of the station and the depot. Copper silver contact wire and copper magnesium catenary wire will be used in flexible OHE system and aluminum conductor rail with copper silver contact wire will be used for rigid OHE system. The return conductor will be all aluminum conductor of suitable cross section. From safety considerations, spring type auto-tensioning device is proposed on the mainline. The entire system of power supply (receiving, traction and auxiliary supply) will be monitored and controlled from the OCC through SCADA system.

12. **Signaling and Telecommunications (excluded from Project financing).** The planned signaling and train control system is the Continuous Automatic Train Control System system. The Continuous Automatic Train Control System comprises automatic train protection, automatic train operation, automatic train supervision and computer-based interlocking. The communication subsystems will provide voice, data and video signal communications between OCC, depots, stations and other locations located throughout RRTS corridor, other designated areas and other facilities through radio and fiber-based communication network. All sub-systems will be designed on a distributed architecture principle, with equipment at all stations and at OCC. All platform will have platform screen doors to enhance safety.

13. An Automatic Fare Collection System (AFCS) is a method of providing automated revenue management. An AFCS facilitates the purchase of pre-paid tickets that can be used to permit access to/from various transport modes using electronic systems and thus eliminate all human error and confrontation. An AFCS also provides valuable information for the management of the transport system and helps to enforce the safety and security policy of the transport system.

### C. Implementation Arrangements

14. MoHUA acting through NCRTC will be the Project implementing entity and the Project organization structure is presented in Figure A2.2.

15. **Implementation Schedule.** NCRTC plans to complete the Project by 2025. However, given the Project's complexity and large geographical scope, ADB and AIIB has budgeted some buffer in the implementation period and therefore anticipates the Project to be completed by August 2027 at the latest. NCRTC supported by the general consultant will share a Gantt chart with indicative high-level timelines to be regularly reviewed by AIIB and ADB during project implementation.

### D. Operation and Management

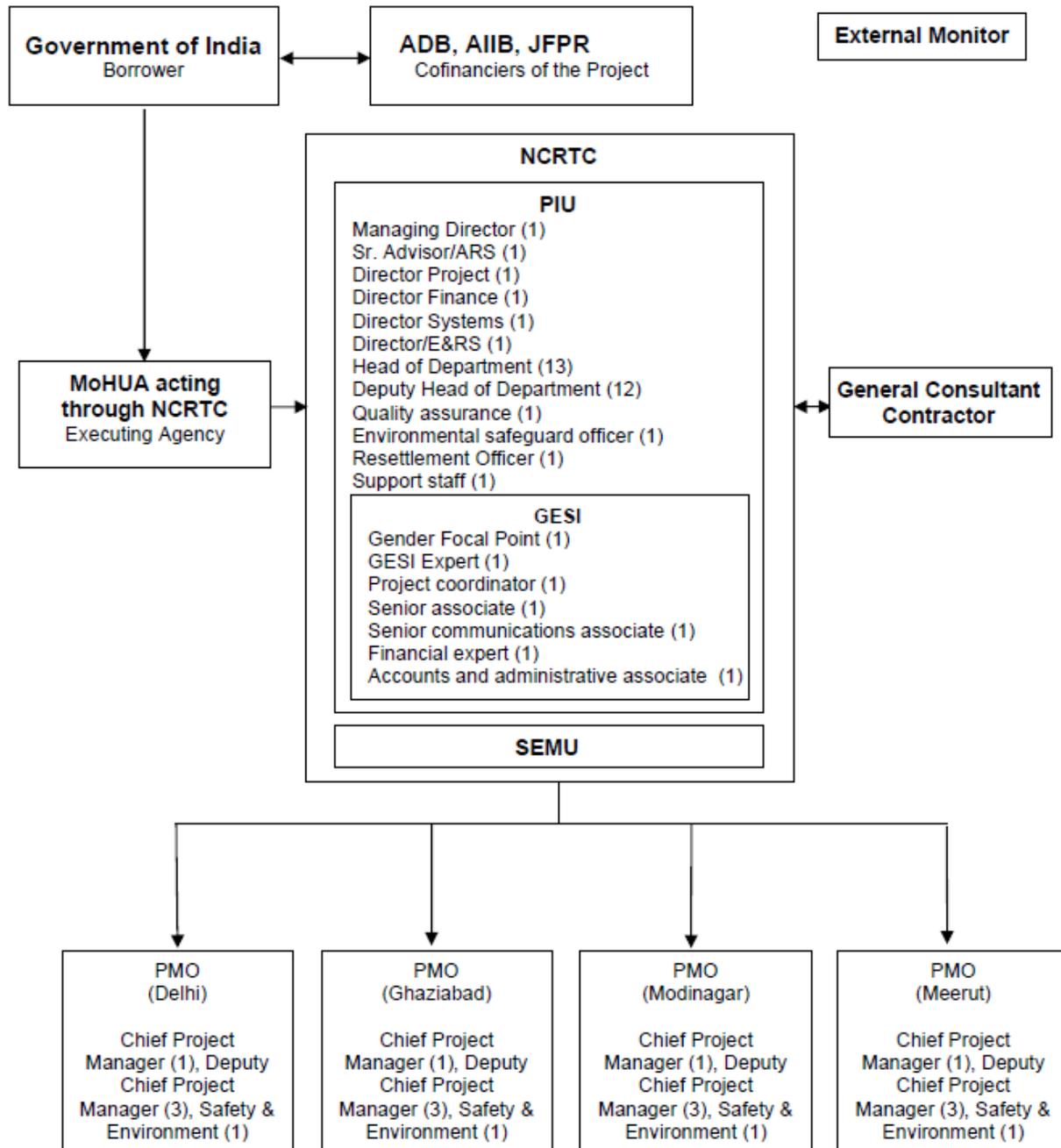
16. **Operation Plan.** The operational plan for the Project is under active discussion within NCRTC. Based on the projected Peak Hour Peak Direction Traffic demand, train operation has been planned as summarized in Table A2.1. As per the detailed project report, no services are proposed between 12:00 AM and 5:30 AM, which are reserved for maintenance of infrastructure and rolling stock.

**Table A2.1:** Headway and Capacity Provided for the Delhi–Meerut Regional Rail Transit System Project as per Detailed Project Report

Parameters	2031	2041
Peak Hour Peak Direction Traffic	22,215	26,462
Number of Trains	13	15
Headway in seconds	4.62	4
Time for round trip in minutes	108	108

Parameters	2031	2041
Number of coaches per train	9	9
Total number of coaches	216	243

**Figure A2.2.** Project Organization Structure



ADB = Asian Development Bank, AIIB = Asian Infrastructure Investment Bank, ARS = alternative revenue sources, E&RS = electrical and rolling stock, JFPR = Japan Fund for Poverty Reduction, MoHUA = Ministry of Housing and Urban Affairs, NCRTC = National Capital Region Transport Corporation, PIU = project implementation unit, PMO = project management office, SEMU = social and environment safeguard management unit.

Source: National Capital Region Transport Corporation.

### Annex 3: Economic and Financial Analysis<sup>1</sup>

#### Demand Analysis for Economic and Financial Analysis

1. Surveys and studies like origin destination surveys, passenger head count surveys, classified traffic volume count surveys, occupancy surveys, stated preference surveys have been carried out to assess the traffic and travel characteristics along the Delhi–Meerut Regional Rail Transit System (RRTS) corridor. In addition, secondary data on socioeconomic profile of Project influence areas were also considered for traffic forecasts. After estimating the potential catchment area trips, data collected by stated preference surveys was analyzed to estimate shift from a given Origin-Destination (OD) pair to RRTS based on the travel time, travel cost and waiting for that OD pair. The resulting composition of modal shift is 22 percent from car, 15 percent from two-wheeler, 2 percent from bus and 15 percent from rail.
2. The daily ridership estimates used in economic and financial analysis are based on the detailed project report's (DPR) transport and demand forecasting model (Table A3.1), while applying additional sets of conservative assumptions respectively on the DPR estimates. The ridership estimates used in the economic and financial analysis have been gradually escalated to and capped at a maximum of 750,000 on a conservative basis.

**Table A3.1.** Daily Ridership Estimates<sup>2</sup> (Detailed Project Report)

Year	Daily Ridership
2021	742,332
2031	919,612
2041	1,135,530

Source: National Capital Region Transport Corporation.

#### Economic Analysis

##### A. Economic Cost

3. The economic costs are calculated from the market prices of capital expenditure (capex) and O&M expenditure (opex) and their respective conversion factors as per 'Appraisal Guidelines for Metro Rail Project Proposals' by Ministry of Housing and Urban Affairs (MoHUA guidelines), 2017. The market prices of the capex are based on inputs from the National Capital Region Transit Corporation. The opex includes maintenance, energy, manpower and rehabilitation grant taken from the DPR. The energy opex includes expenditure toward traction and auxiliary power for the stations. The results are listed in Table A3.2.

**Table A3.2.** Economic Costs (USD million)

Expenses	Cumulative costs in market prices	Conversion factors	Economic costs
Capex	3,963	0.83	3,289
O&M	3,736	0.87	3,250
<b>Total Expenditure</b>	<b>7,750</b>	<b>0.84</b>	<b>6,539</b>

Source: Asian Development Bank.

<sup>1</sup> ADB. 2020. Economic and Financial Analysis for Delhi-Meerut RRTS Investment Project (51073-002)

<sup>2</sup> The DPR was prepared in 2016 and updated in 2018. During the traffic study it was assumed that the operation would commence in 2021.

## B. Economic Benefits

4. The Project is expected to accrue multiple benefits such as time savings, fuel savings, savings in vehicle operating cost (VoC), and reduced pollution. All the benefits are calculated in market price terms and then converted to economic prices using conversion factors as per MoHUA guidelines. The ridership estimates used for the calculation of economic benefits gradually ramp up from 200,000 passengers per day and are capped at maximum ridership of 750,000 passengers per day, which is a more conservative assumption than that of financial analysis.

5. **Time Savings.** Time savings are calculated for the new passengers that are expected to shift from existing modes to RRTS, who will enjoy savings in travel time as RRTS provides higher average speed (90 kilometers per hour based on conservative assumption) vis-à-vis roads (26 kilometers per hour). Time savings calculation also includes the time savings of passengers that continue to use existing modes with less congestion and consequent increase in their average speed after commissioning of RRTS. It was assumed that passengers using existing modes would benefit from an increase of 25 percent in their average speed. The increase in average speed has been tested with various values and the final EIRR is not highly sensitive to this parameter. The growth in the passengers on roads after 2031 have been forecasted using the weighted average compound annual growth rate (CAGR) of the decadal population growth of Delhi, Ghaziabad and Meerut.

6. The monetary value of time savings is computed as the product of total time saved and the value of time (VoT). The VoT is obtained as USD1.02 per hour by taking weighted average of per capita incomes of Delhi, Ghaziabad and Meerut. The result is listed in Table A3.3.

**Table A3.3.** Value of Time Savings in Economic Terms (USD million)

<b>Travel Time Savings</b>	<b>2025</b>	<b>2030</b>	<b>2035</b>	<b>2040</b>	<b>2045</b>	<b>2050</b>	<b>2054</b>
Modal shift to RRTS	126	292	421	538	688	880	1,071
Reduced congestion on road	25	56	85	116	158	215	276
<b>Total</b>	<b>151</b>	<b>348</b>	<b>506</b>	<b>654</b>	<b>846</b>	<b>1,095</b>	<b>1,347</b>

RRTS = regional rail transit system.

Source: ADB.

7. **Fuel Savings.** There will be fuel savings due to reduction in the number of vehicles on the road after a shift of passengers from road to RRTS. The fuel cost per distance travelled by different category of vehicles (cars, two-wheelers and buses) follows the Ministry of Housing and Urban Affairs (MoHUA) guidelines. Monetary values of such fuel savings are then converted into economic prices using a conversion factor of 0.90. The energy cost of RRTS has been accounted for in the O&M cost.

8. **Savings in VoC:** The distance that would have been travelled by the vehicles without RRTS is computed using an average trip length of 30 km and modal shift composition obtained from NCRTC. The VoC per distance travelled by a vehicle is considered according to MoHUA reguidelines.

9. **Savings on Account of Reduced Pollution.** The quantity of pollutants that would have been released into the atmosphere by existing vehicles without RRTS is computed by multiplying emission factors of each category of vehicles and their respective distances saved due to RRTS. The treatment costs of various pollutants (PM, NO<sub>x</sub>, HC, CO & CO<sub>2</sub>) as per MoHUA guidelines<sup>3</sup> are then multiplied to estimate savings from reduced pollution. Similarly, the environmental cost due to generation of electricity consumed by RRTS is also calculated using carbon dioxide emission factors from various fuels used for electricity generation and fuel mix for electricity generation in India and electricity consumed by the RRTS system. Net economic benefits are calculated as the difference between the two. All emission costs are escalated 2 percent annual to reflect increasing marginal damage of global warming.

10. **Non-Quantifiable Benefits.** In addition to the quantifiable Project benefits considered in the economic analysis, the expected non-quantifiable benefits of the Project include: (i) savings due to enhanced road safety and reduced road maintenance costs; (ii) economic stimulation in the region with the labor demand directly generated by the Project; (iii) facilitation of better urban planning and development of the Project area; and (iv) enhanced safety and security, in particular for women and differently-abled passengers.

### C. Results and Sensitivity

11. **Economic Internal Rate of Return.** As summarized in Table A3.4., the Project economic internal rate of return (EIRR) was found to be 11.33 percent and net present value of USD922 million at a 9 percent discount rate. The analysis included six sensitivity tests to ensure a robust result, and the results are listed in Table A3.5.

**Table A3.4.** Economic Cost and Benefit Flows (USD million)

Year	CAPEX	O&M	Saving in Fuel	Saving in VOC and other	Saving in travel time	Reduction in pollution	Net benefits
2019	66	-	-	-	-	-	(1)
2020	323	-	-	-	-	-	(4)
2021	552	-	-	-	-	-	(7)
2022	789	-	-	-	-	-	(10)
2023	817	-	-	-	-	-	(11)
2024	654	-	-	-	-	-	(9)
2025	-	59	39	34	151	4	2
2026	-	70	44	39	178	4	3
2027	-	81	50	44	211	5	3
2028	-	93	57	50	249	6	4
2029	-	105	65	57	295	7	4
2030	-	109	75	65	348	8	5
2031	-	108	85	74	412	9	6
2032	30	108	85	74	434	10	6
2033	-	107	85	74	456	10	7
2034	-	107	85	74	480	10	7
2035	-	111	85	74	506	10	7
2036	-	110	85	74	532	11	8
2037	-	110	85	74	560	11	8
2038	-	110	85	74	590	11	9
2039	-	109	85	74	621	11	9

<sup>3</sup> Treatment costs for pollutants as per MoHUA guidelines: INR 100/kg for NO<sub>x</sub>, HC, CO, and INR 0.5/kg for CO<sub>2</sub>.

Year	CAPEX	O&M	Saving in Fuel	Saving in VOC and other	Saving in travel time	Reduction in pollution	Net benefits
2040	-	114	85	74	654	11	9
2041	-	113	85	74	688	12	10
2042	11	113	85	74	725	12	10
2043	-	113	85	74	763	12	11
2044	-	112	85	74	803	12	11
2045	47	117	85	74	846	13	11
2046	-	117	85	74	891	13	13
2047	-	117	85	74	938	13	13
2048	-	116	85	74	988	13	14
2049	-	116	85	74	1,040	14	14
2050	-	121	85	74	1,095	14	15
2051	-	121	85	74	1,153	14	16
2052	-	121	85	74	1,214	14	17
2053	-	121	85	74	1,279	15	18
2054	-	120	85	74	1,347	15	19
<b>EIRR</b>							<b>11.33%</b>
<b>NPV at 9%</b>							<b>922</b>

Capex = capital expenditure, O&M = operation and maintenance, VOC = vehicle operating cost.  
Source: Asian Development Bank.

**Table A3.5. Sensitivity Analysis**

Scenario	EIRR (%)	NPV at 9% (USD million)
Reduction in ridership (10%)	10.36	517
Reduction in ridership (20%)	9.31	113
Increase in Capex (5%)	10.96	799
Increase in Capex (10%)	10.61	676
Delay in benefit (1 year)	10.29	520
Delay in benefit (2 years)	9.38	154

EIRR = economic internal rate of return.  
Source: Asian Development Bank.

## Financial Analysis

12. The financial analysis of the Project has been carried out in accordance with ADB's guidelines using the discounted cash-flow method to calculate the FIRR. It covers a period of 30 years after commercial operations commence in 2025. All financial calculations have been done in 2019 Indian rupees terms, with no adjustment for inflation.

### A. Project Costs

13. The capital cost has been computed based on updated estimates by NCRTC. For the purpose of financial analysis, the capital cost includes costs of civil works, station buildings, E&M works, depots, permanent ways, traction, signaling and telecommunications, land acquisition, R&R, rolling stock (among other miscellaneous costs), contingency, general charges and goods and services tax (GST). The total Project cost details have been captured in Table A3.6.

**Table A3.6: Total Project Cost (USD billion)**

Costs	Value
Total Hard Costs	3.7
Post-Construction Costs	0.1
Total Soft Costs	0.1

Costs	Value
TOTAL (including post-construction costs)	4.0
TOTAL (excluding post-construction costs)	3.9

Source: Asian Development Bank.

Note: Numbers may not sum precisely due to rounding.

14. The O&M costs include maintenance, energy, manpower and rehabilitation grant taken from the DPR. As per the DPR, energy costs have been based on the assessments given by Coach Manufacturers and Indian Railways specifications for new EMU coaches, TGV trains and Metro trains in India. Energy costs have not been escalated for the duration.

## B. Revenues

15. Revenues are mainly derived from farebox (ticket sales). The fares expressed in 2016 INR terms are brought to 2019 levels using a 5 percent escalation. The fares have not been escalated further for the entire duration of operations. The fares used for computation of farebox revenue have been taken from 'Preparation of Public Transport Travel Demand Model for RRTS in NCR' as provided by NCRTC. As per NCRTC, the initial fares fixed by NCRTC, would be subsequently reviewed and/or updated by the Fare Fixation Committee. An average fare of INR160 (at 2016 levels) is proposed between Sarai Kale Khan station and Modi Puram station based on the passengers' willingness to shift to RRTS, time and cost savings, and revenues maximization.

16. A comparison has been made with fares of various modes of public transport that are currently available between Delhi Meerut sections. Table A3.7 presents the 2016 fares of various modes of public transport. With the proposed fare for RRTS, the table clearly demonstrates that RRTS offers a more affordable fare for its passengers compared to other existing modes of public transport.

**Table A3.7: Mode-Wise Comparison of Existing Fare Structure (INR)**

Mode	Delhi-Meerut Fare
Train-AC Chair Car (Delhi-Meerut City/Meerut Cantt)	260
Shatabdi Fare	320
Express Train-Sleeper Class (Delhi-Meerut City/Meerut Cantt)	140
State Transport bus (Non-AC)	106
State Transport AC Volvo Bus	246
Super Fast Train - AC III Tier	490
Shared Taxi	263

Source: National Capital Region Transport Corporation.

17. Non-farebox revenues include revenue from commercial areas, advertisement, transit-oriented development, additional stamp duty, and additional development fee. NCRTC has conducted a study to identify the relevant value capture financing (VCF) instruments and estimates in the DPR, so that the estimates are realistic and implementable. VCF instruments contribute a revenue of around USD10.3 billion equivalent over the Project period to the state government, out of which a share of USD2 billion equivalent (20.4 percent) is proposed to be allocated for RRTS debt servicing. It is pertinent to note that in addition to VCF instruments, non-fare box revenues are going to be supplemented by revenues from development of commercial areas and advertisements. However, these revenues would take time for mobilization and would

need an institutional mechanism for ploughing back the funds collected by local government bodies into the Project implementing agency. Therefore, a conservative approach has been adopted for non-farebox revenues and it has been assumed to be USD0.4 billion equivalent (5 percent of the fare revenue) for the entire 30 years operations period.

18. **Results and Sensitivity Analysis.** The base case FIRR is found as 2.5 percent. The model’s key sensitive variables along with their impact on the Project’s IRR have been captured in Table A3.8.

**Table A3.8: Sensitivity Analysis**

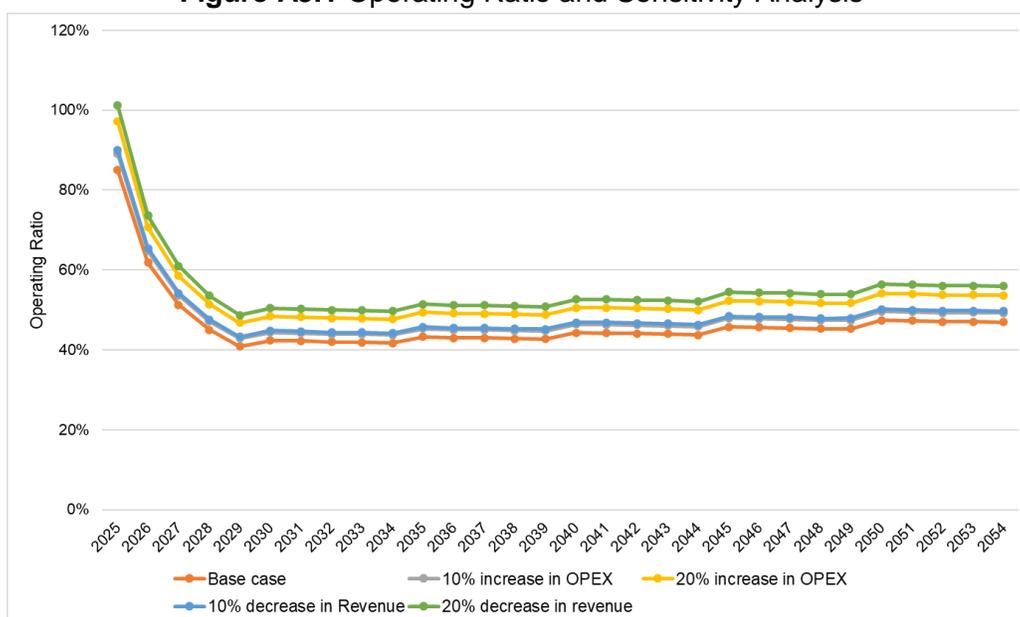
Change in Fare	FIRR
+10%	3.1
-10%	1.8
Change in Ridership	FIRR
+10%	3.1
-10%	1.8
Change in Project Cost	FIRR
+10%	2.1
-10%	2.9
<b>Non-inclusion of non-fare revenue</b>	2.2

FIRR = financial internal rate of return.

Source: Asian Development Bank.

19. In addition to reviewing the results of ADB’s financial analysis, AIIB team has also assessed the operating ratio (operating expenses divided by total revenue) to determine whether revenues are sufficient to cover operating expenses. The base case scenario would produce an operating ratio of 46 percent on average over 30 years of operations period. Figure A3.1 presents the operating ratios for different operating expense or the revenue level. The analysis indicates that revenue will be adequate to cover O&M expenses in various scenarios.

**Figure A3.1 Operating Ratio and Sensitivity Analysis**



## Annex 4: Sovereign Credit Fact Sheet

### A. Recent Economic Development

1. India is a lower-middle-income country, with a GDP per capita at USD 2,104 and a population of 1.37 billion in 2019.<sup>1</sup> It is the world's third largest economy by purchasing power parity. India's economy grew at an average annual rate of 7.4 percent between FY2014 and FY2018 but has slowed down in recent years.<sup>2</sup> Following disruptions due to the demonetization initiative in November 2016 and the rollout of goods and services tax in July 2017, growth slowed to 7.0 percent in FY2017 and 6.1 percent in FY2018.<sup>3</sup> Growth slowed down further to 4.2 percent in FY2019 due to sluggish growth in private consumption, investment and exports, owing to weak rural income growth, stress in the financial sector, and sluggish global demand. Growth in the last quarter of FY2019 (January to March 2020) and first quarter of FY2020 (April to June 2020) was significantly dented by COVID-19 outbreak and associated lockdown introduced by the government.<sup>4</sup> The Indian economy contracted by 23.9 percent in the first quarter of FY2020.

2. Low food prices helped inflation declining from 4.5 percent in FY2016 to 3.4 percent in FY2018. This allowed the central bank to reduce key policy rates by 135 basis points between February 2019 and October 2019. Inflation started inching up from mid-2019 on account of higher food prices and rise in retail oil prices. Inflation averaged 6.8 percent in the first half of FY2020 due to supply side disruptions. Despite this, the central bank reduced the repo and reverse repo rates by 115 and 155 basis points to 4.0 and 3.35 percent respectively, to stimulate aggregate demand, which had declined due to the lockdown. The central bank introduced several measures to reduce the borrowing cost, bolster liquidity, and improve credit flow to the productive sectors.

3. After rising for two years, the current account deficit shrank to 0.9 percent of GDP in FY2019. Slowdown in economic activity led to a contraction in merchandise imports while exports remained weak as global demand turned sluggish. The current account recorded a surplus of 3.9 percent of GDP in the first quarter of FY2020 due to a sharp fall in trade deficit, and stable services balance. A drop in oil prices and weak domestic demand led to merchandise imports contracting by 40 percent in the first half of FY2020 while exports declined by a smaller 21.3 percent.

4. General government fiscal deficit at 8.2 percent of GDP remained high in FY2019, reflecting tepid growth in revenue and higher recurrent expenditure. A downturn in revenue due to economic slowdown and higher spending on the stimulus package resulted in the fiscal deficit in the first half of FY2020 exceeding the annual target.

### B. Economic Indicators

<sup>1</sup> The income group classification for fiscal year 2019 is based on World Bank criteria.

<sup>2</sup> Data is based on fiscal years. Fiscal year 2020 (FY2020) begins on 1 April 2020 and ends on 31 March 2021.

<sup>3</sup> 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.

<sup>4</sup> On March 24, the government announced a nationwide lockdown till April 14, subsequently extended to May 30. Lockdown was eased beginning June 1

## Selected Macroeconomic Indicators (FY2015-FY2021)

<b>Economic Indicators<sup>#</sup></b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019*</b>	<b>FY 2020*</b>	<b>FY 2021*</b>
Real GDP Growth	8.2	7.0	6.1	4.2	-10.3	8.8
Inflation (% change, average)	4.5	3.6	3.4	4.8	4.9	3.7
Current account balance (% of GDP)	-0.6	-1.8	-2.1	-0.9	0.3	-0.9
General government overall balance (% of GDP)	-7.1	-6.4	-6.3	-8.2	-13.1	-10.9
Nominal gross public debt (% of GDP)	68.8	69.4	69.6	72.3	89.3	89.9
Public gross financing needs (% of GDP) <sup>1</sup>	11.1	11.0	10.5	11.4	17.6	15.4
External debt (% of GDP) <sup>1</sup>	20.6	20.0	18.9	19.1	19.2	19.1
Gross external financing need (% of GDP) <sup>1</sup>	9.3	9.6	10.4	10.0	9.5	11.0
Net Foreign Direct Investment Inflow (% of GDP)	1.6	1.1	1.1	1.3	...	...
Gross reserves (USD billion) **	370.0	424.5	412.9	434.0	551.5	...
Broad money (M2, % change)	10.1	9.2	10.5	9.7	...	...
Exchange rate (Rupee/USD, EOP) **	67.9	63.7	69.6	76.6	73.8	...

Note: <sup>#</sup> Data is based on fiscal years.

\* denotes projected figures.

\*\* FX data from Financial Benchmarks India FX rate as of October 29, 2020 while Reserves data pertains to August 2020.

<sup>1</sup> For FY2020 and FY 2021, AIIB Staff Estimates based on IMF Data

Source: IMF, World Economic Outlook Database, April 2020, IMF Country Report No. 19/385, December 2019 and Reserve Bank of India, Government of India.

### C. Economic Outlook and Risks

5. According to the World Economic Outlook, released in October 2020, the economy is expected to contract by 10.3 percent in FY2020. The imposition of a lockdown, with limitations on mobility of people and products, to contain the outbreak, has significantly disrupted demand and supply. With the gradual easing of lockdown from June 2020, many of the high frequency indicators like purchasing managers' index, electricity generation, freight traffic e-way bills, registering interstate shipments indicate a revival of economic activity in the second quarter of FY2020. Growth is expected to pick up strongly in FY2021 as COVID-19 dissipates and stimulus measures have an impact with a lag.

6. In May 2020, Moody's downgraded India's rating to Baa3 with a negative outlook and in June, Fitch revised India's outlook to negative, due to slow reform momentum and challenging economic environment, limited fiscal space and stress in the financial sector.

7. Overall inflation is expected to increase marginally to 4.9 percent in FY2020, due to inflationary pressures from disruptions in supply chains. However, sluggish aggregate demand on account of the lockdown and lower oil prices may dampen the inflationary pressures. Stickiness in food prices and rise in oil prices could raise inflation above the expected level.

8. Recognizing that an expansionary fiscal policy is required to mitigate the economic effect of COVID-19 pandemic, the central government announced several fiscal support measures. These include (a) direct spending including cash transfers, wage support and providing food and cooking gas to low income households (2.0 percent of GDP), (b) foregone or deferred revenue (0.3 percent of GDP) and (c) credit provision (5.2 percent of GDP). An additional 0.1 percent of GDP has been allocated for health infrastructure. In October 2020, additional measures

amounting to 0.2 percent of GDP was announced to support consumption. Various states have also announced additional relief measures. The anticipated economic contraction in FY2020 will adversely impact tax collections. The general government fiscal deficit is expected to significantly increase to 13.1 percent of GDP in FY2020. Public debt is also estimated to rise sharply to 89.3 percent of GDP in FY2020, levels last witnessed in early 2000s. Despite being high, India's public debt remains sustainable given favorable debt dynamics and the projected increasing economic growth trend in the medium term. Furthermore, with public debt having a long and medium maturity, being denominated in domestic currency and primarily held by residents, the debt profile is favorable. India's external debt is expected to remain stable.

9. The current account balance is expected to record a small surplus in FY2020. Sluggish domestic economic activity and subdued oil prices will result in import bill declining significantly. Exports of goods and services are likely to contract given the decline in global demand. Remittances are also expected to decline as lower oil prices in Middle East and spread of the COVID-19 pandemic in advanced economies reduce economic activity in these countries, where most migrant Indian workers are employed.